



**2014 REGIONAL GROUNDWATER MONITORING AND WELLS
REHABILITATION PROGRAM
NORTH ATHABASCA OIL SANDS AREA
REGIONAL GROUNDWATER MONITORING NETWORK**

Report Prepared for:
ALBERTA ENVIRONMENT AND SUSTAINABLE RESOURCE DEVELOPMENT

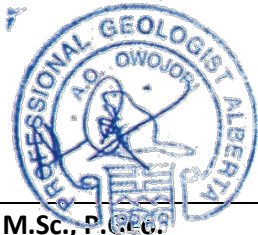
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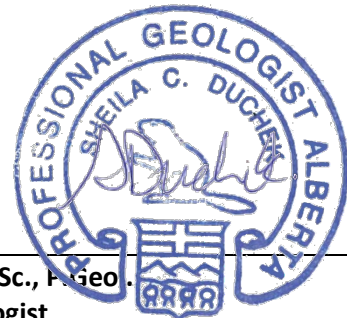
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Report prepared for Alberta Environment and Sustainable Resource Development, March 2015



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EXECUTIVE SUMMARY

The North Athabasca Oil Sands (NAOS) regional groundwater monitoring system was established in 2009 to assess regional baseline conditions and to facilitate an understanding of potential cumulative effects of oil sands activities on regional groundwater quality and quantity. The NAOS monitoring network currently includes monitoring wells installed by Alberta Research Council in the 1970s, and Alberta Geological Survey in the 1990s, and wells provided by various operators in recent years.

The 2014 program objectives were to rehabilitate a number of network wells, complete two groundwater sampling events, and evaluate field program data. Other objectives in 2014 included reviewing the overall NAOS network development strategy; updating the conceptual model of regional groundwater flow; evaluating the state of the network; identifying monitoring gaps; and preparing a program report with recommendations for the 2015 monitoring program.

Two groundwater monitoring and sampling events were completed for the 2014 NAOS field program. All 11 NAOS sites included in the program were accessed during each of the 2014 monitoring and sampling events; 33 and 28 wells (out of possible 37 wells) were sampled in the first and second events, respectively. Also as part of the field program, groundwater level and temperature data were downloaded in 35 and 34 wells (out of possible 35 wells with instrumentation) in the first and second events, respectively. Twelve (out of 16 target wells) were flushed to remove debris and sediments from the well column; two wells were fitted with new instrumentation.

Revisions to the conceptual model included compiling new and previous geologic and hydrogeologic interpretations into two new regional cross-sections. Other data sources included multiple project applications in and around the NAOS area. The hydrogeology conceptual model for the NAOS area is dominated by topographically driven groundwater flow from the uplands to the lowland plains and river valleys. The interaction of bedrock aquifers with groundwater in Quaternary aquifers at buried channel incisions and/or along subcropping edges may explain the highly variable groundwater chemistry in all units within the NAOS area.

Following the conceptual model revisions, the NAOS regional network effectiveness was evaluated based on three criteria: regulatory framework, conceptual model, and monitoring considerations. Results of the network evaluation grouped the GWN/AGS and Operator wells into three categories of relative effectiveness, with regards to meeting the network's management and regulatory objectives. Based on the results, 80% of GWN/AGS wells were categorized as "most" and "moderately" effective, compared to 49% of Operator wells. The "most" and "moderately" effective wells were more appropriately located away from existing operations and communities, and in reasonable proximity to major water bodies and bedrock incisions.

Data results indicated groundwater elevations and temperature measurements in 2014 in the key regional aquifers were similar to historical values. Seasonal temperature variations were pronounced in the Surficial Sands. Temperature charts in the Buried Channels and the Basal McMurray Aquifer mostly

indicated no trends, but showed some seasonal variations especially where the units are relatively shallow. Groundwater chemistry results in 2014 showed that at least one interim trigger parameter was exceeded in the Surficial Sands wells in Sites 1, 3, 5, 6, 8, and 12; at least one interim trigger parameter was also exceeded in the Buried Channel Aquifer wells in Sites 2 (Thickwood), 5 (Birch), 11 and 12 (Kearl). Similarly, at least one interim trigger parameter was exceeded in the Basal McMurray Aquifer (Aquifer Management Units 1 and 2) wells in Sites 7, 9, 10, and 12.

Results of statistical analysis showed that for the applicable interim trigger parameters, all 2014 data were within statistically determined upper and lower control limits except for TDS at GWN-14-32 in the Surficial Sands (Site 3, in August 2014). Results of intra-well trend analysis showed decreasing trends in the Surficial Sands wells for chloride (Sites 5 and 8), sodium (Site 6), sulphate and total ammonia nitrogen (Site 1); decreasing trends in the Buried Channel Aquifer wells for chloride and total ammonia nitrogen (Site 2), and for sodium and chloride (Site 12). No statistically significant increasing or decreasing trends was observed in the Grand Rapids Aquifer wells. In the Clearwater Formation wells, results in 2014 showed a decreasing trend for total ammonia nitrogen (Site 6). For wells in the Basal McMurray Aquifer (AMU 1), results showed decreasing trends for sulphate and total ammonia nitrogen, and increasing trend for naphthenic acids (Site 7); for Basal McMurray AMU 2 wells, decreasing trends for TDS and sulphate (Site 8), chloride and sulphate (Site 12).

Three conceptual sub-networks, A (strategic or background), B (surveillance), and C (investigative), were proposed as more effective monitoring sub-units to support the groundwater monitoring objectives. Also three new investigation areas (Kearl Channel, Lewis and Clark channels, and Birch and McKay channels) were proposed to focus attention on these high vulnerability areas.

General recommendations for the development of the NAOS regional groundwater monitoring network in 2015 included a detailed development plan to address monitoring gaps in key regional aquifers, and revision of the sampling frequency and analytical suite. Also, control limits and triggers should be considered for each key aquifer at each established NAOS monitoring location or cluster of reliable locations (reference point) as benchmarks for assessing the status of the groundwater system.

A web-based data viewer, referred to as the Client Data Portal (CDP), was developed in 2014 for ESRD to access and view all NAOS groundwater monitoring network data that are available to and stored on Matrix databases. Authorized individuals can provide feedback and recommendations to support data quality assurance/quality control beyond the current project completion date.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	iii
1 INTRODUCTION.....	1
1.1 2014 Program Scope of Work.....	1
2 BACKGROUND.....	2
2.1 Network Objectives	2
2.2 Previous Work.....	2
2.2.1 Phase 1 - Regional Monitoring Network Design.....	2
2.2.2 Phase 2 - Regional Monitoring Network Design and Implementation.....	3
2.2.3 2010 - 2011 Monitoring Program	3
2.2.4 2012 Monitoring Program	3
2.2.5 2013 Groundwater Monitoring and Wells Rehabilitation Program	4
3 METHODS – GROUNDWATER MONITORING AND WELLS REHABILITATION.....	4
3.1 Wells Identification.....	4
3.2 Network Monitoring Sites.....	5
3.3 Program Work Plans and Revisions	5
3.4 Groundwater Monitoring and Sampling Methodology.....	5
3.4.1 Groundwater Well Monitoring.....	6
3.4.2 Groundwater Sampling.....	6
3.4.3 Analytical Parameters.....	6
3.4.4 Data Evaluation.....	7
3.5 Well Flushing and Redevelopment	8
3.5.1 Instrumentation.....	9
3.5.2 Miscellaneous	9
3.6 Operator Data Requests	9
3.7 Data Management Strategy.....	10
3.7.1 Web-based Data Viewer	10
4 GEOLOGY AND HYDROGEOLOGY.....	11
4.1 Methods.....	11
4.1.1 Cross-Sections.....	11
4.1.2 Quaternary Channel Aquifers	11
4.1.3 Baseline Data	12
4.2 Hydrostratigraphic Framework.....	13
4.2.1 Quaternary Sediments and Buried Channel Aquifers.....	13
4.2.2 Viking Aquifer.....	13
4.2.3 Grand Rapids Aquifers	14
4.2.4 Basal McMurray Aquifer	14
4.2.5 Pre-Cretaceous Unconformity and Devonian.....	14
4.3 Hydrogeologic Conceptual Model	15

	4.3.1	Conceptual Model Summary	16
5		NETWORK EVALUATION	16
	5.1	Method	16
	5.2	Regulatory Framework and Conceptual Model.....	17
	5.3	Monitoring Considerations	18
6		STATISTICAL ANALYSIS OF GROUNDWATER CHEMISTRY DATA	18
	6.1	Methods.....	18
	6.1.1	Summary Statistics.....	18
	6.1.2	Statistical Analysis.....	19
7		RESULTS	20
	7.1	Statistical Analysis.....	20
	7.1.1	Surficial Sands	20
	7.1.2	Buried Channels	21
	7.1.2.1	Kearl Channel.....	21
	7.1.2.2	Birch Channel.....	21
	7.1.2.3	Thickwood Channel.....	21
	7.1.3	Grand Rapids Formation	21
	7.1.4	Clearwater Formation.....	22
	7.1.5	Basal McMurray Aquifer	22
	7.1.5.1	Basal McMurray AMU 1.....	22
	7.1.5.2	Basal McMurray AMU 2.....	23
	7.1.5.3	Basal McMurray AMU 3.....	23
	7.1.5.4	Basal McMurray AMU 4.....	23
	7.1.6	Prairie Evaporite/Beaverhill Lake/Methy (Keg River) Formations.....	24
	7.2	Groundwater Monitoring	24
	7.2.1	Site 1 (06-13-090-10 W4M)	25
	7.2.2	Site 2 (08-11-090-12 W4M)	26
	7.2.3	Site 3 (04-15-092-12 W4M)	27
	7.2.4	Site 5 (13-06-093-12 W4M)	28
	7.2.5	Site 6 (15-09-093-12 W4M)	29
	7.2.6	Site 7 (13-12-094-11 W4M)	30
	7.2.7	Site 8 (08-15-096-11 W4M)	31
	7.2.8	Site 9 (02-18-095-09 W4M)	32
	7.2.9	Site 10 (13-20-95-08 W4M)	33
	7.2.10	Site 11 (10-24-095-09 W4M)	34
	7.2.11	Site 12 (05-30-94-07 W4M)	35
	7.2.12	Operator Wells - CNRL	36
	7.2.13	Operator Wells - Cenovus.....	37
	7.2.14	Operator Wells - IOR.....	38
	7.2.15	Operator Wells - Shell.....	39

7.2.16	Operator Wells - Total	40
7.3	Miscellaneous – Petroleum Hydrocarbon in Wells.....	41
7.4	Network Evaluation	41
7.4.1	Types of Groundwater Monitoring.....	42
7.4.2	Proposed Investigation Areas	42
7.4.3	Proposed Sub-Networks	43
7.4.4	Monitoring Gaps	44
8	DISCUSSION.....	45
8.1	Surficial Sands	45
8.2	Buried Channel Aquifers	45
8.3	Grand Rapids Formation	46
8.4	Clearwater Formation.....	46
8.5	Basal McMurray Aquifer	46
8.6	Beaverhill Lake, Granite Wash and Undifferentiated Prairie/Beaverhill Lake/Keg River Formations.....	47
8.7	Groundwater Hydrochemistry.....	47
9	CONCLUSIONS.....	49
10	RECOMMENDATIONS	49
11	REFERENCES.....	51

LIST OF FIGURES

FIGURE A	Groundwater Monitoring Directive Statistical Methods Overview.....	19
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LIST OF TABLES

TABLE A	Interim Regional Groundwater Quality Triggers for the North Athabasca Oil Sands Area	7
TABLE B	Well Flushing and Development Summary.....	8

FIGURES

FIGURE 1	Site Location
FIGURE 2	NAOS Regional Groundwater Monitoring Network
FIGURE 3	Hydrostratigraphic Column
FIGURE 4	Hydrogeologic Cross-section, Birch Mountains - Mackay Plains
FIGURE 5	Hydrogeologic Cross-section, Birch Mountains - Muskeg Mountain
FIGURE 6	Buried Channel Aquifer
FIGURE 7	Surficial Deposits Aquifer
FIGURE 8	Bedrock Geology
FIGURE 9	Grand Rapids Aquifer
FIGURE 10	Basal McMurray Aquifer
FIGURE 11	Proposed Investigation Areas and Monitoring Well Categories

TABLES

TABLE 1	Monitoring Wells Summary
TABLE 2	2014 Field Program Summary
TABLE 3	Operator Wells Summary
TABLE 4	Network Evaluation Criteria
TABLE 5	Groundwater Quality Results - Field Parameters
TABLE 6	Groundwater Quality Results - General Parameters
TABLE 7	Groundwater Quality Results - Metals
TABLE 8	Groundwater Quality Results - Hydrocarbons
TABLE 9	Groundwater Quality Results - Polycyclic Aromatic Hydrocarbons
TABLE 10a	Water Quality Control Sample Results - Field Parameters
TABLE 10b	Water Quality Control Sample Results - General Parameters
TABLE 10c	Water Quality Control Sample Results - Metals
TABLE 10d	Water Quality Control Sample Results - Dissolved Hydrocarbons
TABLE 10e	Water Quality Control Sample Results - Polycyclic Aromatic Hydrocarbons
TABLE 11a	Water Quality Control Sample Results - General Parameters - Blanks
TABLE 11b	Water Quality Control Sample Results - Metals - Blanks
TABLE 11c	Water Quality Control Sample Results - Dissolved Hydrocarbons - Blanks
TABLE 11d	Water Quality Control Sample Results - Polycyclic Aromatic Hydrocarbons – Blanks
TABLE 12	Network Evaluation Results (GWN-AGS Wells)
TABLE 13	Network Evaluation Results (Operator Wells)
TABLE 14	Proposed Sub-networks

APPENDICES

APPENDIX A	Groundwater Sampling Methods and Quality Assurance/Quality Control Protocols
APPENDIX B	Client Data Portal Overview
APPENDIX C	Statistical Analysis Charts and Tables
APPENDIX D	Laboratory Reports

1 INTRODUCTION

Alberta Environment and Sustainable Resource Development (ESRD) contracted Matrix Solutions Inc. to provide consulting services for rehabilitating, monitoring, and sampling the North Athabasca Oil Sands (NAOS) Area regional groundwater monitoring network (the network) in 2014. In addition, the program scope also included a review of the overall NAOS network development strategy to ensure the current network and future expansion monitoring sites meet management and regulatory objectives.

As part of the strategy to improve land-use decision-making in Alberta, the government, through the Land-use Framework (GoA 2008), created seven land-use regions and called for a regional management plan for each. The seven land-use regions included the Lower Athabasca Region, a substantial portion of which comprises the Athabasca oil sands. The Athabasca River is the main water source for oil sands mining activities, while groundwater provides the main water source for in situ oil sands activities within the region (GoA 2012).

The NAOS area is located within the Lower Athabasca Regional planning area and covers an area of 18,000 km², north of Fort McMurray, Alberta (Figure 1). The Lower Athabasca Regional Plan (LARP) was released in August 2012 (GoA 2012). Regionally, aquifers may be affected by resource extraction development and other activities. To support cumulative effects management at the regional level, the LARP Groundwater Management Framework (ESRD 2012a), hereafter referred to as the Framework, was also released in August 2012. The Framework encompasses three groundwater management areas, including the NAOS area. The NAOS regional groundwater monitoring network was commissioned in 2009 and comprised wells primarily from the Groundwater Observation Well Network (GWN) and Alberta Geological Survey (AGS) observation wells. In addition to these wells, data from a number of Operator wells have been provided to support the network since 2009. The network objectives include assessing regional baseline conditions and facilitating an understanding of potential cumulative effects of oil sands activities on regional groundwater quality and quantity.

1.1 2014 Program Scope of Work

The scope of work for the 2014 program consisted of two phases:

- Phase 1 included monitoring and sampling of the network GWN/AGS wells in the early summer and mid-fall. Other Phase 1 tasks included servicing select monitoring wells and downloading pressure transducers.
- Phase 2 included an evaluation of data collected in Phase 1. The work plan submitted to ESRD on October 15, 2014 (Matrix 2014a) incorporated priorities communicated through discussions and meetings between Matrix, ESRD, and the NAOS technical committee between August and September 2014. The revised work plan identified the need to review the overall NAOS network and the network development strategy. Matrix, ESRD and the NAOS technical committee confirmed the

network expansion should support meeting management and regulatory objectives. Specific tasks identified as part of the network framework revision included:

- ✦ updating the conceptual model of regional groundwater flow for the NAOS area
- ✦ evaluating the existing network for effectiveness
- ✦ identifying gaps and potential target areas based on the revised conceptual model and results of the network evaluation

2 BACKGROUND

2.1 Network Objectives

The management objectives of the NAOS monitoring network are to increase understanding of the regional hydrogeological setting and assess cumulative effects of oil sands development. The regulatory objectives of the Framework include:

- providing a better understanding of natural variability of regional groundwater conditions
- providing good baseline coverage (in areas of no anthropogenic effects) in regional aquifers
- providing further understanding of regional aquifer interactions and how/where the groundwater system is connected to surface environments
- assessing long-term water quality and water level trends (intra- and inter-well comparisons), and assessing potential cumulative effects from current and future development activities
- identifying potential high-risk areas that may require additional monitoring (including areas of suspected or known groundwater-surface water interaction)
- generating data to assess predictions contained in environmental impact assessments (EIAs) and provide a way to verify model projections
- further refining regional triggers and limits for indicator parameters for key aquifers in the NAOS area through an adaptive management process
- reporting and communicating the results to the public

2.2 Previous Work

The NAOS network development was initiated by WorleyParsons in 2007 and the network was implemented in 2009. The network was completed in two phases: an initial design phase followed by a reconnaissance and sampling phase.

2.2.1 Phase 1 - Regional Monitoring Network Design

In August 2007, WorleyParsons was retained by the Cumulative Environmental Management Association (CEMA) to develop Phase 1 of a regional groundwater monitoring network in the NAOS region. Assessment of 1,500 monitoring wells and over 132,300 pieces of water level and water quality

information was performed. Data was obtained from multiple sources and subsequently refined using standard quality assurance/quality control (QA/QC) protocol. The resulting unified dataset was then used to assess baseline geochemistry and groundwater level fluctuations for the region. WorleyParsons concluded a highly variable geochemical environment exists in the NAOS region, both spatially and within certain formations (WorleyParsons 2010a).

Aquifer vulnerability and risk mapping was used as an assessment tool to identify priority aquifers. During this phase, the Technical Working Group was created to discuss and review assessment results. A final report was produced and submitted to CEMA and Alberta Environment in January 2010 (WorleyParsons 2010a).

2.2.2 Phase 2 - Regional Monitoring Network Design and Implementation

In 2009, WorleyParsons conducted Phase 2 of the NAOS network development. The Phase 2 work included aerial and field reconnaissance of existing well sites and initial field parameter sampling. Based on the reconnaissance work findings, 40 wells were incorporated into the NAOS network. Considerations for selecting specific wells included relative location (proximity to bedrock channels, oil sands leases, and locations within specific aquifers), ease of access, well condition, and groundwater quality (meeting surface water discharge quality criteria).

At commissioning, the NAOS monitoring network comprised wells from the GWN/AGS observation wells and select operator-owned monitoring wells. The regional network used existing infrastructure for prompt implementation and to be cost-effective (WorleyParsons 2010b). In September 2009, the first samples were collected from the NAOS network. Pressure transducers with data logging capability (to monitor hydrostatic pressures) were installed in 38 wells. The Phase 2 summary report was submitted to ESRD in August 2010 (WorleyParsons 2010b).

2.2.3 2010 - 2011 Monitoring Program

WorleyParsons completed the 2010–2011 groundwater monitoring program. Data from an additional 25 operator wells were also incorporated into the program to address key locations. These locations were considered important in terms of spatial distribution for baseline regional groundwater quality conditions. Continued assessment and development of baseline conditions over the longer term was recommended. A summary report for this program was submitted to ESRD in August 2011 (WorleyParsons 2011).

2.2.4 2012 Monitoring Program

The 2012 NAOS network monitoring program was completed by Integrated Sustainability Consultants Ltd. The scope of work included conducting one sampling event, updating available operator-owned well data, and reviewing the monitoring network and assessment approach for potential upgrades and enhancements. The program concluded that groundwater levels in the different formations monitored were generally within their range of natural variability and that pH and electrical conductivity (EC) values

were within historical ranges (as determined from previous programs). The report also included recommendations for network upgrades and suggestions regarding future monitoring locations. The program report was submitted to ESRD in March 2013 (Integrated Sustainability 2013).

2.2.5 2013 Groundwater Monitoring and Wells Rehabilitation Program

The 2013 NAOS network monitoring and wells rehabilitation program was completed by Matrix. The scope of work included servicing and abandoning a number of wells based on recommendations from the 2012 program, completing two groundwater sampling events, and data evaluation. Results indicated groundwater elevations in 2013 in the key regional aquifers were similar to historical values, and also consistent with recent historical observations in sites near active depressurization. Groundwater levels and chemistry data were also updated for existing operator wells, where available. Recommendations included reviewing the network development strategy and revising the current interim regional triggers. In 2013, a web-based data viewer, referred to as the Client Data Portal (CDP), was also developed for ESRD to access and view all NAOS groundwater monitoring network data that were available to and stored on Matrix databases. The program report was submitted to ESRD in March 2014 (Matrix 2014c).

3 METHODS – GROUNDWATER MONITORING AND WELLS REHABILITATION

Matrix personnel were required to comply with legislated and Matrix health and safety standards as well as the health and safety standards of applicable operators when visiting their operation sites.

The following subsections outline Matrix’s approach for achieving the 2014 Groundwater Monitoring and Wells Rehabilitation Program objectives for the NAOS area. The NAOS regional groundwater monitoring well locations, including operator-owned wells, are presented on Figure 2.

3.1 Wells Identification

The current well naming convention for the NAOS regional groundwater monitoring network was established by WorleyParsons (WorleyParsons 2010b) and is summarized below. The first three letters identify the original well owner:

- GWN = GOWN (ESRD’s Groundwater Observation Well Network)
- AGS = Alberta Geological Survey
- SHL = Shell Canada
- CNR = Canadian Natural Resources Limited (CNRL)
- TOT = Total E&P
- SUN = Suncor Energy
- IOR = Imperial Oil Resources
- CVE = Cenovus

For GWN wells, the subsequent two numbers identify the GWN site number and the last two numbers are the GWN well assigned number. For the AGS wells, the last two numbers signify the well completion depth (in metres), with the exception of “WT”, which stands for water table; this is usually the shallowest well at any particular location, and is generally completed less than 5 m below ground surface (WorleyParsons 2010b). Where available, the last two or three letters identify the completion formation or interval as follows:

- SS = Surficial Sands (Undifferentiated Drift Aquifer/Aquitard)
- BCH = Buried Channels and Valleys
- GR = Grand Rapids Formation
- CWR = Clearwater Formation
- BAS = McMurray Formation Basal Aquifer
- BHL = Beaverhill Lake Aquitard
- GRA = Granite Wash (La Loche) Formation (Basal Devonian Aquifer)
- PBM = Undifferentiated Prairie/Beaverhill Lake/Keg River Formations

A list of current GWN/AGS wells in the network is included in Table 1.

3.2 Network Monitoring Sites

The NAOS regional groundwater monitoring network consists of 12 sites, designated as Site 1 through Site 12; all sites, except Site 4, were included in the 2014 program. The number of wells per site varies from one well at Site 11 to six wells at Site 12 (Tables 1 and 2).

3.3 Program Work Plans and Revisions

A work plan to complete the 2014 groundwater monitoring and well rehabilitation program was submitted to ESRD on July 14, 2014. The work plan provided a rationale and methods for completing the 2014 program, which built on Matrix’s proposal of June 6, 2014 (Matrix 2014b). A revised work plan (Matrix 2014a) submitted to ESRD on October 15, 2014 incorporated priorities communicated through discussions and meetings between Matrix, ESRD, and the NAOS technical committee between August and September 2014. The revised work plan identified the need to review the overall NAOS network development strategy. Matrix, ESRD and the NAOS technical committee confirmed the network expansion should support meeting management and regulatory objectives.

3.4 Groundwater Monitoring and Sampling Methodology

The 2014 NAOS groundwater monitoring program comprised two groundwater monitoring and sampling events completed in the summer and fall. The first event was completed between July 30 and August 8, 2014 with groundwater samples collected from 33 out of a possible 37 wells. The second event was completed between October 28 and November 4, 2014 with groundwater samples collected from

28 wells. The 2014 field program is summarized in Table 2. All 11 NAOS monitoring sites were accessed during each of the monitoring and sampling events.

3.4.1 Groundwater Well Monitoring

Each well was assessed for physical condition and static water levels. Monitoring for each well included noting the presence or absence of non-aqueous phase liquids, measuring the depth to groundwater surface (from the top of the monitoring well casing), and recording the depth to the well bottom, using an electronic oil/water interface probe/or an electronic water level tape. Where available, pressure transducers were downloaded and the instrument checked for sufficient recording capacity until the next monitoring cycle.

3.4.2 Groundwater Sampling

Each well was assessed based on groundwater salinity, depth to water level, depth to top of the aquifer, permeability of the geologic unit, casing size, volume of water required to purge, and equipment requirements to determine the most efficient sampling method. Before sampling, produced water chemistry was monitored for field parameters (temperature, pH, EC, and turbidity). For the fall monitoring and sampling program, the priority for field staff was to obtain transducer data downloads and sample the non-saline wells. The wells that yield saline groundwater (i.e., Devonian wells) were considered a lower priority for obtaining samples. The sampling method used for each well is outlined in Table 2.

Where the preferred method was fixed volume purging, the well was purged for at least three well volumes, or until dry, before sampling. Fixed volume purging methods included airlifting using an air compressor or plastic bailers. Where the preferred method was low-flow purging, the well was purged until field parameter measurements stabilized and the water level within the well had also stabilized or was rising. The well was then sampled from the intake interval at a slow rate (0.1 to 0.5 L/min) to keep water level drawdown and disturbance at a minimum. Low-flow sampling devices were selected for use during the program depending on water depth and included the Geotech Geosub™ pump or the Solinst® bladder pump. Where the Geosub or the bladder pump could not be used, either due to pump mechanical issues or extreme cold weather conditions, the low-flow Waterra Inertia Pump (foot-valve) was used instead. Details on low-flow sampling methodology and data QA/QC protocols are included in Appendix A.

3.4.3 Analytical Parameters

Once field-measured parameters stabilized, groundwater samples were collected into laboratory supplied containers, placed in a cooler with ice and submitted to ALS Environmental laboratory in Fort McMurray, Alberta. Laboratory analysis included the following parameters:

- major ions

- pH, electrical conductivity, and total alkalinity
- ammonia (total ammonia nitrogen), nitrate, and nitrite
- dissolved organic carbon
- dissolved metals
- turbidity
- total dissolved solids
- total phenols
- benzene, toluene, ethylbenzene, and xylenes (BTEX) and petroleum hydrocarbons fraction 1 (F1; C₆-C₁₀, excluding BTEX), fraction 2 (F2; C_{>10}-C₁₆), fraction 3 (F3; C_{>16}-C₃₄), and fraction 4 (F; C_{>34})
- polycyclic aromatic hydrocarbons
- naphthenic acids
- iron related bacteria
- sulphur reducing bacteria

3.4.4 Data Evaluation

Groundwater chemistry results from the 2014 NAOS program were compared to historical data (where available) and to the interim groundwater quality triggers for the NAOS area. The interim groundwater quality triggers for the NAOS area were outlined in the Framework for the Lower Athabasca Region (ESRD 2012a). The results were also compared to the *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* for Natural Areas (AENV 2010) for comparison purposes only. A list of the interim trigger values is provided in Table A below.

TABLE A Interim Regional Groundwater Quality Triggers for the North Athabasca Oil Sands Area

Interval	TDS ^{1,3}	Na ^{1,4}	Cl ^{1,4}	SO ₄ ¹	TAN ^{1,3}	As ¹	Si ³	NAs ^{1,3}
Surficial Deposits	600 ¹	50 ¹	20	50	1 ¹	0.003	10	2 ¹
Buried Channels	1,000 ¹	150 ¹	50	250	1 ³	0.003	10	3 ³
Basal McMurray AMU 1	1,000 ³	200 ⁴	250	400	2 ³	0.003	10	5 ¹
Basal McMurray AMU 2	3,700 ³	1,000 ¹	1,100	400	2 ³	0.003	10	20 ¹

Concentrations are shown in mg/L.

1 - Value represents the 75th percentile of data from the existing database for each identified interval.

2 - Value represents the 95th percentile of data from the existing database for each identified interval.

3 - Values selected based on regional knowledge and professional judgment.

4 - Value is from the Guidelines for Canadian Drinking Water Quality (Health Canada 2012).

AMU = Aquifer management unit (AMU1 = TDS < 500 mg/L, AMU2 = 500 to 4,000 mg/L [WorleyParsons 2010b])

TDS = Total dissolved solids

Na = Sodium

Cl = Chloride

SO₄ = Sulphate

TAN = Total ammonia nitrogen

As = Arsenic

Si = Silica

NAs = Naphthenic Acids

The Basal McMurray Aquifer was divided into four aquifer management units (AMUs) based on TDS concentrations (WorleyParsons 2010a). The TDS ranges for the designated AMUs within the NAOS area are:

- AMU 1 (less than 500 mg/L TDS)
- AMU 2 (500 to 4,000 mg/L TDS)
- AMU 3 (4000 to 30,000 mg/L TDS)
- AMU 4 (greater than 30,000 mg/L TDS)

Only the two AMUs related with non-saline conditions (AMU 1 and AMU 2) are managed under the Framework.

3.5 Well Flushing and Redevelopment

A total of 16 wells were proposed for flushing and redevelopment during the 2014 summer field event. The redevelopment involved airlifting with a mobile compressor. Criteria for selecting specific wells for further development included:

- historical chemistry indicating groundwater was non-saline and met surface discharge guidelines for chloride and pH (ERCB 2001)
- the well not being flushed or redeveloped during the 2013 field program

Twelve wells at six sites were flushed to remove debris and sediments from the well casing and, subsequently, were further developed through airlifting to clear the screens and improve hydraulic connection with the aquifer. Wells with sediment accumulations were flushed by injecting compressed air into the water column through 38 mm inside diameter PVC coiled tubing. During flushing, the PVC tubing was progressively lowered within the water column and sediments were displaced from the well bottom. After the well was flushed from top to bottom, it was further developed by airlifting from above the screened interval, until the produced water was clear. A summary of the flushing and development activities is included in Table B below.

TABLE B Well Flushing and Development Summary

Site	NAOS Well ID	Completion Formation/Aquifer	Comments
3	GWN-14-32	Surficial Sands	Well flushed until dry
5	AGS-02-97	Buried Channels - Birch	Well flushed, redeveloped
5	AGS-02-108	Clearwater	Well flushed until dry
6	AGS-03-17	Buried Channels - Birch	Well flushed, redeveloped
6	AGS-03-30	Clearwater	Well flushed until dry
8	GWN-01-74	Surficial Sands	Well flushed, redeveloped
10	GWN-07-55	Surficial Sands	Well flushed, redeveloped
10	GWN-07-57	Basal McMurray	Well flushed, redeveloped

Site	NAOS Well ID	Completion Formation/Aquifer	Comments
10	GWN-07-59	Granite Wash	Well flushed, redeveloped
12	GWN-08-43	Surficial Sands	Well flushed until dry
12	GWN-08-44	Buried Channels - Kearl	Well flushed, redeveloped
12	GWN-08-45	Clearwater	Well flushed, redeveloped

3.5.1 Instrumentation

GWN-01-76 was instrumented with a new pressure transducer in the Basal McMurray Aquifer to determine if low temperature measurements recorded in the well were due to instrument malfunction. The Solinst® Levellogger Edge M10/F30 transducer is rated to 10 metres of water gauge. Transducer serial number and installation depth are included in the field program summary (Table 2).

A mechanical packer was installed in AGS-02-WT at Site 5 to prevent frost damage (Table 2). A second packer could not be installed in AGS-03-WT (Site 6) due to a pinch inside the well casing.

3.5.2 Miscellaneous

Non-aqueous phase liquid samples were collected from two monitoring wells during the summer event; the samples were also submitted to ALS for hydrocarbon composition analysis to assess whether the samples were refined petroleum products or naturally-occurring hydrocarbons. Also at ESRD's request, additional groundwater samples from two wells at Site 12 (GWN-08-43 and GWN-08-44) were collected and forwarded to Environment Canada for testing of artificial sweeteners in Quaternary aquifers in the Site 12 area. These samples and subsequent analyses were not part of the NAOS regional groundwater monitoring scope and the results from that investigation will be reported by Environment Canada.

3.6 Operator Data Requests

Matrix and ESRD reached an understanding in 2014 to postpone requesting data for new operator-owned monitoring wells. The rationale for limiting the NAOS network expansion for the 2014 program year was to evaluate the network (as of 2014) and ensure that a balanced, objective and practical regional groundwater monitoring network was being developed for the NAOS area (Matrix 2014c). The list of current operator wells volunteered to support the NAOS network development are included in Table 3.

In 2014, Matrix reviewed and updated the NAOS network development strategy. The development of the network will involve continually updating the conceptual model of groundwater flow followed by an evaluation of the network. This process will be iterative and ongoing. Each operator well currently included in the network was also evaluated in terms of value to the overall program objectives.

3.7 Data Management Strategy

The program data management strategy strives to ensure data integrity for all phases where data is obtained. This includes field collection; QA/QC protocols with respect to laboratory and field techniques; data storage; analysis and data presentation.

Field data were recorded using standard groundwater sampling forms and field notes. Groundwater sample records were submitted to the laboratory using triplicate chain-of-custody forms documenting sample identification numbers, analytical parameters, shipping and reporting details for each sample submitted. The laboratory analytical data was stored and accessed in EQUIS (a company-wide platform to manage environmental data) and well completion information, hydrostatic pressure and temperature data were stored and managed in Matrix's Physical Hydrogeology Database. Historical data, including chemistry and pressure data generated by outside sources for all network wells (including operator-owned wells), were provided by ESRD and are also housed in the Matrix databases. All data entered into the Matrix databases were reviewed as part of Matrix's in-house quality assurance procedures.

Details regarding data management and QA/QC processes are included in Appendix A.

3.7.1 Web-based Data Viewer

The CDP provides a web-based platform for accessing and viewing all available NAOS groundwater monitoring data stored in Matrix's databases. CDP enables rapid data access and supports a QA/QC process for the entire NAOS dataset. CDP works through a web browser and allows authorized individuals to view and download physical hydrogeological time series data, including hydraulic heads and temperatures, which are stored in Matrix's databases. Key chemistry indicator charts, generated by a script from the Matrix EQUIS database, are also available in CDP as PDF documents. Details on full CDP functionality are included in Appendix B.

Authorized individuals at ESRD and members of the NAOS technical and scientific panels were provided access to CDP (via a unique username and password issued by Matrix) since March 31, 2014 to support data QA/QC. Data access in CDP will be available through March 31, 2016. After the current project completion date, technical and scientific panel members will channel all data QA/QC issues to the program ESRD contact, who in turn will forward to the Matrix project manager. While every effort will be made to address data quality issues related to the web viewer before March 31, 2015, addressing how and when additional data corrections are handled will require further discussion (and possibly, additional contracts to be drawn up) between ESRD and Matrix.

A copy of the entire NAOS dataset will be provided to ESRD with the project data deliverables.

4 GEOLOGY AND HYDROGEOLOGY

Objectives of the NAOS monitoring network, in terms of managing groundwater quality and quantity resources, include:

- increasing the understanding of the regional hydrogeological setting
- assessing the cumulative effects of oil sands development on potential receptors

To meet those objectives, it is imperative that the monitoring network represent the current understanding of the groundwater system and the constraints from industry operations. Although the hydrogeology conceptual model is used to present the current understanding of the groundwater system on a regional scale, it allows local scale phenomenon to be incorporated.

The updated conceptual model is a compilation of new and previous interpretations of the hydrogeology within the geologic framework of the NAOS area. Under ESRD's mandate, the focus of the regional monitoring network is on non-saline groundwater resources; emphasis is thereby placed on Cretaceous and Quaternary age aquifers and aquitards within the conceptual model. The effect of Devonian age formations on regional groundwater flow and interactions with overlying Cretaceous and Quaternary age aquifers is acknowledged, but not presented in detail.

4.1 Methods

4.1.1 Cross-Sections

Presenting hydrostratigraphic information on a cross-section helps to visualize possible flow paths and identify potential hydrogeologic interactions between adjacent units. Based on the hydrostratigraphic framework shown in Figure 3, two regional-scale cross-sections were developed by examining well logs and determining formation tops using the software package *geoSCOUT* (geoLOGIC 2015). Figure 4 (A-A') is a north-south regional schematic section from the Birch Mountains to the Thickwood Hills near the southern NAOS boundary. Figure 5 (B-B') is a northwest-southeast regional schematic section from the Birch Mountain through the Athabasca River Valley to Muskeg Mountain.

4.1.2 Quaternary Channel Aquifers

Features that have been deemed particularly important in the region are the abundant Quaternary channel aquifers (Andriashek and Atkinson 2007; the term "channel" will be used and is synonymous here with the term valley). These aquifers have the potential to deliver very high volumes of water (typically non-saline) due to their relatively high transmissivity. However, Quaternary channel aquifers present a number of challenges with respect to understanding regional hydrogeology. Quaternary channel aquifers can:

- be in contact with adjacent Cretaceous aquifers, resulting in aquifer interactions

- be in direct contact with Cretaceous aquifers, where it is difficult to differentiate on well logs; open hole logs and formation samples are typically not available for analysis
- have infilling sediments that are heterogeneous and can have variable permeability and thickness, making characterization difficult
- present the potential for groundwater-surface water interaction

Outlines of the known Quaternary channel aquifers are presented on Figure 6. The data presented in this map is compiled from the following sources:

- *Application for Approval of the Mackay River Commercial Project* (AOSC 2009; outlines of Mackay, Birch, and Thickwood channels)
- *Buried Channels and Glacial-Drift Aquifers in the Fort McMurray Region, Northeast Alberta* (Andriashek and Atkinson 2007)

It is important to note the channels presented on Figure 6 are only those that can be classified as aquifers. Other Quaternary channels have been identified (e.g., Teck 2011), which are infilled with sediments too fine-grained to be considered an aquifer and are not included herein.

4.1.3 Baseline Data

The following reports were used as geologic and hydrogeologic data sources when developing the conceptual model:

- *Application for Approval of the Terre de Grace Pilot Project* (VCI 2007)
- *Responses to Supplemental Information Requests from the Energy Resources Conservation Board for the Application for Approval of the Terre de Grace Pilot Project* (VCI 2009)
- *Application for Approval of the Mackay River Commercial Project* (AOSC 2009)
- *Application for Approval of the Rigel Oil Sands Project* (Prosper 2013)
- *Environmental Protection and Enhancement Act and Waste Act Application: STP McKay Thermal Project - Phase 2* (Southern Pacific 2011)
- *Application for Mackay River Expansion Project* (Petro-Canada 2005)
- *Frontier Oil Sands Mine Project. Integrated Application and Environmental Impact Assessment* (Teck 2011)
- *Application for Approval of the Imperial Oil Resources Ventures Limited Aspen Project* (Imperial Oil 2013)
- *Application for the Imperial Oil Resources Ventures Limited and ExxonMobil Canada Properties Kearl Oil Sands Project - Mine Development* (Imperial Oil 2005)
- *Telephone Lake Project* (Cenovus 2011)
- *Application for the Suncor Oil Sands Firebag In-Situ Project* (Suncor 2000)
- *Application for Approval for the Horizon Oil Sands Project* (CNRL 2002)

- *Application for Approval of the Jackpine Mine Expansion Project & Pierre River Mine Project* (Shell 2007)

4.2 Hydrostratigraphic Framework

4.2.1 Quaternary Sediments and Buried Channel Aquifers

Quaternary sediments are found covering much of the NAOS area (Figure 7) and are generally composed of poorly-sorted sandy to clay till, with isolated areas of well-sorted sand and gravel deposits. Undifferentiated till deposits can be upwards of 150 m thick on topographic highs, such as the Birch Mountains or Muskeg Mountain, and generally thin to tens of metres on plains or lowland areas.

There are no regionally correlatable till sheets and associated aquifers in the NAOS area, such as those found south of Fort McMurray (e.g., Sand River, Ethel Lake, and Bonnyville Sand Aquifers). Where present, isolated deposits of aquifer quality are only found on local scales, and are seldom utilized as source water for industrial projects. Aquifer quality Quaternary deposits along the flanks of the Birch Mountains or Muskeg Mountain are conceptualized as alluvial fan and/or outwash deposits.

Buried channel aquifers are far more common than the till sheet or alluvial fan aquifers discussed above. Numerous buried channel aquifers are found on both sides of the Athabasca River and in various orientations (Figure 6). These channels are commonly composed of coarse-grained sediments at the base, overlain by variable thicknesses of till (commonly upwards of 100 m thick). The coarse sediments at the base of these channels are generally referred to as the Empress Formation, as they are defined as the first unconsolidated, stratified sediments resting on bedrock and are covered by the first occurrence of till (Andriashek 2003).

Buried channels on the west side of the Athabasca River occur on the MacKay plain and can be upwards of 150 m deep. Continuous sand and gravel deposits of the Empress Formation can be upwards of 40 m in some locations, with cumulative thicknesses of sand and gravel potentially over 100 m (AOSC 2009). These channels incise into the underlying bedrock formations (Figure 8), potentially as deep as the Clearwater Formation. On the east side of the Athabasca River, buried channel aquifers generally are not as deeply incising and are more variable in their setting. The Kearn Channel is the longest of these channels and can incise upwards of 50 m into the McMurray Formation (Figure 6).

The LaBiche Aquitard is the first bedrock formation beneath the Birch Mountains. This thick (possibly upwards of 200 m) shale succession separates the overlying Undifferentiated Quaternary sediments from the underlying Viking Aquifer.

4.2.2 Viking Aquifer

The Viking Aquifer is present beneath the Birch Mountains and Muskeg Mountain and consists of a coarsening upwards sand. In the plains and river valleys, it has been removed by erosion. Beneath the

uplands, the Viking Aquifer can be upwards of 60 m thick (AOSC 2009). An unconfined zone within the Viking Aquifer has been documented from well logs near the subcrop edge on the west side of the Athabasca River (Prosper 2013). This unconfined zone is generally 15 to 30 km wide and is characterized by an unsaturated zone at the top of the aquifer (Figures 4 and 5). The Joli Fou Formation shale is found beneath the Viking Aquifer and is generally on the order of 10 to 20 m thick.

4.2.3 Grand Rapids Aquifers

The Grand Rapids Formation consists of coarsening upwards sand sequences separated by silts and shales. On the west side of the Athabasca River, these units have been referred to (from the bottom of the formation to the top) as 5, 4, 3, and 2 (AOSC 2009). Sand units 5 and 4 can each be upwards of 35 m thick in the southwest portion of the NAOS area and gradually thin to the north. Sand units 3 and 2 are generally more developed in the central portion of the NAOS area and can each be upwards of 30 m thick. On the east side of the Athabasca River, Matrix has identified the Grand Rapids sand units as C and B in ascending order. The Grand Rapids Formation subcrops underneath the MacKay Plains west of the Athabasca River and beneath Muskeg Mountain east of the river (Figure 8). The aquifer has been conceptualized as possibly being present anywhere the formation is present (Figure 9).

4.2.4 Basal McMurray Aquifer

The Basal McMurray Aquifer is generally found in structural lows on the highly irregular surface of the Devonian formations. Sediments of the McMurray Formation that constitute the Basal McMurray Aquifer are those that are water saturated to an appreciable extent (generally greater than 70%) and are fine- to medium-grained sand. This aquifer is typically present in isolated areas with thicknesses less than 20 m, although it is more extensive in the Kearl and Jackpine project areas (Imperial Oil 2005; Shell 2007; Figure 10).

The middle and upper members of the McMurray Formation consist of interbedded sandstones and shales saturated with bitumen, resulting in very low permeability for water. The McMurray Formation outcrops along the Athabasca River west and north of Fort McMurray (Figure 8). The overlying Wabiskaw Member and Clearwater Formation are composed of relatively fine-grained mudstone and siltstone and, for the purposes of this report, are interpreted together as an aquitard. This aquitard can be upwards of 100 m thick, but thins significantly where it has been eroded along its subcropping surface. The Clearwater Formation has been identified as the subcropping unit along the thalwegs of MacKay and Birch channels (AOSC 2009), as well as much of the lowland plains along the Athabasca River (Figure 8).

4.2.5 Pre-Cretaceous Unconformity and Devonian

The Pre-Cretaceous Unconformity is a highly irregular surface due to the partial or entire dissolution of underlying Devonian formations. The elevation of this surface can range from less than 200 m above sea level (asl) to greater than 300 m asl. Porosity and permeability of the Devonian formations are highly

variable and range from that of non-permeable aquicludes such as the Prairie Evaporite Formation to permeable and porous carbonate units such as Keg River or Grosmont Aquifers. The effect of dissolution and collapse is noticeable on the structure observed in the overlying McMurray and Clearwater formations in some areas (CNRL 2002). The Waterways Formation outcrops along the Clearwater River on the southeast side of the NAOS area and also along much of the length of the Athabasca River north of Fort McMurray (Figure 8).

4.3 Hydrogeologic Conceptual Model

The hydrogeology of the Quaternary and Cretaceous units in the NAOS area is generally controlled by the topographic highs of the Birch Mountains and Muskeg Mountain (and to a lesser extent the Thickwood Hills) and the lowlands of the Mackay Plain and Athabasca River valley. Topographically driven flow towards the Athabasca River is interpreted to dominate the aquifers in the region. Recharge occurs through the surficial till in the uplands. Some shallow groundwater flow travels to streams and lakes and some travels more or less vertically downwards.

Beneath the uplands, the first significant aquifer is the Viking Aquifer. West of the Athabasca River, the Viking Aquifer has a hydraulic head of 500 m asl and is unconfined for a significant distance (up to 30 km) from its subcrop edge. Where the Viking Aquifer is confined, available head is generally low (on the order of metres). The cause of this low available head (i.e., low pressure) is interpreted to be the limited recharge available to the Viking Aquifer from the thick overlying La Biche Aquitard, coupled with the relatively high transmissivity and lateral flow rate within the Viking Aquifer. Although measurements in the Viking Aquifer east of the Athabasca River are limited, hydraulic head is 580 m asl and available head is interpreted to be low here also.

The Grand Rapids Aquifers are fully saturated and generally have available heads ranging from 400 to 480 m asl west of the Athabasca River and 450 to 580 m asl east of the Athabasca River. West and east of the Athabasca River, the Grand Rapids Aquifers are conceptualized as a major conduit for transmitting vertical recharge from beneath the uplands toward the Athabasca River. However, since the unit is eroded and subcrops before reaching the river, this groundwater discharges into buried Quaternary channels, Quaternary aquifers, or Undifferentiated till. This is conceptualized to partly contribute to the variable chemistry of groundwater in the Quaternary sediments. The similarity of hydraulic head observations in the MacKay channel and adjacent Grand Rapids Aquifers (AOSC 2009; Southern Pacific 2011) is also indicative of significant interactions between these adjacent units.

Hydraulic head values within the Basal McMurray Aquifer generally range from less than 300 to 350 m asl west of the Athabasca River and up to 425 m asl east of the Athabasca River. Pressures are interpreted to be influenced by the thickness of overburden and the underlying Devonian formations. The Clearwater Formation and Wabiskaw Member is conceptualized to act as a barrier preventing infiltration of significant groundwater flow from above and is generally greater than 100 m thick across the study area where it hasn't been eroded. Closer to the Athabasca River, where the Clearwater shale

thins or is absent and the McMurray Formation subcrops, groundwater conditions are likely increasingly influenced by infiltration through thinner overburden sediments along with discharge from Devonian Formations.

4.3.1 Conceptual Model Summary

The hydrogeology conceptual model of the NAOS region is dominated by topographically driven groundwater flow from the uplands to the lowland plains and river valleys. Groundwater also travels vertically through undifferentiated Quaternary deposits and aquitards and horizontally in aquifers. The potential exists for groundwater in bedrock aquifers to interact with groundwater in Quaternary aquifers at the incisions of buried channels and/or along subcropping edges. This interaction may explain the highly variable chemistry of groundwater observed in all units within the NAOS area. The potential also exists for the interaction of groundwater and surface water. The increase in mineralization of groundwater in bedrock aquifers and the potential for aquifer and groundwater-surface water interactions emphasizes the need to better understand local gradients and fluxes between aquifers and surface water bodies. Hydrogeology of the Basal McMurray Aquifer is also generally controlled by overburden pressure (i.e., generally towards the Athabasca River), but is also influenced by Devonian hydrogeology. The characterization of vertical gradients and fluxes in the Basal McMurray and Devonian formations is also important where overburden above the Basal McMurray Aquifer thins.

5 NETWORK EVALUATION

5.1 Method

After revising the conceptual model, the current NAOS regional monitoring network was evaluated for effectiveness. Three criteria were considered for an effective monitoring network:

- Regulatory framework - evaluating the network for consistency with regulatory objectives of the Framework
- Conceptual Model - evaluating the network's representation of the current understanding of the regional groundwater flow system
- Monitoring Considerations - considering specific well and aquifer characteristics

Specific evaluation parameters were defined for each criterion within the context of the Framework regulatory objectives. Where necessary, specific parameters were differentiated for groundwater quality and quantity. Generally, quality impacts tend to be local, while quantity impacts are easily transmitted regionally. Local quality and quantity effects are currently managed under separate regulatory regimes and are not the focus of a regional monitoring network.

Each monitoring well in the NAOS network (GWN/AGS and Operator wells) was evaluated and assigned a rating of 0, 1, or 2 for each parameter. Completion and lithologic records for each well were also

reviewed to verify the completion interval and the corresponding hydrostratigraphic unit. The total percentage score for each well was determined by the sum of ratings divided by the total possible ratings score, multiplied by a hundred.

5.2 Regulatory Framework and Conceptual Model

The regulatory framework and conceptual model criteria were evaluated within the context of the Framework regulatory objectives. These objectives include:

- providing a better understanding of natural variability of regional groundwater conditions
- providing good baseline coverage (in areas of no anthropogenic effects) in regional aquifers
- providing further understanding of regional aquifer interactions and how/where the groundwater system is connected to surface environments
- identifying potential high-risk areas that may require additional monitoring (including areas of suspected or known groundwater-surface water interaction)
- assessing long-term water quality and water level trends (intra- and inter-well comparisons) and assessing potential cumulative effects from current and future development activities
- generating data to assess predictions contained in EIAs and provide a way to verify model projections

Evaluation parameters for the regulatory framework and conceptual model were found to overlap, and so were considered once for both criteria. These parameters are:

- Spatial distribution - evaluates the spatial distribution of wells relative to each other on an aquifer basis (natural variability of regional groundwater conditions)
- Proximity to current operations footprints and communities - evaluates the relative ability of the wells to provide good baseline coverage and monitor regional and cumulative effects (quality and quantity)
- Proximity to major rivers/lakes and bedrock incisions - evaluates the relative ability of the wells to assess aquifer interactions, groundwater-surface water interactions, and monitor high risk areas

Proximity was evaluated based on default setbacks used for the Southern Alberta Oil Sands (SAOS) network development framework for consistency between the two networks where appropriate (Matrix 2013). Post-review, some setbacks were modified specifically for the NAOS network, based on professional judgment. Details on criteria, applicable regulatory objectives, evaluation parameters, and rating rules are included in Table 4.

5.3 Monitoring Considerations

According to ESRD's mandate, the Framework is currently applied and focused on non-saline groundwater resources. However, within the NAOS area, there are hydrostratigraphic units that are saline regionally (and therefore, fall outside the Framework), but may locally yield non-saline groundwater. Requirements for an effective regional monitoring network demands that all key aquifers (saline and non-saline) within the regional groundwater system be considered. A regional groundwater system is an integrated system. Monitoring considerations that were evaluated include:

- Groundwater mineralization - evaluates whether a well is monitoring saline or non-saline groundwater (wells monitoring non-saline groundwater resources were prioritized to keep in line with the Framework groundwater management priorities)
- Well completion – evaluates, on a well by well basis, how accurately the well completion interval represents the specified corresponding hydrostratigraphic unit(s)

Details on the criteria, applicable regulatory objectives, evaluation parameters, and rating rules are included in Table 4.

6 STATISTICAL ANALYSIS OF GROUNDWATER CHEMISTRY DATA

Basic summary statistics (data count, mean, median, maximum, and minimum) were determined for all network wells for the interim regional groundwater quality trigger parameters. Statistical analysis was also completed for the interim trigger parameters using the statistical methods in the draft Groundwater Monitoring Directive (ESRD 2012b).

The objectives of the analyses were to establish the natural range of variability for groundwater quality concentrations and monitor over time the water quality values for each indicator parameter within each well. The wells were analyzed in groups based on the completion aquifer or hydrostratigraphic unit.

6.1 Methods

6.1.1 Summary Statistics

Before calculating the summary statistics for each well and analyte data set, outliers were first identified and removed. The adjusted boxplot method was employed to label outliers. This technique is similar to Tukey's Method (boxplot) where data points falling outside of 1.5 times the interquartile range are labeled as outliers. The method takes into account a robust measure of skewness when determining the boundaries of the range (Hubert and Vandervieren 2008; Seo 2006). After identifying possible outliers statistically, a secondary verification was performed based on professional judgment to determine the statistical outliers were truly outside the range of natural variability. Data points identified and verified as outliers were documented and removed from the sets used for subsequent calculations.

Whenever possible, any data below the detection limit was estimated using the robust regression on order statistics (ROS) method. The ROS method was chosen due to the small sample size of some data sets and because the test relaxes the parametric assumptions of normality or log-normality so that it only applies to the censored data. When less than 80% of the data was below the detection limit and at least four data points were above the detection limit, the non-detect values were estimated using this method, which utilizes least-squares regression on probability plots (Helsel 2012). These estimates were used when calculating the statistical parameters mean and median. In cases where the values below detection limit could not be calculated, only maximum and minimum values were reported.

Once outliers were removed and non-detect values were estimated, the parameters mean, median, maximum, and minimum were calculated for each well and analyte data set. When the minimum or maximum were non-detect data points, the values were reported as the detection limit.

6.1.2 Statistical Analysis

An overview of the Groundwater Monitoring Directive statistical methods used, is presented in Figure A below:

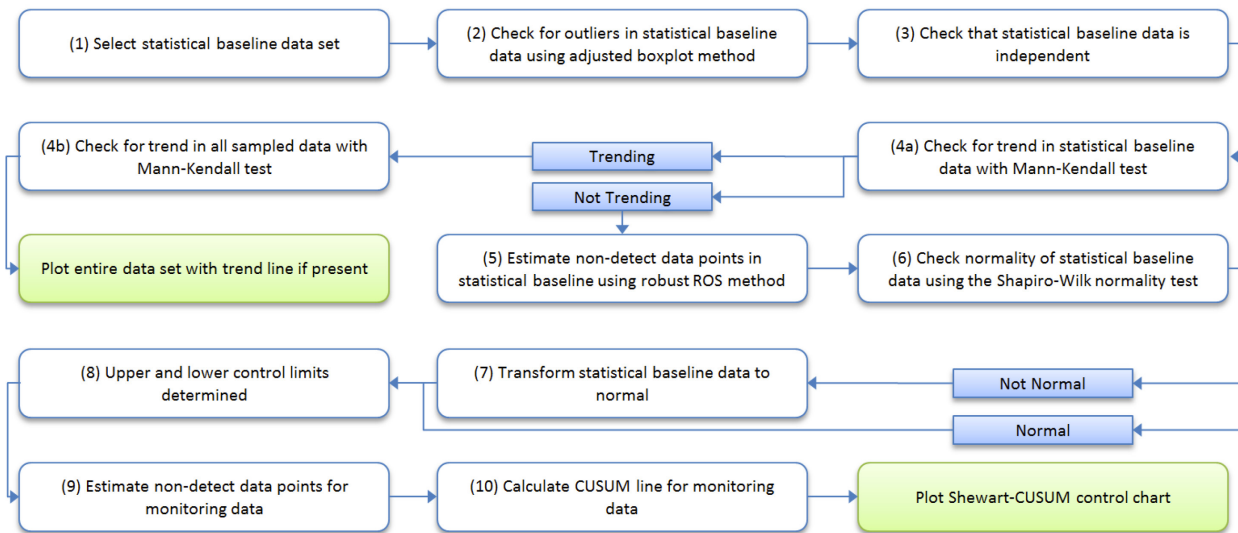


FIGURE A Groundwater Monitoring Directive Statistical Methods Overview

Given the limited data that is currently available for many of the wells, all data (except results from samples collected on the same day) were included in the determination of the statistical baseline for this analysis.

The interim regional groundwater quality triggers are indicated on the statistical charts where applicable, along with the Alberta Tier 1 natural guideline values. No comparisons to these interim quality triggers or Alberta Tier 1 guidelines were made as part of the statistical analysis.

7 RESULTS

7.1 Statistical Analysis

The summary statistics table for the interim trigger parameters, including data count, minimum, maximum, mean, median, and outliers is included as Appendix C1. The detailed results of the statistical analyses are provided in Appendices C2 to C76.

Appendices C2a through C74a show time series graphs for each parameter in each well category, which allows the network wells to be compared with each other in time. Appendices C2b through C74b show the intra-well statistical analysis results for each parameter and for each well.

Wherever possible, Upper Control Limits (UCL) and Lower Control Limits (LCL) were established and Shewhart-CUSUM control charts were created. When these control charts could not be created (due to data limitations), a Mann-Kendall trend analysis was performed on the data. Where there was insufficient data for Mann-Kendall trend analysis, no statistics were determined.

Appendix C75 shows the key values derived from the statistical analyses, including control limits, transformation details, and Mann-Kendall trend test p-value and Sen's Slope (where control limits could not be derived). Appendix C76 lists the statistical outliers that were excluded from the data analysis.

7.1.1 Surficial Sands

Statistical analyses results for wells in the Surficial Sands are included as Appendices C2a-C9b. A total of 18 Shewhart-CUSUM control charts were generated, and 110 Mann-Kendall trend analyses were completed for the Surficial Sands wells. From the Shewhart-CUSUM charts, all 2014 data for the applicable parameters and CUSUM values were within statistically determined upper and lower control limits with the following exception:

- Total Dissolved Solids: values were above the upper control limit in August for GWN-14-32 (Site 3)

Statistically significant data trends, determined from the Mann-Kendall trend analyses, included:

- Sodium: decreasing trends in AGS-03-WT, CVE-BOR-02, IOR-KRL-06 (SS), IOR-KRL-08 and IOR-KRL-09
- Chloride: decreasing trends in AGS-02-20 and GWN-01-74
- Sulphate: decreasing trend in GWN-16-22; increasing trend in IOR-KRL-01
- Ammonia-N: decreasing trend in GWN-16-22
- Silica (Dissolved): increasing trend in GWN-08-43

7.1.2 Buried Channels

7.1.2.1 *Kearl Channel*

Statistical analytical results for wells in the Kearl Channel are included as Appendices C10a to C17b. Two Shewhart-CUSUM control charts were generated and 16 Mann-Kendall trend analyses were completed for the Kearl Channel wells. From the Shewhart-CUSUM charts, all 2014 data for the applicable parameters and CUSUM values were within statistically determined upper and lower control limits. Note that for dissolved sulphate at GWN-08-44, there were too few values above the detection limit to calculate a CUSUM line.

Only one statistically significant data trend was identified from the Mann-Kendall trend analyses:

- Sodium and Chloride: decreasing trend in GWN-08-44

7.1.2.2 *Birch Channel*

Statistical analytical results for wells in the Birch Channel are included as Appendices C10a to C17b. No Shewhart-CUSUM control charts were generated, and 13 Mann-Kendall trend analyses were completed for the Birch Channel wells. There was no statistically significant increasing or decreasing trends determined from the Mann-Kendall trend analyses.

7.1.2.3 *Thickwood Channel*

Statistical analytical results for wells in the Thickwood Channel are included as Appendices C10a to C17b. Three Shewhart-CUSUM control charts were generated and four Mann-Kendall trend analyses were completed for the Thickwood Channel wells. From the Shewhart-CUSUM charts, all 2014 data for the applicable parameters and CUSUM values were within statistically determined upper and lower control limits.

Statistically significant data trends were identified from the Mann-Kendall trend analyses:

- Chloride and Ammonia-N: decreasing trends in GWN-13-27

7.1.3 Grand Rapids Formation

Statistical analytical results for wells in the Grand Rapids Aquifer are included as Appendices C18a to C25b. Three Shewhart-CUSUM control charts were generated and ten Mann-Kendall trend analyses were completed for the Grand Rapids Aquifer wells. From the Shewhart-CUSUM charts, all 2014 data for the applicable parameters and CUSUM values were within statistically determined upper and lower control limits.

There were no statistically significant increasing or decreasing trends determined from the Mann-Kendall trend analyses.

7.1.4 Clearwater Formation

Statistical analytical results for wells in the Clearwater Formation are included as Appendices C26a to C33b. Five Shewhart-CUSUM control charts were generated and 19 Mann-Kendall trend analyses were completed for the Clearwater Formation wells. From the Shewhart-CUSUM charts, all 2014 data for the applicable parameters and CUSUM values were within statistically determined upper and lower control limits. Note that for dissolved sulphate, there were too few values above detection limit to calculate CUSUM line for GWN-08-45 and GWN-14-33.

Only one statistically significant data trend was identified from the Mann-Kendall trend analyses:

- Ammonia-N: decreasing trend in AGS-03-30

7.1.5 Basal McMurray Aquifer

The Basal McMurray Aquifer was divided into four aquifer management units (AMUs) based on TDS concentrations (WorleyParsons 2010a). These AMUs relate to the following TDS ranges within the NAOS area:

- AMU 1 (less than 500 mg/L TDS)
- AMU 2 (500 to 4,000 mg/L TDS)
- AMU 3 (4000 to 30,000 mg/L TDS)
- AMU 4 (greater than 30,000 mg/L TDS)

Only the two AMUs relating to non-saline conditions (AMU 1 and AMU 2) are monitored in the Framework.

7.1.5.1 Basal McMurray AMU 1

Seven Shewhart-CUSUM control charts were generated and nine Mann-Kendall trend analyses were completed for the Basal McMurray AMU 1 wells (Appendices C34a to C41b). From the Shewhart-CUSUM charts, all 2014 data for the applicable parameters and CUSUM values were within statistically determined upper and lower control limits. Note that for dissolved sulphate at GWN-06-60, a CUSUM line could not be determined as the analysis methods do not include non-detect values.

Statistically significant data trends, determined from the Mann-Kendall trend analyses, included:

- Sulphate and Ammonia-N: decreasing trends in GWN-17-50
- Naphthenic Acids: increasing trend in GWN-17-50

7.1.5.2 Basal McMurray AMU 2

Twenty-two Shewhart-CUSUM control charts were generated and 46 Mann-Kendall trend analyses were completed for the Basal McMurray AMU 2 wells (Appendices C42a to C50b). From the Shewhart-CUSUM charts, all 2014 data for the applicable parameters and CUSUM values were within statistically determined upper and lower control limits. Note that for dissolved sulphate at GWN-06-61, GWN-07-57, IOR-KRL-05 (BAS) and SHL-JKP-01, dissolved arsenic at IOR-KRL-03 and IOR-KRL-05 (BAS), and naphthenic acids at SHL-JKP-01; there were too few values above detection limit to calculate a CUSUM line.

Statistically significant data trends, determined from the Mann-Kendall trend analyses, included:

- Total Dissolved Solids: increasing trends in GWN-13-29 and SHL-JKP-01; decreasing trend in GWN-01-75
- Sodium: increasing trend in GWN-13-29
- Chloride: increasing trends in GWN-13-29 and IOR-KRL-03 (BAS); decreasing trend in GWN-08-46
- Sulphate: decreasing trends in GWN-01-75, GWN-08-46 and IOR-KRL-04 (BAS)

7.1.5.3 Basal McMurray AMU 3

Statistical analytical results for wells in the Basal McMurray Aquifer AMU 3 are included as Appendices C51a to C58b. Shewhart-CUSUM control charts could not be generated and 16 Mann-Kendall trend analyses were completed for the AMU 3 wells. Statistically significant data trends, determined from the Mann-Kendall trend analyses, included:

- Sodium: increasing trend in GWN-16-24
- Sulphate: decreasing trend in GWN-16-24

7.1.5.4 Basal McMurray AMU 4

Statistical analyses results for wells in the Basal McMurray Aquifer AMU 4 are included as Appendices C59a to C66b. Six Shewhart-CUSUM control charts were generated and six Mann-Kendall trend analyses were completed for the AMU 4 wells. From the Shewhart-CUSUM charts, all 2014 data for the applicable parameters and CUSUM values were within statistically determined upper and lower control limits. Note that for naphthenic acids at CNR-HRZ-01; there were too few values above detection limit to calculate a CUSUM line.

Only one statistically significant data trend was identified from the Mann-Kendall trend analyses:

- Total Dissolved Solids: increasing trend in GWN-01-76

7.1.6 Prairie Evaporite/Beaverhill Lake/Methy (Keg River) Formations

Statistical analytical results for the wells in the Prairie Evaporite/Beaverhill Lake/Methy (Keg River) formations are included as Appendices C67a to C74b. Fifteen Shewhart-CUSUM control charts were generated and 29 Mann-Kendall trend analyses were completed for the Devonian wells. From the Shewhart-CUSUM charts, all 2014 data for the applicable parameters and CUSUM values were within statistically determined upper and lower control limits.

Statistically significant data trends, determined from the Mann-Kendall trend analyses, included:

- Total Dissolved Solids: increasing trends in GWN-08-48, GWN-16-25 and GWN-01-79; decreasing trend in GWN-01-77
- Sodium: increasing trend in GWN-16-25; decreasing trend in GWN-01-77
- Chloride: increasing trend in GWN-16-25
- Sulphate: decreasing trends in GWN-06-62, GWN-14-36, GWN-17-51 and GWN-01-79

7.2 Groundwater Monitoring

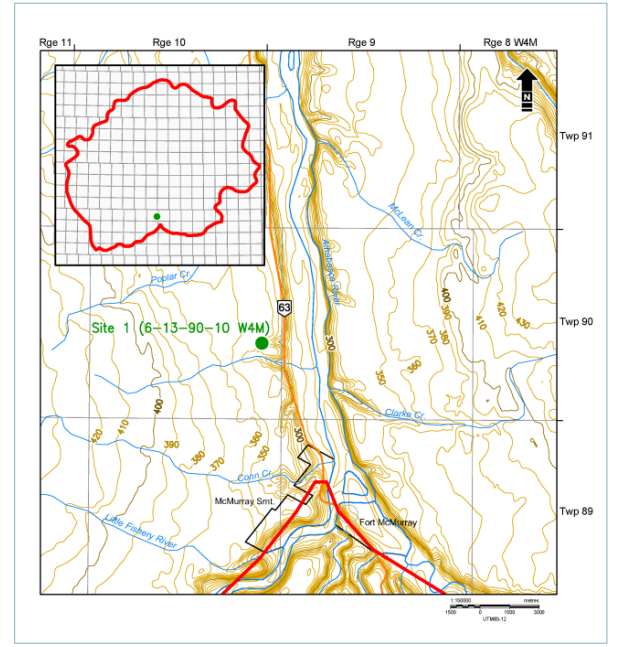
Results from the 2014 NAOS regional groundwater monitoring program, including industry-owned well data, are presented in the following summary pages. Each monitoring site summary page presents well information for the site, hydraulic heads and temperature charts, a table showing indicator parameter concentrations that exceed the interim water quality triggers, statistical analysis results, and site-specific comments. Water quality results are presented in Table 5 (Field-measured Parameters), Table 6 (General Parameters), Table 7 (Metals), Table 8 (Hydrocarbons) and Table 9 (Polycyclic Aromatic Hydrocarbons). Data quality evaluation procedures are presented in Appendix A and QA/QC tables are presented in Tables 10a through 10f, and 11a through 11e. Laboratory reports are included in Appendix D.

Hydraulic head elevations and temperatures are presented on charts in the summary sheets. The hydrostatic pressure and temperature data was retrieved from transducers in the GWN/AGS wells during the 2014 program. This pressure data was converted to hydraulic heads and corrected for atmospheric pressure variation using pressure data recorded by barometric pressure loggers installed at each site. The 2014 hydraulic head elevations and temperatures were then compiled with the 2013 data set (collected by Matrix) and other historical data provided by ESRD and stored in Matrix's in-house database. Historical groundwater elevations (pre-September 2009) provided by ESRD did not include temperature data.

There was no request to operators to update groundwater monitoring data in 2014, due to the emphasis placed on evaluating the network before adding further data. Historical operator-owned well data that were already compiled in Matrix's database were also summarised and presented below.

SITE 1 (06-13-090-10 W4M)

Completion Formation/Aquifer and Monitoring Wells	Site 1 Monitoring Wells				
	NAOS Well ID	Screened/Open Hole Interval (m asl)	Owner	Completion Unit	Instrument Depth (m btoc)
	GWN-16-22	331.3 - 326.7	ESRD	Surficial Sands (SS)	5.8
	GWN-16-24	247.5 - 244.5	ESRD	Basal McMurray (BAS)	86.3
GWN-16-25	238.3 - 174.3	ESRD	Beaverhill Lake (BHL)	112.3	



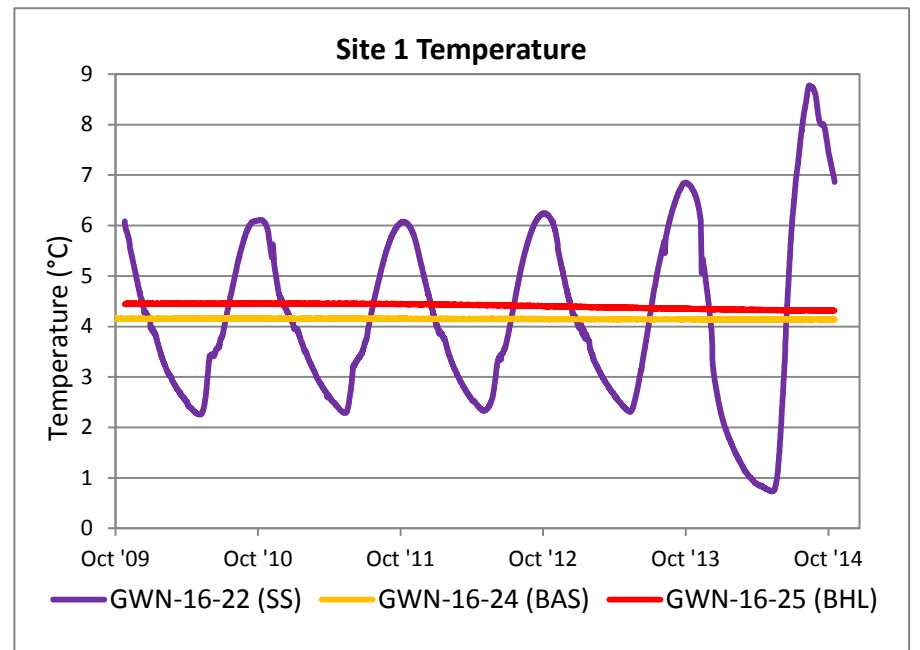
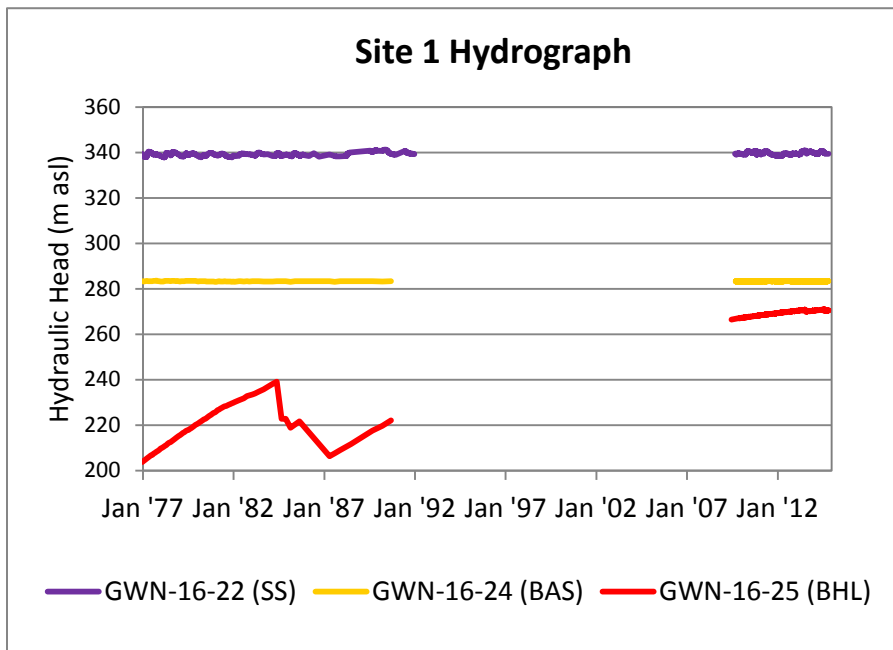
- GWN-16-23 abandoned in 2013

Parameter Exceedances and Statistical Analysis Results				
NAOS Well ID	Completion Unit	Parameters Exceeding Applicable Interim Triggers ¹	Shewart-CUSUM (2014 parameters outside statistical UCL and LCL)	Mann-Kendall Trend Analysis
GWN-16-22	SS	Na, Si, NAs	None	SO ₄ , TAN (decreasing)
GWN-16-24	BAS	n/a	---	Na (increasing); SO ₄ (decreasing)
GWN-16-25	PBM	n/a	None	TDS, Na, Cl (increasing)

1 - Exceeds the interim regional groundwater quality trigger in at least one sampling event in 2014

n/a - Not Applicable (not monitored under the Groundwater Management Framework; if Basal McMurray Aquifer, TDS >4,000 mg/L)

--- No Shewart-CUSUM control charts generated, or no statistically significant trend determined



Notes

A downward vertical hydraulic gradient was observed. Hydraulic heads and temperatures were generally consistent with recent historical data in the Surficial Sands (SS), Basal McMurray Aquifer (BAS), and the Beaverhill Lake Aquitard (BHL). Seasonal temperature variations were observed in the SS. Temperature in the BHL continued a slight downward trend.

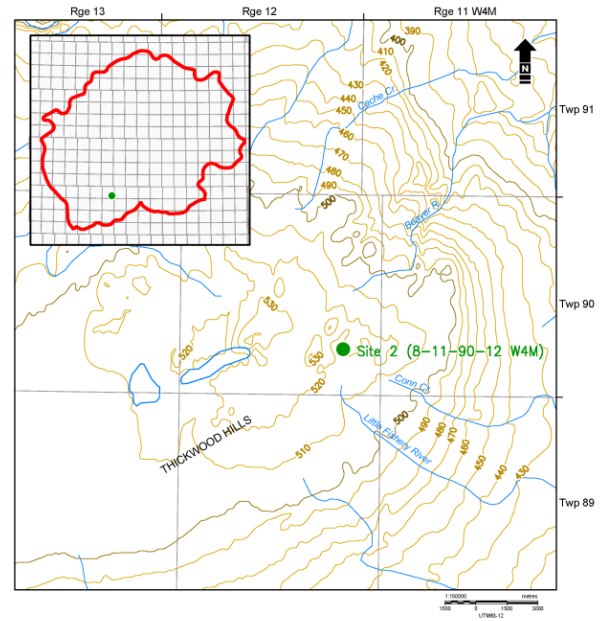
The proposed sub-network classification for the wells is:

- Sub-network A (Strategic): GWN-16-22, GWN-16-24, GWN-16-25

In keeping with recommendations made regarding analytical frequency and parameters within the main body of this report, ESRD should continue monitoring wells at this site for hydraulic head, temperature, and water quality parameters.

SITE 2 (08-11-090-12 W4M)

Completion Formation/ Aquifer and Monitoring Wells	Site 2 Monitoring Wells				
	NAOS Well ID	Screened/Open Hole Interval (m asl)	Owner	Completion Unit	Instrument Depth (m btoc)
	GWN-13-26	516.1 -514.5	ESRD	Surficial Sands (SS)	Unknown
	GWN-13-27	469.1 – 464.5	ESRD	Buried Channels (BCH) - Thickwood	38.6
	GWN-13-28	399.3 - 394.7	ESRD	Grand Rapids (GR)	Unknown
	GWN-13-30	370.5 – 367.5	ESRD	Basal McMurray (BAS)	Unknown
GWN-13-31	197.1 – 158.6	ESRD	Beaverhill Lake (BHL)	No logger	



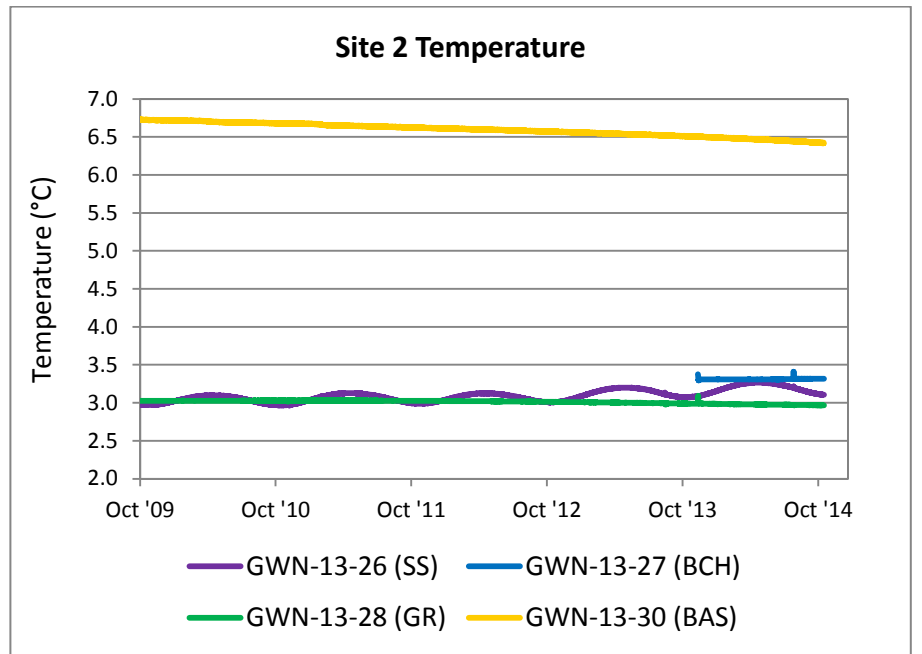
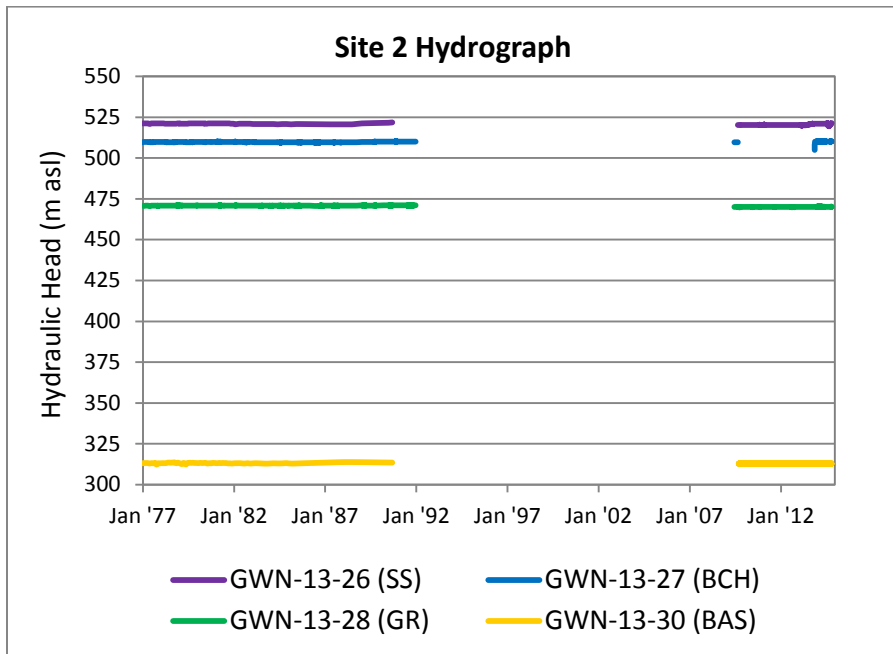
- GWN-13-29 abandoned in 2013

Interim Trigger Parameter Exceedances and Statistical Analysis Results				
NAOS Well ID	Completion Unit	Parameters Exceeding Applicable Interim Triggers ¹	Shewart-CUSUM (2014 parameters outside statistical UCL and LCL)	Mann-Kendall Trend Analysis
GWN-13-26	SS	None	None	---
GWN-13-27	BCH - Thickwood	Na, TAN, As	None	Cl, TAN (decreasing)
GWN-13-28	GR	n/a	None	---
GWN-13-30	BAS	Not sampled	---	---
GWN-13-31	BHL	n/a (Not sampled)	---	---

1 - Exceeds the interim regional groundwater quality trigger in at least one sampling event in 2014

n/a - Not Applicable (not monitored under the Groundwater Management Framework; if Basal McMurray Aquifer, TDS >4,000 mg/L)

--- No Shewart-CUSUM control charts generated, or no statistically significant trend determined



Notes

A downward vertical hydraulic gradient was observed. Hydraulic heads and temperatures were generally consistent with historical data in the Surficial Sands (SS), Thickwood Channel (BCH), Grand Rapids Aquifer (GR), and Basal McMurray Aquifer (BAS). Seasonal temperature variations were observed in the SS, with a slight overall upward trend. Temperature in the BAS indicated a downward trend (0.3°C) since late 2009. GWN-13-27 in the BCH was instrumented in 2013.

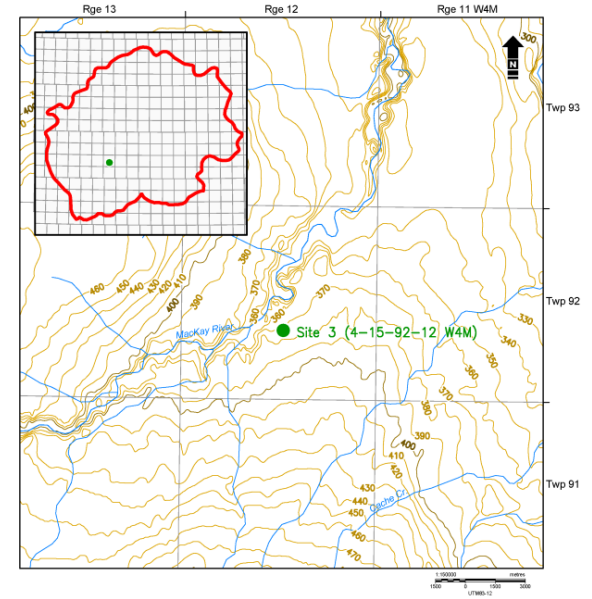
The proposed sub-network classification for the wells is:

- Sub-network A (Strategic): GWN-13-26, GWN-13-27, GWN-13-28, GWN-13-30
- Sub-network B (Surveillance): GWN-13-31

In keeping with recommendations made regarding analytical frequency and parameters within the main body of this report, ESRD should continue monitoring wells at this site (every 3 to 5 years recommended for GWN-13-30 and GWN-13-31) for hydraulic head, temperature, and water quality parameters.

SITE 3 (04-15-092-12 W4M)

Completion Formation/Aquifer and Monitoring Wells	Site 3 Monitoring Wells				
	NAOS Well ID	Screened/Open Hole Interval (m asl)	Owner	Completion Unit	Instrument Depth (m btoc)
	GWN-14-32	363.7 – 362.1	ESRD	Surficial Sands (SS)	Unknown
	GWN-14-33	342.6 – 338.0	ESRD	Clearwater (CWR)	Unknown
	GWN-14-34	303.3 – 298.7	ESRD	Basal McMurray (BAS)*	Unknown
	GWN-14-35	254.7 - 160.2	ESRD	Beaverhill Lake (BHL)	Unknown
GWN-14-36	-79.3 – (-111.7)	ESRD	Keg River (PBM)	Unknown	



* Completion unit was determined to be unsaturated Wabiskaw sand unit or Upper McMurray aquitard

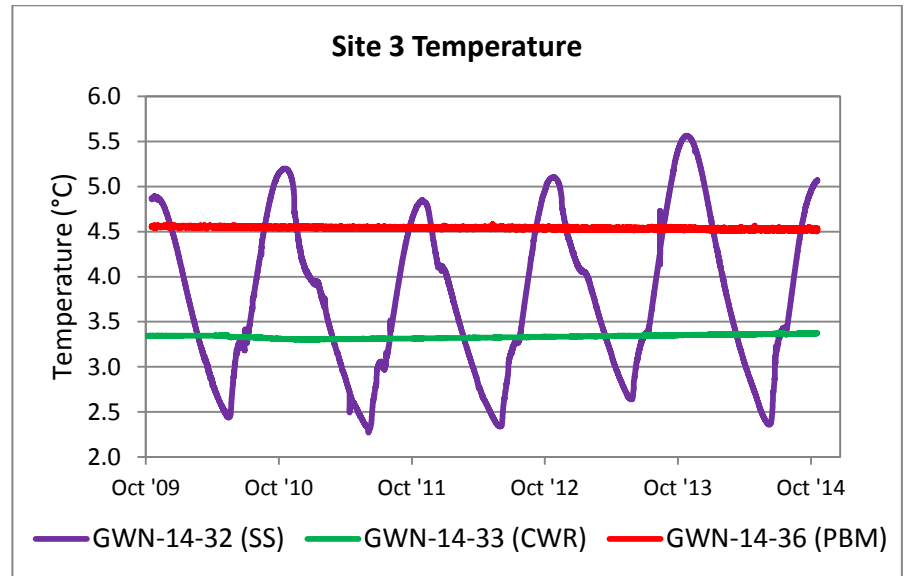
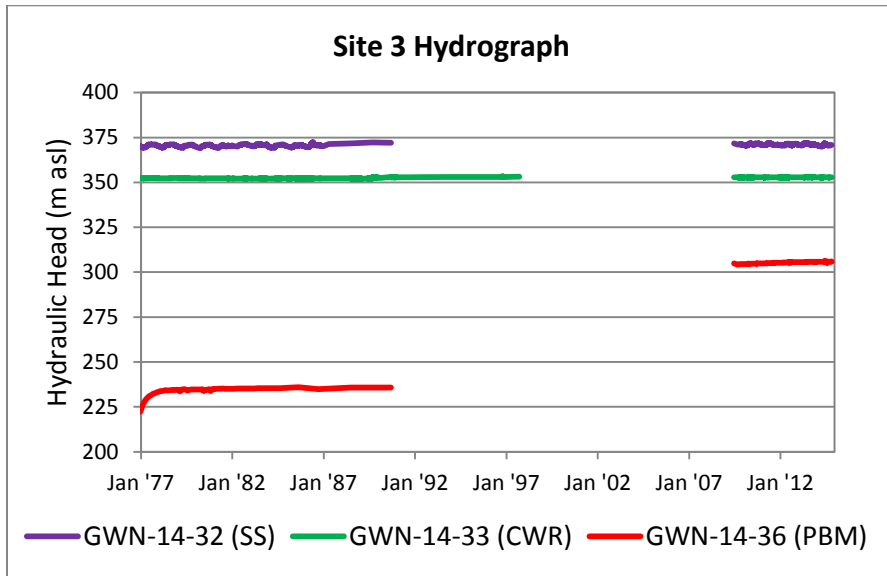
Interim Trigger Parameter Exceedances and Statistical Analysis Results				
NAOS Well ID	Completion Unit	Parameters Exceeding Applicable Interim Triggers ¹	Shewart-CUSUM (2014 parameters outside statistical UCL and LCL)	Mann-Kendall Trend Analysis
GWN-14-32	SS	TDS, Na, Cl, SO ₄ , TAN, NAs	TDS above UCL (August 2014)	---
GWN-14-33	CWR	n/a	None	---
GWN-14-34	BAS*	Dry	---	---
GWN-14-35	BHL	n/a	None	---
GWN-14-36	PBM	n/a	None	SO ₄ (decreasing)

¹ - Exceeds the interim regional groundwater quality trigger in at least one sampling event in 2014

* Completion unit was determined to be unsaturated Wabiskaw sand unit or Upper McMurray aquitard

n/a - Not Applicable (not monitored under the Groundwater Management Framework; if Basal McMurray Aquifer, TDS >4,000 mg/L)

--- No Shewart-CUSUM control charts generated, or no statistically significant trend determined



Notes

A downward vertical hydraulic gradient was observed. Hydraulic heads and temperatures were generally consistent with historical data in the Surficial Sands (SS), Clearwater (CWR), and the Keg River Formation (PBM). Seasonal variations were observed in the SS.

The proposed sub-network classification for the wells is:

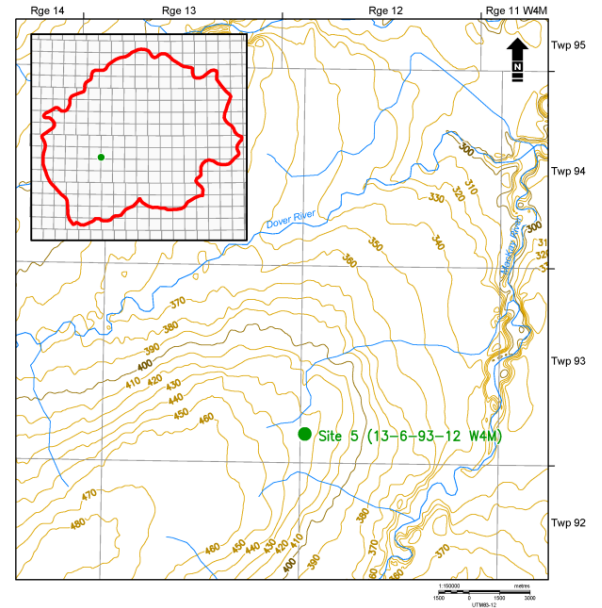
- Sub-network A (Strategic): GWN-14-36
- Sub-network B (Surveillance): GWN-14-32, GWN-14-33

Results of hydrocarbon distribution analysis confirmed the presence of light hydrocarbon fuels (gasoline or kerosene) in GWN-14-32 and GWN-14-35; the results and historical records suggested hydrocarbon fuels may have been previously artificially introduced.

In keeping with recommendations made regarding analytical frequency and parameters within the main body of this report, ESRD should continue monitoring wells GWN-14-32, GWN-14-33, and GWN-14-36 for hydraulic head, temperature, and water quality parameters. It may be necessary to adjust the analytical schedule for GWN-14-32 in consideration of the presence of hydrocarbons. GWN-14-35 appeared to have been significantly impacted by hydrocarbons and should be discontinued from the network. GWN-14-34 is dry historically and has been determined to be completed in unsaturated Wabiskaw sand unit or Upper McMurray aquitard; the well is thereby recommended to be reclassified or discontinued from the network.

SITE 5 (13-06-093-12 W4M)

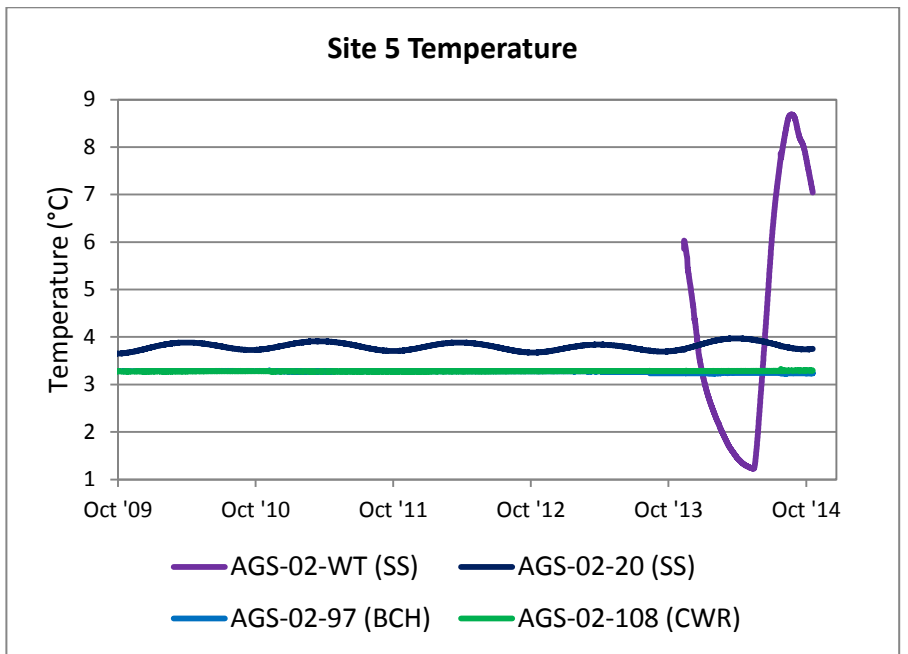
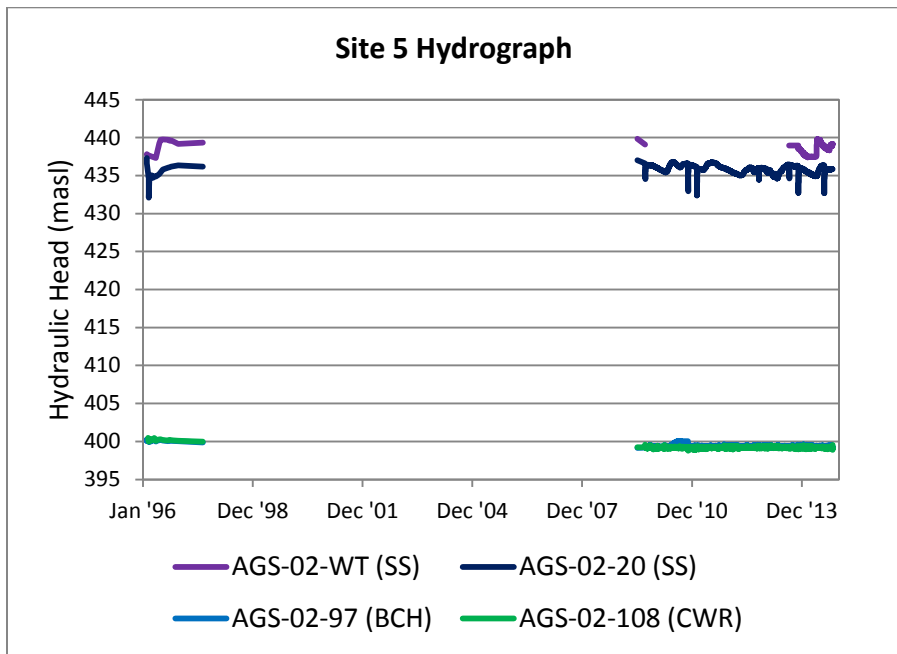
Completion Formation/ Aquifer and Monitoring Wells	Site 5 Monitoring Wells				
	NAOS Well ID	Screened/Open Hole Interval (m asl)	Owner	Completion Unit	Instrument Depth (m btoc)
	AGS-02-WT	437.7 – 434.7	ESRD	Surficial Sands (SS)	6.3
	AGS-02-20	425.0 – 422.0	ESRD	Surficial Sands (SS)	18.6
	AGS-02-97	344.9 – 343.4	ESRD	Buried Channels (BCH) - Birch	96.8
AGS-02-108	334.5 - 331.5	ESRD	Clearwater (CWR)	109.2	



- AGS-02-50 abandoned in 2013

Interim Trigger Parameter Exceedances and Statistical Analysis Results				
NAOS Well ID	Completion Unit	Parameters Exceeding Applicable Interim Triggers ¹	Shewart-CUSUM (2014 parameters outside statistical UCL and LCL)	Mann-Kendall Trend Analysis
AGW-02-WT	SS	TDS, SO ₄ , Si	None	---
AGW-02-20	SS	TDS, Na, SO ₄ , TAN, Si	None	Cl (decreasing)
AGW-02-97	BCH - Birch	TDS, Na, Cl, SO ₄ , TAN, Si	None	---
AGS-02-108	CWR	n/a	None	---

1 - Exceeds the interim regional groundwater quality trigger in at least one sampling event in 2014
n/a - Not Applicable (not monitored under the Groundwater Management Framework; if Basal McMurray Aquifer, TDS >4,000 mg/L)
--- No Shewart-CUSUM control charts generated, or no statistically significant trend determined



Notes

A downward vertical hydraulic gradient was observed. Hydraulic heads and temperatures were generally consistent with historical data in the Surficial Sands (SS), Birch Channel (BCH), and Clearwater Formation (CWR). Seasonal temperature variations were observed in the SS. Hydraulic heads and temperatures in the Birch Channel Aquifer were similar to those in the Clearwater Formation, suggesting both units are connected at this location. At this location, the Birch Channel incises into the Clearwater Formation (Figure 4).

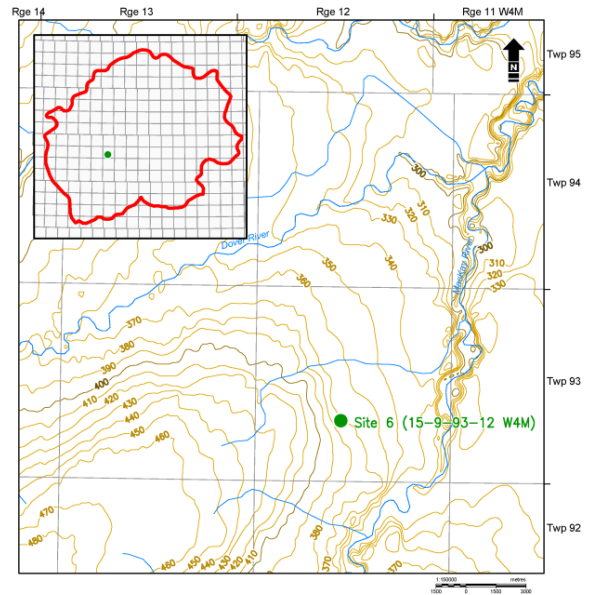
The proposed sub-network classification for the wells is:

- Sub-network B (Surveillance): AGS-02-WT, AGS-02-108
- Sub-networks B and C (Surveillance and Investigative): AGS-02-20, AGS-02-97

In keeping with recommendations made regarding analytical frequency and parameters within the main body of this report, ESRD should continue monitoring wells at this site for hydraulic head, temperature, and water quality parameters.

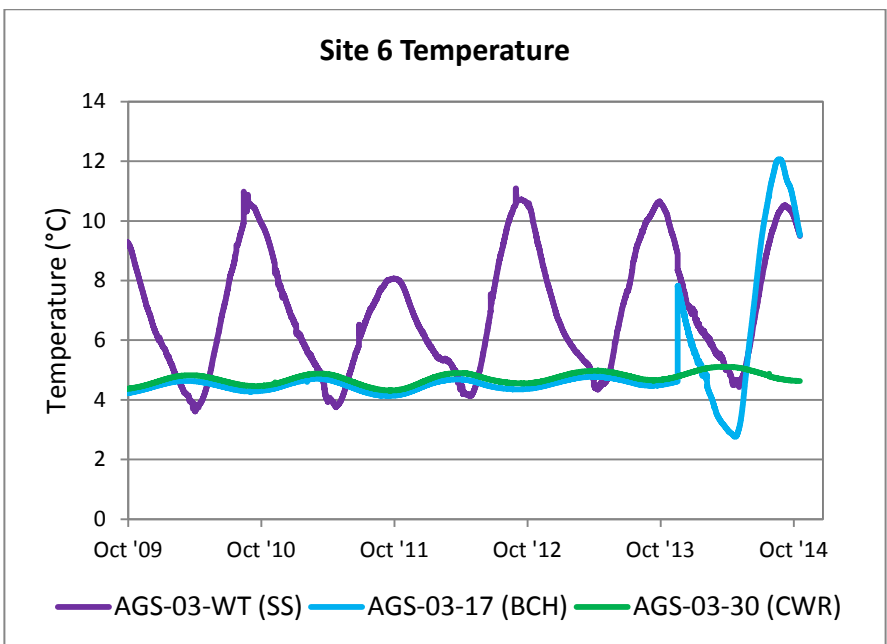
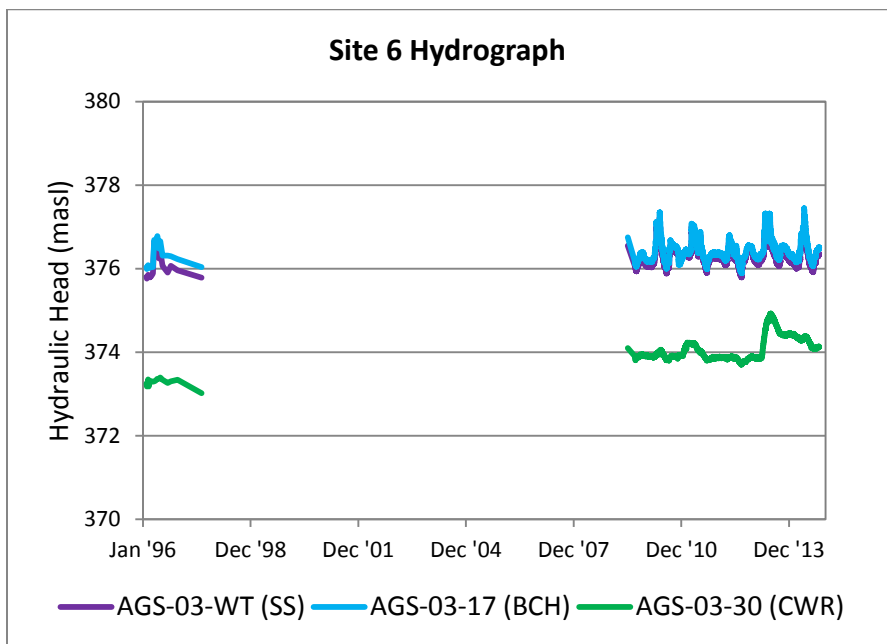
SITE 6 (15-09-093-12 W4M)

Completion Formation/Aquifer and Monitoring Wells	Site 6 Monitoring Wells				
	NAOS Well ID	Screened/Open Hole Interval (m asl)	Owner	Completion Unit	Instrument Depth (m btoc)
	AGS-03-WT	375.2 – 372.2	ESRD	Surficial Sands (SS)	Unknown
	AGS-03-17	362.3 – 360.8	ESRD	Buried Channels (BCH) - Birch	Unknown
AGS-03-30	349.7 – 347.7	ESRD	Clearwater (CWR)	---	



Interim Trigger Parameter Exceedances and Statistical Analysis Results				
NAOS Well ID	Completion Unit	Parameters Exceeding Applicable Interim Triggers ¹	Shewart-CUSUM (2014 parameters outside statistical UCL and LCL)	Mann-Kendall Trend Analysis
AGW-03-WT	SS	SO ₄ , Si	None	Na (decreasing)
AGW-03-17	BCH - Birch	Si	None	---
AGS-03-30	CWR	n/a	None	TAN (decreasing)

1 - Exceeds the interim regional groundwater quality trigger in at least one sampling event in 2014
n/a - Not Applicable (not monitored under the Groundwater Management Framework; if Basal McMurray Aquifer, TDS >4,000 mg/L)
--- No Shewart-CUSUM control charts generated, or no statistically significant trend determined



Notes

Hydraulic head and temperature changes were consistent with seasonal and historical variations in the shallow Surficial Sands (SS) and Birch Channel Aquifer (BCH). Similarities in head variations in the SS and BCH suggested hydraulic connectivity at this location. Hydraulic head measurements suggested slight flow component from BCH to SS.

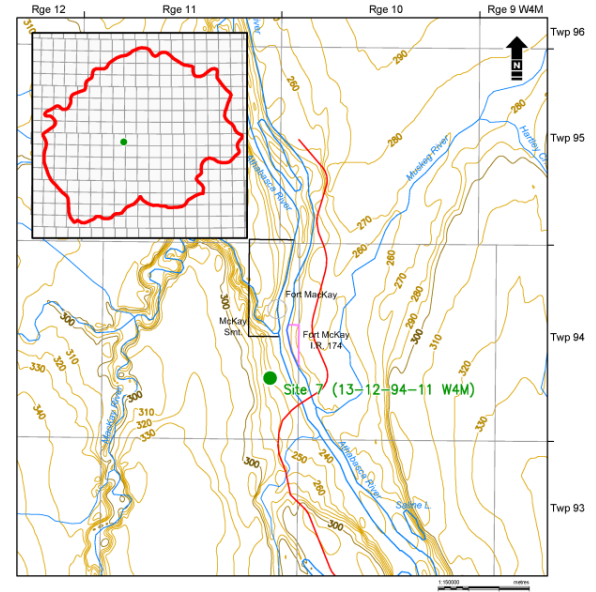
The proposed sub-network classification for the wells is:

- Sub-network B (Surveillance): AGS-03-WT, AGS-03-30
- Sub-networks B and C (Surveillance and Investigative): AGS-03-17

In keeping with recommendations made regarding analytical frequency and parameters within the main body of this report, ESRD should continue monitoring wells at this site for hydraulic head, temperature, and water quality parameters.

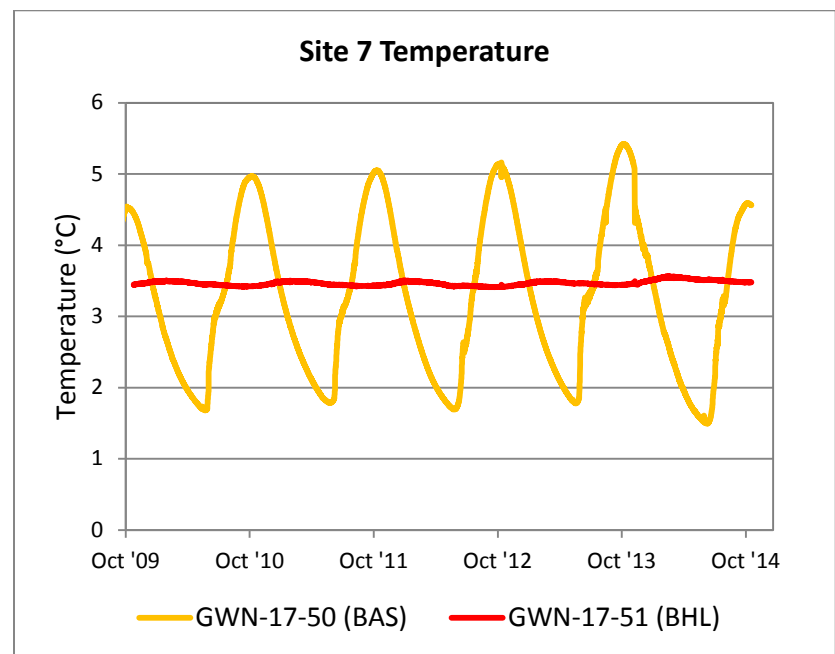
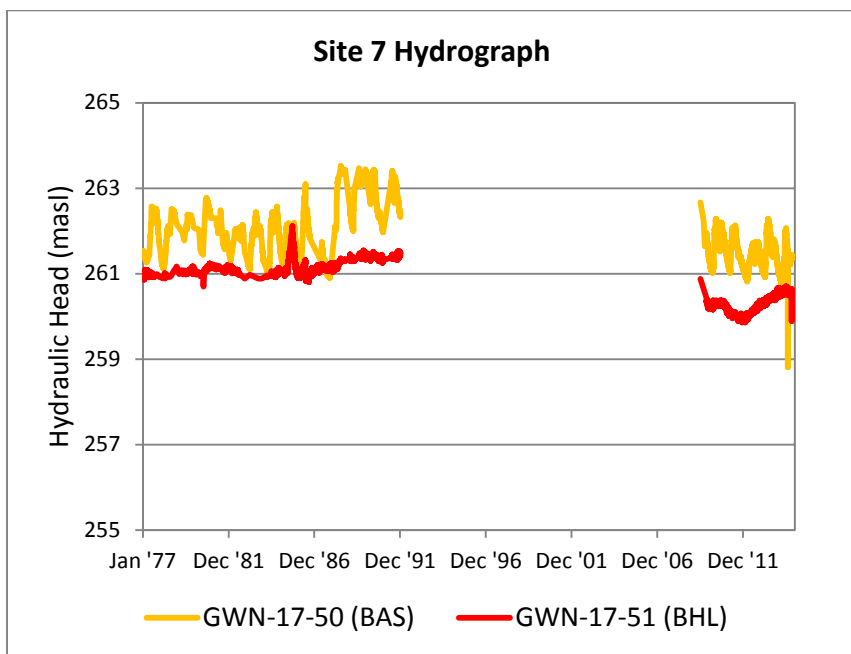
SITE 7 (13-12-094-11 W4M)

Completion Formation/Aquifer and Monitoring Wells	Site 7 Monitoring Wells				
	NAOS Well ID	Screened/Open Hole Interval (m asl)	Owner	Completion Unit	Instrument Depth (m btoc)
	GWN-17-50	254.8 – 250.2	ESRD	Basal McMurray (BAS)	5.6
GWN-17-51	240.5 – 201.4	ESRD	Beaverhill Lake (BHL)	55.8	



Interim Trigger Parameter Exceedances and Statistical Analysis Results				
NAOS Well ID	Completion Unit	Parameters Exceeding Applicable Interim Triggers ¹	Shewart-CUSUM (2014 parameters outside statistical UCL and LCL)	Mann-Kendall Trend Analysis
GWN-17-50	BAS	Si, NA _s	None	SO ₄ , TAN (decreasing); NA (increasing)
GWN-17-51	BHL	n/a	None	SO ₄ (decreasing)

1 - Exceeds the interim regional groundwater quality trigger in at least one sampling event in 2014
n/a - Not Applicable (not monitored under the Groundwater Management Framework; if Basal McMurray Aquifer, TDS >4,000 mg/L)
--- No Shewart-CUSUM control charts generated, or no statistically significant trend determined



Notes

Hydraulic head and temperature data in the Basal McMurray Aquifer (BAS) and the Beaverhill Lake Aquitard (BHL) at this location were consistent with seasonal and historical variations. Hydraulic head data in the BHL continued an upward trend since late 2011; temperatures in the BHL showed some seasonal effects but after a time lag, compared to the SS. The site is located near an active mine, west of the Athabasca River.

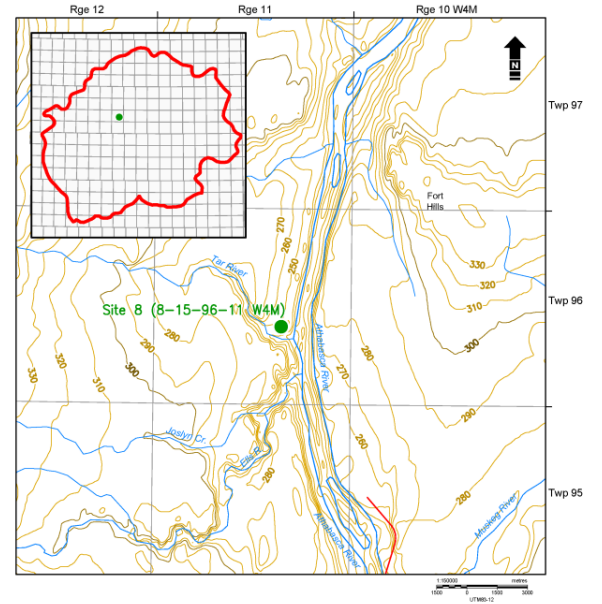
The proposed sub-network classification for the wells is:

- Sub-network B (Surveillance): GWN-17-50, GWN-17-51

In keeping with recommendations made regarding analytical frequency and parameters within the main body of this report, ESRD should continue monitoring wells at this site for hydraulic head, temperature, and water quality parameters.

SITE 8 (08-15-096-11 W4M)

Completion Formation/Aquifer and Monitoring Wells	Site 8 Monitoring Wells				
	NAOS Well ID	Screened/Open Hole Interval (m asl)	Owner	Completion Unit	Instrument Depth (m btoc)
	GWN-01-74	252.4 – 250.9	ESRD	Surficial Sands (SS)	8.8
	GWN-01-75	226.3 – 223.2	ESRD	Basal McMurray (BAS)	No logger
	GWN-01-76	132.4 – 129.4	ESRD	Basal McMurray (BAS)	123.3
	GWN-01-77	114.4 – 104.4	ESRD	Beaverhill Lake (BHL)	142.6
	GWN-01-78	49.1 – 38.1	ESRD	Prairie Evaporite/Keg River Formations (PBM)	211.4
GWN-01-79	-30.7 – (-57.7)	ESRD	Granite Wash (GRA)	---	

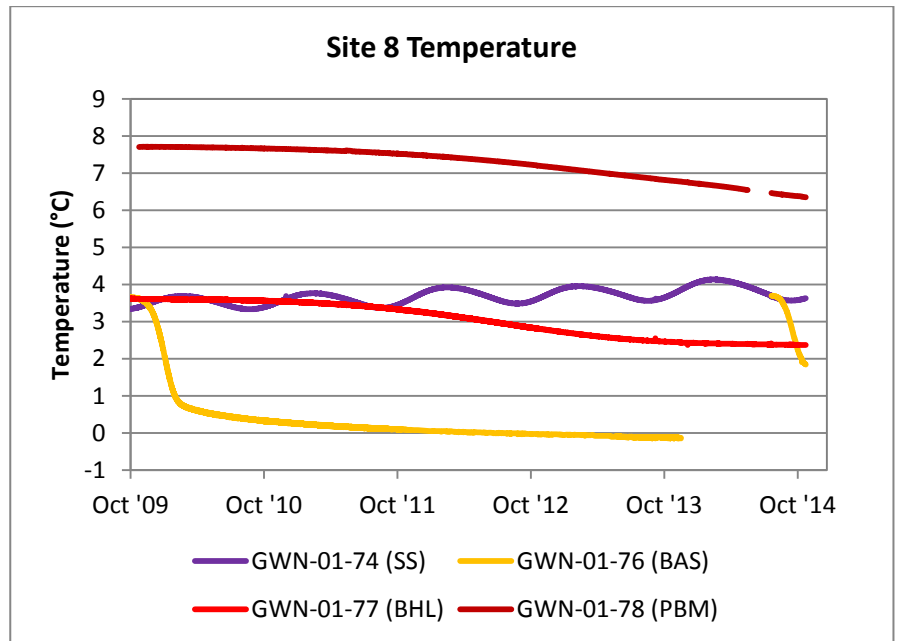
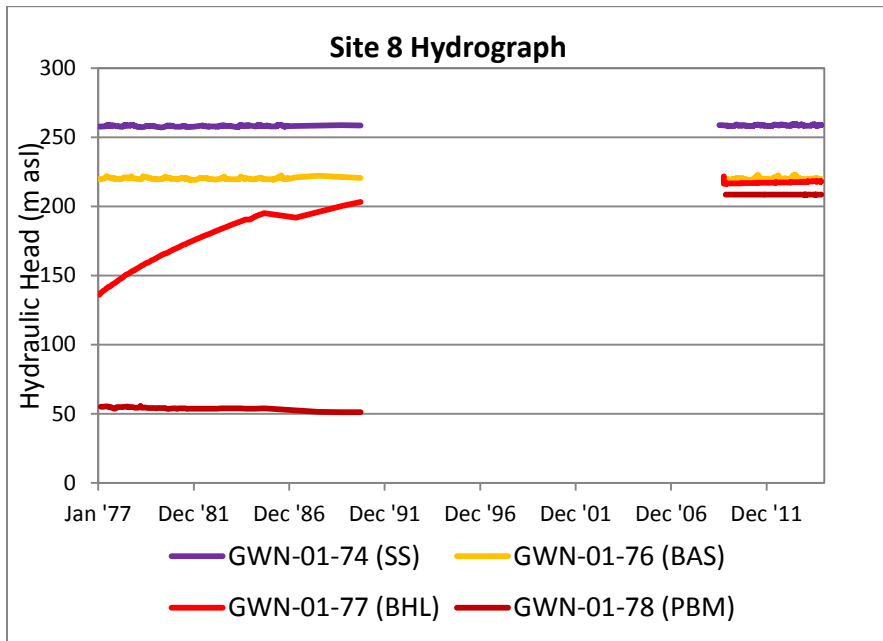


Interim Trigger Parameter Exceedances and Statistical Analysis Results				
NAOS Well ID	Completion Unit	Parameters Exceeding Applicable Interim Triggers ¹	Shewart-CUSUM (2014 parameters outside statistical UCL and LCL)	Mann-Kendall Trend Analysis
GWN-01-74	SS	TDS, Na, Cl, SO ₄ , TAN, As	None	Cl (decreasing)
GWN-01-75	BAS	None	None	TDS, SO ₄ (decreasing)
GWN-01-76	BAS	n/a	None	TDS (increasing)
GWN-01-77	BHL	n/a	None	TDS, Na (decreasing)
GWN-01-78	PBM	n/a	None	---
GWN-01-79	GRA	n/a	---	TDS (increasing); SO ₄ (decreasing)

1 - Exceeds the interim regional groundwater quality trigger in at least one sampling event in 2014

n/a - Not Applicable (not monitored under the Groundwater Management Framework; if Basal McMurray Aquifer, TDS >4,000 mg/L)

--- No Shewart-CUSUM control charts generated, or no statistically significant trend determined



Notes

Hydraulic heads and temperatures in the Surficial Sands (SS), Basal McMurray Aquifer (BAS), and the Devonian formations (BHL, PBM, and GRA) were consistent with recent seasonal and historical data. Upward vertical hydraulic gradients were observed in the BHL. Site is near an active mine, and near Devonian discharge into the Athabasca River.

Temperature data in the SS shows fluctuations consistent with seasonal variations, with a slight overall upward trend since late 2009. Low recorded temperatures in the BAS were interpreted to represent true groundwater temperatures at this location, as confirmed by the trend in the newly installed replacement transducer. Temperatures in the BHL and PBM also indicated continuing downward trends.

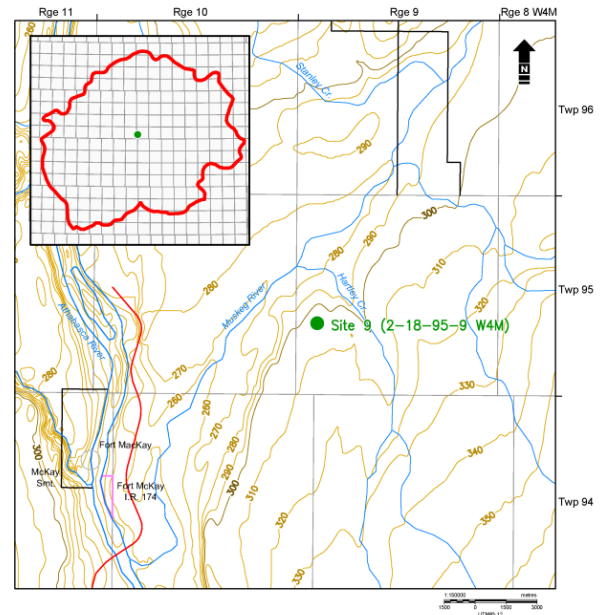
The proposed sub-network classification for the wells is:

- Sub-network A (Strategic): GWN-01-78, GWN-01-79
- Sub-network B (Surveillance): GWN-01-74, GWN-01-75, GWN-01-76, GWN-01-77

Historical records and field observations confirmed the presence of hydrocarbon in GWN-01-75. In keeping with recommendations made regarding analytical frequency and parameters within the main body of this report, ESRD should continue monitoring the other wells at this site (every 3 to 5 years recommended for GWN-01-78 and GWN-01-79) for hydraulic head, temperature, and water quality parameters. GWN-01-75 should be discontinued from the network.

SITE 9 (02-18-095-09 W4M)

Completion Formation/Aquifer and Monitoring Wells	Site 9 Monitoring Wells				
	NAOS Well ID	Screened/Open Hole Interval (m asl)	Owner	Completion Unit	Instrument Depth (m btoc)
	GWN-06-60	296.1 – 294.6	ESRD	Basal McMurray (BAS)*	5.8
	GWN-06-61	240.4 – 235.3	ESRD	Basal McMurray (BAS)	65.7
GWN-06-62	218.2 – 206.0	ESRD	Beaverhill Lake (PBM)	84.7	



* Completion unit was determined to be McMurray aquitard (oil sands).

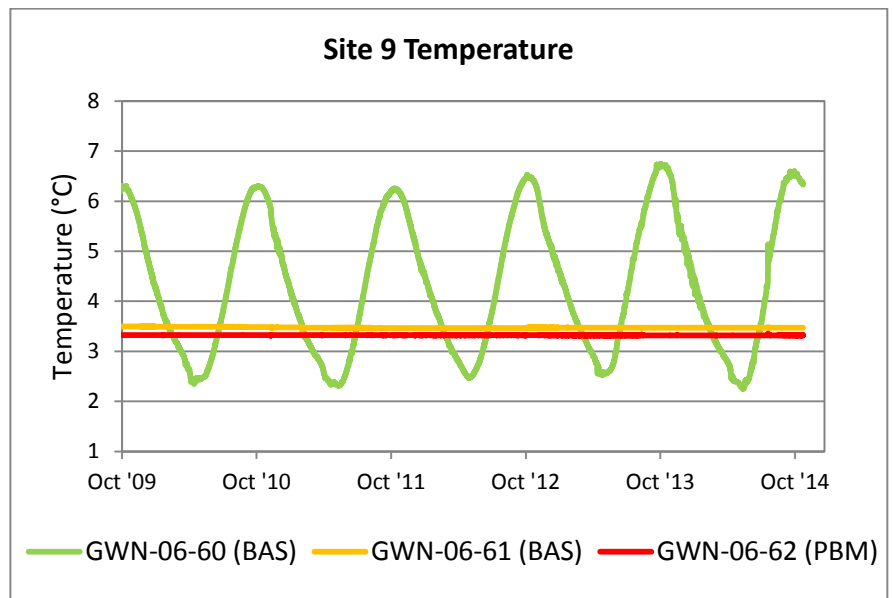
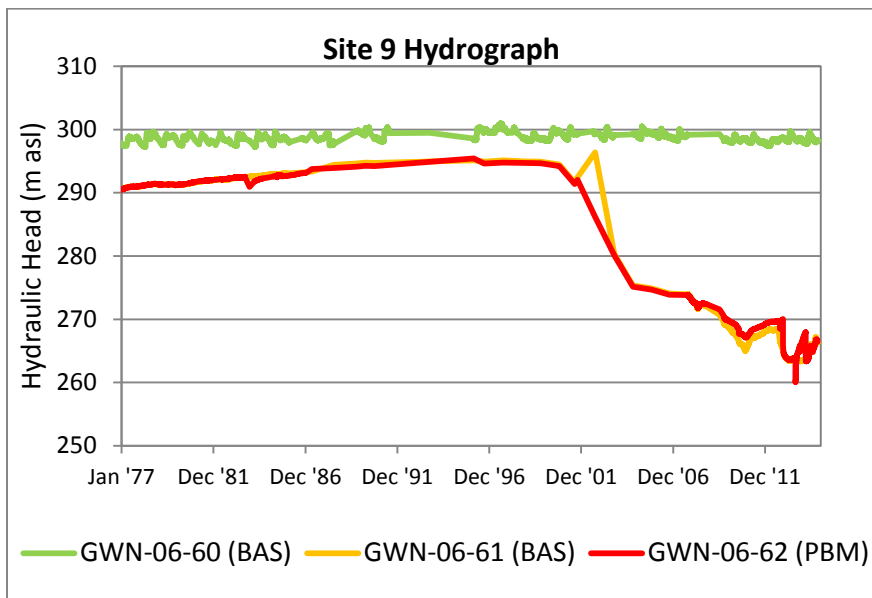
Interim Trigger Parameter Exceedances and Statistical Analysis Results				
NAOS Well ID	Completion Unit	Parameters Exceeding Applicable Interim Triggers ¹	Shewart-CUSUM (2014 parameters outside statistical UCL and LCL)	Mann-Kendall Trend Analysis
GWN-06-60	BAS*	None	None	---
GWN-06-61	BAS	TDS, Na, Cl, TAN, NAs	None	---
GWN-06-62	PBM	n/a	---	SO ₄ (decreasing)

1 - Exceeds the interim regional groundwater quality trigger in at least one sampling event in 2014

* Completion unit was determined to be McMurray aquitard (oil sands)

n/a - Not Applicable (not monitored under the Groundwater Management Framework; if Basal McMurray Aquifer, TDS >4,000 mg/L)

--- No Shewart-CUSUM control charts generated, or no statistically significant trend determined



Notes

Hydraulic heads and temperatures in the Basal McMurray Aquifer (BAS) and the Devonian formations (PBM) at this location were consistent with seasonal and recent historical observations. The site is located in an active mining area where depressurization of the Basal McMurray Aquifer is occurring as indicated by the lowering of hydraulic heads in the BAS and PBM aquifers since 2000. An upward groundwater flow gradient is observed in the PBM.

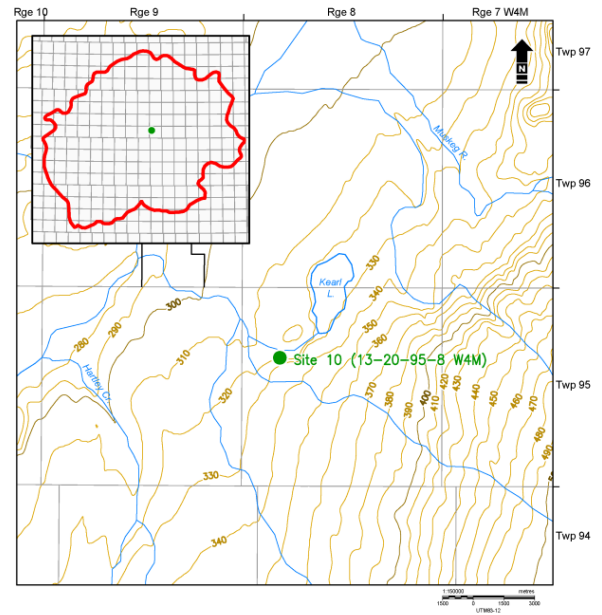
The proposed sub-network classification for the wells is:

- Sub-network B (Surveillance): GWN-06-61, GWN-06-62

In keeping with recommendations made regarding analytical frequency and parameters within the main body of this report, ESRD should continue monitoring wells GWN-06-61 and GWN-06-62 for hydraulic head, temperature, and water quality parameters. The well screens for GWN-06-60 have been interpreted to be within the McMurray oil sands; the well is thereby recommended to be reclassified or discontinued from the network.

SITE 10 (13-20-95-08 W4M)

Completion Formation/ Aquifer and Monitoring Wells	Site 10 Monitoring Wells				
	NAOS Well ID	Screened/Open Hole Interval (m asl)	Owner	Completion Unit	Instrument Depth (m btoc)
	GWN-07-55	319.7 – 318.2	ESRD	Surficial Sands (SS)	No logger
	GWN-07-56	289.6 – 286.6	ESRD	Basal McMurray (BAS)*	No logger
	GWN-07-57	228.0 – 224.9	ESRD	Basal McMurray (BAS)	Unknown
	GWN-07-58	157.5 – 145.3	ESRD	Beaverhill Lake (BHL)	Unknown
GWN-07-59	55.1 – 41.9	ESRD	Granite Wash (GRA)	Unknown	



* Completion unit was determined to be McMurray aquitard (oil sands).

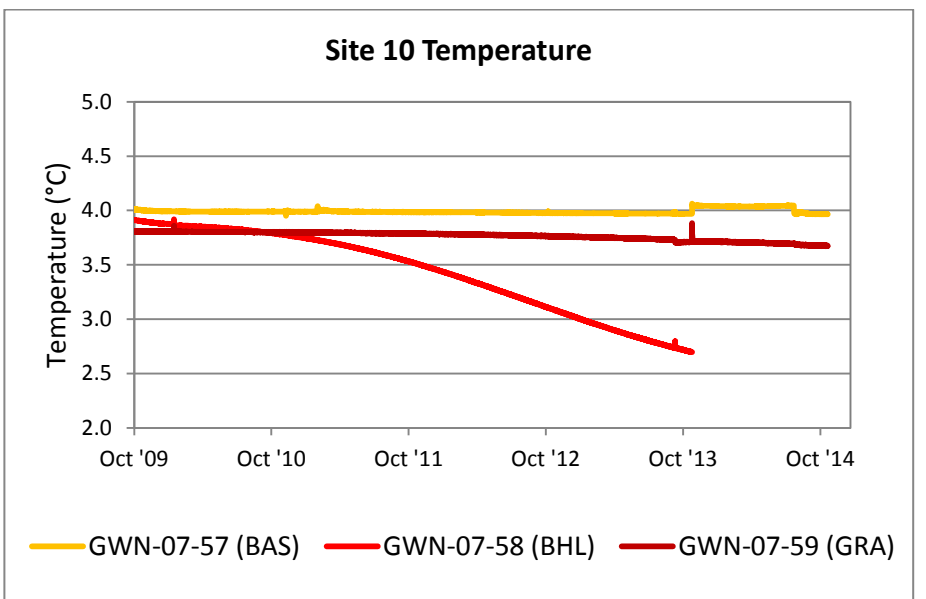
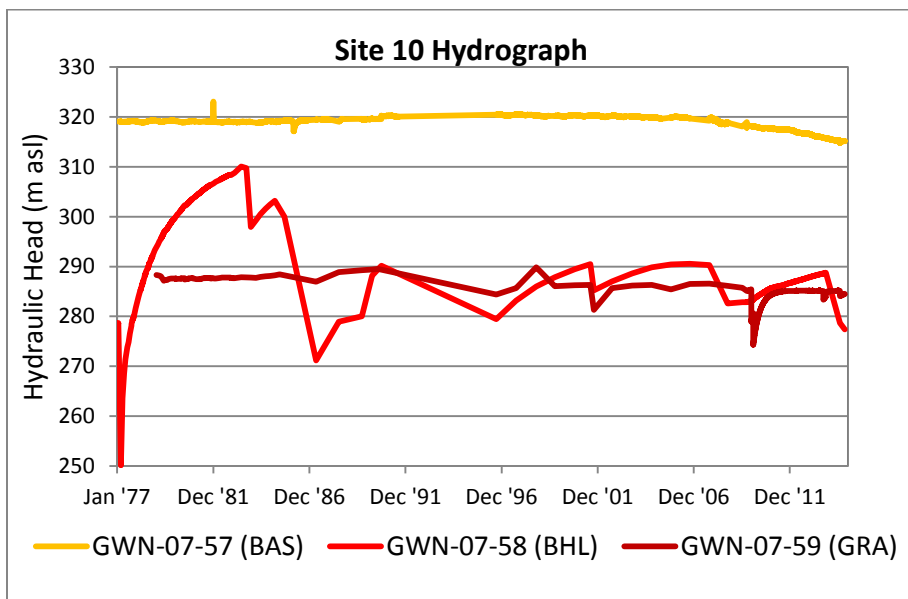
Interim Trigger Parameter Exceedances and Statistical Analysis Results				
NAOS Well ID	Completion Unit	Parameters Exceeding Applicable Interim Triggers ¹	Shewart-CUSUM (2014 parameters outside statistical UCL and LCL)	Mann-Kendall Trend Analysis
GWN-07-55	SS	None	---	---
GWN-07-56	BAS*	TAN, NAs	---	---
GWN-07-57	BAS	TAN	None	---
GWN-07-58	BHL	n/a	None	---
GWN-07-59	GRA	n/a	None	---

1 - Exceeds the interim regional groundwater quality trigger in at least one sampling event in 2014

* Completion unit was determined to be McMurray aquitard (oil sands)

n/a - Not Applicable (not monitored under the Groundwater Management Framework; if Basal McMurray Aquifer, TDS >4,000 mg/L)

--- No Shewart-CUSUM control charts generated, or no statistically significant trend determined



Notes

Hydraulic heads and temperatures in the Basal McMurray Aquifer (BAS) and the Devonian formations (BHL, PBM) were generally consistent with historical data and observations. Site is near active and developing mines; hydraulic head fluctuations in the BHL and PBM are believed to be related to nearby oil sands operations.

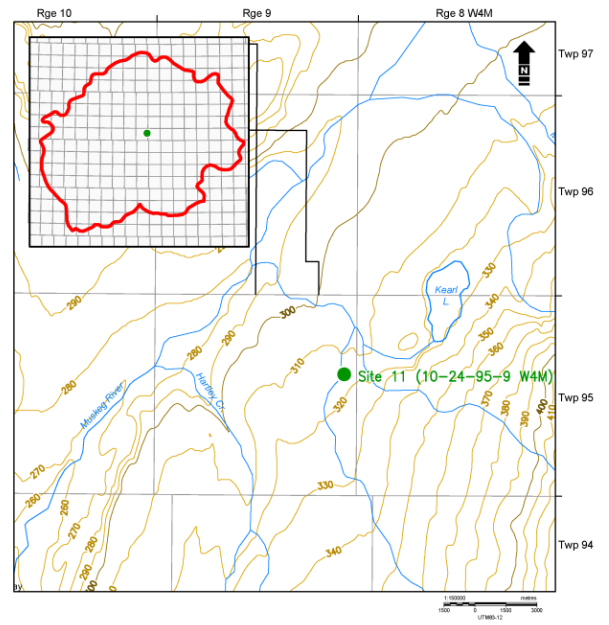
The proposed sub-network classification for the wells is:

- Sub-network B (Surveillance): GWN-07-57, GWN-07-58, GWN-07-59
- Sub-networks B and C (Surveillance and Investigative): GWN-07-55

In keeping with recommendations made regarding analytical frequency and parameters within the main body of this report, ESRD should continue monitoring wells GWN-07-55, GWN-07-57, GWN-07-58, and GWN-07-59 for hydraulic head, temperature, and water quality parameters. The completion of GWN-07-56 has been interpreted to be within the McMurray oil sands (field observations confirmed hydrocarbon odor in well); the well is thereby recommended to be reclassified or discontinued from the network.

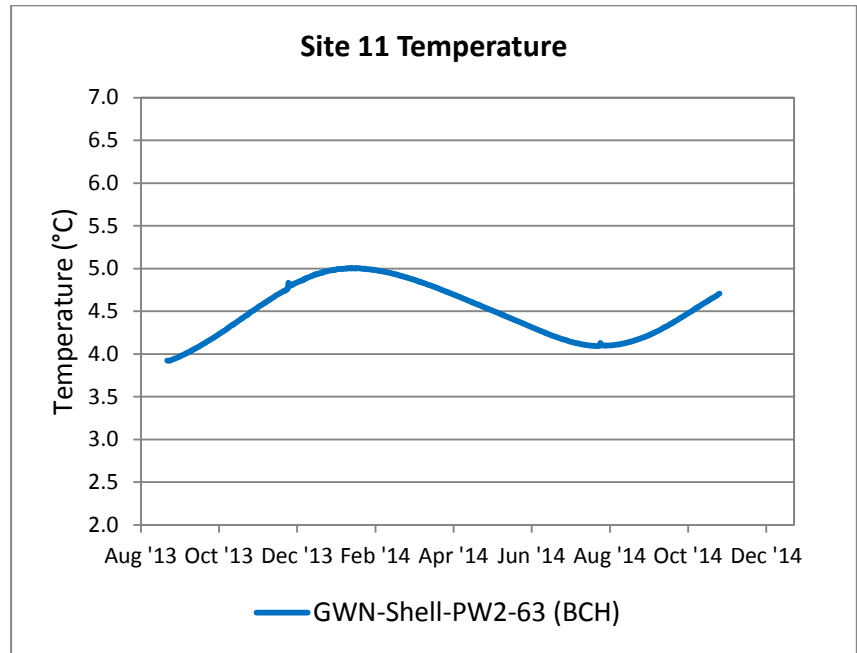
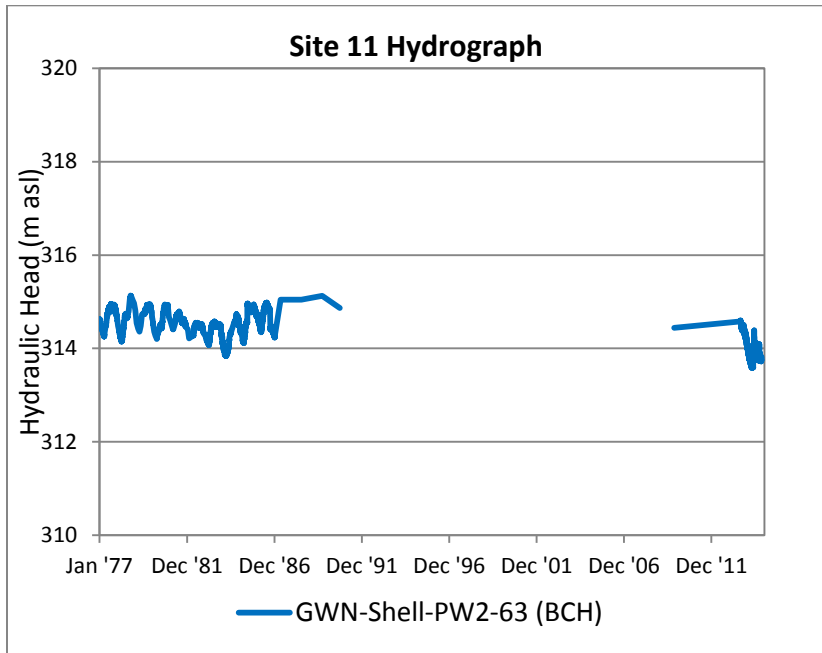
SITE 11 (10-24-095-09 W4M)

Completion Formation/Aquifer and Monitoring Wells	Site 11 Monitoring Well				
	NAOS Well ID	Screened/Open Hole Interval (m asl)	Owner	Completion Unit	Instrument Depth (m btoc)
	GWN-Shell-PW2-63	305.1 – 297.1	ESRD	Buried Channels (BCH) - Kearl	11.5



Interim Trigger Parameter Exceedances and Statistical Analysis Results				
NAOS Well ID	Completion Unit	Parameters Exceeding Applicable Interim Triggers ¹	Shewart-CUSUM (2014 parameters outside statistical UCL and LCL)	Mann-Kendall Trend Analysis
GWN-Shell-PW2-63	BCH - Kearl	Si	None	---

1 - Exceeds the interim regional groundwater quality trigger in at least one sampling event in 2014
n/a - Not Applicable (not monitored under the Groundwater Management Framework; if Basal McMurray Aquifer, TDS >4,000 mg/L)
--- No Shewart-CUSUM control charts generated, or no statistically significant trend determined



Notes

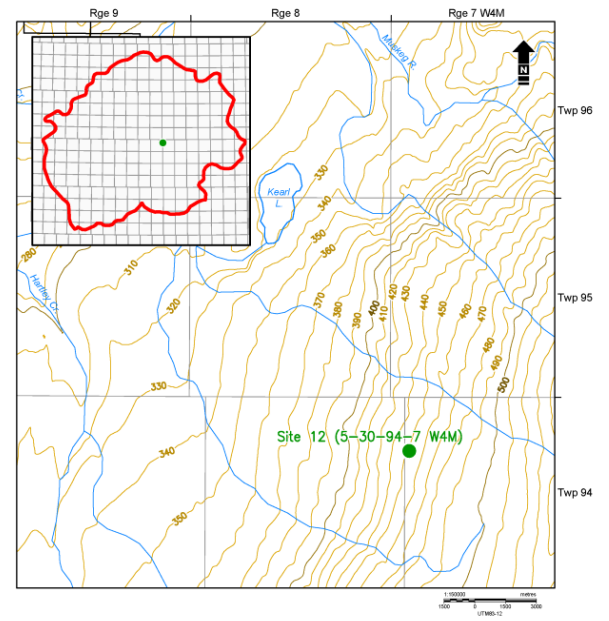
Well instrumented with new transducer in August 2013.
The proposed sub-network classification for the wells is:

- Sub-networks B and C (Surveillance and Investigative): GWN-Shell-PW2-63

In keeping with recommendations made regarding analytical frequency and parameters within the main body of this report, ESRD should continue monitoring wells at this site for hydraulic head, temperature, and water quality parameters.

SITE 12 (05-30-94-07 W4M)

Completion Formation/Aquifer and Monitoring Wells	Site 12 Monitoring Wells				
	NAOS Well ID	Screened/Open Hole Interval (m asl)	Owner	Completion Unit	Instrument Depth (m btoc)
	GWN-08-43	423.7 - 422.2	ESRD	Surficial Sands (SS)	5.9
	GWN-08-44	400.7 - 397.5	ESRD	Buried Channels (BCH) - Kearl	33.4
	GWN-08-45	373.7 - 311.2	ESRD	Clearwater (CWR)	57.7
	GWN-08-46	326.5 - 322.5	ESRD	Basal McMurray (BAS)*	101.4
	GWN-08-47	273.1 - 270.1	ESRD	Prairie Evaporite/ Beaverhill Lake/ Keg River Formations (PBM)	151.6
GWN-08-48	224.9 - 212.9	ESRD	Beaverhill Lake Formation (BHL)	212.6	



* Completion unit was determined to be Clearwater Formation aquitard.

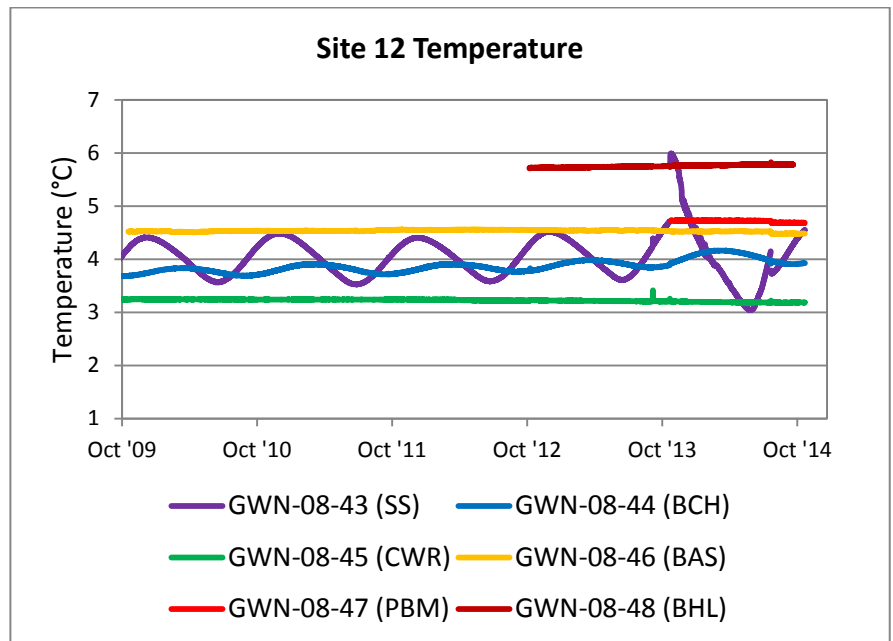
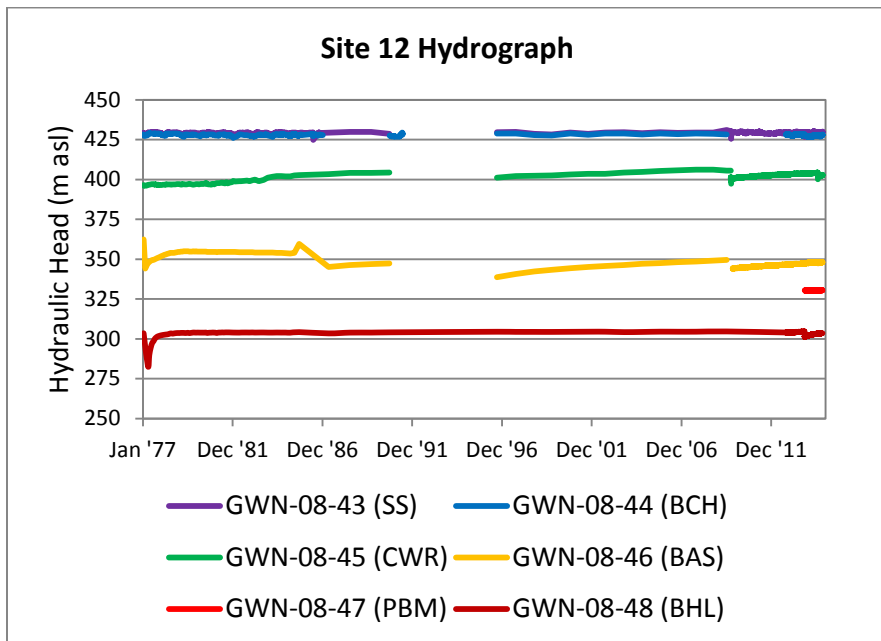
Interim Trigger Parameter Exceedances and Statistical Analysis Results				
NAOS Well ID	Completion Unit	Parameters Exceeding Applicable Interim Triggers ¹	Shewart-CUSUM (2014 parameters outside statistical UCL and LCL)	Mann-Kendall Trend Analysis
GWN-08-43	SS	TDS, Na, TAN	None	Si (increasing)
GWN-08-44	BCH - Kearl	Na, Si	None	Na, Cl (decreasing)
GWN-08-45	CWR	n/a	None	---
GWN-08-46	BAS*	TAN	None	Cl, SO ₄ (decreasing)
GWN-08-47	PBM	n/a	---	---
GWN-08-48	BHL	n/a	None	TDS (increasing)

1 - Exceeds the interim regional groundwater quality trigger in at least one sampling event in 2014

* Completion unit was determined to be Clearwater Formation aquitard

n/a - Not Applicable (not monitored under the Groundwater Management Framework; if Basal McMurray Aquifer, TDS >4,000 mg/L)

--- No Shewart-CUSUM control charts generated, or no statistically significant trend determined



Notes

A downward vertical hydraulic gradient was observed. Hydraulic heads and temperatures in the Surficial Sands (SS), Buried Channel Aquifer (BCH), Clearwater Formation aquitard (CWR), and the Devonian formations (BHL, PBM) were generally consistent with historical data trends. Similarities in hydraulic head responses in the Kearl Channel and the SS suggest hydraulic connectivity at this location. Site is near in-situ development with active groundwater extraction for operations and disposal into the Middle Devonian.

GWN-08-47 was instrumented with new transducer in November 2013 (former transducer was lost). Physical evidence (water dripping into well from shallower zone), laboratory-reported EC values and profiling results in GWN-08-47 suggested groundwater mixing in the well. Laboratory-reported EC values were consistent with field EC measurement from or close to the completion interval, but distinct from field EC measurements obtained in the shallower parts of the water column (Matrix 2014c).

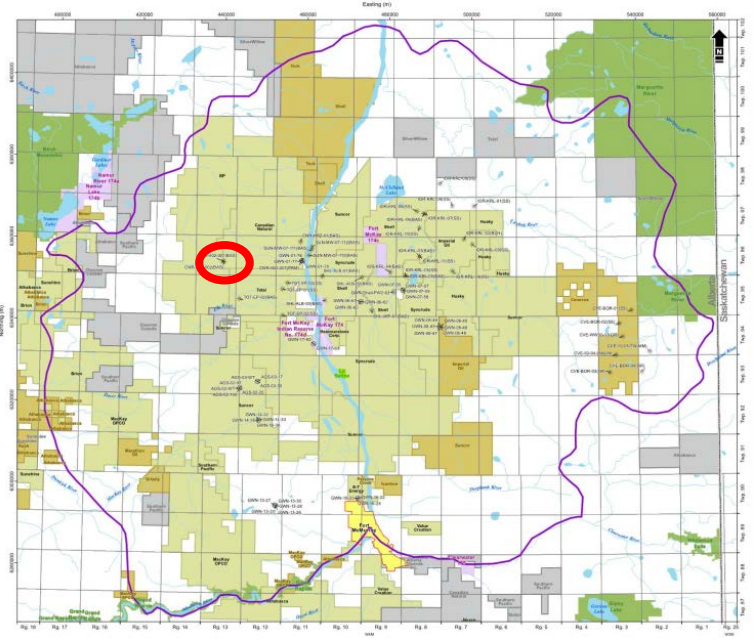
The proposed sub-network classification for the wells was:

- Sub-network A (Strategic): GWN-08-43, GWN-08-45, GWN-08-47, GWN-08-48
- Sub-networks A and C (Strategic and Investigative): GWN-08-44

In keeping with recommendations made regarding analytical frequency and parameters within the main body of this report, ESRD should continue monitoring wells GWN-08-43, GWN-08-44, GWN-08-45, and GWN-08-48 for hydraulic head, temperature, and water quality parameters. GWN-08-46 has been determined to be completed in the Clearwater Formation aquitard; the well is recommended to be reclassified or discontinued from the network. Due to apparent groundwater mixing from shallower zones, GWN-08-47 should be monitored only for hydraulic head and discontinued for groundwater chemistry monitoring.

Operator Wells - CNRL

Completion Formation/Aquifer and Monitoring Wells	Operator Wells - CNRL			
	NAOS Well ID	Screened/Open Hole Interval (m asl)	Owner	Completion Unit
	CNR-HRZ-01(BAS)	---	CNRL	Basal McMurray
	CNR-H02-001(BAS)	213.7 - 229	CNRL	Basal McMurray
	CNR-H02-002(BAS)	213.7 - 226.3	CNRL	Basal McMurray
CNR-H02-007(PBM)	---	CNRL	Prairie Evaporite-Beaverhill Lake-Methyl	



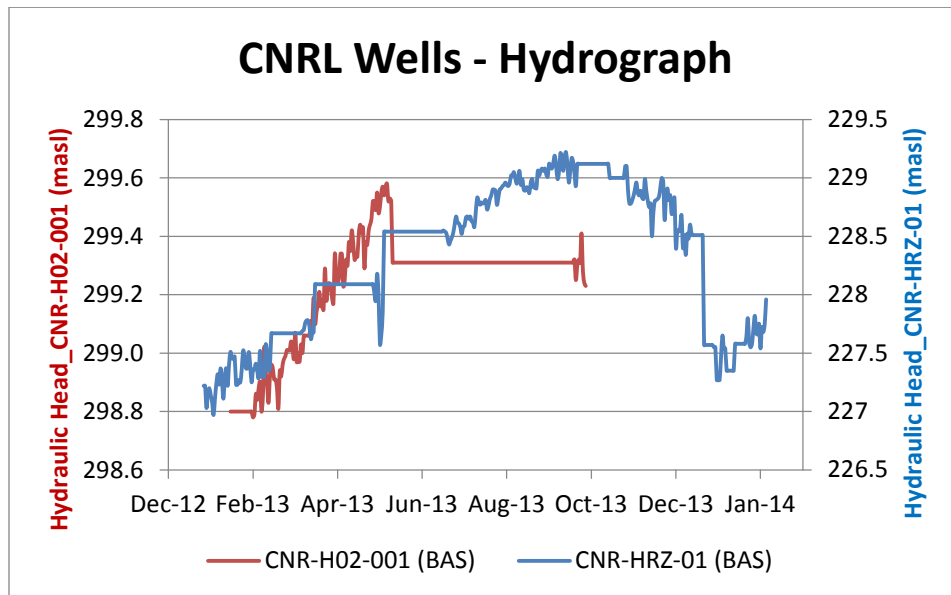
Interim Trigger Parameter Exceedances and Statistical Analysis Results				
NAOS Well ID	Completion Unit	Parameters Exceeding Applicable Interim Triggers ¹	Shewart-CUSUM (parameters outside statistical UCL and LCL in most recent sampling data available)	Mann-Kendall Trend Analysis
CNR HRZ 01(BAS)	BAS	n/a	None	---
CNR-H02-001(BAS)	BAS	ND	---	---
CNR-H02-002(BAS)	BAS	n/a	---	---
CNR-H02-007(PBM)	PBM	n/a	---	---

1 - Exceeds the interim regional groundwater quality trigger in at least one sampling event in the most recent sampling year

ND - No chemistry data provided

n/a - Not Applicable (not monitored under the Groundwater Management Framework; if Basal McMurray Aquifer, TDS >4,000 mg/L)

--- No Shewart-CUSUM control charts generated, or no statistically significant trend determined



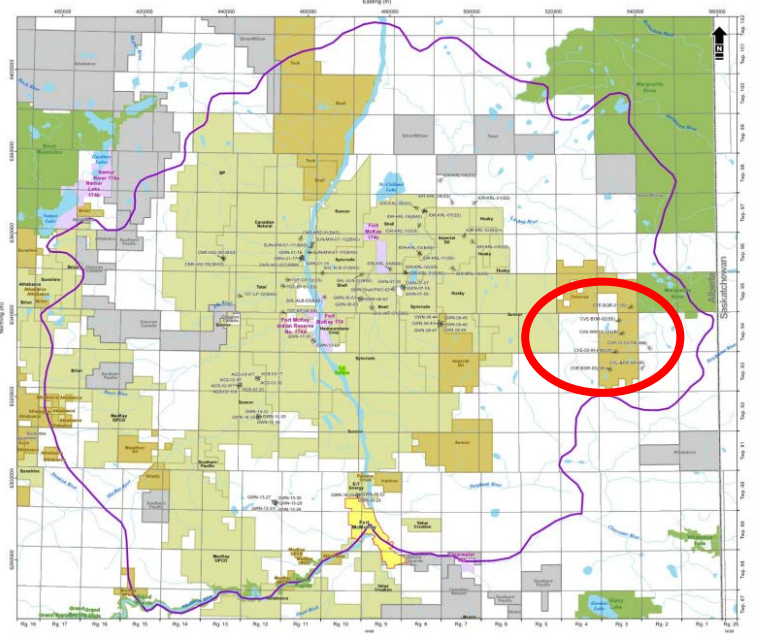
Notes

No operator data requested in 2014.

It is recommended ESRD continue collaborating with CNRL to identify additional monitoring locations for the network. If monitoring wells are proposed, well details and locations should be reviewed and assessed to confirm the wells support overall network objectives.

Operator Wells - Cenovus

Completion Formation/Aquifer and Monitoring Wells	Operator Wells - Cenovus			
	NAOS Well ID	Screened/Open Hole Interval (m asl)	Owner	Completion Unit
	CVE-BOR-01(SS)	461.9 – 458.9	Cenovus	Surficial Sands
	CVE-BOR-02(SS)	501.6 – 500.1	Cenovus	Surficial Sands
	CVE-BOR-03(GR)	558.4 – 555.4	Cenovus	Grand Rapids
	CVE-BOR-04(GR)	---	Cenovus	Grand Rapids
	CVE-WW10-13(GR)	441.9 – 438.9	Cenovus	Grand Rapids
	CVE-10-05-TW(MM)	325.6 – 320.6	Cenovus	Middle McMurray
CVE-02-04-LM(LM)	301.4 – 294.4	Cenovus	Lower McMurray	



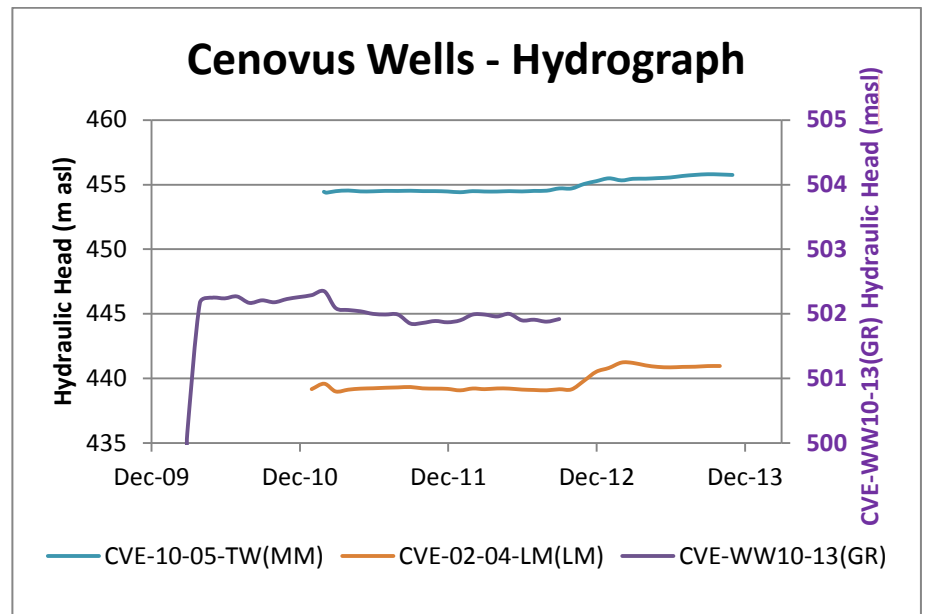
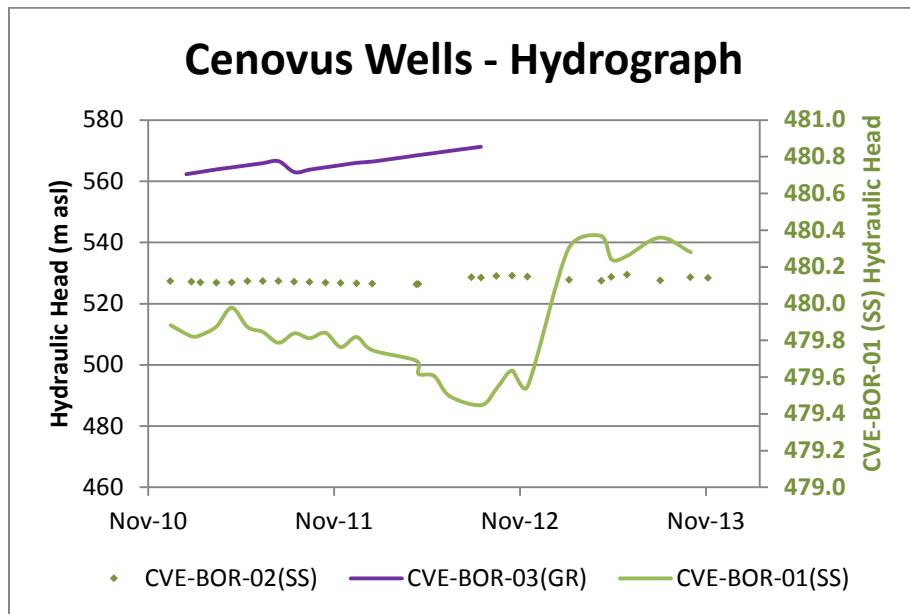
Interim Trigger Parameter Exceedances and Statistical Analysis Results				
NAOS Well ID	Completion Unit	Parameters Exceeding Applicable Interim Triggers ¹	Shewart-CUSUM (parameters outside statistical UCL and LCL in most recent sampling data available)	Mann-Kendall Trend Analysis
CVE-BOR-01(SS)	SS	TAN, Si	---	---
CVE-BOR-02(SS)	SS	TAN, Si	---	Na (decreasing)
CVE-BOR-03(GR)	GR	n/a	---	---
CVE-BOR-04(GR)	GR	ND	---	---
CVE-WW10-13(GR)	GR	n/a	---	---
CVE-10-05TW(MM)	MM	n/a	---	---
CVE-02-04(LM)	LM	n/a	---	---

1 - Exceeds the interim regional groundwater quality trigger in at least one sampling event in the most recent sampling year

ND - No chemistry data provided

n/a - Not Applicable (not monitored under the Groundwater Management Framework; if Basal McMurray Aquifer, TDS >4,000 mg/L)

--- No Shewart-CUSUM control charts generated, or no statistically significant trend determined



Notes

No operator data requested in 2014.

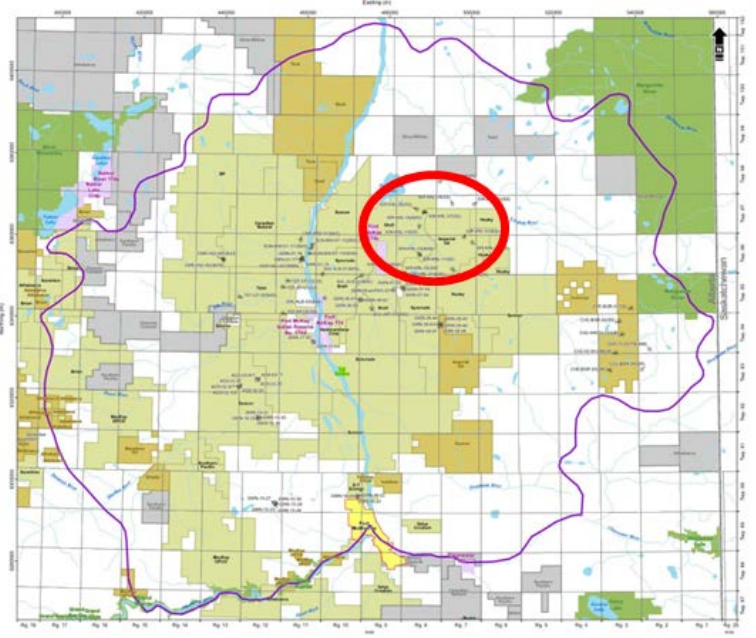
The proposed sub-network classification for the wells is:

- Sub-network A (Strategic): CVE-BOR-01(SS), CVE-BOR-02(SS), CVE-BOR-03(GR), CVE-BOR-04(GR), CVE-WW10-13(GR), CVE-02-04(LM)

In keeping with the recommendations provided in the main text of this report, it is recommended ESRD continue collaborating with Cenovus for regular updates to the groundwater data set from the Cenovus-owned monitoring wells. It is also recommended that if Cenovus identifies additional monitoring wells for incorporation within the network, these well completion details and locations should be reviewed and assessed to determine proposed wells support overall network objectives.

Operator Wells - IOR

Completion Formation/Aquifer and Monitoring Wells	Operator Wells - IOR			
	NAOS Well ID	Screened/Open Hole Interval (m asl)	Owner	Completion Unit
	IOR-KRL-01(SS)	344.2 - 341.2	IOR	Surficial Sands
	IOR-KRL-03(SS)	357.4 - 355.9	IOR	Surficial Sands
	IOR-KRL-04(SS)	388.2 - 386.7	IOR	Surficial Sands
	IOR-KRL-05(SS)	315.1 - 312.1	IOR	Surficial Sands
	IOR-KRL-06(SS)	286.5 - 272.8	IOR	Surficial Sands
	IOR-KRL-07(SS)	282.9 - 260.1	IOR	Surficial Sands
	IOR-KRL-08(SS)	321.0 - 311.8	IOR	Surficial Sands
	IOR-KRL-09(SS)	282.5 - 279.5	IOR	Surficial Sands
	IOR-KRL-10(SS)	289.5 - 288.0	IOR	Surficial Sands
	IOR-KRL-11(SS)	318.5 - 312.4	IOR	Surficial Sands
	IOR-KRL-02(BCH)	356.0 - 354.5	IOR	Buried Channel - Kearl
	IOR-KRL-03(BAS)	260.3 - 252.3	IOR	Basal McMurray
	IOR-KRL-04(BAS)	215.2 - 212.2	IOR	Basal McMurray
	IOR-KRL-05(BAS)	217.0 - 214.0	IOR	Basal McMurray
IOR-KRL-06(BAS)	226.5 - 225.0	IOR	Basal McMurray	



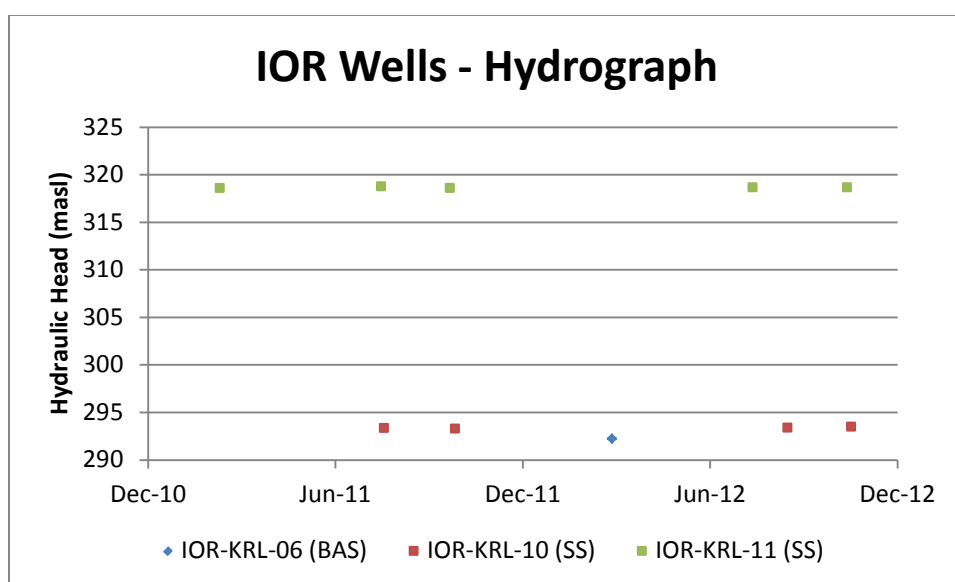
Interim Trigger Parameter Exceedances and Statistical Analysis Results				
NAOS Well ID	Completion Unit	Parameters Exceeding Applicable Interim Triggers ¹	Shewart-CUSUM (parameters outside statistical UCL and LCL in most recent sampling data available)	Mann-Kendall Trend Analysis
IOR-KRL-01(SS)	SS	Si, NAs	---	SO ₄ (increasing)
IOR-KRL-03(SS)	SS	None	None	---
IOR-KRL-04(SS)	SS	TDS, Na, SO ₄ , TAN, Si	None	---
IOR-KRL-05(SS)	SS	Si	---	---
IOR-KRL-06(SS)	SS	TAN, Si	---	Na (decreasing)
IOR-KRL-07(SS)	SS	Si	---	---
IOR-KRL-08(SS)	SS	Si	---	Na (decreasing)
IOR-KRL-09(SS)	SS	Si	---	Na (decreasing)
IOR-KRL-10(SS)	SS	TAN	---	---
IOR-KRL-11(SS)	SS	Si	---	---
IOR-KRL-02(BCH)	BCH	TAN, Si	---	---
IOR-KRL-03(BAS)	BAS	None	None	Cl (increasing)
IOR-KRL-04(BAS)	BAS	TAN	---	SO ₄ (decreasing)
IOR-KRL-05(BAS)	BAS	TAN	None	---
IOR-KRL-06(BAS)	BAS	ND	---	---

1 - Exceeds the interim regional groundwater quality trigger in at least one sampling event in the most recent sampling year

ND - No chemistry data provided

n/a - Not Applicable (not monitored under the Groundwater Management Framework; if Basal McMurray Aquifer, TDS >4,000 mg/L)

--- No Shewart-CUSUM control charts generated, or no statistically significant trend determined



Notes

No operator data requested in 2014.

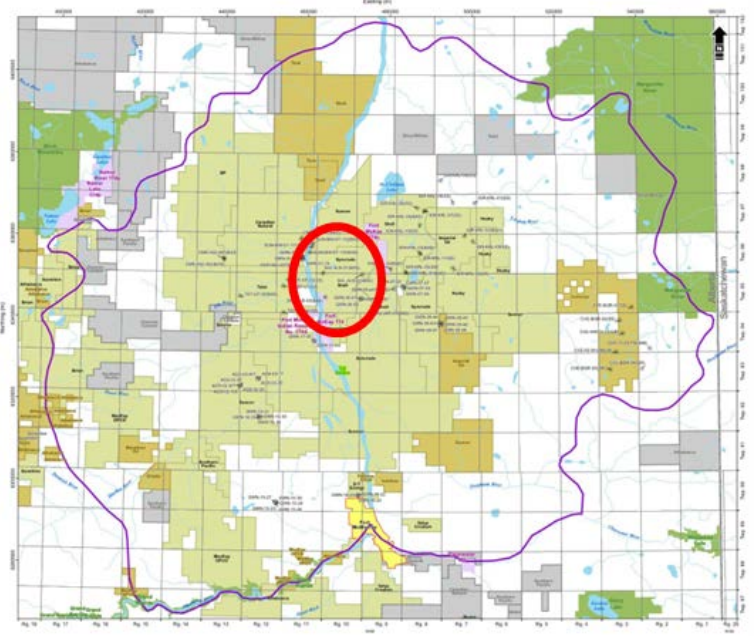
The proposed sub-network classification for the wells is:

- Sub-network B (Surveillance): IOR-KRL-01(SS), IOR-KRL-10(SS), IOR-KRL-04(BAS)
- Sub-networks B and C (Surveillance and Investigative): IOR-KRL-03(SS), IOR-KRL-04(SS), IOR-KRL-05(SS), IOR-KRL-06(SS), IOR-KRL-07(SS), IOR-KRL-08(SS), IOR-KRL-09(SS), IOR-KRL-011(SS), IOR-KRL-02(BCH), IOR-KRL-03(BAS), IOR-KRL-05(BAS), IOR-KRL-06(BAS)

It is recommended ESRD continue collaborating with IOR for data updates for the IOR-owned monitoring wells. Also, it is recommended that if additional monitoring wells are proposed for the network, these well details and locations should be reviewed and assessed to confirm the wells support overall network objectives.

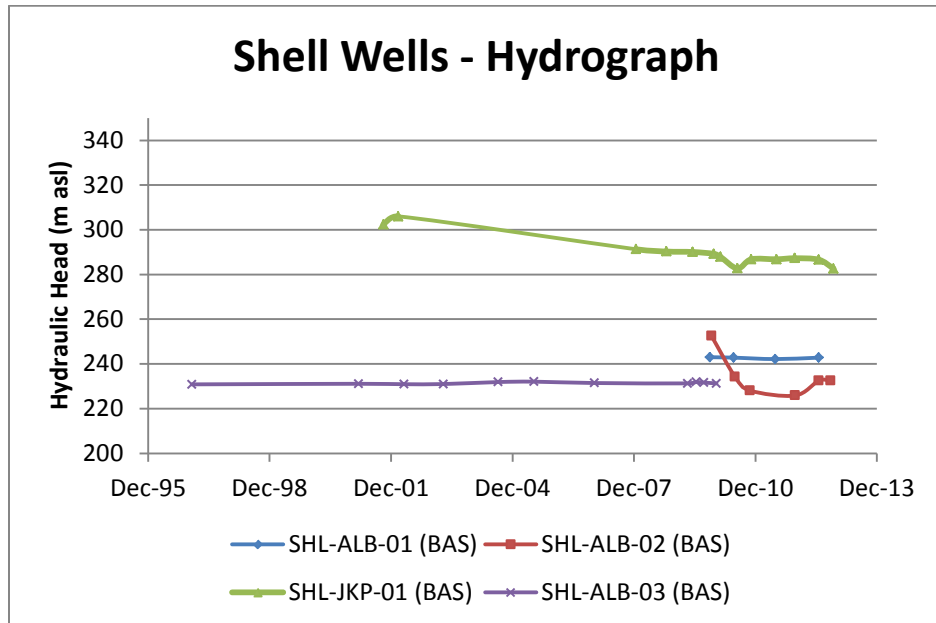
Operator Wells - Shell

Completion Formation/Aquifer and Monitoring Wells	Operator Wells - Shell			
	NAOS Well ID	Screened/Open Hole Interval (m asl)	Owner	Completion Unit
	SHL-ALB-01(BAS)	212.6 – 202.5	Shell	Basal McMurray
	SHL-ALB-02(BAS)	191.9 – 185.9	Shell	Basal McMurray
	SHL-ALB-03(BAS)	203.8 – 191.8	Shell	Basal McMurray
SHL-JKP-01(BAS)	211.9 – 197.9	Shell	Basal McMurray	



Interim Trigger Parameter Exceedances and Statistical Analysis Results				
NAOS Well ID	Completion Unit	Parameters Exceeding Applicable Interim Triggers ¹	Shewart-CUSUM (parameters outside statistical UCL and LCL in most recent sampling data available)	Mann-Kendall Trend Analysis
SHL-ALB-01(BAS)	BAS	Na	---	---
SHL-ALB-02(BAS)	BAS	None	---	---
SHL-ALB-03(BAS)	BAS	Na, Cl, TDS, NAs	None	---
SHL-JKP-01(BAS)	BAS	None	None	TDS (increasing)

1 - Exceeds the interim regional groundwater quality trigger in at least one sampling event in the most recent sampling year
 ND - No chemistry data provided
 n/a - Not Applicable (not monitored under the Groundwater Management Framework; if Basal McMurray Aquifer, TDS >4,000 mg/L)
 --- No Shewart-CUSUM control charts generated, or no statistically significant trend determined



Notes

Wells in an active mining area with Basal McMurray Aquifer depressurization; no operator data requested in 2014.

The proposed sub-network classification for the wells is:

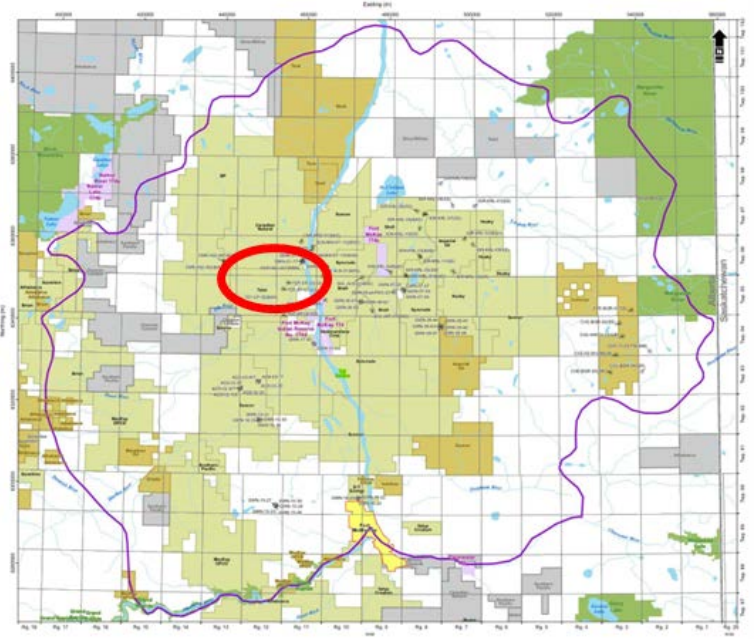
- Sub-network B (Surveillance): SHL-ALB-03(BAS)
- Sub-networks B and C (Surveillance and Investigative): SHL-JKP-01(BAS)

It is recommended ESRD continue collaborating with Shell for data updates for the Shell-owned monitoring wells. Also, it is recommended that if additional monitoring wells are proposed for the network, these well details and locations should be reviewed and assessed to confirm the wells support overall network objectives.

for its existing operator wells, and for additional wells that supports the overall network objectives.

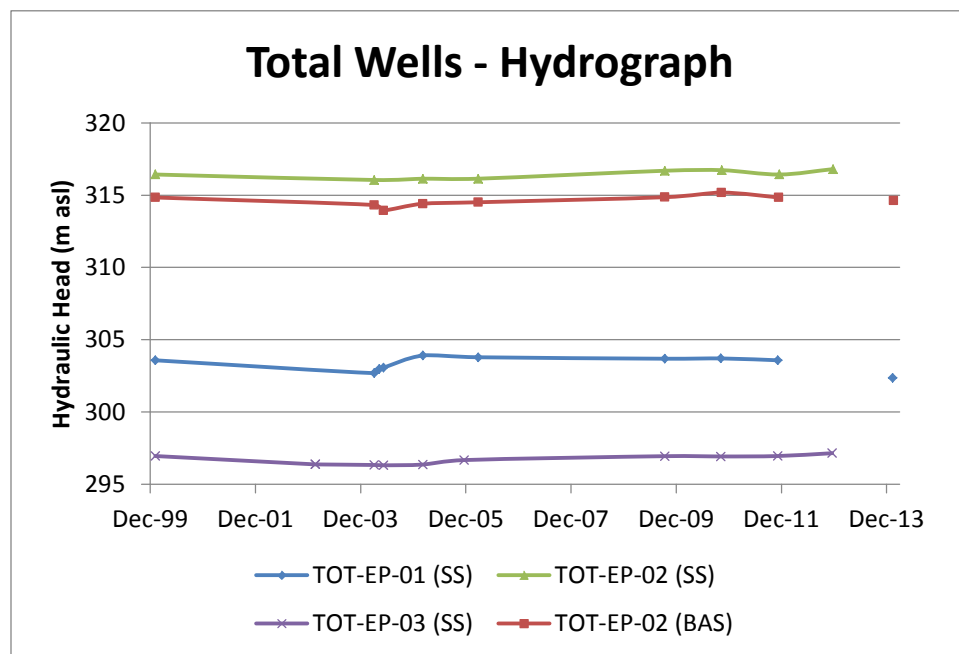
Operator Wells - Total

Completion Formation/Aquifer and Monitoring Wells	Operator Wells - Total			
	NAOS Well ID	Screened/Open Hole Interval (m asl)	Owner	Completion Unit
	TOT-EP-01(SS)	315.8 – 312.8	Total	Surficial Sands
	TOT-EP-02(SS)	309.1 – 306.1	Total	Surficial Sands
	TOT-EP-03(SS)	314.6 – 311.7	Total	Surficial Sands
TOT-EP-02(BAS)	187.5 - 186.5	Total	Basal McMurray	



Interim Trigger Parameter Exceedances and Statistical Analysis Results				
NAOS Well ID	Completion Unit	Parameters Exceeding Applicable Interim Triggers ¹	Shewart-CUSUM (parameters outside statistical UCL and LCL in most recent sampling data available)	Mann-Kendall Trend Analysis
TOT-EP-01(SS)	SS	ND	---	---
TOT-EP-02(SS)	SS	ND	---	---
TOT-EP-03(SS)	SS	ND	---	---
TOT-EP-02(BAS)	BAS	n/a	---	---

1 - Exceeds the interim regional groundwater quality trigger in at least one sampling event in the most recent sampling year
 ND - No chemistry data provided
 n/a - Not Applicable (not monitored under the Groundwater Management Framework; if Basal McMurray Aquifer, TDS >4,000 mg/L)
 --- No Shewart-CUSUM control charts generated, or no statistically significant trend determined



Notes

An apparent upward vertical hydraulic gradient was observed in the Basal McMurray Aquifer. No operator data requested in 2014.

The proposed sub-network classification for the wells was:

- Sub-network A (Strategic): TOT-EP-01(SS), TOT-EP-02(SS)

It is recommended ESRD continue collaborating with Total for data updates for the Total-owned monitoring wells. Also, it is recommended that if additional monitoring wells are proposed for the network, these well details and locations should be reviewed and assessed to confirm the wells support overall network objectives.

7.3 Miscellaneous – Petroleum Hydrocarbon in Wells

The laboratory hydrocarbon distribution reports indicated the presence of petroleum hydrocarbon in GWN-14-35 (BHL) at Site 3 and GWN-01-75 (BAS) at Site 8 (Appendix D). The prevalent signature in the GWN-14-35 (BHL) chromatograph is for hydrocarbon F2, which suggested refined light hydrocarbon fuels (e.g., gasoline or kerosene) were in the well (Appendix D: Report L1496774, ALS Sample ID 1496774-4). Historical records (Integrated Sustainability 2013) suggested kerosene was introduced in 1976 into GWN-14-32 (SS); this other well at the same monitoring site had prevalent peaks that were generally similar to those observed in GWN-14-35 (BHL) (Appendix D: Report L1496774, ALS Sample ID 1496774-5).

A relatively low peak was observed in the GWN-01-75 (BAS) chromatograph, suggesting low hydrocarbon concentration in the analyzed sample (Appendix D: Report L1496514, ALS Sample ID 1496514-2). Peak heights in the hydrocarbon distribution reports are a function of sample concentration, the amount of sample extracted, and the dilution factor. Historical records (Integrated Sustainability 2013) suggested that “bitumen or oil” may have been artificially introduced into this well; recent field observations confirmed the presence of heavy hydrocarbon (oil or bitumen) in the well. The hydrocarbon in GWN-01-75 (BAS) could, however, not be characterized due to low concentrations in the analyzed sample.

7.4 Network Evaluation

Details on the network evaluation criteria, applicable regulatory objectives, evaluation parameters, and rating rules are included in Table 4.

The results of the wells evaluation exercise are shown in Table 12 for the NAOS core network (GWN/AGS wells), and Table 13 for the operator wells. The total percentage score for each well (horizontal) measured the relative effectiveness of that well within the network in meeting the regulatory objectives. The total percentage score for each column (vertical) measures the relative effectiveness of the network to assess that specific key parameter (representing aspects of the regulatory objectives).

Wells with a total score below or equal to 50% were categorized as “least effective” towards meeting the network regulatory objectives. Wells with total scores of 51 to 65% and above 65% were categorized as “moderately effective” and “most effective,” respectively. Some key observations from the evaluation results were as follows:

- The specified hydrostratigraphic units for five GWN wells (which were listed as completed in the Basal McMurray Aquifer) were questionable following a review of completion and lithologic records. Following a secondary review, including correlating to the closest offset wells and reviewing historical field observations, four wells were believed to be completed in different lithologic units, and one well was questionable and recommended for further review (Table 12).

- A total of 24 GWN/AGS wells were categorized as most effective; a total of 7 and 8 wells were categorized as moderately and least effective, respectively (Table 12).
- Only 9 operator wells (or 24%) were categorized as most effective compared to 24 (or 62%) of the GWN/AGS wells; a total of 19 Operator wells (51%) were categorized as least effective, compared to 8 (or 21%) of the GWN/AGS wells.
- The “most” and “moderately” effective wells tended to be more appropriately located spatially (not too close or too far) from existing operations and communities and in reasonable proximity to major water bodies and bedrock incisions; the least effective network wells were generally too close to or have been enclosed by industry operations over time (Tables 12 and 13).
- Overall, the GWN/AGS wells, based on the current configuration, were relatively more effective to understanding aquifer interactions, groundwater-surface water interactions, and natural variability of regional groundwater conditions especially in non-saline units. By contrast, the operator-owned network wells were relatively less effective for good baseline coverage and for monitoring regional and cumulative effects (quality and quantity; Table 12).

7.4.1 Types of Groundwater Monitoring

The existing groundwater monitoring categories for the GWN/AGS wells were revised and updated where applicable or proposed for the operator wells. Three category types were proposed for the NAOS network:

- strategic
- surveillance
- investigative

Strategic monitoring (sometimes referred to as ambient or background monitoring) is typically beyond anthropogenic influence and aims to identify background levels and trends. Surveillance monitoring provides early warning of threshold exceedances and supports cumulative effects monitoring. Investigative monitoring is linked to monitoring areas of special interest and supports testing and updating the conceptual model. A fourth type, operation or compliance monitoring, is linked to a specific purpose and regulations and is already covered under *Environmental Protection and Enhancement Act* and *Water Act* regulatory requirements.

7.4.2 Proposed Investigation Areas

Investigation areas were proposed for the NAOS network, based on results of vulnerability mapping completed by WorleyParsons Canada Ltd. for the surficial deposits (including buried channels) and Basal McMurray Aquifer (WorleyParsons 2009), and the newly revised conceptual model. The relative higher groundwater vulnerability in the investigation areas is attributed to higher hydraulic conductivity of

aquifer media, oil sands development pressures, and connectivity to surface water systems. Significant aquifer interactions are also a factor due to channel incision into multiple bedrock units. Three proposed high priority investigation areas are shown on Figure 11 and described below:

- **Kearl Channel Investigation Area (KCIA)** - Includes areas around the Kearl Channel and its tributaries. Potential vulnerability has been identified in the surficial and bedrock channel aquifers from oil sands development pressures and possible channel connection (in the uppermost reaches) to the Firebag River. Also, historically, the largest percentage of annual groundwater withdrawal (of Quaternary aquifers within the NAOS area) has been from the Kearl Channel (WorleyParsons 2009). This area also supports investigation of mine depressurization influences in the Basal McMurray Aquifer. Regional monitoring wells currently exist in the upper and central parts of this investigation area in the Surficial Sands, Kearl Channel, Basal McMurray Aquifer, and Devonian aquifers. There is no regional monitoring in the lower reaches of the Kearl Channel. Target aquifers (primarily in the lower reaches of the Kearl Channel) include: Surficial Sands, Kearl Channel, Basal McMurray Aquifer, and Devonian aquifers.
- **Lewis and Clark Channels Investigation Area (LCCIA)** - Includes areas around the Lewis and Clark channels in the southeastern part of the NAOS area. The channels were identified as potentially connected to the Athabasca River and associated tributaries (WorleyParsons 2009). Development pressures are still low in this area, except for mining operations in the northern reaches of the Lewis Channel; which also makes this an area of potential strategic monitoring and investigation of aquifer interactions. There is currently no NAOS regional monitoring in this investigation area. Target aquifers include: Surficial Sands, Lewis and Clark channels, Basal McMurray Aquifer, and Devonian aquifers.
- **Birch and Mackay Channels Investigation Area (BMCIA)** - Include areas around the Birch and Mackay channels and tributaries. Both channels were also identified as potentially connected to a tributary of the Athabasca River (i.e., MacKay River) and possibly hydraulically connected to each other. Development is still relatively low (but growing) in this area, making it an area of potential strategic monitoring and investigating aquifer interactions. NAOS regional monitoring wells currently exist in the eastern part of this investigation area in the Surficial Sands, Birch Channel, Clearwater Formation, and Devonian aquifers; there is no NAOS regional monitoring in the western and central parts. Target aquifers include: Surficial Sands, Birch and MacKay Channels, Grand Rapids Aquifers, Basal McMurray Aquifer, and Devonian aquifers.

7.4.3 Proposed Sub-Networks

Similar to the current SAOS network development approach (Matrix 2013), three conceptual sub-networks (A, B, and C) are proposed to support the groundwater monitoring objectives based on the conceptual model, regulatory framework, and monitoring considerations. The proposed

sub-networks are included in Table 14. Designated monitoring wells for each sub-network are shown on Figure 11.

- Sub-network A: Includes monitoring wells reasonably situated beyond industry operations. The primary purpose of this sub-network is to provide “strategic” monitoring to determine background hydrogeologic conditions in terms of groundwater levels (primarily) and quality (secondarily).
- Sub-network B: Includes monitoring wells situated closer to industry operations (but not too close). The primary purpose of this sub-network is to provide “surveillance” monitoring (early warning of threshold exceedances and cumulative effects) of groundwater levels (primarily) and quality (secondarily). Wells that don’t fall into sub-network A or C are considered sub-network B.
- Sub-network C: Includes monitoring wells within and adjacent to investigation areas identified in Section 7.3.2. The primary purpose of this sub-network is to investigate areas of special interest, test the conceptual model, and perhaps provide supplemental surveillance monitoring in terms of groundwater levels and quality. There are currently no wholly designated sub-network C wells, but this is expected to change as more wells are incorporated into the network. All current sub-network C wells also double as either sub-network A or B wells.

It is important that sub-networks A and B have adequate spatially distributed completions in all the key aquifers within the regional network. Since this is an existing regional network, that requirement was not considered in assigning wells to a specific sub-network. Spatial distribution was however considered in identifying monitoring gaps in each key regional aquifer for each sub-network.

7.4.4 Monitoring Gaps

Groundwater flow patterns and chemistry varies naturally over a regional area; therefore, a balanced monitoring network must have adequate and strategic spatial coverage of the target regional aquifer. Ideally, monitoring wells are required near aquifer boundaries and in the middle portion of the aquifer. Following a review of the spatial distribution of existing network wells in the key aquifers/hydrostratigraphic units, observed high level monitoring gaps on a sub-network basis are highlighted below:

- Sub-network A: Buried Channels (Birch, MacKay, Kearn, and Lewis and Clark); Grand Rapids Aquifer units southwest of the NAOS area between the Dover River and Mackay Channel; Basal McMurray Aquifer in the central NAOS area.
- Sub-network B: Buried Channels (MacKay, Kearn - upper and lower reaches, Lewis and Clark, and Pine Valley); Grand Rapids Aquifer units southwest of the NAOS area - an area of growing in situ development (MacKay River Commercial Project and Dover Commercial Project) and east of the Athabasca River on the western flank of the Muskeg Mountains.

- Sub-network C: Lower reaches of the Kearn Channel and Devonian aquifers in the KCIA; surficial sands, Lewis and Clark Channels, Basal McMurray Aquifer, and Devonian aquifers in the LCCIA; Surficial Sands, Birch and MacKay channels, Grand Rapids aquifers, Basal McMurray Aquifer, and Devonian aquifers in the BMCIA.

8 DISCUSSION

8.1 Surficial Sands

Aquifers in isolated permeable units within the surficial deposits across the NAOS area are managed under the Framework (ESRD 2012a). There are currently 24 monitoring wells (including 9 GWN/AGS and 15 operator-owned wells) completed in surficial deposits in the NAOS network (Figure 7). Only 13 out of 24 wells have groundwater elevation data (including all the GWN/AGS wells), although temporal gaps exist in the data.

Seven GWN/AGS wells completed within the Surficial Sands exceeded the interim trigger for at least one indicator parameter in 2014 (Tables 6 to 8). All nine GWN/AGS Surficial Sands wells exceeded the Alberta Tier 1 guidelines for at least one general and metals parameter each in 2014 (Tables 6 and 7). Other Tier 1 guidelines exceedances in 2014 include four GWN/AGS wells for at least one hydrocarbons parameter (Tables 8); and five GWN/AGS wells for at least one polycyclic aromatic hydrocarbons (PAH) parameter (Table 9).

Results of statistical analysis (where possible) showed, for the applicable indicator parameters, all 2014 data were within statistically determined upper and lower control limits except for TDS at GWN-14-32 (August 2014). Results of intra-well trend analysis of the GWN/AGS wells showed decreasing trends for sodium (AGS-03-WT), chloride (AGS-02-20 and GWN-01-74), sulphate and total ammonia nitrogen (GWN-16-22) and increasing trends for silica (GWN-08-43; Figure 7).

8.2 Buried Channel Aquifers

Aquifers in the buried channels are managed under the Framework (ESRD 2012a). There are currently six monitoring wells (including five GWN/AGS and one operator-owned well) completed in the Buried Channel Aquifers in the NAOS network (Figure 6). Five out of six wells have groundwater elevation data, and that includes all the GWN/AGS wells although temporal gaps exist in the data.

Three GWN/AGS wells completed in the Buried Channels Aquifers exceeded the interim trigger for at least one indicator parameter in 2014 (Tables 6 to 8). All five GWN/AGS wells in the Buried Channels exceeded the Alberta Tier 1 guidelines for at least one general and metals parameter each in 2014 (Tables 6 and 7). None of the GWN/AGS wells exceeded any Tier 1 guidelines in 2014 for hydrocarbon parameters (Table 8); one well exceeded the guidelines for at least one PAH parameter (Table 9).

Results of statistical analysis (where possible) showed, for the applicable indicator parameters, all 2014 data were within statistically determined upper and lower control limits. Results of intra-well trend analysis of the GWN/AGS wells showed decreasing trends for: sodium and chloride (GWN-08-44 in the Kearn Channel), chloride and total ammonia nitrogen (GWN-13-27 in the Thickwood Channel; Figure 6).

8.3 Grand Rapids Formation

There are no regional groundwater quality triggers specified for aquifers within the Grand Rapids Formation in the Framework (ESRD 2012a). There are currently four monitoring wells (including one GWN and three operator-owned wells) completed in the Grand Rapids in the NAOS network (Figure 9). Three out of four wells have groundwater elevation data, and that includes the GWN/AGS well, although temporal gaps exist in the data.

The sole GWN/AGS well (GWN-13-28) completed in the Grand Rapids Aquifer exceeded the Alberta Tier 1 guidelines for at least one general and metals parameter each in 2014 (Tables 6 and 7). The well did not report any Tier 1 guidelines exceedances in 2014 for hydrocarbon and PAH parameters (Tables 8 and 9).

Results of statistical analysis (where possible) showed, for the applicable indicator parameters, all 2014 data were within statistically determined upper and lower control limits. Results of intra-well trend analysis indicated there were no statistically significant increasing or decreasing trends.

8.4 Clearwater Formation

The Clearwater Formation is not managed under the Framework (ESRD 2012a). There are currently four GWN/AGS monitoring wells completed in the Clearwater Formation in the NAOS network. Temporal gaps exist in the hydraulic heads records.

Results of statistical analysis (where possible) showed that for the applicable indicator parameters, all 2014 data were within statistically determined upper and lower control limits. Results of intra-well trend analysis of the GWN/AGS wells showed a decreasing trend for total ammonia nitrogen (AGS-03-30).

8.5 Basal McMurray Aquifer

The Basal McMurray Aquifer is a key regional aquifer managed under the Framework (ESRD 2012a). Two Basal McMurray Aquifer management units (AMU1 = TDS < 500 mg/L and AMU2 = 500 to 4,000 mg/L) are included in the Framework. There are currently 27 monitoring wells (including 11 GWN and 16 operator wells) completed in the Basal McMurray Aquifer within the NAOS network (Figure 10). Operator well CVE-02-04-LM is listed to be completed in the Lower McMurray, but is grouped with the Basal McMurray wells. Fourteen out of 27 wells have groundwater elevation data, and that includes all the GWN wells although temporal gaps exist in the data.

One of two GWN wells in the Basal McMurray AMU 1 (GWN-17-50) exceeded the interim trigger for naphthenic acids in 2014. Four out of five GWN wells in the Basal McMurray AMU 2 exceeded the interim trigger for at least one indicator parameter in 2014 (Tables 6 to 8).

Results of statistical analysis (where possible) showed, for the applicable indicator parameters, all 2014 data were within statistically determined upper and lower control limits. Results of intra-well trend analysis of the GWN/AGS wells showed:

- Basal McMurray AMU 1: decreasing trends for sulphate and total ammonia nitrogen, and increasing trend for naphthenic acids (GWN-17-50; Figure 10)
- Basal McMurray AMU 2: decreasing trends for TDS and sulphate (GWN-01-75), chloride and sulphate (GWN-08-46; Figure 10)
- Basal McMurray AMU 3: increasing trend for sodium, decreasing trend for sulphate (GWN-16-24; Figure 10)
- Basal McMurray AMU 4: increasing trend for TDS (GWN-01-76; Figure 10)

8.6 Beaverhill Lake, Granite Wash and Undifferentiated Prairie/Beaverhill Lake/Keg River Formations

The Beaverhill Lake, Granite Wash and Undifferentiated Prairie/Beaverhill Lake/Keg River Formations (or PBM) are not managed under the Framework (ESRD 2012a). There are currently 14 monitoring wells (including 13 GWN and 1 operator well) completed in the PBM formations in the NAOS network. Nine GWN/AGS wells have recorded hydraulic head records, though some data gaps exist.

Results of statistical analysis (where possible) showed that for the applicable indicator parameters, all 2014 data were within statistically determined upper and lower control limits. Results of intra-well trend analysis of the GWN wells showed increasing trends for: TDS (GWN-08-48, GWN-16-25 and GWN-01-79), sodium and chloride (GWN-16-25); decreasing trends for TDS and sodium (GWN-01-77), and sulphate (GWN-06-62, GWN-14-36, GWN-17-51 and GWN-01-79).

8.7 Groundwater Hydrochemistry

Groundwater hydrochemistry varies systematically from Quaternary to Devonian age units in the NAOS area. Groundwater compositions in the Quaternary aquifers recharged directly from surface are characteristically enriched in calcium, magnesium and bicarbonate, and transition to sodium, calcium and sulphate dominated compositions where oxidation of the Clearwater Formation shale has occurred. Groundwater in the Quaternary aquifers tends to have low salinity in contrast to that in the Cretaceous aquifers, particularly the Basal McMurray Aquifer. The Basal McMurray Aquifer lies directly on the Devonian age Waterways Formation, and its composition reflects contributions from lateral flow within

Cretaceous rocks and vertical flow out of the Devonian. Salinity in the Basal McMurray Aquifer varies from less than 500 mg/L TDS in the AMU 1 wells to several thousand mg/L TDS in the AMU 4 wells. The groundwater compositions are typically calcium-sodium-bicarbonate to sodium-calcium-bicarbonate-chloride and sodium-chloride-bicarbonate types (Abercrombie 2015).

Three distinct water types are recognized in Devonian aquifer systems and these can be directly linked to the mineralogy of the aquifer systems (Abercrombie 2015). These distinct water types are:

- Type 1 – This groundwater type belongs to the Na-HCO₃ hydrochemical facies and reflects interaction with carbonate minerals calcite and dolomite; contains variable amounts of chloride and low sulphate concentrations.
- Type 2 – This groundwater type belongs to the Na-SO₄ hydrochemical facies and is typically found within the Keg River ramp and reef where they indicate interaction with carbonate and sulphate minerals calcite, dolomite and gypsum. They have higher salinities than Type 1, but are typically less than about 12,000 mg/L TDS. They generally contain low concentrations of chloride and bicarbonate, the latter reflecting equilibration with calcite/dolomite.
- Type 3 – This is the most recognizable Devonian groundwater type and characterized by compositions within Na-Cl hydrochemical facies. Type 3 Na-Cl groundwaters occur in Prairie Evaporite Formation aquifers and in discharge areas proximal to the Athabasca River. Type 3 Devonian groundwaters have a large range in salinities, from less than 10,000 mg/L to as high as 350,000 mg/L, but characteristically show molar Na/Cl ratios near 1 indicating that halite dissolution is the dominant control on solute chemistry, even at high dilution. Type 3 groundwaters indicate halite dissolution; no residual evaporite brines are recognized east of the Athabasca River.

Groundwater quality data shows intermediate groundwater compositions consisting of a mixture of Types 2 and 3 are dominant within the Devonian aquifers penetrated by the NAOS monitoring wells (Table 6). There are few instances of Types 1 and 3 mixtures and even fewer, if any, ternary mixtures of all Devonian water types. It is suggested the intermediate water types are more reflective of the flow path mineralogy rather than large scale mixing of different flow systems, except in regional discharge areas (Abercrombie 2015).

The distribution and composition of groundwater types in the NAOS area east of the Athabasca River reflects the groundwater flow regimes and mineralogy of Devonian through Quaternary age sediments. The flow system east of the Athabasca River is fundamentally different than the system west of the river and in deeper regions of the Alberta Basin where there has been little or no influx of meteorically derived fluids. This condition has persisted for tens of millions of years and may be the fundamental control on the localization of highly biodegraded and water-washed bitumens of the Athabasca Oil Sands region (Abercrombie 2015).

9 CONCLUSIONS

- The program objectives for the 2014 NAOS regional groundwater monitoring network were achieved by completing two groundwater monitoring and sampling events, implementing a well servicing/rehabilitation program, and downloading wells' pressure transducers. In addition, the NAOS network development strategy was revised by updating the conceptual model of regional groundwater flow, evaluating the network effectiveness, and identifying monitoring gaps and new investigation areas.
- The state of baseline conditions in the key NAOS aquifers has been summarized in WorleyParsons (2010a); the underlying data was acknowledged to be of poor spatial and temporal representation (ESRD 2013). While additional data has been collected in many of the network wells in the key regional aquifers since inception, the network configuration has not changed significantly to ensure appropriate spatial representation in the key aquifers.
- To address the monitoring gaps identified in this report, a detailed development plan is required as a matter of first priority. This document will also act as a guidance document (i.e., road map) to support developing an effective regional groundwater monitoring network for the NAOS area.
- Where a sufficient number of data points exist, the upper and lower control limits were calculated for each interim regional groundwater quality trigger parameter for each well using the Shewhart-CUSUM statistical method (Appendix C65). However, the aquifer-based control limits and final triggers envisioned for the network may not be appropriate due to the natural spatial variability of hydrochemical parameters in key NAOS aquifers. An alternative is to establish control limits and triggers for each key aquifer at each established NAOS monitoring location or cluster of reliable locations (reference point) as benchmarks for assessing the status of the groundwater system.

10 RECOMMENDATIONS

Specific recommendations for monitoring sites and the operator wells are included in the summary sheets presented in Section 7. General recommendations for the development of the NAOS regional groundwater monitoring network in 2015 are as follows:

- Four GWN wells were previously interpreted to have been completed in the Basal McMurray Aquifer (GWN-14-34, GWN-06-60, GWN-07-56, and GWN-08-46); however, these wells are believed to be completed in different lithologic units based on a review of well completion and lithologic records. These wells are recommended for reclassification or removal from the monitoring network; the completion of well GWN-13-30 remains questionable and is recommended for further review.
- Field evidence and laboratory results indicated the presence of refined light hydrocarbon fuels (e.g., gasoline or kerosene) in GWN-14-35 (BHL). Field evidence also confirmed the presence of heavy

hydrocarbon (oil or bitumen) in GWN-01-75 (BAS). Both wells are recommended to be discontinued from the network.

- Reduce annual operating costs and improve overall network efficiency, by discontinuing the “least efficient” wells (i.e., with total score below or equal to 50%) from the network except where they serve another purpose within the sub-network or network (e.g., surveillance monitoring).
- Prepare a detailed development plan to address monitoring gaps in key regional aquifers with a sub-network focus through synergy with industry and by installing new monitoring wells in the target aquifers.
 - ✦ Numerous industry regional groundwater monitoring wells exist in several aquifers in the area. ESRD should first work with industry operators to explore existing wells that may fit, with regards to target aquifers and spatial representation; requesting new operator-owned wells for incorporation into the network should be based on clearly defined criteria and critical evaluation of potential wells.
 - ✦ Because of potentially substantial costs associated with installing new wells where no suitable wells exist, the development plan should use a phased approach, similar to that in place for the SAOS Area regional network (Matrix 2013).
- Sampling frequency and the analytical suite should be revised on a sub-network basis and be consistent with the Framework objectives. In general terms, wells in shallower aquifers would require more frequent sampling as would wells in sub-network B.
 - ✦ Where biannual sampling is determined to still be appropriate, field programs should be implemented at least four months apart; annual sampling may be considered for deep wells that are not directly influenced by seasonal variations.
- The conceptual model should be re-evaluated regularly to identify other potentially vulnerable areas of aquifer interactions and to ensure the network reflects the most current understanding of the regional groundwater system.
 - ✦ Evaluate and integrate the most current groundwater use and disposal data for the key NAOS area aquifers into the conceptual model.
 - ✦ Revise the conceptual model to better account for the effects of Devonian age formations on regional groundwater flow and interactions with overlying Cretaceous and Quaternary age aquifers; liaise with industry operators for the most current data and interpretations on the Devonian formations that are available for the NAOS area.

- Instead of aquifer-based control limits and triggers, consider establishing control limits and triggers for each key aquifer at each established NAOS monitoring location or cluster of related locations (reference point) as benchmarks for assessing the status of the groundwater system.

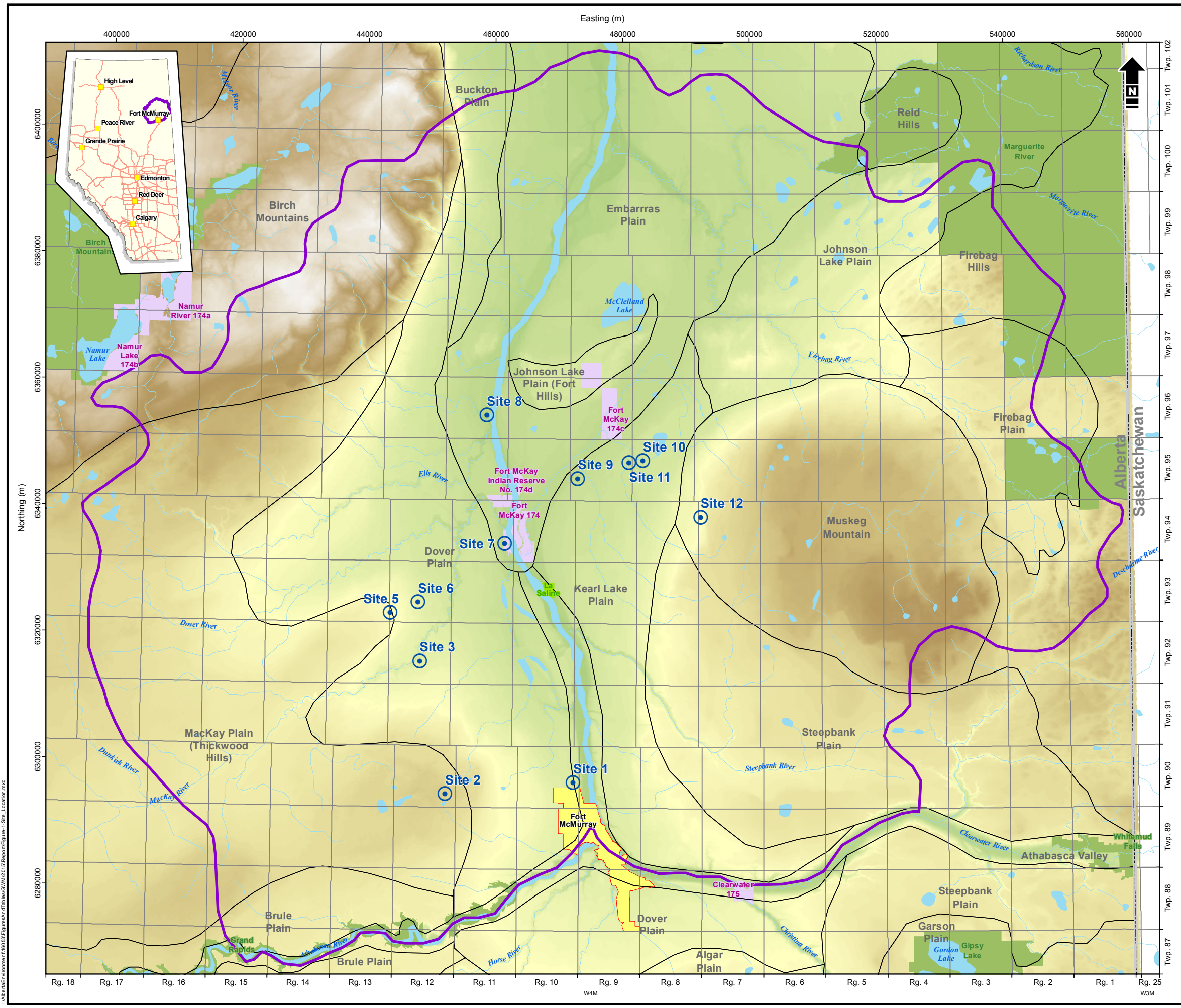
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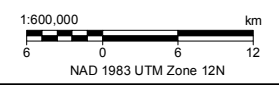
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- North Athabasca Oil Sands Area
 - Physiographic District
 - Community
 - Indian Reserve
 - Natural Area
 - Wildland Provincial Park
 - Water Body
 - Watercourse
 - NAOS Regional Groundwater Monitoring Well Site
- Surface Elevation (masl)**
- High : 864
 - Low : 217



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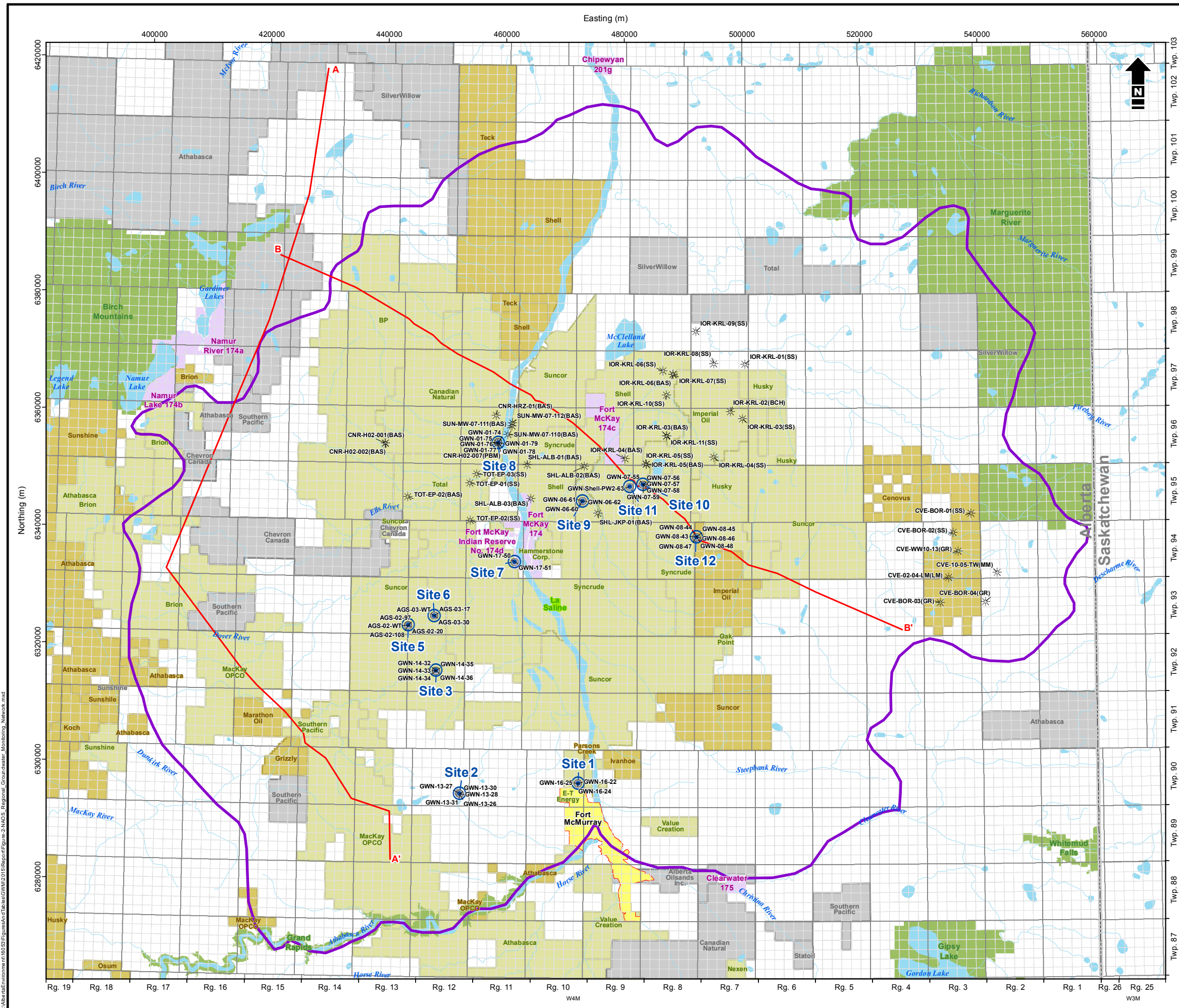


Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area

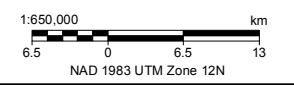
Site Location

Date: 18 Mar 2015 Project: 16053-502 Technical: S. Duchek Reviewer: A. Oworji Drawn: M. Pfeifer

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- North Athabasca Oil Sands Area
- Existing Development
- Planned Development
- Inactive Development
- Community
- Indian Reserve
- Natural Area
- Wildland Provincial Park
- Water Body
- Watercourse
- Operator Well
- GWN / AGS Well
- NAOS Regional Groundwater Monitoring Well Site



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Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Region

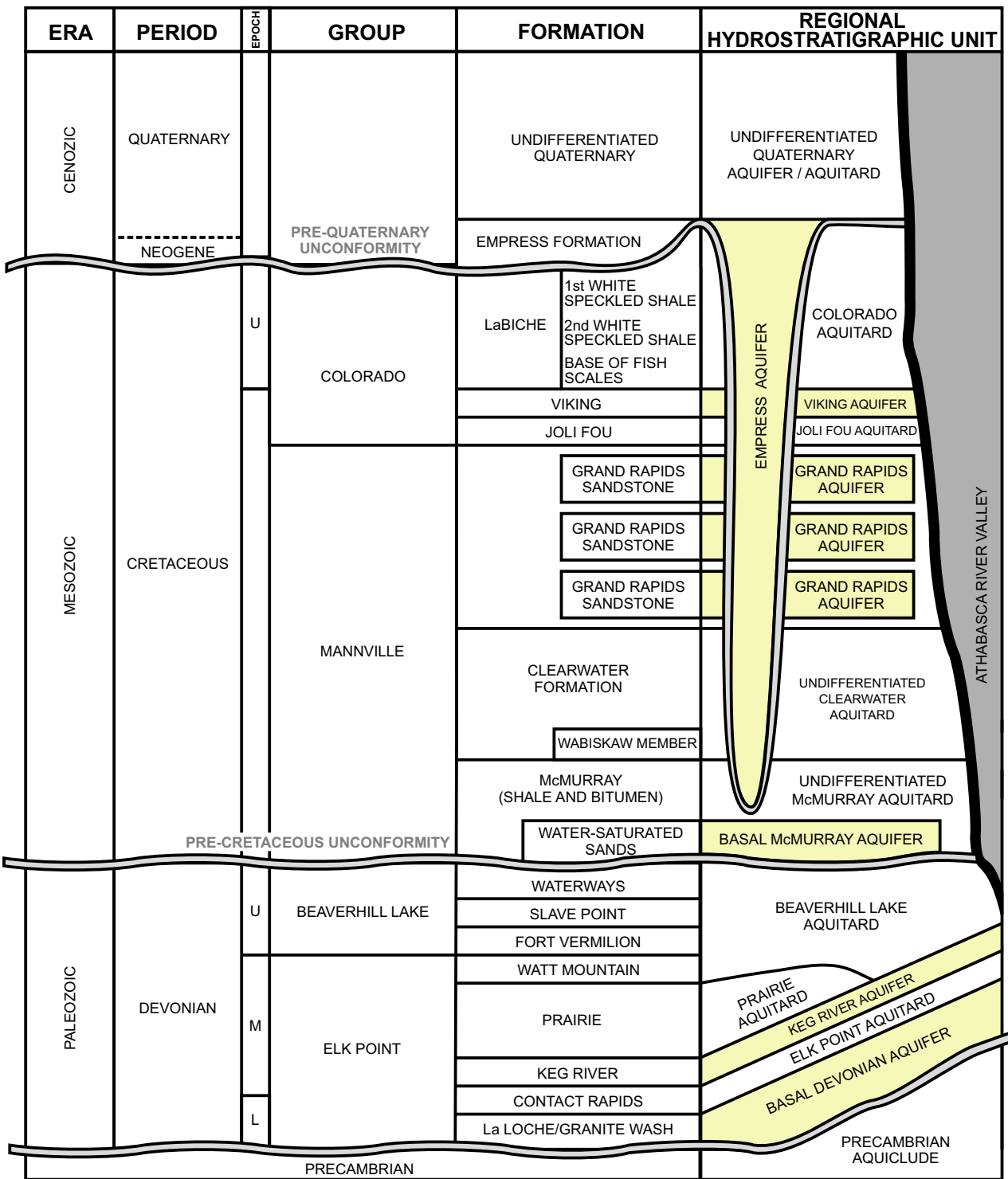
**NAOS Regional Groundwater
Monitoring Network**

Date: 18 Mar 2015	Project: 16053-502	Technical: S. Duchek	Reviewer: A. Oworji	Drawn: M. Pfeifer
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Figure 2

I:\Biodiversity\Environment\16053\Figures\Tables\GWN\2015\Report\Figure 2-NAOS Regional Groundwater Monitoring Network.mxd



Aquifer



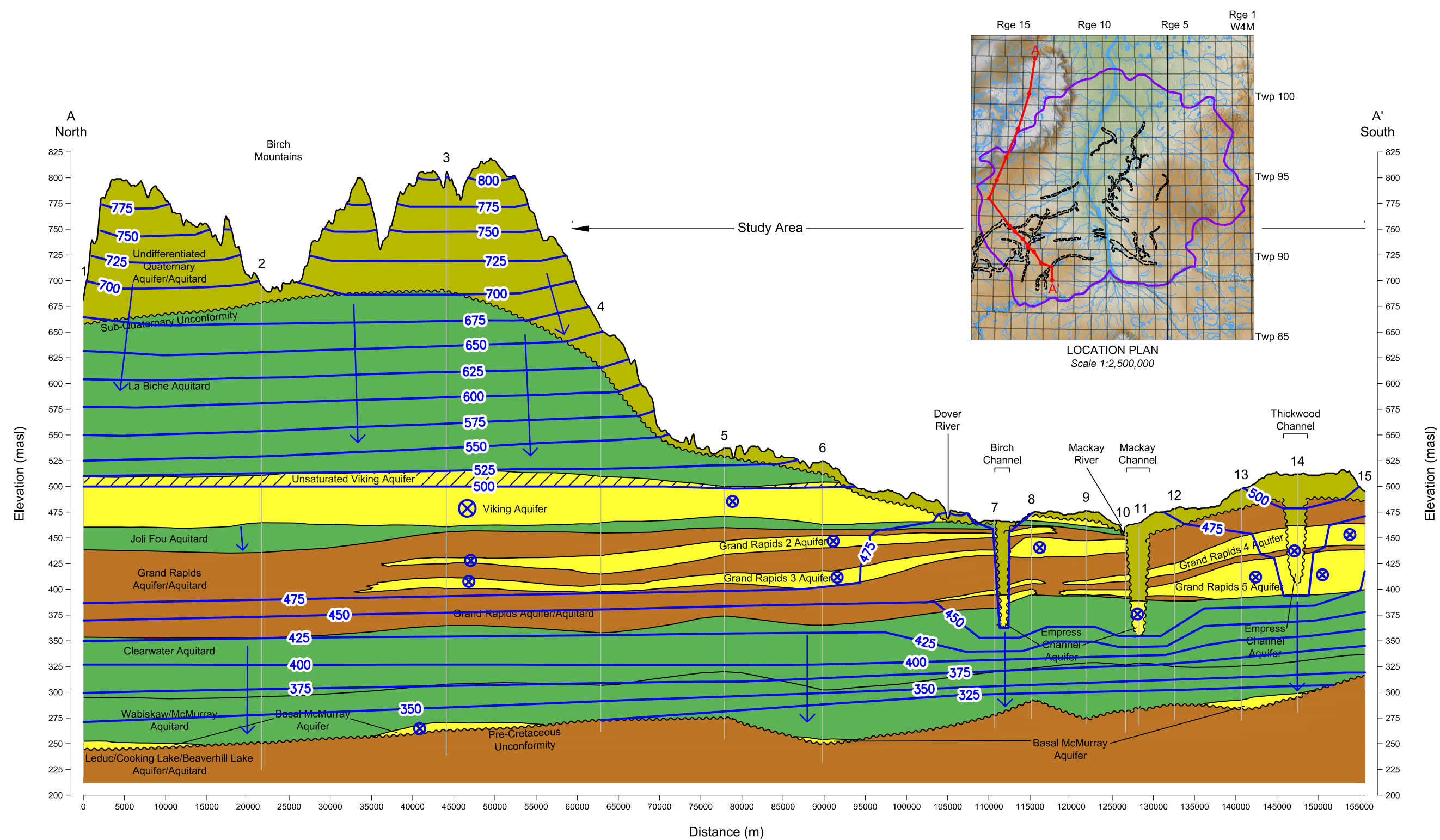
Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area

Hydrostratigraphic Column

Date: March 2015 | Project: 10653-ST-14 | Technical: N. Green | Reviewer: W. Wilmot | Drawn: J. Kern

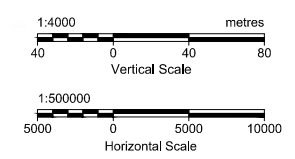
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Figure 3



- Major Unconformity
- Stratigraphic Contact
- Aquifer
- Aquitard
- Aquifer/Aquitard
- Undifferentiated Quaternary Aquifer/Aquitard
- Hydraulic Head Contour (masl)
- Groundwater Flow Into Page
- Interpreted Groundwater Flow Direction

1	100/06-35-102-14W4/00	9	1AA/11-24-091-15W4/00
2	100/03-28-100-14W4/00	10	1AA/06-08-091-14W4/00
3	100/15-15-098-15W4/00	11	1AA-06-05-091-14W4/00
4	100/03-25-096-16W4/00	12	1AA/16-28-090-14W4/00
5	100/05-09-095-16W4/00	13	1AA/10-01-090-14W4/00
6	1AA/10-02-094-17W4/00	14	1AA/07-34-089-13W4/00
7	1AA/06-18-092-15W4/00	15	1AA/08-03-089-13W4/00
8	1AA/06-04-092-15W4/00		



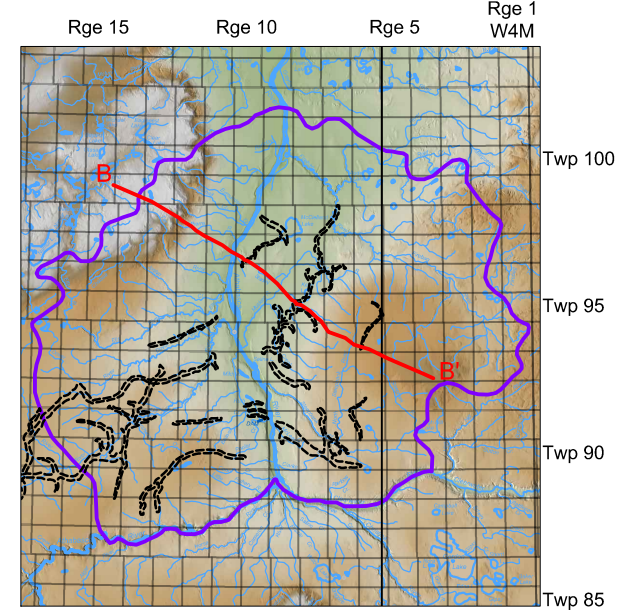
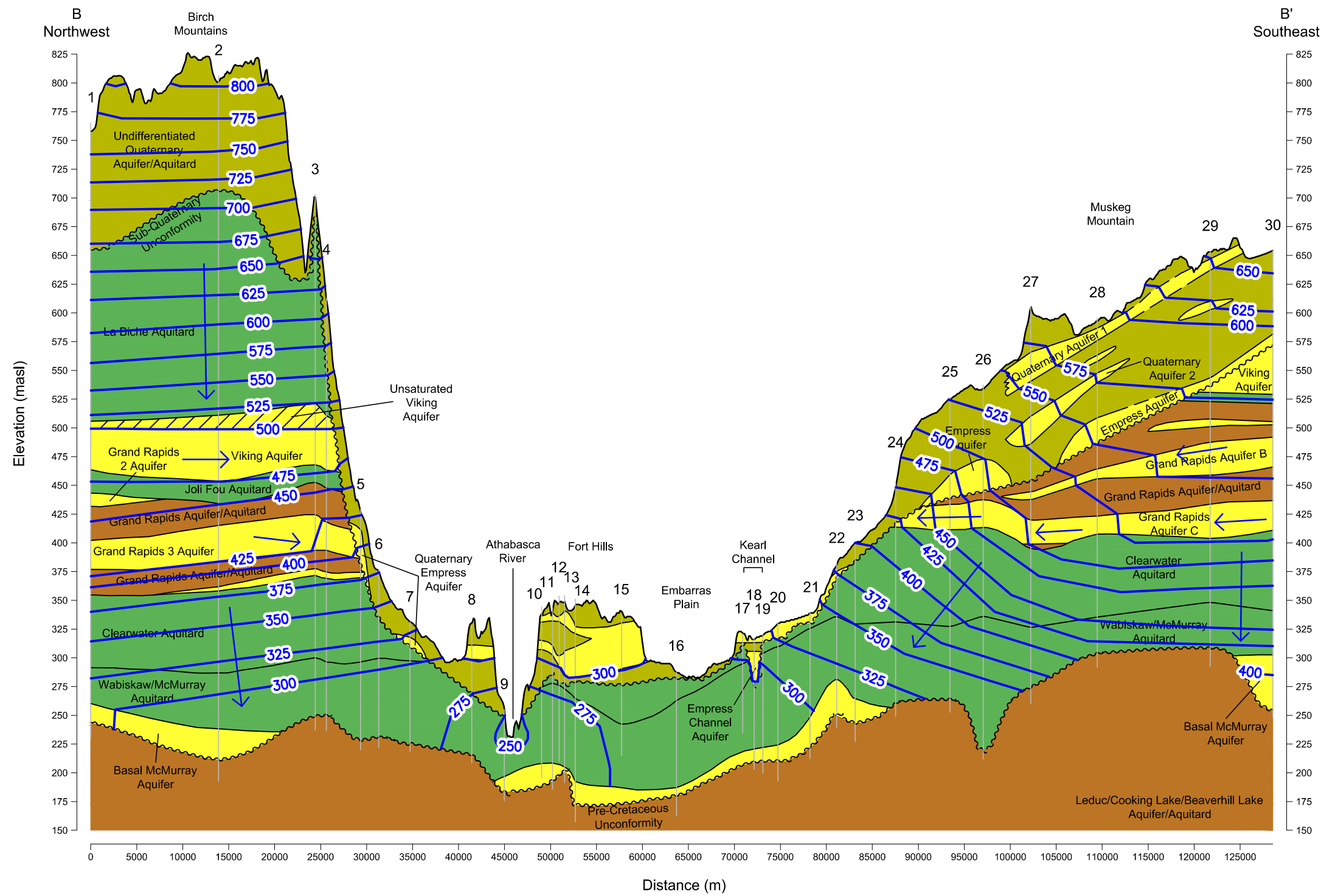
Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area

Geologic Cross-section Birch Mountains - Mackay Plains

Date: January 2015 | Project: 16053-XS-14 | Technical: T. Johnsen | Reviewer: A. Haluszka | Drawn: J. Kern

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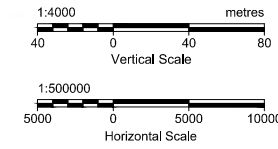
Figure 4



Elevation (masl)

Distance (m)

	Major Unconformity	1	1AA/10-24-099-15-W4M	9	1AA/05-13-097-11-W4M	17	1AA/11-25-095-09-W4M	25	1AA/16-15-094-07-W4M
	Stratigraphic Contact	2	1F1/07-05-099-13-W4M	10	1AB/06-08-097-10-W4M	18	1AA/05-30-095-08-W4M	26	1AA/10-12-094-07-W4M
	Aquifer	3	1AA/03-19-098-12-W4M	11	1AA/10-05-097-10-W4M	19	1AA/14-19-095-08-W4M	27	1AA/10-04-094-06-W4M
	Aquitard	4	1AA/09-18-098-12-W4M	12	1AA/12-04-097-10-W4M	20	1AB/11-20-095-08-W4M	28	1AA/10-30-093-05-W4M
	Aquifer/Aquitard	5	1AA/09-09-098-12-W4M	13	1AA/07-04-097-10-W4M	21	1AA/05-15-095-08-W4M	29	1AA/10-08-093-04-W4M
	Undifferentiated Quaternary Aquifer/Aquitard	6	1AA/09-03-098-12-W4M	14	1AB/04-03-097-10-W4M	22	1AA/03-11-095-08-W4M	30	100/10-03-093-04-W4M
	Hydraulic Head Contour (masl)	7	1AA/10-36-097-12-W4M	15	1AB/07-25-096-10-W4M	23	1AA/06-01-095-08-W4M		
	Groundwater Flow Into Page	8	1AA/11-22-097-11-W4M	16	1AA/14-09-096-09-W4M	24	1AA/03-30-094-07-W4M		
	Interpreted Groundwater Flow Direction								



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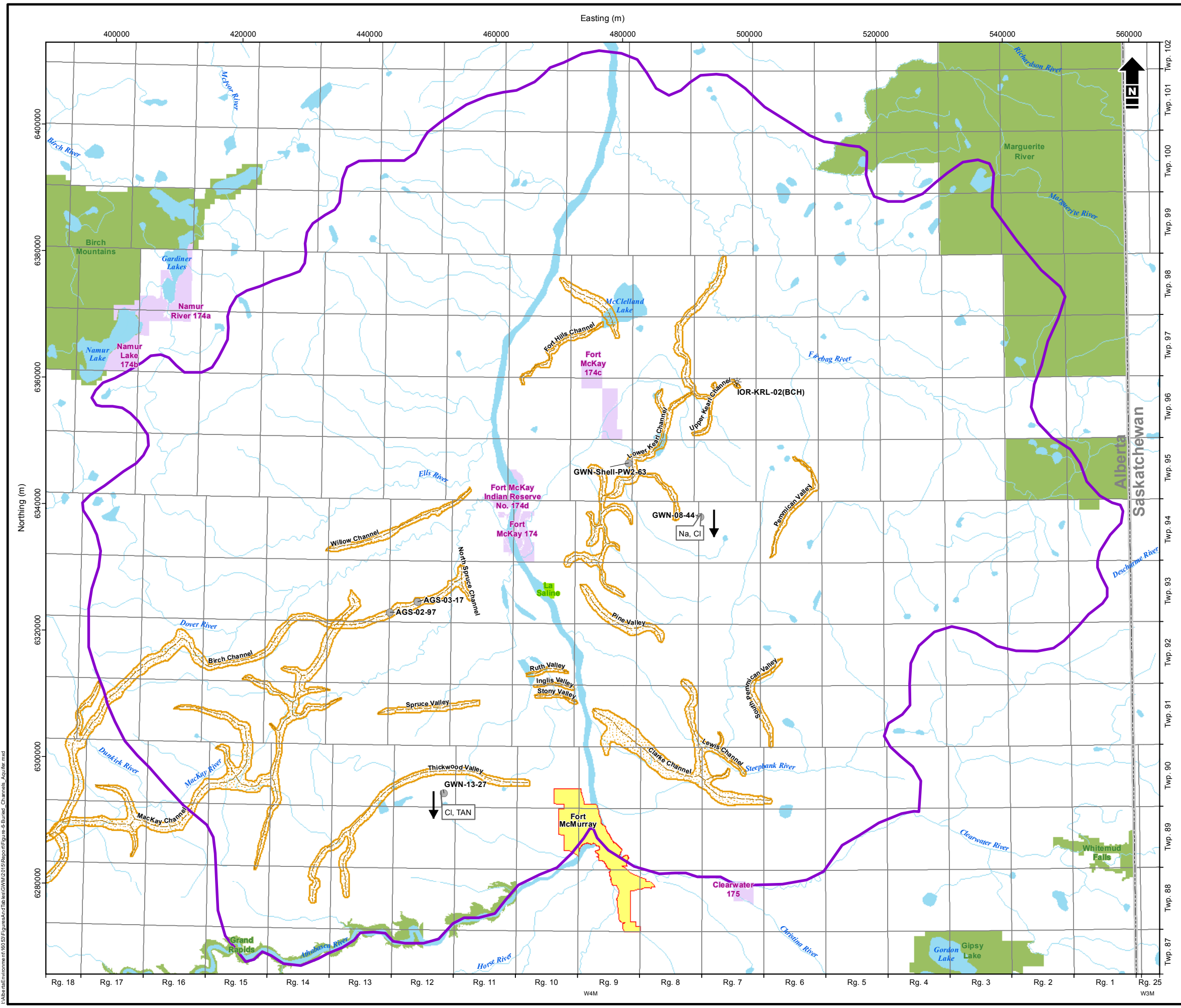
Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area

**Geologic Cross-section
Birch Mountains - Muskeg Mountain**

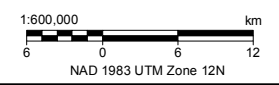
Date: January 2015	Project: 16053-XS-14	Technical: T. Johnsen	Reviewer: A. Haluszka	Drawn: J. Kern
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Figure 5



- North Athabasca Oil Sands Area
- Buried Channels Aquifer Potentially Present
- Community
- Indian Reserve
- Natural Area
- Wildland Provincial Park
- Water Body
- Watercourse
- Buried Channels Aquifer Thalweg Potentially Present
- Operator Well
- GWN / AGS Well
- Decreasing Trend
- Parameters With Statistically Significant Trends



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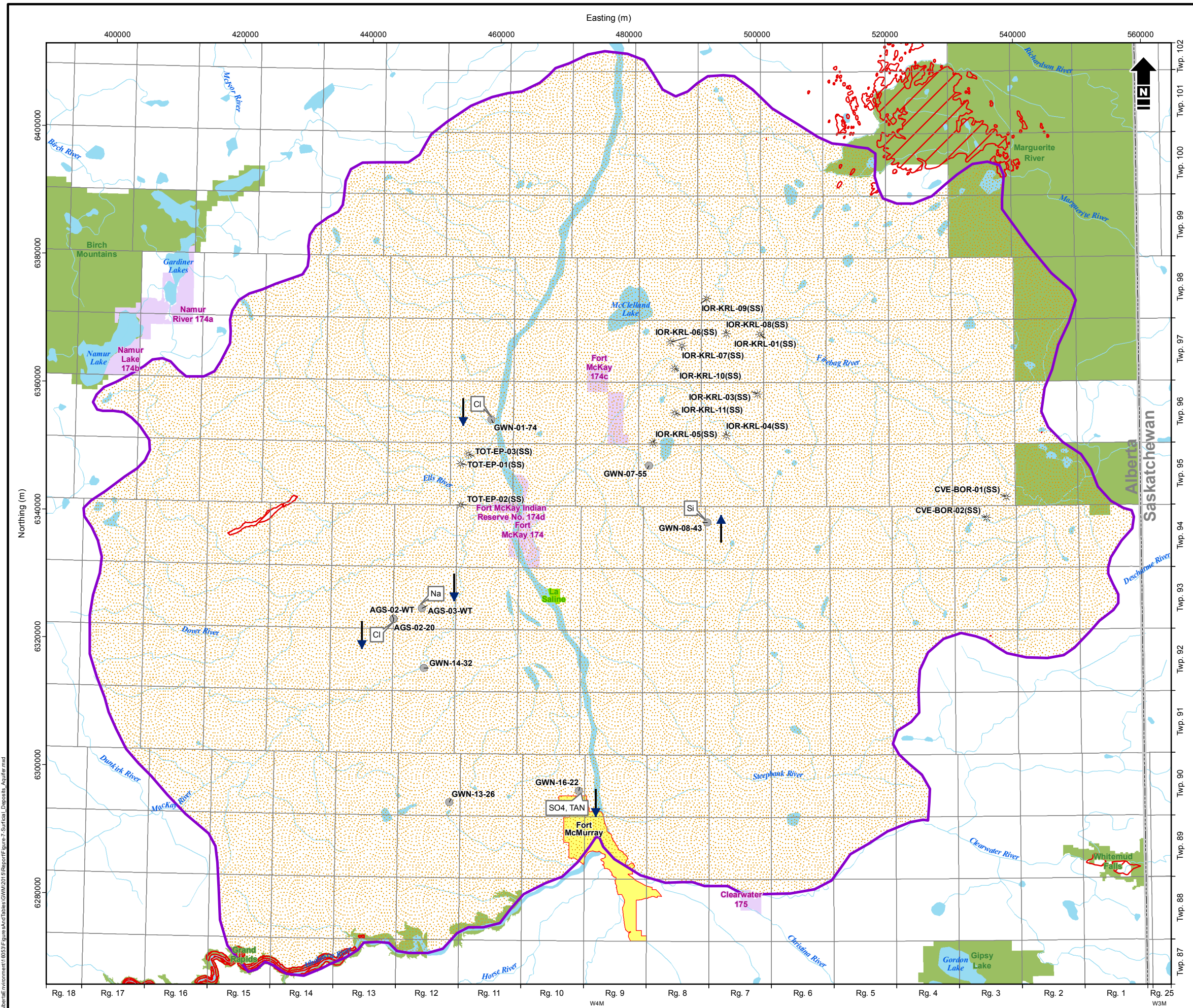


Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area

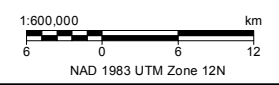
Buried Channel Aquifer

Date: 18 Mar 2015 Project: 16053-502 Technical: S. Duchek Reviewer: A. Oworji Drawn: M. Pfeifer

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- North Athabasca Oil Sands Area
- Drift Aquifer Potentially Present
- Area of Thin or No Drift
- Community
- Indian Reserve
- Natural Area
- Wildland Provincial Park
- Water Body
- Watercourse
- Operator Well
- GWN / AGS Well
- Decreasing Trend
- Increasing Trend
- Parameters With Statistically Significant Trends



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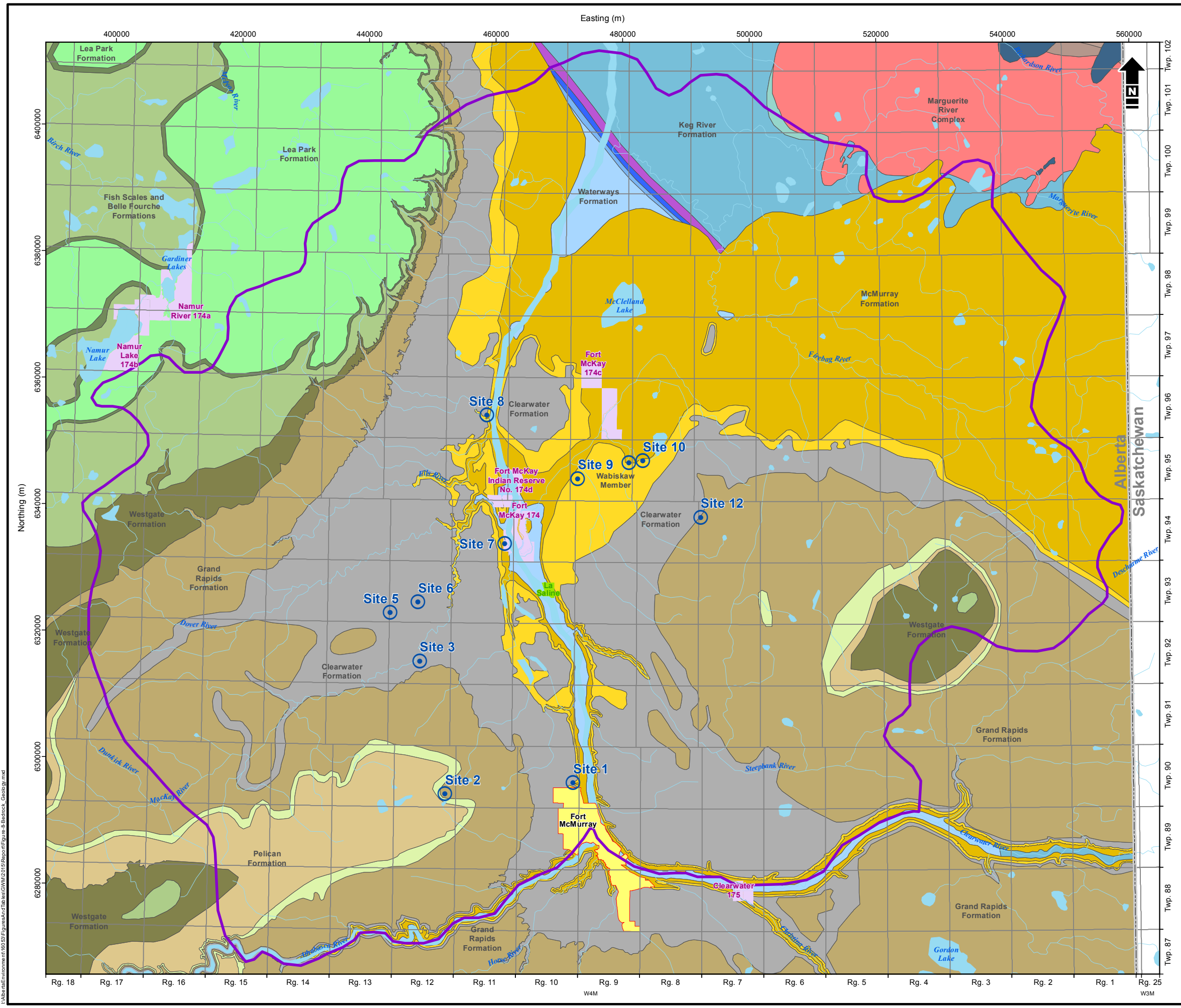
Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area

Surficial Deposits Aquifer

Date: 30 Mar 2015	Project: 16053-502	Technical: S. Duchek	Reviewer: A. Oworji	Drawn: M. Pfeifer
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Figure 7

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- North Athabasca Oil Sands Area
 - Community
 - Indian Reserve
 - Natural Area
 - Water Body
 - Watercourse
 - NAOS Regional Groundwater Monitoring Well Site
- Bedrock Geology**
- Prairie Evaporite Formation
 - Joli Fou Formation
 - Puskwaskau and Lea Park Formations
 - Basal Cretaceous Sandstone and McMurray Formation
 - Grand Rapids Formation
 - Pelican Formation
 - Lower Shaftesbury and Westgate Formations
 - Contact Rapids Formation
 - Waterways Formation
 - Manitou Falls Formation
 - Slave Point Formation
 - Kaskapau, Second White Specks, Carlile, Niobrara Formations and Smoky Group (Undivided; Plains)
 - Lower Loon River and Clearwater (Excluding Wabiskaw Member) Formations
 - Upper Shaftesbury, Fish Scales and Belle Fourche Formations
 - Elk Point Group
 - Bluesky and Wabiskaw Member of Clearwater Formations
 - Marguerite River Complex
 - Keg River Formation
 - Watt Mountain Formation
 - Smart Formation

Reference: Data obtained from AtlasIS © Government of Alberta and GeoGratis © Department of Natural Resources Canada (all rights reserved) used under license. Bedrock geology information from AGS: Map 600.

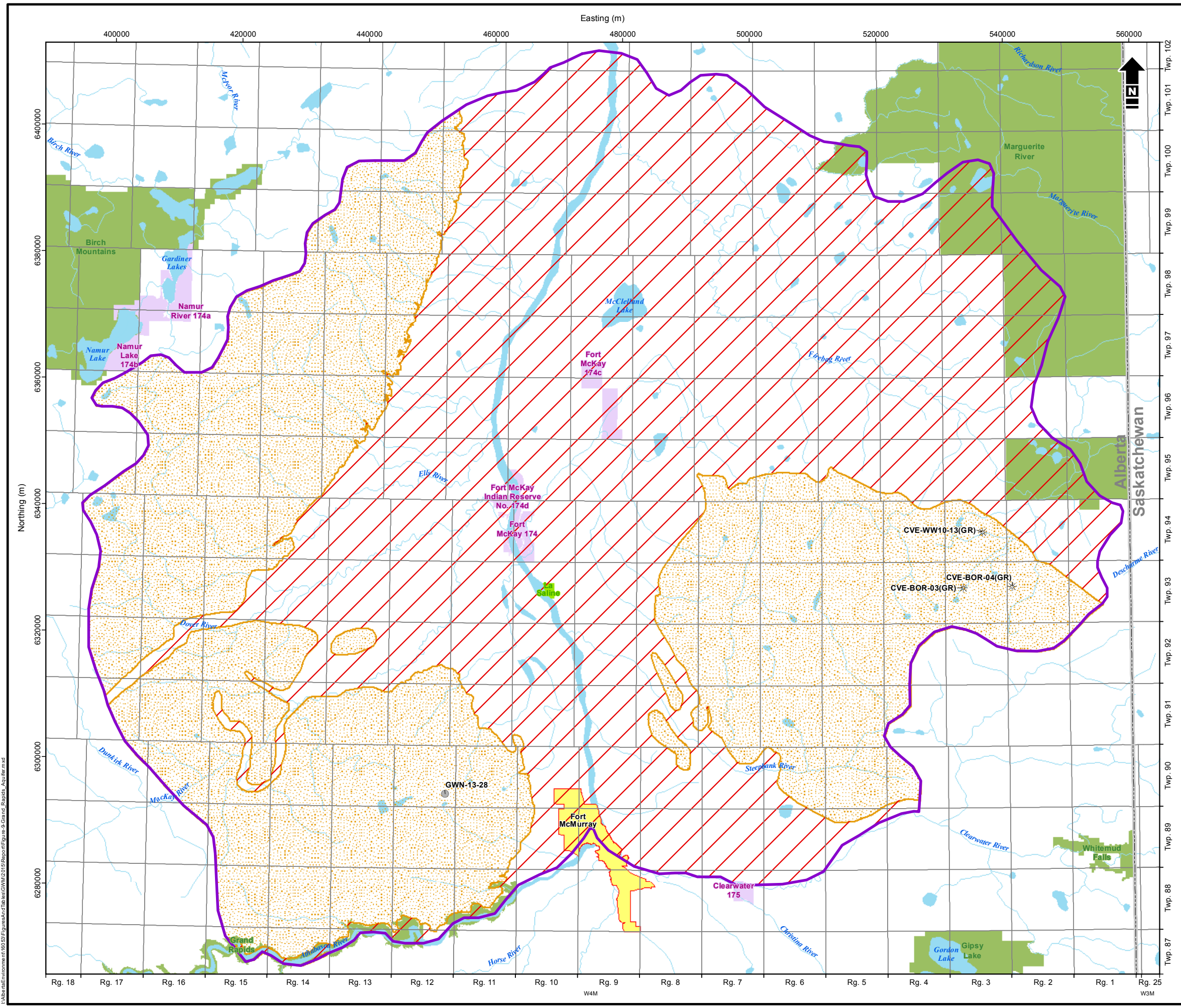
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NAD 1983 UTM Zone 12N



Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area

Bedrock Geology

Date: 18 Mar 2015	Project: 16053-502	Technical: S. Duchek	Reviewer: A. Owajori	Drawn: M. Pfeifer
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- North Athabasca Oil Sands Area
- Grand Rapids Aquifer Potentially Present
- Grand Rapids Formation Eroded
- Community
- Indian Reserve
- Natural Area
- Wildland Provincial Park
- Water Body
- Watercourse
- Operator Well
- GWN / AGS Well

Reference: Data obtained from Atlas IS © Government of Alberta and GeoGratis © Department of Natural Resources Canada (all rights reserved) used under license. Aquifer extents based on surficial geological map from Prior et al. (2013).

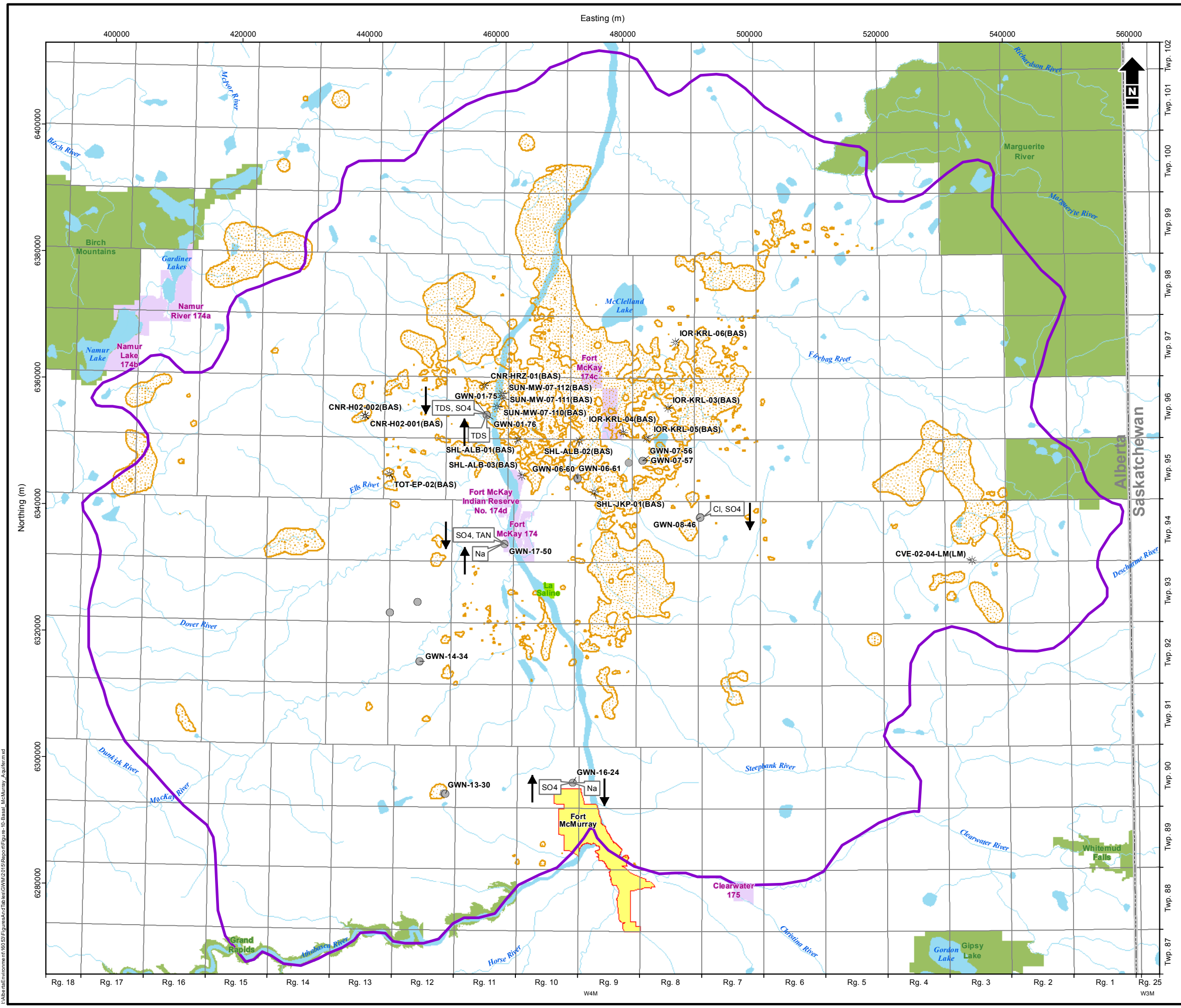
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 NAD 1983 UTM Zone 12N

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Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area

Grand Rapids Aquifer

Date: 18 Mar 2015 Project: 16053-502 Technical: S. Duchek Reviewer: A. Owajori Drawn: M. Pfeifer
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- North Athabasca Oil Sands Area
- Basal McMurray Aquifer Potentially Present
- Community
- Indian Reserve
- Natural Area
- Wildland Provincial Park
- Water Body
- Watercourse
- Operator Well
- GWN / AGS Well
- Increasing Trend
- Decreasing Trend
- Parameters With Statistically Significant Trends

Reference: Data obtained from Atlas IS © Government of Alberta and GeoGratis © Department of Natural Resources Canada (all rights reserved) used under license. Aquifer extents based on WorleyParsons and MSI mapping.

1:600,000 km
NAD 1983 UTM Zone 12N

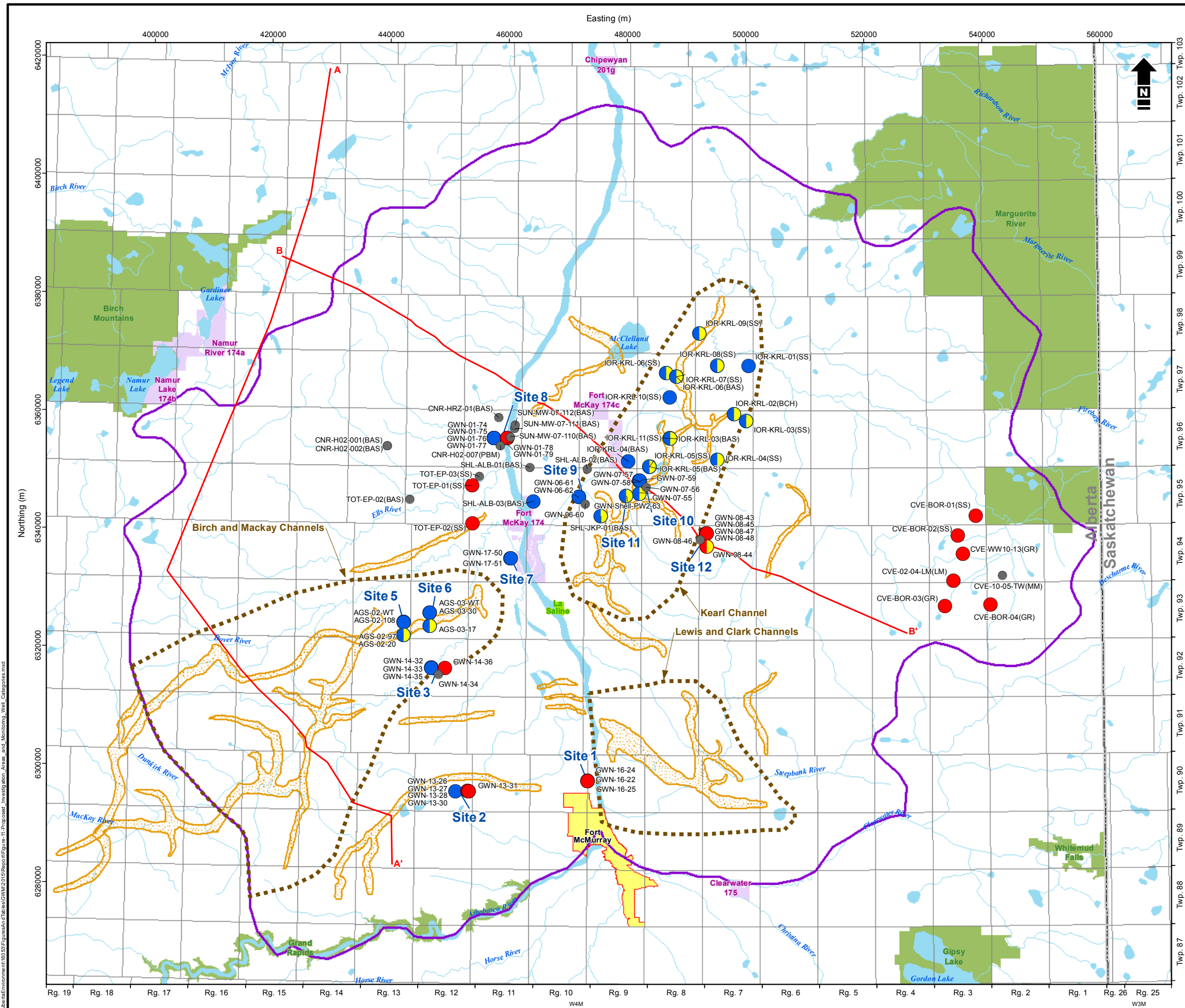


Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area

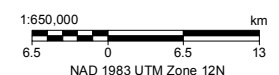
Basal McMurray Aquifer

Date: 18 Mar 2015	Project: 16053-502	Technical: S. Duchek	Reviewer: A. Owajori	Drawn: M. Pfeifer
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- North Athabasca Oil Sands Area
 - Buried Channels Aquifer Potentially Present
 - Proposed Investigation Area
 - Indian Reserve
 - Natural Area
 - Wildland Provincial Park
 - Community
 - Water Body
 - Watercourse
 - Cross Section
- Proposed Sub-Networks / Well Categories**
- Sub-Network A (Strategic)
 - Sub-Network B (Surveillance)
 - Sub-Network C (Investigative)
 - Well in Sub-Networks A & C (Strategic / Investigative)
 - Well in Sub-Networks B & C (Surveillance / Investigative)
 - Not Classified



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Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area

Proposed Investigation Areas and Monitoring Well Categories

Date: 18 Mar 2015 Project: 16053-502 Technical: S. Duchek Reviewer: A. Owajori Drawn: M. Pfeifer

Figure 11

TABLE 1.

MONITORING WELLS SUMMARY

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Monitoring Events																				Depth (m)			Completion Formation/Aquifer			
	Ground Surface (masl)	Top of Casing (masl)	1st Monitoring Event [^]					2nd Monitoring Event ^{^^}					3rd Monitoring Event ^{^^^}					4th Monitoring Event ^{^^^^}					Grnd. To Well Depth		Grnd. To Top of Intake Interval	Grnd. To Bottom of Intake Interval	
			Top of Casing to Water (m)	Grnd. To Water (m)	Groundwater Elevation (masl)	Top of Casing To Product	Date	Top of Casing to Water (m)	Grnd. To Water (m)	Groundwater Elevation (masl)	Top of Casing To Product (m)	Date	Top of Casing to Water (m)	Grnd. To Water (m)	Groundwater Elevation (masl)	Top of Casing To Product (m)	Date	Top of Casing to Water (m)	Grnd. To Water (m)	Groundwater Elevation	Top of Casing To Product	Date					
Site 1																											
GWN-16-22	342.0	342.6	2.0	1.4	340.6	---	19-Aug-13	2.3	1.7	340.3	---	21-Nov-13	2.7	2.1	339.9	---	5-Aug-14	3.1	2.5	339.5	---	29-Oct-14	15.3	10.7	15.3	Surficial Sands	
GWN-16-23	---	---	---	---	---	---	---	---	---	---	---	---	---	---	abandoned	---	5-Aug-14	---	---	---	---	---	---	---	---	---	
GWN-16-24	342.0	342.6	59.2	58.6	283.4	---	19-Aug-13	59.3	58.7	283.3	---	---	59.4	58.7	283.3	---	8-Aug-14	59.3	58.7	283.3	---	29-Oct-14	97.5	94.5	97.5	Basal McMurray	
GWN-16-25	342.0	342.7	NM	NM	NM	---	---	---	---	---	---	21-Nov-13	71.8	---	---	---	8-Aug-14	72.2	71.5	270.5	---	29-Oct-14	167.7	103.7	167.7	Beaverhill Lake	
Site 2																											
GWN-13-26	533.4	533.9	12.8	12.3	521.1	---	26-Aug-13	12.6	12.1	521.3	---	23-Nov-13	12.5	12.0	521.4	---	7-Aug-14	12.5	12.0	521.4	---	28-Oct-14	18.9	17.3	18.9	Surficial Sands	
GWN-13-27	533.1	533.6	23.7	23.2	509.9	---	26-Aug-13	23.5	23.0	510.1	---	23-Nov-13	23.5	23.0	510.1	---	7-Aug-14	23.4	22.9	510.2	---	28-Oct-14	68.6	64.0	68.6	Buried Channels - Thickwood Valley	
GWN-13-28	533.4	533.8	63.7	63.3	470.1	---	27-Aug-13	63.6	63.2	470.2	---	23-Nov-13	63.7	63.3	470.1	---	7-Aug-14	63.7	63.3	470.1	---	28-Oct-14	138.7	134.1	138.7	Grand Rapids	
GWN-13-30	532.8	533.4	NM	NM	NM	---	---	---	---	---	---	---	220.6	220.0	312.8	---	7-Aug-14	220.6	220.0	312.8	---	28-Oct-14	165.3	162.3	165.3	Basal McMurray	
GWN-13-31	533.6	534.1	NM	NM	NM	---	---	---	---	---	---	---	215.0	214.5	319.1	---	7-Aug-14	Dry	Dry	Dry	---	28-Oct-14	375.0	336.5	375.0	Beaverhill Lake	
Site 3																											
GWN-14-32	372.5	372.9	1.7	1.2	371.2	---	24-Aug-13	1.9	1.4	371.1	---	28-Nov-13	2.0	1.6	370.9	---	4-Aug-14	2.1	1.6	370.9	---	31-Oct-14	10.4	8.8	10.4	Surficial Sands	
GWN-14-33	372.8	373.2	20.2	19.8	353.0	---	24-Aug-13	20.3	19.9	352.9	---	28-Nov-13	20.4	20.0	352.8	---	4-Aug-14	20.4	20.0	352.8	---	---	34.8	30.2	34.8	Clearwater	
GWN-14-34	372.5	373.7	1.2	NM	NM	---	---	NM	NM	---	---	---	---	---	---	---	---	---	---	---	---	31-Oct-14	53.1	69.2	73.8	Basal McMurray	
GWN-14-35	372.4	372.9	91.4	90.8	281.6	---	25-Aug-13	92.0	91.5	280.9	---	28-Nov-13	91.2	90.6	281.7	---	4-Aug-14	91.4	90.8	281.5	---	31-Oct-14	212.2	117.7	212.2	Beaverhill Lake	
GWN-14-36	373.1	373.4	68.9	68.6	304.5	~ 68	25-Aug-13	67.6	67.3	305.8	~ 67	28-Nov-13	67.5	67.2	305.9	---	4-Aug-14	67.5	67.2	305.9	---	31-Oct-14	484.8	452.4	484.8	Methy (Keg River)	
Site 5																											
AGS-02-108	440.2	441.0	41.9	41.1	399.2	---	23-Aug-13	42.0	41.3	399.0	---	28-Nov-13	41.8	41.1	399.2	---	6-Aug-14	42.1	41.4	398.9	---	30-Oct-14	108.5	105.5	108.5	Clearwater	
AGS-02-20	440.0	440.8	4.4	3.6	436.4	---	23-Aug-13	4.7	3.9	436.1	---	22-Nov-13	4.5	3.7	436.3	---	6-Aug-14	5.0	4.1	435.9	---	30-Oct-14	18.0	15.0	18.0	Surficial Sands	
AGS-02-97	440.2	440.9	41.7	41.0	399.2	---	23-Aug-13	42.0	41.3	398.9	---	22-Nov-13	41.7	41.0	399.2	---	6-Aug-14	41.9	41.2	399.0	---	30-Oct-14	96.8	95.3	96.8	Buried Channels - Birch	
AGS-02-WT	440.0	440.9	1.9	1.0	439.0	---	23-Aug-13	1.9	1.0	439.0	---	22-Nov-13	1.9	1.0	439.0	---	6-Aug-14	1.8	0.9	439.2	---	30-Oct-14	5.5	2.5	5.5	Surficial Sands	
Site 6																											
AGS-03-17	377.7	378.4	2.1	1.3	376.3	---	22-Aug-13	1.9	1.2	376.5	---	28-Nov-13	2.2	1.4	376.2	---	6-Aug-14	1.9	1.2	376.5	---	30-Oct-14	16.9	15.4	16.9	Buried Channels - Birch	
AGS-03-30	378.0	378.4	NM	NM	NM	---	---	NM	NM	NM	---	---	4.2	3.8	374.2	---	6-Aug-14	4.3	3.9	374.1	---	30-Oct-14	30.3	28.3	30.3	Clearwater	
AGS-03-WT	377.7	378.4	2.2	1.5	376.2	---	22-Aug-13	2.1	1.3	376.3	---	28-Nov-13	2.3	1.6	376.1	---	6-Aug-14	2.1	1.3	376.4	---	30-Oct-14	5.5	2.5	5.5	Surficial Sands	
Site 7																											
GWN-17-50	262.4	263.0	1.4	0.9	261.6	---	26-Aug-13	1.5	1.0	261.5	---	19-Nov-13	4.2	3.6	258.8	---	5-Aug-14	1.6	1.0	261.4	---	29-Oct-14	12.2	7.6	12.2	Basal McMurray	
GWN-17-51	262.4	262.1	2.2	2.5	259.9	---	26-Aug-13	2.2	2.6	259.9	---	19-Nov-13	1.5	1.8	260.6	---	5-Aug-14	2.2	2.5	259.9	---	29-Oct-14	61.0	21.9	61.0	Beaverhill Lake	
Site 8																											
GWN-01-74	259.1	259.6	1.1	0.6	258.5	---	18-Sep-13	NM	NM	NM	---	27-Nov-13	1.0	0.5	258.6	---	1-Aug-14	0.7	0.2	258.9	---	4-Nov-14	8.2	6.7	8.2	Surficial Sands	
GWN-01-75	259.2	259.6	NM	NM	NM	---	---	NM	NM	NM	---	---	4.4	---	---	---	1-Aug-14	4.3	3.9	255.3	---	4-Nov-14	---	32.3	35.4	Basal McMurray	
GWN-01-76	259.4	259.8	39.8	39.4	220.1	---	18-Sep-13	40.2	39.8	219.7	---	27-Nov-13	39.5	39.1	220.3	---	1-Aug-14	40.3	39.9	219.5	---	4-Nov-14	130.0	127.0	130.0	Basal McMurray	
GWN-01-77	259.4	259.7	37.3	37.0	222.4	---	18-Sep-13	39.8	39.5	219.9	---	27-Nov-13	41.4	41.1	218.4	---	1-Aug-14	41.7	41.4	218.0	---	4-Nov-14	155.0	145.0	155.0	Beaverhill Lake	
GWN-01-78	259.1	259.7	208.5	207.9	51.3	---	18-Sep-13	208.4	207.8	51.3	---	27-Nov-13	209.0	208.4	50.7	---	1-Aug-14	209.1	208.5	50.6	---	4-Nov-14	221.0	210.0	221.0	Prairie Evaporite/Methy (Keg River) Formations	
GWN-01-79	259.5	260.0	NM	NM	NM	---	---	NM	NM	NM	---	---	NM	NM	NM	---	---	NM	NM	NM	---	---	317.2	290.2	317.2	Granite Wash	
Site 9																											
GWN-06-60	300.2	300.6	2.3	1.9	298.4	---	21-Aug-13	2.2	1.8	298.5	---	26-Nov-13	2.1	1.7	298.6	---	31-Jul-14	2.4	2.0	298.2	---	3-Nov-14	5.6	4.1	5.6	Basal McMurray	
GWN-06-61	299.9	300.4	37.1	36.6	263.3	---	21-Aug-13	37.3	36.8	263.1	---	26-Nov-13	35.3	34.8	265.1	---	31-Jul-14	34.1	33.6	266.3	---	3-Nov-14	64.6	59.5	64.6	Basal McMurray	
GWN-06-62	300.5	301.1	37.4	36.8	263.7	---	21-Aug-13	35.1	34.5	266.0	---	26-Nov-13	35.8	35.3	265.3	---	31-Jul-14	34.6	34.1	266.5	---	3-Nov-14	94.5	82.3	94.5	Beaverhill Lake	
Site 10																											
GWN-07-55	326.4	326.9	2.1	1.6	324.8	---	21-Sep-13	1.2	0.8	325.7	---	5-Nov-13	1.8	1.4	325.1	---	3-Aug-14	1.9	1.4	325.0	---	1-Nov-14	8.2	6.7	8.2	Surficial Sands	
GWN-07-56	326.2	326.7	NM	NM	NM	---	---	NM	NM	NM	---	---	7.7	---	---	---	3-Aug-14	8.2	7.7	318.5	---	1-Nov-14	41.1	36.6	41.1	Basal McMurray	
GWN-07-57	326.1	326.7	10.9	10.3	315.8	---	21-Sep-13	11.0	10.4	315.7	---	5-Nov-13	11.5	10.9	315.3	---	3-Aug-14	11.5	10.9	315.2	---	1-Nov-14	101.2	98.1	101.2	Basal McMurray	
GWN-07-58	326.4	326.8	45.8	45.5	281.0	---	21-Sep-13	49.6	49.2	277.2	---	5-Nov-13	48.1	47.8	278.7	---	3-Aug-14	49.4	49.0	277.4	---	1-Nov-14	181.1	168.9	181.1	Beaverhill Lake	
GWN-07-59	326.4	326.9	41.1	40.6	285.8	---	21-Sep-13	42.9	42.5	284.0	---	5-Nov-13	41.8	41.3	285.1	---	3-Aug-14	42.4	41.9	284.5	---	1-Nov-14	284.5	271.3	284.5	Granite Wash	
Site 11																											
GWN-Shell-PW2-63	321.1	321.1	6.5	6.5	314.6	---	21-Aug-13	6.9	6.9	314.2	---	25-Nov-13	7.2	7.2	313.9	---	31-Jul-14	7.4	7.4	313.8	---	3-Nov-14	22.0	16.0	22.0	Buried Channels - Kearl	

TABLE 1.

MONITORING WELLS SUMMARY

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well																					Depth (m)			Completion Formation/Aquifer			
	Ground Surface (masl)	Top of Casing (masl)	1st Monitoring Event [^]				2nd Monitoring Event ^{^^}				3rd Monitoring Event ^{^^^}				4th Monitoring Event ^{^^^^}					Grnd. To Well Depth	Grnd. To Top of Intake Interval	Grnd. To Bottom of Intake Interval					
			Top of Casing to Water (m)	Grnd. To Water (m)	Groundwater Elevation (masl)	Top of Casing To Product	Date	Top of Casing to Water (m)	Grnd. To Water (m)	Groundwater Elevation (masl)	Top of Casing To Product (m)	Date	Top of Casing to Water (m)	Grnd. To Water (m)	Groundwater Elevation (masl)	Top of Casing To Product (m)	Date	Top of Casing to Water (m)	Grnd. To Water (m)	Groundwater Elevation	Top of Casing To Product	Date					
Site 12																											
GWN-08-43	430.4	430.7	1.6	1.2	429.2	---	17-Sep-13	1.0	0.6	429.8	---	2-Nov-13	1.0	0.7	429.7	---	2-Aug-14	1.0	0.6	429.8	---	2-Nov-14	8.2	6.7	8.2	Surficial Sands	
GWN-08-44	430.7	431.3	3.7	3.1	427.6	---	17-Sep-13	3.1	2.5	428.2	---	2-Nov-13	3.2	2.6	428.1	---	2-Aug-14	3.1	2.4	428.2	---	2-Nov-14	33.2	30.0	33.2	Buried Channels	
GWN-08-45	430.1	430.6	26.8	26.2	403.8	---	17-Sep-13	26.7	26.2	403.9	---	2-Nov-13	26.4	25.9	404.2	---	2-Aug-14	28.0	27.5	402.6	---	2-Nov-14	62.5	56.4	62.5	Clearwater	
GWN-08-46	430.5	431.1	80.8	80.2	350.3	---	17-Sep-13	82.1	81.5	349.0	---	4-Nov-13	83.0	82.4	348.1	---	2-Aug-14	83.0	82.4	348.1	---	2-Nov-14	108.0	104.0	108.0	Basal McMurray	
GWN-08-47	430.7	431.0	100.4	100.1	330.6	---	20-Sep-13	100.5	100.2	330.5	---	3-Nov-13	100.7	100.4	330.3	---	2-Aug-14	100.5	100.3	330.5	---	2-Nov-14	160.6	157.6	160.6	Prairie Evaporite/Beaverhill	
GWN-08-48	430.9	431.5	127.6	127.0	303.9	---	20-Sep-13	128.4	127.8	303.1	---	3-Nov-13	128.2	127.6	303.3	---	2-Aug-14	128.0	127.4	303.5	---	2-Nov-14	218.0	206.0	218.0	Lake/Methy (Keg River) Formations Beaverhill Lake	

Notes:

- - not available
- NM - not measured
- [^] - denotes September 17-21, 2013 sampling event
- ^{^^} - denotes November 2-29, 2013 sampling event
- ^{^^^} - denotes July 31-August 8, 2014 sampling event
- ^{^^^^} - denotes October 28-31, November 1-4 sampling event
- 0.xx - negative groundwater level denotes above ground surface

TABLE 2.

2014 FIELD PROGRAM SUMMARY

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

NAOS Well ID	GOWN ID	Formation	Well Diameter (mm)	Top of Intake Interval (mbg)	Bottom of Intake Interval (mbg)	Depth to Water (mtoc) - Oct/Nov 2014 (or last recorded)	Easting (NAD 83)	Well Abandonment, Servicing/Rehabilitation Tasks Completed in 2013	Proposed Well Servicing/Rehabilitation/ Tasks for 2014	1st Sampling Event (July/August 2014)			2nd Sampling Event (October/November 2014)			Recommendations
										Sampled	Transducer Download	Comments/Other Tasks	Sampled	Transducer Download	Comments/Other Tasks	
Site 1: 06-13-090-10 W4M																
GWN-16-22	16-55	SS	51	10.7	15.3	3.1	472140	Downhole camera imaging confirmed apparent sand blockage at 5.8 mbtoc; well flushed to depth and redeveloped; recompleted with 51 mm PVC; packer installed	No servicing/rehabilitation tasks required	Yes	Yes	n/a	Yes	Yes	Fixed volume purging	Continue to monitor in sub-network A
GWN-16-23	16-165	BAS	---	---	---	---	472130	Well abandoned with thermal cement	N/A	---	---	---	---	---	---	---
GWN-16-24	16-325	BAS	140	94.5	97.5	59.3	472118	---	None (groundwater chemistry exceeds surface water discharge criteria, ERCB 2001)	Yes	Yes	Sampled with wterra	Yes	Yes	Low-flow purging/sampling	Continue to monitor in sub-network A
GWN-16-25	16-550	BHL	180	103.7	167.7	72.2	472113	---	None (groundwater chemistry exceeds surface water discharge criteria, ERCB 2001)	Yes	Yes	Routine sampling only	---	Yes	---	Continue to monitor in sub-network A
Site 2: 08-11-090-12 W4M																
GWN-13-26	13-70	SS	126	17.3	18.9	12.5	451904	Downhole camera imaging confirmed well integrity - observed reduced casing diameter from 11.2 mbtoc (telescopic completion), debris blockage at 16.3 mbtoc (looks like tubing or rope); well flushed and redeveloped; filled collapsed area around well	No servicing/rehabilitation tasks required	Yes	Yes	Purged dry after 30 L	Yes	Yes	Sampled with Wterra	Continue to monitor in sub-network A
GWN-13-27	13-230	BCH	141	64	68.6	23.4	451751	Well flushed and redeveloped; new pressure transducer installed (Solinst F30/M10, S/N 0032023170) @ 38.6 mbtoc; 6 hr intervals	No servicing/rehabilitation tasks required	Yes	Yes	Sampled with wterra	Yes	Yes	Low-flow purging/sampling	Continue to monitor in sub-network A
GWN-13-28	13-460	GR	126	134.1	138.7	63.7	451945	---	Possible flush; redevelop well until field parameters stabilize	Yes	Yes	Not flushed - depth-to-WL/equipment issues; sampled with bladder pump	Yes	Yes	Low-flow purging/sampling; duplicate sampling	Continue to monitor in sub-network A
GWN-13-29	13-770	BAS	---	---	---	---	451929	Well abandoned with thermal cement	N/A	---	---	n/a	---	---	n/a	---
GWN-13-30	13-872	BAS	141	162.3	165.3	220.6	451977	Not sampled for logistic reasons, water level > 200 mbtoc; consider sampling every 3 to 5 years	Water levels only; No sampling 2014	n/a	Yes	---	n/a	Yes	---	Continue to monitor in sub-network A (every 3 to 5 years for chemistry); completion in the Basal McMurray Aquifer is questionable, further review required
GWN-13-31	13-1230	BHL	154	336.5	375	> 250	451995	Not sampled for logistical reasons (depth-to-water > 200 mbtoc); consider sampling every 3 to 5 years	Water level only, No sampling 2014	n/a	n/a	---	n/a	n/a	---	Continue to monitor in sub-network B (every 3 to 5 years for chemistry)
Site 3: 04-15-092-12 W4M																
GWN-14-32	14-31	SS	163	8.8	10.4	2.1	447905	---	Possible flush; redevelop well until field parameters stabilize	Yes	Yes	Flushed until dry; very turbid, sheen in water (historical records suggests kerosene introduced into well in 1976 to inhibit freezing)	Yes	Yes	Fixed volume purging; oily sheen in water (historical records suggests kerosene introduced into well in 1976 to inhibit freezing)	Continue to monitor in sub-network B (adjust analytical schedule in consideration of the presence of hydrocarbons)
GWN-14-33	14-119	CWR	141	30.2	34.8	20.4	447930	---	None (groundwater chemistry exceeds surface water discharge criteria, ERCB 2001)	Yes	Yes	Duplicate sampling	Yes	Yes	Low-flow purging/sampling; duplicate sampling	Continue to monitor in sub-network B

TABLE 2.

2014 FIELD PROGRAM SUMMARY

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

NAOS Well ID	GOWN ID	Formation	Well Diameter (mm)	Top of Intake Interval (mbg)	Bottom of Intake Interval (mbg)	Depth to Water (mtoc) - Oct/Nov 2014 (or last recorded)	Easting (NAD 83)	Well Abandonment, Servicing/Rehabilitation Tasks Completed in 2013	Proposed Well Servicing/Rehabilitation/ Tasks for 2014	1st Sampling Event (July/August 2014)			2nd Sampling Event (October/November 2014)			Recommendations
										Sampled	Transducer Download	Comments/Other Tasks	Sampled	Transducer Download	Comments/Other Tasks	
GWN-14-34	14-247	BAS	141	69.2	73.8	dry	447924	Well is historically dry (not abandoned in 2013 due to accessibility issues)	None	n/a	n/a	---	n/a	n/a	---	Reclassify or discontinue from network - completed in unsaturated Wabiskaw sand unit or Upper McMurray aquitard
GWN-14-35	14-699	BHL	---	117.7	212.2	91.4	447914	Hydrocarbon in well	None (groundwater chemistry exceeds surface water discharge criteria, ERCB 2001)	Yes	n/a	Collected and analyzed hydrocarbon sample; no transducer in well	---	n/a	Well impacted by hydrocarbon	Discontinue from network
GWN-14-36	14-1590	PBM	116	452.4	484.8	67.5	447921		Collect hydrocarbon sample (if confirmed in well)	Yes	Yes	No hydrocarbon in well	---	Yes	No hydrocarbon in well	Continue to monitor in sub-network A
Site 5: 13-06-093-12 W4M																
AGS-02-WT		SS	51	2.5	5.5	1.8	443216	Well flushed and redeveloped; well pinch repaired (at 0.6 m bgs); well resurveyed.	Install mechanical packer to below frost level	Yes	Yes	Purged 12L, sampled with watterra	Yes	Yes	Fixed volume purging; mechanical packer installed	Continue to monitor in sub-network B
AGS-02-20		SS	51	15	18	5.0	443221	Downhole camera imaging confirmed well integrity; well flushed and redeveloped	No servicing/rehabilitation tasks required	Yes	Yes	Purged until dry after 60L, sampled with watterra	Yes	Yes	Fixed volume purging	Continue to monitor in sub-networks B and C
AGS-02-50		SS	---	---	---	---	443211	Well abandoned with bentonite slurry	N/A	n/a	n/a	n/a	n/a	n/a	n/a	---
AGS-02-97		BCH	51	95.3	96.8	41.9	443203		Possible flush; develop well until field parameters stabilize	Yes	Yes	Sample duplicate; well flushed by airlifting (sampled after airlifting)	Yes	Yes	Low-flow purging/sampling	Continue to monitor in sub-networks B and C
AGS-02-108		CWR	38	105.5	108.5	42.1	443195		Possible flush; develop well until field parameters stabilize	Yes	Yes	Flushed until dry; sampled with watterra	---	Yes	---	Continue to monitor in sub-network B
Site 6: 15-09-093-12 W4M																
AGS-03-WT		SS	51	2.5	5.5	2.1	447628	Well pinch repaired	Install mechanical packer below frost level	Yes	Yes	Sampled with watterra	Yes	Yes	Fixed volume purging; could not install packer due to well pinch	Continue to monitor in sub-network B
AGS-03-17		BCH	51	15.4	16.9	1.9	447634	Well purged, packer installed with datalogger	Possible flush; develop well until field parameters stabilize	Yes	Yes	Well flushed by airlifting; sampled after airlifting	Yes	Yes	Fixed volume purging (packer in well)	Continue to monitor in sub-networks B and C
AGS-03-30		CWR	38	28.3	30.3	4.3	447634		Water level; possible flush/redevelop well (well runs dry on purge)	Yes	Yes	Flushed (by airlifting) until dry; sampled after airlifting	Yes	Yes	Fixed volume purging	Continue to monitor in sub-network B
Site 7: 13-12-094-11 W4M																
GWN-17-50	17-45	BAS	180	7.6	12.2	1.6	461310	Downhole camera imaging confirmed well integrity; well flushed and redeveloped	No servicing/rehabilitation tasks required	Yes	Yes	Low-flow sampling	Yes	Yes	Sampled with Watterra	Continue to monitor in sub-network B
GWN-17-51	17-200	BHL	140	21.9	61	2.2	461340		None (groundwater chemistry exceeds surface water discharge criteria, ERCB 2001)	Yes	Yes	---	Yes	Yes	Low-flow purging/sampling	Continue to monitor in sub-network B

TABLE 2.

2014 FIELD PROGRAM SUMMARY

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

NAOS Well ID	GOWN ID	Formation	Well Diameter (mm)	Top of Intake Interval (mbg)	Bottom of Intake Interval (mbg)	Depth to Water (mtoc) - Oct/Nov 2014 (or last recorded)	Easting (NAD 83)	Well Abandonment, Servicing/Rehabilitation Tasks Completed in 2013	Proposed Well Servicing/Rehabilitation/ Tasks for 2014	1st Sampling Event (July/August 2014)			2nd Sampling Event (October/November 2014)			Recommendations
										Sampled	Transducer Download	Comments/Other Tasks	Sampled	Transducer Download	Comments/Other Tasks	
Site 8: 08-15-096-11 W4M																
GWN-01-74	1-32	SS	114	6.7	8.2	0.7	458500	Frozen in November (2013) at 0.72 mbtoc	Possible flush; develop well until field parameters stabilize	Yes	Yes	Well flushed	Yes	Yes	Sampled with Waterra	Continue to monitor in sub-network B
GWN-01-75	1-123	BAS	114	32.3	35.4	4.3	458496	Hydrocarbon in well	Sample hydrocarbon if possible	Yes	n/a	Collected and analyzed hydrocarbon sample; no transducer in well	Yes	n/a	Well impacted by hydrocarbon; sampled with Waterra	Discontinue from network
GWN-01-76	1-432	BAS	114	127	130	40.3	458508	---	Install replacement transducer to confirm temperature measurements. Groundwater chemistry exceeds surface water discharge criteria, ERCB 2001;	---	Yes	Pump problems likely related to water density; replacement transducer installed at 123.3 mbtoc (F30/M10; S/N 32025310)	Yes	Yes	Low-flow purging/sampling	Continue to monitor in sub-network B
GWN-01-77	1-507	BHL	114	145	155	41.7	458504	---	None (groundwater chemistry exceeds surface water discharge criteria, ERCB 2001)	---	Yes	Pump problems likely related to water density	---	Yes	---	Continue to monitor in sub-network B
GWN-01-78	1-726	PBM	114	210	221	209.1	458515	Foul odour in well, depth-to-water > 200 mbtoc	Take manual fluid level or bottom of well	n/a	Yes	n/a	n/a	Yes	---	Continue to monitor in sub-network A (every 3 to 5 years for chemistry)
GWN-01-79	1-1040	GRA	114	290.2	317.2	22.5	458507	Damaged	None	n/a	n/a	n/a	n/a	n/a	n/a	Continue to monitor in sub-network A (every 3 to 5 years for chemistry)
Site 9: 02-18-095-09 W4M																
GWN-06-60	6-21	BAS	139	4.1	5.6	2.4	472874	Downhole camera imaging confirmed well integrity (no video record, recorder not working) - observed reduced casing diameter from 2.9 mbtoc (telescopic completion), apparent sand blockage at 5.8 mbtoc	Possible flush; develop well until field parameters stabilize	Yes	Yes	Purged dry	Yes	Yes	Fived volume purging	Reclassify or discontinue from network - completed in McMurray aquitard (oil sands)
GWN-06-61	6-220	BAS	130	59.5	64.6	34.1	472879	---	None (groundwater chemistry exceeds surface water discharge criteria, ERCB 2001)	Yes	Yes	Runs dry during low-flow purging	Yes	Yes	Low-flow purging/sampling	Continue to monitor in sub-network B
GWN-06-62	6-310	BHL	141	82.3	94.5	34.6	472893	---	Groundwater chemistry exceeds surface water discharge criteria, ERCB 2001; complete electrical conductivity (EC) profiling to assess potential groundwater mixing and confirm well casing integrity at near surface.	---	Yes	EC profiling not completed due to technical issues with probe	---	Yes	---	Continue to monitor in sub-network B
Site 10: 13-20-95-08 W4M																
GWN-07-55	7-32	SS	130	6.7	8.2	1.9	483145	---	Possible flush; develop well until field parameters stabilize	Yes	n/a	Well flushed	Yes	n/a	Sampled with Waterra; turbid water	Continue to monitor in sub-networks B and C
GWN-07-56	7-135	BAS	130	36.6	41.1	8.2	483157	Bitumen present in well, consider sampling every 3 to 5 years (if bitumen assessed to be naturally present).	Sample and analyze hydrocarbon (NAPL) and groundwater to confirm natural HCs; bitumen plug in well	Yes	n/a	No LNAPL in well, has hydrocarbon odor	Yes	n/a	Sampled with Waterra; hydrocarbon odor	Reclassify or discontinue from network - completed in McMurray aquitard (oil sands)
GWN-07-57	7-337	BAS	130	98.1	101.2	11.5	483162	---	Possible flush; develop well until field parameters stabilize	Yes	Yes	Sample duplicate, well flushed	Yes	Yes	Low-flow purging/sampling	Continue to monitor in sub-network B
GWN-07-58	7-594	BHL	114	168.9	181.1	49.4	483148	Could not sample in the fall due to equipment failure (pump) in the field; logger stuck in well but communicating	None (groundwater chemistry exceeds surface water discharge criteria, ERCB 2001)	Yes	Yes	---	---	Yes	Logger stuck in well but communicating	Continue to monitor in sub-network B
GWN-07-59	7-933	GRA	142	271.3	284.5	42.4	483180	Could not sample in the fall due to equipment failure (pump) in the field	Possible flush; develop well until field parameters stabilize	Yes	Yes	Well flushed	---	Yes	---	Continue to monitor in sub-network B

TABLE 2.

2014 FIELD PROGRAM SUMMARY

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

NAOS Well ID	GOWN ID	Formation	Well Diameter (mm)	Top of Intake Interval (mbg)	Bottom of Intake Interval (mbg)	Depth to Water (mtoc) - Oct/Nov 2014 (or last recorded)	Easting (NAD 83)	Well Abandonment, Servicing/Rehabilitation Tasks Completed in 2013	Proposed Well Servicing/Rehabilitation/ Tasks for 2014	1st Sampling Event (July/August 2014)			2nd Sampling Event (October/November 2014)			Recommendations
										Sampled	Transducer Download	Comments/Other Tasks	Sampled	Transducer Download	Comments/Other Tasks	
Site 11: 10-24-095-09 W4M																
GWN-Shell-PW2-63		BCH	219	16	22	7.4	480925	Downhole camera imaging confirmed well integrity, did not observe transducer in well before it turned cloudy; sampled with Waterra; installed new pressure transducer (Solinst S/N 32023199) with aircraft cable	Possible flush; develop well until field parameters stabilize	Yes	Yes	Low-flow sampling (did not flush)	Yes	Yes	Low-flow purging/sampling; duplicate sampling	Continue to monitor in sub-networks B and C
Site 12: 05-30-94-07 W4M																
GWN-08-43	8-34	SS	139	6.7	8.2	1.0	492290	Downhole camera imaging confirmed well integrity - observed metal debris blocking well at 5.7 mbtoc	Possible flush; develop well until field parameters stabilize (downhole camera imaging completed in 2013); test for potential presence of artificial sweeteners in groundwater	Yes	Yes	Purged well through airlifting until dry; sampled for Environment Canada (artificial sweeteners testing)	Yes	Yes	Fixed volume purging	Continue to monitor in sub-network A
GWN-08-44	8-114	BCH	130	30	33.2	3.1	492310	---	Possible flush; develop well until field parameters stabilize; test for potential presence of artificial sweeteners in groundwater	Yes	Yes	Flushed well through airlifting; sampled for Environment Canada (artificial sweeteners testing)	Yes	Yes	Fixed volume purging	Continue to monitor in sub-networks A and C
GWN-08-45	8-220	CWR	135	56.4	62.5	28.0	492285	---	Possible flush; develop well until field parameters stabilize	Yes	Yes	Flushed well through airlifting; sampled with waterra	Yes	Yes	Low-flow purging/sampling	Continue to monitor in sub-network A
GWN-08-46	8-370	BAS	130	104	108	83.0	492304	---	Possible flush; develop well until field parameters stabilize	Yes	Yes	Limited parameters sampling	Yes	Yes	Low-flow purging/sampling	Reclassify or discontinue from network - completed in Clearwater Formation aquitard
GWN-08-47	8-532	PBM	131	157.6	160.6	100.5	492194	Field electrical conductivity (EC) vertical profiling suggests groundwater mixing; did not sample in November (field parameters did not stabilize likely due to groundwater mixing); installed new pressure transducer (Solinst S/N 32023170)	Water level and download only	n/a	n/a	---	n/a	n/a	---	Continue to monitor in sub-network A (hydraulic head only, discontinue for groundwater chemistry)
GWN-08-48	8-716	BHL	130	206	218	130.0	492316	---	None (groundwater chemistry exceeds surface water discharge criteria, ERCB 2001)	---	Yes	---	---	No	Could not connect to transducer	Continue to monitor in sub-network A

n/a - Not Applicable

Completion Unit

- SS = Surficial Sands
- BCH = Buried Channels and Valleys
- GR = Grand Rapids Formation
- CWR = Clearwater Formation
- BAS = McMurray Formation Basal Aquifer
- PBM = Prairie Evaporite/Keg River Formations
- BHL = Beaverhill Lake Formation
- GRA = Granite Wash Formation

TABLE 3.

OPERATOR WELLS SUMMARY

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well Owner (Operator)	Operator Well name	UWI	NAOS Well ID	RFI Sent (Y/N)	Data Received (Y/N)	New Data Received	Completion Formation/Aquifer	EastingNAD83	NorthingNAD83	Comments	
CNRL	H01-002		CNR-HRZ-01(BAS)	Y	Y		Basal McMurray	458152	6358590	Hydraulic head data from Jan 2013 - Feb 2014; chemistry (Jan 2010 to Dec 2013)	
	H02-007		CNR-H02-007(PBM)	Y	N		Prairie Evaporite - Beaverhill Lake-Methyl	458422	6353808	No data received	
	H02-001	100041409613W400	CNR-H02-001(BAS)			Y	Basal McMurray	439253.56	6353850.3	Some well data; hydraulic head data from Jan - Sep 2013; no chemistry received	
	H02-002	102041409613W400	CNR-H02-002(BAS)			Y	Basal McMurray	439254.56	6353851.3	Some well data, chemistry (Nov 2010 to Dec 2013)	
Cenovus	WW07-11	WW07-11-GR 7-20-93-3	CVE-BOR-03(GR)	Y	Y		Grand Rapids	533800	6326685	Well data, chemistry (Jan 2011)	
	WW07-13		CVE-BOR-04(GR)	Y	N		Grand Rapids	541530	6326917	No data received	
	WW07-06	WW07-06-S2 13-1-95-3	CVE-BOR-01(SS)	Y	Y		Surficial Sands	539018	6341946	Well data, chemistry (Feb 2013)	
	WW07-08	WW07-08-S2 13-27-94-3	CVE-BOR-02(SS)	Y	Y		Surficial Sands	535997	6338668	Well data, chemistry (Feb 2013)	
	WW10-13-GR	WW10-13-GR 15-15-94-3	CVE-WW10-13(GR)			Y	Grand Rapids	536830	6335489	Well data, monthly water level data from Feb 2010 - Sep 2012; chemistry (Feb 2011)	
	10-05-94-2-TW	100/10-05-94-2-TW	CVE-10-05-TW(MM)			Y	Middle McMurray	543509	6331828	Well data, monthly water level data from Jan 2011 - Nov 2013; chemistry (Jan/Feb 2011)	
	02-04-94-3-LM	100/02-04-94-3-LM	CVE-02-04-LM(LM)			Y	Lower McMurray (water zone)	535227	6331019	Well data, monthly water level data from Jan 2011 - Oct 2013; chemistry (Feb 2011)	
Imperial Oil Resources	3-22-96-8(B)	3-22-96-8 W4M	IOR-KRL-03(BAS)	Y	Y		Basal McMurray	487165.5	6355092.56	Well data; chemistry (Mar 1998 to Oct 2012)	
	12-1-96-9B	12-1-96-8 W4M	IOR-KRL-04(BAS)	Y	Y		Basal McMurray	480118.6	6351189.2	Well data; chemistry (Feb 1998 to Oct 2012)	
	03-5-96-8(B)	3-5-96-8 W4M	IOR-KRL-05(BAS)	Y	Y		Basal McMurray	483760.84	6350290.91	Well data; chemistry (Feb 1998 to Oct 2012)	
	P12359607Q1	12-35-96-07 W4M	IOR-KRL-02(BCH)	Y	Y		Buried Channels	498065.81	6359189.67	Well data; chemistry (Mar 2004 to Oct 2012)	
	P05-038Q	10-25-97-07 W4M	IOR-KRL-01(SS)	Y	Y		Surficial Sands	500504	6367332	Well data; chemistry (Mar 2005 to Oct 2012)	
	P14259607Q	14-25-96-07 W4M	IOR-KRL-03(SS)	Y	Y		Surficial Sands	500093.98	6357991.08	Well data; chemistry (Mar 2004 to Oct 2012)	
	P14049607Q1	14-04-96-07 W4M	IOR-KRL-04(SS)	Y	Y		Surficial Sands	495224.88	6351481.23	Well data; chemistry (Mar 2004 to Oct 2012)	
	03-5-96-8(Q)	3-5-96-8 W4M	IOR-KRL-05(SS)	Y	Y		Surficial Sands	483760.8	6350291	Well data; chemistry (Oct 2010 to Oct 2012)	
	KH09-095		IOR-KRL-06(SS)	Y	Y		Surficial Sands	486567.121	6366130.446	Well data; chemistry (Jan 2009 to Oct 2012)	
	KH09-098		IOR-KRL-07(SS)	Y	Y		Surficial Sands	488308.287	6365522.402	Well data; chemistry (Jan 2009 to Oct 2012)	
	KH10-022		IOR-KRL-08(SS)	Y	Y		Surficial Sands	495240.339	6367376.811	Well data; chemistry (Jan 2010 to Oct 2012)	
										Well data; chemistry (Feb 2010 to Oct 2012); KH09-069 was deferred to 2010 drilling and renamed KH10-069	
		KH10-069		IOR-KRL-09(SS)	Y	Y		Surficial Sands	492172.366	6372855.649	Well data; chemistry (Feb 2011 to Oct 2012); new addition to monitoring network
		KH11-180		IOR-KRL-10(SS)			Y	Surficial Sands	487167.48	6362005.22	Well data; chemistry (Feb 2011 to Oct 2012); new addition to monitoring network
	KH11-181		IOR-KRL-11(SS)			Y	Surficial Sands	487208.56	6355044.05	Well data; chemistry (Feb 2011 to Oct 2012); new addition to monitoring network	
	KH12-136		IOR-KRL-06(BAS)			Y	Basal McMurray	488299.5	6365521.18	Well data; new addition to monitoring network, no chemistry	
Shell	ASE09-5043		SHL-ALB-01(BAS)	Y	Y		Basal McMurray	463447.831	6350164.476	Well data, manual water level and chemistry from Oct 2009 to Jun 2012	
	ASE08-107		SHL-ALB-02(BAS)	Y	Y		Basal McMurray	473145.6	6349884	Well data, manual water level from Nov 2009 to Oct 2012; chemistry from Nov 2009 to Oct 2010	
	ASE97-042		SHL-ALB-03(BAS)	Y	Y		Basal McMurray	6344360.53	464085.35	Well data, manual water level from Jan 1997 to Dec 2009; chemistry from Feb 2001 to Nov 2009; well has not been monitored since 2009	
	P01-902D		SHL-JKP-01(BAS)	Y	Y		Basal McMurray	475457.62	6341859.98	Well data, manual water level and chemistry from Sep 2001 to Nov 2012	
Suncor	MW-07-110		SUN-MW-07-110(BAS)	Y	N		Basal McMurray	460178	6355322	No data received	
	MW-07-111		SUN-MW-07-111(BAS)	Y	N		Basal McMurray	460894	6356745	No data received	
	MW-07-112		SUN-MW-07-112(BAS)	Y	N		Basal McMurray	460978	6357368	No data received	
Total	SP_04-078	100071809512W400	TOT-EP-02(BAS)	Y	Y		Basal McMurray	443139.63	6344715.327	Well data, manual water levels from Jan 2000 to Jan 2014; no chemistry received	
	SP_04-021	1AB161909511W400	TOT-EP-01(SS)	Y	Y		Surficial Sands	453689.541	6347067.69	Well data, manual water levels from Jan 2000 to Jan 2014; scheduled for abandonment in 2014 (located in middle of plant site & haul road); no chemistry received	
	SP_04-010	1AB040509511W400	TOT-EP-02(SS)	Y	Y		Surficial Sands	453741.211	6340665.511	Well data, manual water levels from Jan 2000 to Nov 2012; no chemistry received	
	SP_03-009	03-009_152909511W400	TOT-EP-03(SS)			Y	Surficial Sands	454905.079	6348598.409	Well data, manual water levels from Jan 2000 to Nov 2012; replacement well for SP_04-021; no chemistry received	

TABLE 4.

NETWORK EVALUATION CRITERIA

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Criteria	GMF Regulatory Objectives	Evaluation Parameter	Description/Interpretation	Rating Rule 1	Rating Rule 2	Rating
Regulatory Framework and Conceptual Model	<ul style="list-style-type: none"> providing a better understanding of natural variability of regional groundwater conditions providing good baseline coverage (in areas of no anthropogenic effects) in regional aquifers further refining regional triggers and limits for indicator parameters for key aquifers in the NAOS area through an adaptive management process 	Spatial distribution	evaluates the spatial distribution of wells relative to each other on an aquifer-specific basis; based on a 10 km radius area of influence	No equivalent monitoring well within a 10 km radius area of influence	N/A	2
				Multiple equivalent wells within a 10km radius area of influence, but > 5km apart	Highest rated well within the area of influence	2
					Other wells	1
				Multiple equivalent wells within a 10km radius area of influence, but < 5km apart	Highest rated well within the area of influence	2
					Other wells	0
				Proximity to current operations footprints and communities	evaluates the relative ability of the wells to provide good baseline coverage, monitor regional effects	Quality
		1 to 3 km	1			
		> 3 km	2			
		Quantity	≤ 1 km			0
			1 to 5 km	1		
> 5 km	2					

TABLE 4.**NETWORK EVALUATION CRITERIA**

Alberta Environment and Sustainable Resource Development

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Criteria	GMF Regulatory Objectives	Evaluation Parameter	Description/Interpretation	Rating Rule 1	Rating Rule 2	Rating
Regulatory Framework and Conceptual Model	<ul style="list-style-type: none"> providing further understanding of regional aquifer interactions and how/where the groundwater system is connected to surface environments identifying potential high risk areas that may require additional monitoring (including areas of suspected or known groundwater surface water interaction) 	Proximity to major rivers and lakes	evaluates the relative ability of the wells to help understand aquifer interactions, groundwater-surface water interactions	> 10 km	N/A	0
				5 to 10 km	N/A	1
				< 5 km	N/A	2
		Proximity to bedrock incisions		> 10 km	N/A	0
				5 to 10 km	N/A	1
				< 5 km	N/A	2
	<ul style="list-style-type: none"> assessing long term water quality and water level trends (intra and inter well comparisons), and assessing potential cumulative effects from current and future development activities generating data to assess predictions contained in environmental impact assessments (EIAs) and provide a way to verify model projections 	Proximity to current operations footprints	evaluates the relative ability of the wells to monitor cumulative effects	Quantity	≤ 1 km OR ≥ 20 km	0
					1 to 5 km	1
					5 to 20 km	2
				Quality (assumed to be local)	---	---

TABLE 4.**NETWORK EVALUATION CRITERIA**

Alberta Environment and Sustainable Resource Development

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Criteria	GMF Regulatory Objectives	Evaluation Parameter	Description/Interpretation	Rating Rule 1	Rating Rule 2	Rating
Monitoring Considerations (Specific Aquifer Parameters and Well Characteristics)	N/A	Groundwater mineralization	evaluates network coverage of non-saline versus saline aquifer units - primary goal of GMF is to manage non saline groundwater resources	TDS > 5000 mg/L	N/A	0
				TDS 4000 to 5000 mg/L	N/A	1
				TDS ≤ 4000 mg/L	N/A	2
	N/A	Well completion	evaluates how accurately the well completion interval represents the specified corresponding hydrostratigraphic unit(s)	Well intake corresponds to a single hydrostratigraphic unit (verified through borehole logs or from professional judgement)	N/A	2
				Well intake corresponds to specific but undifferentiated hydrostratigraphic unit or multiple hydrostratigraphic units within a geologic Group or Period, or where lithologic records are unavailable	N/A	1
				Borehole logs and lithologic records suggests well intake may not correspond to the specified hydrostratigraphic unit	N/A	0

TABLE 5.

GROUNDWATER QUALITY RESULTS - FIELD PARAMETERS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Temp °C	Field pH	Field EC ²⁵ µS/cm	Field Cl mg/L	Field Turbidity NTU
Surficial Sands							
AGS-02-20	01-Jul-09	16053090701007	6.0	7.4	1223	---	---
AGS-02-20	19-Nov-10	16053101119004	0.1	6.9	729	---	---
AGS-02-20	15-Feb-11	16053110215004	5.4	7.2	1188	---	---
AGS-02-20	23-Aug-13	16053130823011	6.9	7.1	1130	---	---
AGS-02-20	22-Nov-13	16053131122006	3.0	7.8	1330	---	---
AGS-02-20	06-Aug-14	16053140806030	7.0	7.3	1190	---	461.5
AGS-02-20	30-Oct-14	16053141030014	3.9	7.5	1240	---	492
AGS-02-50	01-Jul-09	16053090701006	6.8	7.4	1519	---	---
AGS-02-50	15-Sep-09	16053090915003	8.5	7.5	1454	---	---
AGS-02-50	19-Nov-10	16053101119003	---	---	---	---	---
AGS-02-50	15-Feb-11	16053110215003	---	---	---	---	---
AGS-02-WT	15-Sep-09	16053090915001	10.0	7.1	937	---	---
AGS-02-WT	19-Nov-10	16053101119001	0.1	7.1	648	---	---
AGS-02-WT	15-Feb-11	16053110215001	---	---	---	---	---
AGS-02-WT	23-Aug-13	16053130823012	9.2	7.4	970	---	---
AGS-02-WT	22-Nov-13	16053131122007	4.1	7.5	980	---	---
AGS-02-WT	06-Aug-14	16053140806028	10.5	7.1	910	---	57.6
AGS-02-WT	30-Oct-14	16053141030015	6.3	7.3	1100	---	117
AGS-03-WT	17-Sep-09	16053090917001	9.4	7.2	1014	---	---
AGS-03-WT	20-Nov-10	16053101120001	3.7	6.8	695	---	---
AGS-03-WT	16-Feb-11	16053110216004	3.4	7.5	870	---	---
AGS-03-WT	22-Aug-13	16053130822009	12.8	7.1	800	---	---
AGS-03-WT	28-Nov-13	16053131128022	7.7	7.2	910	---	---
AGS-03-WT	06-Aug-14	16053140806026	14.0	7.2	800	---	37.1
AGS-03-WT	30-Oct-14	16053141030010	9.0	6.9	800	---	76.5
GWN-01-74	05-Jul-77	16053770705005	5.0	8.5	---	---	---
GWN-01-74	05-Jul-78	16053780705006	4.0	8.7	---	---	---
GWN-01-74	08-Jul-79	16053790708007	4.0	8.8	---	---	---
GWN-01-74	01-Jul-80	16053800701005	4.0	8.8	---	---	---
GWN-01-74	10-Sep-09	16053090910002	6.2	7.7	3680	---	---
GWN-01-74	13-Dec-10	16053101213002	3.6	7.9	2640	---	---
GWN-01-74	18-Feb-11	16053110218005	---	---	---	---	---
GWN-01-74	18-Sep-13	16053130918033	6.4	8.8	3880	83	---
GWN-01-74	27-Nov-13	frozen	---	---	---	---	---
GWN-01-74	01-Aug-14	16053140801004	7.8	8.6	3760	---	84.8
GWN-01-74	04-Nov-14	16053141104035	3.9	8.3	3850	---	192.5
GWN-07-55	21-Sep-13	16053130921039	11.1	7.4	680	32	---
GWN-07-55	05-Nov-13	16053131105034	6.0	7.7	680	---	---
GWN-07-55	03-Aug-14	16053140803014	12.8	7.6	570	---	---
GWN-07-55	01-Nov-14	16053141101022	7.0	8.0	590	---	---
GWN-08-43	02-Jul-09	16053090702005	5.5	9.1	701	---	---
GWN-08-43	24-Sep-09	16053090924002	7.4	8.9	665	---	---
GWN-08-43	30-Sep-09	16053090930003	6.5	9.0	650	---	---
GWN-08-43	17-Sep-13	16053130917031	8.0	9.5	720	---	---
GWN-08-43	02-Nov-13	16053131102028	3.0	8.7	730	---	---
GWN-08-43	02-Aug-14	16053140802006	10.6	8.7	740	---	---
GWN-08-43	02-Nov-14	16053141102025	5.7	8.8	800	---	343.9
GMF Interim Quality Triggers for NAOSA^^			NS	NS	NS	NS	NS
Alberta Tier 1 - Natural Areas*			NS	6.5-8.5^P	NS	230^A	NS

TABLE 5.

GROUNDWATER QUALITY RESULTS - FIELD PARAMETERS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Temp °C	Field pH	Field EC ²⁵ µS/cm	Field Cl mg/L	Field Turbidity NTU
Surficial Sands							
GWN-13-26	20-Feb-76	16053760220003	---	7.3	---	---	---
GWN-13-26	19-Jul-76	16053760719005	4.0	8.1	---	---	---
GWN-13-26	11-Jul-77	16053770711004	6.0	7.1	---	---	---
GWN-13-26	10-Jul-78	16053780710005	10.0	6.7	---	---	---
GWN-13-26	10-Jul-79	16053790710004	7.5	7.2	---	---	---
GWN-13-26	07-Jul-80	16053800707007	5.5	6.8	---	---	---
GWN-13-26	10-Jul-80	16053800710001	5.5	6.8	---	---	---
GWN-13-26	30-Jun-09	16053090630006	5.8	7.6	206	---	---
GWN-13-26	08-Sep-09	16053090908002	10.7	7.1	486	---	---
GWN-13-26	18-Nov-10	16053101118004	0.1	6.0	380	---	---
GWN-13-26	12-Feb-11	16053110212007	3.9	6.5	453	---	---
GWN-13-26	26-Aug-13	16053130826023	4.5	7.9	340	---	---
GWN-13-26	23-Nov-13	16053131123012	2.4	7.7	400	---	---
GWN-13-26	07-Aug-14	16053140807036	8.0	7.9	380	---	123.7
GWN-13-26	28-Oct-14	16053141028002	3.4	7.9	410	---	119
GWN-14-32	09-Feb-76	16053760209001	---	6.9	---	---	---
GWN-14-32	15-Jul-76	16053760715003	5.0	7.2	---	---	---
GWN-14-32	07-Jul-77	16053770707003	6.0	7.1	---	---	---
GWN-14-32	07-Jul-78	16053780707003	5.0	7.0	---	---	---
GWN-14-32	05-Jul-79	16053790705003	4.0	6.9	---	---	---
GWN-14-32	05-Jul-80	16053800705003	4.5	7.0	---	---	---
GWN-14-32	01-Jul-09	16053090701003	7.0	9.6	1508	---	---
GWN-14-32	14-Sep-09	16053090914001	8.7	7.1	2820	---	---
GWN-14-32	16-Feb-11	16053110216003	4.1	7.4	1670	---	---
GWN-14-32	24-Aug-13	16053130824016	6.6	8.2	1540	106	---
GWN-14-32	28-Nov-13	16053131128025	2.5	7.9	1730	---	---
GWN-14-32	04-Aug-14	16053140804021	10.0	7.3	2630	---	---
GWN-14-32	31-Oct-14	16053141031017	5.2	8.0	2520	---	320
GWN-16-22	18-Jul-76	16053760718003	5.0	6.9	---	---	---
GWN-16-22	08-Jul-77	16053770708003	5.0	7.3	---	---	---
GWN-16-22	04-Jul-78	16053780704005	6.5	8.9	---	---	---
GWN-16-22	04-Jul-78	16053780704006	6.5	8.9	---	---	---
GWN-16-22	03-Jul-79	16053790703003	6.0	8.2	---	---	---
GWN-16-22	07-Jul-80	16053800707003	5.0	8.3	---	---	---
GWN-16-22	30-Jun-09	16053090630003	8.3	7.9	847	---	---
GWN-16-22	21-Sep-09	16053090921001	8.0	8.0	839	---	---
GWN-16-22	30-Sep-09	16053090930001	6.2	7.0	872	---	---
GWN-16-22	18-Nov-10	16053101118003	1.9	6.4	556	---	---
GWN-16-22	12-Feb-11	16053110212003	3.0	7.4	901	---	---
GWN-16-22	19-Aug-13	16053130819001	9.4	8.5	700	0	---
GWN-16-22	21-Nov-13	16053131121004	2.7	7.8	10700	---	---
GWN-16-22	05-Aug-14	16053140805023	7.6	8.9	950	---	318.7
GWN-16-22	29-Oct-14	16053141029006	1.6	8.4	850	---	60.9
GMF Interim Quality Triggers for NAOSA^^			NS	NS	NS	NS	NS
Alberta Tier 1 - Natural Areas*			NS	6.5-8.5^P	NS	230^A	NS

TABLE 5.

GROUNDWATER QUALITY RESULTS - FIELD PARAMETERS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Temp °C	Field pH	Field EC ²⁵ µS/cm	Field Cl mg/L	Field Turbidity NTU
Buried Channels and Valleys - Birch Channel							
AGS-02-97	01-Jul-09	16053090701005	6.0	7.8	1483	---	---
AGS-02-97	15-Sep-09	16053090915002	6.0	7.7	1802	---	---
AGS-02-97	19-Nov-10	16053101119002	0.0	6.9	1159	---	---
AGS-02-97	15-Feb-11	16053110215002	---	---	---	---	---
AGS-02-97	23-Aug-13	16053130823015	11.9	7.7	1770	45	---
AGS-02-97	22-Nov-13	16053131122005	4.7	7.9	1830	---	---
AGS-02-97	06-Aug-14	16053140806029	8.8	8.2	1760	---	13.2
AGS-02-97	30-Oct-14	16053141030013	4.8	7.8	1840	---	10.7
AGS-03-17	01-Jul-09	16053090701004	6.2	7.4	624	---	---
AGS-03-17	17-Sep-09	16053090917003	5.6	7.2	767	---	---
AGS-03-17	20-Nov-10	16053101120003	0.9	6.7	626	---	---
AGS-03-17	16-Feb-11	16053110216006	3.3	7.5	780	---	---
AGS-03-17	22-Aug-13	16053130822008	7.9	7.2	760	---	---
AGS-03-17	28-Nov-13	16053131128021	6.0	7.2	810	---	---
AGS-03-17	06-Aug-14	16053140806024	5.1	7.2	780	---	2.2
AGS-03-17	30-Oct-14	16053141030012	5.7	7.2	810	---	88
GMF Interim Quality Triggers for NAOSA^^			NS	NS	NS	NS	NS
Alberta Tier 1 - Natural Areas*			NS	6.5-8.5^P	NS	230^A	NS
Buried Channels and Valleys - Kearl Channel							
GWN-08-44	02-Jul-09	16053090702004	6.2	<u>12.0</u>	1066	---	---
GWN-08-44	17-Sep-13	16053130917030	5.8	<u>9.8</u>	810	---	---
GWN-08-44	02-Nov-13	16053131102030	4.1	<u>9.4</u>	870	---	---
GWN-08-44	02-Aug-14	16053140802008	---	8.5	870	---	3.2
GWN-08-44	02-Nov-14	16053141102026	4.1	<u>9.2</u>	870	---	30.2
GWN-Shell-PW2-63	21-Aug-13	16053130821005	4.9	7.0	600	---	---
GWN-Shell-PW2-63	25-Nov-13	16053131125014	5.5	7.6	430	---	---
GWN-Shell-PW2-63	31-Jul-14	16053140731001	6.5	7.0	660	---	5.7
GWN-Shell-PW2-63	03-Nov-14	16053141103028	6.1	7.0	640	---	5.7
GMF Interim Quality Triggers for NAOSA^^			NS	NS	NS	NS	NS
Alberta Tier 1 - Natural Areas*			NS	6.5-8.5^P	NS	230^A	NS
Buried Channels and Valleys - Thickwood Channel							
GWN-13-27	17-Jan-76	16053760117001	---	<u>10.3</u>	---	---	---
GWN-13-27	19-Jul-76	16053760719004	4.0	<u>12.0</u>	---	---	---
GWN-13-27	11-Jan-77	16053770111003	---	7.1	---	---	---
GWN-13-27	10-Jul-78	16053780710004	5.5	<u>6.3</u>	---	---	---
GWN-13-27	07-Jul-80	16053800707006	3.0	6.5	---	---	---
GWN-13-27	30-Jun-09	16053090630005	5.2	<u>8.7</u>	814	---	---
GWN-13-27	08-Sep-09	16053090908001	6.1	7.7	1112	---	---
GWN-13-27	16-Nov-10	16053101116004	1.3	<u>5.7</u>	787	---	---
GWN-13-27	12-Feb-11	16053110212006	3.5	8.1	882	---	---
GWN-13-27	26-Aug-13	16053130826022	6.0	<u>9.0</u>	820	45	---
GWN-13-27	23-Nov-13	16053131123011	4.9	8.2	910	---	---
GWN-13-27	07-Aug-14	16053140807037	9.0	<u>8.7</u>	860	---	74.6
GWN-13-27	28-Oct-14	16053141028004	4.0	<u>8.8</u>	850	---	93.8
GMF Interim Quality Triggers for NAOSA^^			NS	NS	NS	NS	NS
Alberta Tier 1 - Natural Areas*			NS	6.5-8.5^P	NS	230^A	NS

TABLE 5.

GROUNDWATER QUALITY RESULTS - FIELD PARAMETERS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Temp °C	Field pH	Field EC ²⁵ µS/cm	Field Cl mg/L	Field Turbidity NTU
Grand Rapids Formation							
GWN-13-28	15-Jan-76	16053760115001	---	<u>9.2</u>	---	---	---
GWN-13-28	19-Jul-76	16053760719003	4.0	<u>10.6</u>	---	---	---
GWN-13-28	11-Nov-76	16053761111001	---	<u>9.0</u>	---	---	---
GWN-13-28	11-Jan-77	16053770111002	---	8.5	---	---	---
GWN-13-28	11-Jul-77	16053770711003	5.0	<u>8.9</u>	---	---	---
GWN-13-28	10-Jul-78	16053780710003	5.0	<u>9.0</u>	---	---	---
GWN-13-28	10-Jul-79	16053790710003	5.0	<u>9.3</u>	---	---	---
GWN-13-28	07-Jul-80	16053800707005	5.0	<u>9.3</u>	---	---	---
GWN-13-28	30-Jul-81	16053810730001	0.0	---	---	---	---
GWN-13-28	30-Jun-09	16053090630004	5.5	<u>10.4</u>	1576	---	---
GWN-13-28	16-Nov-10	16053101116003	---	---	---	---	---
GWN-13-28	12-Feb-11	16053110212005	---	---	---	---	---
GWN-13-28	27-Aug-13	16053130827026	15.8	<u>9.9</u>	1470	---	---
GWN-13-28	23-Nov-13	16053131123008	3.3	<u>9.5</u>	1530	---	---
GWN-13-28	07-Aug-14	16053140807035	6.0	<u>9.5</u>	1520	---	49.2
GWN-13-28	28-Oct-14	16053141028001	3.9	<u>9.6</u>	1540	---	69.1
Alberta Tier 1 - Natural Areas*			NS	6.5-8.5^P	NS	230^A	NS
Clearwater Formation							
AGS-02-108	19-Nov-10	16053101119005	---	---	---	---	---
AGS-02-108	15-Feb-11	16053110215005	---	---	---	---	---
AGS-02-108	23-Aug-13	16053130823014	10.1	7.6	1510	66	---
AGS-02-108	28-Nov-13	16053131128024	2.9	8.0	2920	---	---
AGS-02-108	06-Aug-14	16053140806032	16.4	7.9	4020	---	385.8
AGS-03-30	17-Sep-09	16053090917002	6.3	7.7	1631	---	---
AGS-03-30	20-Nov-10	16053101120002	0.9	6.8	1224	---	---
AGS-03-30	16-Feb-11	16053110216005	4.0	7.6	1393	---	---
AGS-03-30	06-Aug-14	16053140806027	13.6	7.7	1470	---	---
AGS-03-30	30-Oct-14	16053141030009	4.3	6.5	1540	---	571.5
GWN-08-45	02-Jul-09	16053090702003	5.0	<u>8.7</u>	25700	---	---
GWN-08-45	24-Sep-09	16053090924001	9.6	<u>8.6</u>	2600	---	---
GWN-08-45	30-Sep-09	16053090930002	4.3	<u>7.0</u>	2590	---	---
GWN-08-45	17-Sep-13	16053130917029	10.0	<u>8.7</u>	2560	---	---
GWN-08-45	02-Nov-13	16053131102027	3.9	<u>8.7</u>	2540	---	---
GWN-08-45	02-Aug-14	16053140802007	8.6	<u>8.5</u>	2560	---	315.9
GWN-08-45	02-Nov-14	16053141102024	3.8	<u>8.6</u>	2570	---	34.7
GWN-14-33	17-Feb-76	16053760217001	---	<u>8.9</u>	---	---	---
GWN-14-33	15-Jul-76	16053760715002	7.0	8.5	---	---	---
GWN-14-33	07-Jul-77	16053770707002	7.0	<u>9.6</u>	---	---	---
GWN-14-33	07-Jul-78	16053780707002	5.5	8.5	---	---	---
GWN-14-33	05-Jul-79	16053790705002	4.5	<u>9.5</u>	---	---	---
GWN-14-33	05-Jul-80	16053800705002	10.0	8.1	---	---	---
GWN-14-33	01-Jul-09	16053090701002	6.1	<u>9.2</u>	6280	---	---
GWN-14-33	16-Feb-11	16053110216002	---	---	---	---	---
GWN-14-33	24-Aug-13	16053130824017	7.2	<u>9.2</u>	6200	<u>986</u>	---
GWN-14-33	28-Nov-13	16053131128026	2.8	<u>9.0</u>	6210	---	---
GWN-14-33	04-Aug-14	16053140804017	8.3	<u>9.7</u>	6130	---	42.5
GWN-14-33	31-Oct-14	16053141031016	4.3	<u>8.9</u>	6390	---	37.8
Alberta Tier 1 - Natural Areas*			NS	6.5-8.5^P	NS	230^A	NS

TABLE 5.**GROUNDWATER QUALITY RESULTS - FIELD PARAMETERS**

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Temp °C	Field pH	Field EC ²⁵ µS/cm	Field Cl mg/L	Field Turbidity NTU
McMurray Formation Basal Aquifer - Aquifer Management Unit 1							
GWN-06-60	08-Jun-77	16053770608003	10.0	7.1	---	---	---
GWN-06-60	08-Jul-78	16053780708006	8.0	6.9	---	---	---
GWN-06-60	06-Jul-79	16053790706003	6.0	6.8	---	---	---
GWN-06-60	17-Jan-80	16053800117001	-1.0	---	---	---	---
GWN-06-60	13-Feb-80	16053800213001	-1.0	---	---	---	---
GWN-06-60	09-Apr-80	16053800409001	-1.0	---	---	---	---
GWN-06-60	07-May-80	16053800507001	-1.0	---	---	---	---
GWN-06-60	04-Jun-80	16053800604001	-1.0	---	---	---	---
GWN-06-60	06-Jul-80	16053800706006	7.0	7.0	---	---	---
GWN-06-60	27-Aug-80	16053800827001	0.0	---	---	---	---
GWN-06-60	16-Jan-81	16053810116001	-1.0	---	---	---	---
GWN-06-60	11-Mar-81	16053810311001	-1.0	---	---	---	---
GWN-06-60	05-May-81	16053810505001	-1.0	---	---	---	---
GWN-06-60	01-Jul-81	16053810701001	0.0	---	---	---	---
GWN-06-60	29-Jul-81	16053810729001	0.0	---	---	---	---
GWN-06-60	26-Aug-81	16053810826001	0.0	---	---	---	---
GWN-06-60	23-Sep-81	16053810923001	0.0	---	---	---	---
GWN-06-60	02-Jul-09	16053090702011	6.4	7.3	436	---	---
GWN-06-60	26-Sep-09	16053090926001	7.3	6.8	670	---	---
GWN-06-60	21-Oct-10	16053101021001	6.1	6.9	516	---	---
GWN-06-60	14-Feb-11	16053110214005	4.0	6.6	630	---	---
GWN-06-60	21-Aug-13	16053130821007	8.4	7.0	500	---	---
GWN-06-60	26-Nov-13	16053131126015	4.9	7.1	750	---	---
GWN-06-60	31-Jul-14	16053140731003	9.6	7.6	730	---	80.1
GWN-06-60	03-Nov-14	16053141103029	5.8	8.7	670	---	---
GWN-17-50	26-Feb-76	16053760226001	---	7.7	---	---	---
GWN-17-50	13-Jul-76	16053760713002	5.0	7.1	---	---	---
GWN-17-50	04-Jul-78	16053780704002	4.0	7.1	---	---	---
GWN-17-50	10-Jul-79	16053790710002	6.0	7.0	---	---	---
GWN-17-50	30-Jun-80	16053800630002	5.0	7.4	---	---	---
GWN-17-50	03-Jul-09	16053090703013	5.3	7.8	706	---	---
GWN-17-50	10-Sep-09	16053090910001	6.5	6.8	706	---	---
GWN-17-50	14-Feb-11	frozen	---	---	---	---	---
GWN-17-50	26-Aug-13	16053130826020	7.8	8.0	680	83	---
GWN-17-50	19-Nov-13	16053131119002	4.0	7.3	680	---	---
GWN-17-50	05-Aug-14	16053140805022	7.2	7.2	710	---	44.6
GWN-17-50	29-Oct-14	16053141029008	4.1	8.3	750	---	63.8
GMF Interim Quality Triggers for NAOSA^^			NS	NS	NS	NS	NS
Alberta Tier 1 - Natural Areas*			NS	6.5-8.5^P	NS	230^A	NS

TABLE 5.

GROUNDWATER QUALITY RESULTS - FIELD PARAMETERS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Temp °C	Field pH	Field EC ²⁵ µS/cm	Field Cl mg/L	Field Turbidity NTU
McMurray Formation Basal Aquifer - Aquifer Management Unit 2							
GWN-01-75	05-Jul-77	16053770705004	7.0	<u>8.8</u>	---	---	---
GWN-01-75	05-Jul-78	16053780705005	4.0	<u>8.7</u>	---	---	---
GWN-01-75	08-Jul-79	16053790708006	3.5	7.5	---	---	---
GWN-01-75	01-Jul-80	16053800701004	5.0	8.1	---	---	---
GWN-01-75	13-Dec-10	16053101213001	4.1	7.4	859	---	---
GWN-01-75	18-Feb-11	16053110218004	---	---	---	---	---
GWN-01-75	01-Aug-14	16053140801005	---	---	---	---	---
GWN-01-75	04-Nov-14	16053141104034	3.3	<u>8.6</u>	950	---	186
GWN-06-61	08-Jun-77	16053770608002	6.0	<u>8.8</u>	---	---	---
GWN-06-61	08-Jul-78	16053780708005	6.0	8.0	---	---	---
GWN-06-61	06-Jul-79	16053790706002	6.0	<u>8.9</u>	---	---	---
GWN-06-61	06-Jul-80	16053800706005	4.0	<u>8.7</u>	---	---	---
GWN-06-61	02-Jul-09	16053090702010	6.9	<u>9.0</u>	6110	---	---
GWN-06-61	23-Nov-10	16053101123002	0.1	7.8	5550	---	---
GWN-06-61	14-Feb-11	16053110214004	---	---	---	---	---
GWN-06-61	21-Aug-13	16053130821006	4.5	<u>8.8</u>	5910	---	---
GWN-06-61	26-Nov-13	16053131126018	2.6	7.8	6350	---	---
GWN-06-61	31-Jul-14	16053140731002	6.0	7.6	6490	---	66.5
GWN-06-61	03-Nov-14	16053141103031	4.2	7.7	6240	---	28.4
GWN-07-56	01-Nov-14	16053141101021	4.6	<u>9.3</u>	1450	---	56.7
GWN-07-57	10-Jul-77	16053770710003	6.0	7.8	---	---	---
GWN-07-57	08-Jul-78	16053780708003	5.0	<u>8.6</u>	---	---	---
GWN-07-57	08-Jul-79	16053790708001	5.5	<u>8.9</u>	---	---	---
GWN-07-57	06-Jul-80	16053800706003	5.5	<u>8.8</u>	---	---	---
GWN-07-57	02-Jul-09	16053090702008	6.0	<u>8.7</u>	2870	---	---
GWN-07-57	25-Sep-09	16053090925001	5.2	7.2	2850	---	---
GWN-07-57	21-Nov-10	16053101121003	---	---	---	---	---
GWN-07-57	21-Sep-13	16053130921040	6.2	8.4	2800	162	---
GWN-07-57	05-Nov-13	16053131105033	4.8	8.4	2890	---	---
GWN-07-57	03-Aug-14	16053140803010	8.3	7.8	2770	---	4.4
GWN-07-57	01-Nov-14	16053141101020	4.5	8.0	2890	---	46.6
GWN-08-46	02-Jul-09	16053090702002	5.7	8.2	1053	---	---
GWN-08-46	17-Sep-13	16053130917032	5.3	8.0	970	---	---
GWN-08-46	04-Nov-13	16053131104031	2.9	7.2	950	---	---
GWN-08-46	02-Aug-14	16053140802009	---	---	---	---	---
GWN-08-46	02-Nov-14	16053141102023	3.5	7.9	950	---	88.3
GWN-13-29	20-Feb-76	16053760220002	---	<u>11.8</u>	---	---	---
GWN-13-29	19-Jul-76	16053760719002	9.0	<u>13.0</u>	---	---	---
GWN-13-29	11-Jul-77	16053770711002	9.0	<u>11.6</u>	---	---	---
GWN-13-29	10-Jul-78	16053780710002	8.0	<u>11.5</u>	---	---	---
GWN-13-29	09-Jul-79	16053790709001	9.0	<u>11.2</u>	---	---	---
GWN-13-29	07-Jul-80	16053800707004	0.0	<u>11.1</u>	---	---	---
GWN-13-29	01-Jun-09	16053090601002	---	---	---	---	---
GWN-13-29	16-Nov-10	16053101116002	---	---	---	---	---
GWN-13-29	23-Nov-13	abandoned	---	---	---	---	---
GWN-13-30	20-Feb-76	16053760220001	---	<u>12.2</u>	---	---	---
GWN-13-30	19-Jul-76	16053760719001	7.0	<u>13.6</u>	---	---	---
GWN-13-30	11-Jul-77	16053770711001	9.0	<u>9.8</u>	---	---	---
GWN-13-30	10-Jul-78	16053780710001	8.0	<u>11.6</u>	---	---	---
GWN-13-30	01-Jun-09	16053090601001	---	---	---	---	---
GWN-13-30	16-Nov-10	16053101116001	---	---	---	---	---
GWN-13-30	12-Feb-11	16053110212004	---	---	---	---	---
GWN-13-30	07-Aug-14	not sampled	---	---	---	---	---
GMF Interim Quality Triggers for NAOSA^^			NS	NS	NS	NS	NS
Alberta Tier 1 - Natural Areas*			NS	6.5-8.5^P	NS	230^A	NS

TABLE 5.

GROUNDWATER QUALITY RESULTS - FIELD PARAMETERS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Temp °C	Field pH	Field EC ²⁵ µS/cm	Field Cl mg/L	Field Turbidity NTU
McMurray Formation Basal Aquifer - Aquifer Management Unit 3							
GWN-16-24	18-Jul-76	16053760718002	5.0	<u>9.4</u>	---	---	---
GWN-16-24	08-Jul-77	16053770708002	6.0	<u>9.5</u>	---	---	---
GWN-16-24	04-Jul-78	16053780704004	6.0	<u>9.4</u>	4000	---	---
GWN-16-24	03-Jul-79	16053790703002	5.0	<u>9.4</u>	---	---	---
GWN-16-24	07-Jul-80	16053800707002	5.0	<u>9.3</u>	---	---	---
GWN-16-24	30-Jun-09	16053090630002	6.9	<u>8.7</u>	10940	---	---
GWN-16-24	18-Nov-10	16053101118002	---	---	---	---	---
GWN-16-24	12-Feb-11	16053110212002	---	---	---	---	---
GWN-16-24	19-Aug-13	16053130819002	6.7	<u>8.9</u>	11330	<u>2142</u>	---
GWN-16-24	21-Nov-13	16053131121003	3.7	<u>9.0</u>	11350	---	---
GWN-16-24	08-Aug-14	16053140805039	10.8	<u>8.9</u>	11130	---	36.7
GWN-16-24	29-Oct-14	16053141029005	3.7	<u>8.9</u>	11390	---	17.9
Alberta Tier 1 - Natural Areas*			NS	6.5-8.5^P	NS	230^A	NS
McMurray Formation Basal Aquifer - Aquifer Management Unit 4							
GWN-01-76	05-Jul-77	16053770705003	6.0	<u>6.3</u>	---	---	---
GWN-01-76	05-Jul-78	16053780705004	6.0	<u>6.1</u>	---	---	---
GWN-01-76	08-Jul-79	16053790708005	5.5	<u>6.1</u>	---	---	---
GWN-01-76	01-Jul-80	16053800701003	6.0	6.5	---	---	---
GWN-01-76	18-Sep-13	not sampled	5.7	7.2	245000	<u>6633</u>	---
GWN-01-76	27-Nov-13	16053131127019	3.5	6.7	244000	---	---
GWN-01-76	01-Aug-14	not sampled	---	---	---	---	---
GWN-01-76	04-Nov-14	16053141104033	3.2	<u>6.1</u>	243000	---	20.6
Alberta Tier 1 - Natural Areas*			NS	6.5-8.5^P	NS	230^A	NS
Prairie Evaporite/Beaverhill Lake/Methy (Keg River) Formations							
GWN-01-77	05-Jul-77	16053770705002	9.0	<u>8.8</u>	---	---	---
GWN-01-77	05-Jul-78	16053780705003	6.0	8.3	---	---	---
GWN-01-77	08-Jul-79	16053790708004	6.0	<u>6.1</u>	---	---	---
GWN-01-77	01-Jul-80	16053800701002	6.0	<u>6.1</u>	---	---	---
GWN-01-77	18-Feb-11	16053110218003	---	---	---	---	---
GWN-01-77	18-Sep-13	16053130918034	6.1	<u>8.8</u>	172400	>6633	---
GWN-01-77	27-Nov-13	16053131127020	1.7	<u>10.2</u>	164200	---	---
GWN-01-77	01-Aug-14	not sampled	---	---	---	---	---
GWN-01-78	05-Jul-78	16053780705002	8.0	7.9	---	---	---
GWN-01-78	08-Jul-79	16053790708003	9.0	7.8	---	---	---
GWN-01-78	01-Jul-80	16053800701001	8.0	<u>10.5</u>	---	---	---
GWN-01-78	18-Feb-11	16053110218002	---	---	---	---	---
GWN-01-78	18-Sep-13	insufficient water	---	---	---	---	---
GWN-01-78	27-Nov-13	not sampled	---	---	---	---	---
GWN-01-78	01-Aug-14	not sampled	---	---	---	---	---
GWN-01-79	05-Jul-77	16053770705001	12.0	<u>9.1</u>	---	---	---
GWN-01-79	05-Jul-78	16053780705001	12.0	<u>9.3</u>	---	---	---
GWN-01-79	08-Jul-79	16053790708002	12.0	<u>9.3</u>	---	---	---
GWN-01-79	18-Feb-11	16053110218001	---	---	---	---	---
GWN-06-62	08-Jun-77	16053770608001	6.5	7.0	---	---	---
GWN-06-62	08-Jul-78	16053780708004	5.5	7.2	---	---	---
GWN-06-62	06-Jul-79	16053790706001	6.0	7.4	---	---	---
GWN-06-62	06-Jul-80	16053800706004	5.0	7.1	---	---	---
GWN-06-62	02-Jul-09	16053090702009	6.0	<u>9.3</u>	6380	---	---
GWN-06-62	23-Nov-10	16053101123001	---	---	---	---	---
GWN-06-62	14-Feb-11	16053110214003	---	---	---	---	---
GWN-06-62	21-Aug-13	16053130821004	4.5	<u>9.8</u>	5270	---	---
GWN-06-62	26-Nov-13	16053131126016	2.1	<u>9.8</u>	6180	---	---
GWN-06-62	31-Jul-14	not sampled	---	---	---	---	---
Alberta Tier 1 - Natural Areas*			NS	6.5-8.5^P	NS	230^A	NS

TABLE 5.

GROUNDWATER QUALITY RESULTS - FIELD PARAMETERS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Temp °C	Field pH	Field EC ²⁵ µS/cm	Field Cl mg/L	Field Turbidity NTU
Prairie Evaporite/Beaverhill Lake/Methy (Keg River) Formations							
GWN-07-58	10-Jul-77	16053770710002	7.0	7.0	---	---	---
GWN-07-58	08-Jul-78	16053780708002	7.0	7.5	---	---	---
GWN-07-58	07-Jul-79	16053790707002	7.0	8.4	---	---	---
GWN-07-58	06-Jul-80	16053800706002	7.5	8.5	---	---	---
GWN-07-58	02-Jul-09	16053090702007	6.4	13.1	10200	---	---
GWN-07-58	21-Nov-10	16053101121002	---	---	---	---	---
GWN-07-58	13-Feb-11	16053110213002	---	---	---	---	---
GWN-07-58	21-Sep-13	16053130921041	5.2	9.7	12080	2536	---
GWN-07-58	05-Nov-13	not sampled	---	---	---	---	---
GWN-07-58	03-Aug-14	16053140803013	6.9	10.6	10070	---	18.8
GWN-07-59	10-Jul-77	16053770710001	11.0	9.4	---	---	---
GWN-07-59	08-Jul-78	16053780708001	11.0	8.3	---	---	---
GWN-07-59	07-Jul-79	16053790707001	10.5	8.6	---	---	---
GWN-07-59	06-Jul-80	16053800706001	11.0	10.0	---	---	---
GWN-07-59	02-Jul-09	16053090702006	6.6	12.7	3880	---	---
GWN-07-59	21-Nov-10	16053101121001	---	---	---	---	---
GWN-07-59	13-Feb-11	16053110213001	---	---	---	---	---
GWN-07-59	21-Sep-13	16053130921042	4.9	12.7	4060	191	---
GWN-07-59	05-Nov-13	not sampled	---	---	---	---	---
GWN-07-59	03-Aug-14	16053140803016	8.4	12.6	3990	---	15.3
GWN-08-47	20-Sep-13	16053130920036	8.6	7.6	3340	443	---
GWN-08-47	03-Nov-13	not sampled	2.9	9.3	1420	---	---
GWN-08-47	02-Aug-14	not sampled	---	---	---	---	---
GWN-08-48	02-Jul-09	16053090702001	7.1	12.4	2300	---	---
GWN-08-48	20-Sep-13	16053130920037	6.7	11.9	1850	283	---
GWN-08-48	03-Nov-13	16053131103032	2.4	9.9	6560	---	---
GWN-08-48	02-Aug-14	not sampled	---	---	---	---	---
GWN-14-35	25-Aug-13	16053130825018	10.5	8.9	21800	4455	---
GWN-14-35	28-Nov-13	not sampled	---	---	---	---	---
GWN-14-35	04-Aug-14	16053140804020	---	---	---	---	---
GWN-14-36	13-Feb-76	16053760213001	---	6.9	---	---	---
GWN-14-36	14-Feb-76	16053760214001	---	7.2	---	---	---
GWN-14-36	15-Feb-76	16053760215001	---	8.9	---	---	---
GWN-14-36	15-Jul-76	16053760715001	12.0	7.4	---	---	---
GWN-14-36	07-Jul-77	16053770707001	15.0	8.1	---	---	---
GWN-14-36	07-Jul-78	16053780707001	16.0	8.0	---	---	---
GWN-14-36	05-Jul-79	16053790705001	0.0	7.8	---	---	---
GWN-14-36	05-Jul-80	16053800705001	15.0	7.6	---	---	---
GWN-14-36	01-Jul-09	16053090701001	7.1	8.5	42500	---	---
GWN-14-36	16-Feb-11	16053110216001	---	---	---	---	---
GWN-14-36	28-Nov-13	16053131128050	---	---	---	---	---
GWN-14-36	04-Aug-14	16053140804018	9.3	8.5	36500	---	178.9
GWN-16-25	18-Jul-76	16053760718001	7.0	8.5	---	---	---
GWN-16-25	08-Jul-77	16053770708001	6.0	7.7	---	---	---
GWN-16-25	04-Jul-78	16053780704003	8.5	7.6	---	---	---
GWN-16-25	03-Jul-79	16053790703001	7.0	7.7	---	---	---
GWN-16-25	07-Jul-80	16053800707001	8.0	7.6	---	---	---
GWN-16-25	30-Jun-09	16053090630001	6.1	9.0	38900	---	---
GWN-16-25	18-Nov-10	16053101118001	---	---	---	---	---
GWN-16-25	12-Feb-11	16053110212001	---	---	---	---	---
GWN-16-25	21-Nov-13	not sampled	---	---	---	---	---
GWN-16-25	08-Aug-14	16053140805038	13.6	9.0	38300	---	47.8
Alberta Tier 1 - Natural Areas*			NS	6.5-8.5^P	NS	230^A	NS

TABLE 5.**GROUNDWATER QUALITY RESULTS - FIELD PARAMETERS**

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Temp °C	Field pH	Field EC ²⁵ µS/cm	Field Cl mg/L	Field Turbidity NTU
Prairie Evaporite/Beaverhill Lake/Methy (Keg River) Formations							
GWN-17-51	23-Feb-76	16053760223001	---	8.0	---	---	---
GWN-17-51	13-Jul-76	16053760713001	6.0	8.3	---	---	---
GWN-17-51	04-Jul-77	16053770704001	4.0	7.6	---	---	---
GWN-17-51	04-Jul-78	16053780704001	5.0	7.5	---	---	---
GWN-17-51	10-Jul-79	16053790710001	5.0	7.5	---	---	---
GWN-17-51	30-Jun-80	16053800630001	5.0	7.7	---	---	---
GWN-17-51	03-Jul-09	16053090703012	6.4	7.7	38700	---	---
GWN-17-51	14-Feb-11	16053110214001	---	---	---	---	---
GWN-17-51	26-Aug-13	16053130826019	6.1	7.5	38200	6633	---
GWN-17-51	19-Nov-13	16053131119001	3.1	7.8	39200	---	---
GWN-17-51	05-Aug-14	16053140805021	5.3	7.6	3870	---	28.5
GWN-17-51	29-Oct-14	16053141029007	3.8	7.6	39400	---	22.1
Alberta Tier 1 - Natural Areas*			NS	6.5-8.5^P	NS	230^A	NS

Notes:

--- - not analyzed

NS - guideline not specified

^A - indicates guideline for Aquatic Life exposure pathway^P - indicates guideline for Potable Groundwater exposure pathway²⁵ - field EC corrected to 25°C^{*} - *Alberta Tier 1 Soil and Groundwater Remediation Guidelines (AENV 2010)*^{^^} - *Groundwater Management Framework Interim Quality Triggers for the North Athabasca Oil Sands Area***Underline** - indicates values do not meet Alberta Tier 1 Natural Areas guideline

TABLE 6.

GROUNDWATER QUALITY RESULTS - GENERAL PARAMETERS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO ₄ mg/L	NO ₂ -N mg/L	NO ₃ -N mg/L	NO ₂ +NO ₃ -N mg/L	NH ₃ -N mg/L	TKN mg/L	PO ₄ -P-T mg/L	Si as SiO ₂ -D mg/L	T-Alkalinity mg/L	HCO ₃ mg/L	Hardness mg/L	TDS ^{grav} mg/L	TDS ^{calc} mg/L	TOC mg/L	Phenol mg/L	Turbidity NTU		
Surficial Sands																											
AGS-01-WT	09-Oct-96	16053961009003	---	---	---	---	---	---	---	16.9	---	---	---	---	---	---	---	---	353	430	374	592	375	4.1	---	---	
AGS-01-WT	09-Oct-96	16053961009012	7.46	619	89.6	36.5	17.4	1.9	0.6	16	---	---	0.11	---	---	---	---	---	350	430	350	340	---	---	<0.002	---	
AGS-01-WT	16-Sep-09	16053090916001	7.79	570	83.0	35.0	6.1	0.9	<1	10.0	<0.003	<0.003	<0.003	0.13	---	---	19.7	---	350	430	350	340	---	---	<0.002	---	
AGS-01-WT	25-Oct-12	16053121025003	7.69	700	94.0	37.0	6.4	0.8	1.3	7.2	<0.003	<0.003	<0.003	<0.05	---	---	23.56	---	390	480	390	---	380	---	<0.002	---	
AGS-02-20	09-Oct-96	16053961009005	---	---	112.0	44.2	145.0	11.0	16.1	206	---	---	---	---	---	---	---	---	---	721	---	1255	---	---	---	---	
AGS-02-20	15-Sep-09	16053090915004	7.99	1100	120.0	43.0	74.0	9.7	1.0	140	<0.003	<0.003	<0.003	3.4	---	---	13.49	---	600	730	470	750	---	---	<0.002	---	
AGS-02-20	19-Nov-10	16053101119004	8.15	1180	120.0	46.6	73.1	11.5	2.3	114	<0.05	<0.05	<0.071	3.78	---	---	---	---	592	722	492	723	---	7	<0.001	---	
AGS-02-20	15-Feb-11	16053110215004	8.01	1210	121.0	45.5	74.6	11.3	0.8	123	<0.05	<0.05	<0.071	3.55	---	---	---	---	597	729	490	734	---	---	<0.001	---	
AGS-02-20	15-Feb-11	16053110215006	8.04	1210	124.0	47.1	74.6	11.4	1.1	122	<0.05	<0.05	<0.071	3.55	---	---	---	---	597	729	504	739	---	---	---	---	
AGS-02-20	24-Oct-12	16053121024005	7.94	1200	130.0	50.0	70.0	11.0	1.8	120	0.0031	<0.003	0.003	3.7	---	---	16.28	---	580	710	540	---	740	---	<0.002	---	
AGS-02-20	23-Aug-13	16053130823011	7.78	1160	128.0	48.6	61.0	11.4	0.7	109	<0.05	<0.05	<0.071	3.09	---	---	---	---	601	734	520	---	719	---	<0.001	34.3	
AGS-02-20	22-Nov-13	16053131122006	7.87	1220	135.0	48.1	75.9	11.7	0.7	103	<0.05	<0.05	<0.071	3.44	---	---	16.3	---	581	709	535	---	723	---	<0.001	156	
AGS-02-20	06-Aug-14	16053140806030	8.21	1150	125.0	50.5	76.3	11.9	0.6	121	0.141	0.152	0.293	3.61	---	---	15.6	---	539	658	520	804	710	9.2	<0.001	845	
AGS-02-20	30-Oct-14	16053141030014	8.10	1120	129.0	46.4	71.2	11.7	<0.5	120	<0.02	<0.05	<0.054	3.3	---	---	16.7	---	564	688	513	769	717	8.3	<0.001	473	
AGS-02-50	09-Oct-96	16053961009006	---	---	174.0	70.3	111.0	13.6	35.3	376	---	---	---	---	---	---	---	---	---	690	---	1470	---	---	---	---	
AGS-02-50	15-Sep-09	16053090915003	7.95	1300	180.0	66.0	53.0	12.0	1.0	290	<0.003	<0.003	<0.003	3.3	---	---	17.56	---	580	700	720	950	---	---	<0.002	---	
AGS-02-WT	09-Oct-96	16053961009008	---	---	116.0	72.9	45.4	4.6	14.4	29.3	---	---	---	---	---	---	---	---	---	633	---	916	---	---	---	---	
AGS-02-WT	15-Sep-09	16053090915001	7.78	840	110.0	48.0	19.0	1.3	5.0	120	<0.003	<0.003	<0.003	0.09	---	---	14.56	---	440	540	480	570	---	---	<0.002	---	
AGS-02-WT	19-Nov-10	16053101119001	7.99	984	118.0	58.2	13.9	1.2	3.3	99	<0.05	<0.05	<0.071	0.476	---	---	---	---	477	582	534	581	---	9	<0.001	---	
AGS-02-WT	24-Oct-12	16053121024004	7.82	940	130.0	61.0	11.0	1.0	2.6	93	0.0062	0.079	0.086	0.18	---	---	16.71	---	450	540	570	---	570	---	<0.002	---	
AGS-02-WT	23-Aug-13	16053130823012	7.62	989	130.0	58.2	10.0	2.7	2.3	86	<0.05	0.056	0.071	0.077	---	---	---	---	516	629	564	599	---	8.2	<0.001	44.2	
AGS-02-WT	22-Nov-13	16053131122007	8.14	1000	124.0	57.3	9.3	1.4	2.0	83	<0.05	<0.05	<0.071	<0.05	---	---	15.8	---	528	644	546	---	593	---	<0.001	97.3	
AGS-02-WT	06-Aug-14	16053140806028	8.14	967	109.0	46.3	31.8	1.4	3.3	133	<0.02	<0.05	<0.054	0.129	---	---	15.6	---	412	503	463	613	572	12.2	0.0011	263	
AGS-02-WT	30-Oct-14	16053141030015	8.13	993	130.0	58.0	23.1	2.2	3.4	103	<0.02	<0.05	<0.054	0.064	---	---	19.4	---	497	606	563	690	618	9.4	<0.001	133	
AGS-03-WT	09-Oct-96	16053961009011	---	---	---	---	---	---	---	98	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
AGS-03-WT	09-Oct-96	16053961009015	7.58	733	83.1	30.4	46.3	4.4	2.7	105	<0.05	<0.05	<0.05	---	---	---	---	---	323	394	333	666	459	10.6	---	---	
AGS-03-WT	17-Sep-09	16053090917001	7.97	870	110.0	41.0	53.0	4.6	4.0	150	<0.003	<0.003	<0.003	0.1	---	---	14.35	---	410	500	440	610	---	---	<0.002	---	
AGS-03-WT	20-Nov-10	16053101120001	8.04	908	105.0	41.3	50.1	4.4	2.8	123	<0.05	<0.05	<0.071	<0.05	---	---	---	---	391	477	432	561	---	12.8	0.001	---	
AGS-03-WT	20-Nov-10	16053101120004	7.79	898	96.1	38.9	47.3	4.4	2.5	120	<0.05	<0.05	<0.071	0.053	---	---	---	---	388	474	400	542	---	12.2	<0.001	---	
AGS-03-WT	16-Feb-11	16053110216004	7.98	911	100.0	38.5	47.7	3.9	2.6	136	<0.05	<0.05	<0.071	<0.05	---	---	---	---	386	471	408	561	---	---	0.0013	---	
AGS-03-WT	22-Aug-13	16053130822009	7.57	853	95.1	34.2	37.9	4.0	1.9	84	<0.05	<0.05	<0.071	0.527	---	---	16.08	---	413	503	378	---	504	---	<0.001	108	
AGS-03-WT	28-Nov-13	16053131128022	7.99	860	97.6	37.3	47.6	4.0	5.8	118	<0.05	<0.05	<0.071	0.053	---	---	14.8	---	411	502	397	---	557	---	0.0016	223	
AGS-03-WT	06-Aug-14	16053140806026	8.31	829	91.5	35.3	44.2	4.2	1.9	84	<0.02	<0.05	<0.054	<0.05	---	---	14.6	---	381	461	374	541	490	10.9	<0.001	51	
AGS-03-WT	30-Oct-14	16053141030010	8.33	743	89.1	32.2	42.4	3.8	1.7	74	<0.02	<0.05	<0.054	<0.05	---	---	15.7	---	351	423	355	546	454	10.9	<0.001	150	
CVE-BOR-01	02-Feb-07	16053070202001	8.23	276	37.7	9.3	9.7	1.3	0.3	0.8	0.11	<0.05	---	---	---	---	---	---	159	194	132	175	---	---	---	---	
CVE-BOR-01	24-Jan-08	16053080124001	8.10	281	36.0	8.7	10.0	1.1	<0.5	0.6	<0.003	<0.003	<0.003	---	---	---	9.64	---	159	194	130	154	---	---	<0.002	---	
CVE-BOR-01	24-Feb-10	16053100224001	7.88	280	34.0	8.5	10.0	1.2	<1	<1	<0.003	<0.003	<0.003	---	---	---	13.06	---	150	190	120	148	---	---	<0.002	---	
CVE-BOR-01	19-Jun-10	16053100619001	7.95	320	40.0	10.0	17.0	1.4	<1	<1	<0.003	0.004	0.004	---	---	---	12.64	---	170	210	142	177	---	---	<0.002	---	
CVE-BOR-01	19-Jun-10	16053100619002	7.97	320	39.0	10.0	17.0	1.4	<1	<1	<0.003	0.039	0.039	---	---	---	12.42	---	170	210	140	174	---	---	<0.002	---	
CVE-BOR-01	19-Jun-10	16053100619003	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<0.002	---
CVE-BOR-01	07-Oct-10	16053101007001	8.07	330	37.0	9.8	17.0	1.4	<1	<1	<0.003	<0.003	<0.003	---	---	---	12.42	---	170	210	133	170	---	---	<0.002	---	
CVE-BOR-01	20-Feb-13	16053130220001	8.05	280	39.0	9.0	9.3	<3	1.7	<1	<0.003	0.004	0.004	1.8	---	---	13.28	---	150	180	130	190	150	13	<0.002	---	
CVE-BOR-02	06-Mar-07	16053070306001	8.23	454	36.1	16.3	11.3	2.0	0.6	3.1	0.15	<0.05	---	---	---	---	---	---	260	317	240	260	---	---	---	---	
CVE-BOR-02	23-Jan-08	16053080123001	8.15	415	61.0	16.0	9.5	1.9	1.2	<0.5	<0.003	<0.003	<0.003	---	---	---	1.29	---	241	294	220	235	---	---	<0.002	---	
CVE-BOR-02	25-Feb-10	16053100225001	7.91	390	53.0	15.0	8.3	1.7	1.0	<1	<0.003	<0.003	<0.003	---	---	---	10.07	---	220	270	190	214	---	---	<0.002	---	

TABLE 6.

GROUNDWATER QUALITY RESULTS - GENERAL PARAMETERS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO ₄ mg/L	NO ₂ -N mg/L	NO ₃ -N mg/L	NO ₂ +NO ₃ -N mg/L	NH ₃ -N mg/L	TKN mg/L	PO ₄ -P-T mg/L	Si as SiO ₂ -D mg/L	T-Alkalinity mg/L	HCO ₃ mg/L	Hardness mg/L	TDS ^{grav} mg/L	TDS ^{calc} mg/L	TOC mg/L	Phenol mg/L	Turbidity NTU		
Surficial Sands																											
GWN-01-74	13-Jan-75	16053750113001	8.60	3300	10.5	8.3	780.0	4.2	180.3	187.4	---	4.4968	---	---	---	---	---	---	1229	---	---	1840	---	---	---	---	
GWN-01-74	13-Jan-75	16053750113002	8.30	3300	15.0	27.5	775.0	5.1	158.2	249.8	---	2.898	---	---	---	---	---	---	1332	---	---	1944	---	---	---	---	
GWN-01-74	10-Sep-75	16053750910001	8.30	4000	2.1	6.8	838.0	6.8	184.3	259.8	---	1.799	---	---	---	---	---	---	1692	---	---	2220	---	---	---	---	
GWN-01-74	13-Jul-76	16053760713003	8.10	4000	11.6	7.2	1013.0	7.6	260.4	225.9	---	6.7956	---	---	---	---	5.89	---	1914	---	---	2480	---	---	---	---	
GWN-01-74	13-Jul-76	16053760713007	---	---	23.5	7.6	1738.0	33.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
GWN-01-74	05-Jul-77	16053770705005	8.40	3900	11.7	7.7	975.0	114.0	320.0	233.0	---	0.7	---	---	---	---	---	---	1835	11.5	---	2444	---	---	---	---	
GWN-01-74	05-Jul-77	16053770705006	8.40	3900	11.7	7.7	975.0	115.2	320.5	232.9	---	0.7	---	---	---	---	---	---	1834	---	---	2444	---	---	---	---	
GWN-01-74	05-Jul-78	16053780705006	8.70	3240	2.3	4.2	975.0	7.1	320.0	160.0	---	1.9	---	---	---	---	---	---	1693	2.4	---	2248	---	---	---	---	
GWN-01-74	05-Jul-78	16053780705007	8.70	3240	2.3	4.2	975.0	7.2	320.5	159.9	---	1.8984	---	---	---	---	---	1457.3	1692	23	---	2248	---	---	---	---	
GWN-01-74	08-Jul-79	16053790708007	8.30	3280	7.3	0.5	900.0	6.3	182.0	278.0	---	0.4	---	---	---	---	---	---	1918	11.1	---	2364	---	---	---	---	
GWN-01-74	08-Jul-79	16053790708008	8.30	3280	7.3	0.5	900.0	6.4	182.3	277.8	---	0.4004	---	---	---	---	---	1534.4	1917	20	---	2364	---	---	---	---	
GWN-01-74	01-Jul-80	16053800701005	8.70	30000	5.7	12.0	744.0	6.0	154.0	175.0	---	0.4	---	---	---	---	---	---	1527	5.5	---	1938	---	---	---	---	
GWN-01-74	01-Jul-80	16053800701006	8.70	30000	5.7	12.0	744.0	6.1	154.2	174.9	---	0.4004	---	---	---	---	---	---	1527	---	---	1938	---	---	---	---	
GWN-01-74	01-Jul-80	16053800701007	8.60	32000	3.9	13.0	819.0	6.3	152.2	299.8	---	---	---	---	---	---	---	---	1410	---	---	1959	---	---	---	---	
GWN-01-74	10-Sep-09	16053090910002	8.18	3600	7.6	5.9	860.0	5.6	160.0	230.0	<0.003	<0.003	<0.003	2.7	---	---	5.78	1700	2100	44	---	2300	---	---	0.007	---	
GWN-01-74	13-Dec-10	16053101213002	8.45	3760	7.1	6.6	917.0	6.9	154.0	219.0	<0.05	<0.05	<0.071	2.97	---	---	---	1760	2060	44.6	---	2370	---	---	0.0397	---	
GWN-01-74	27-Oct-12	16053121027004	9.02	3800	5.9	6.7	950.0	7.8	150.0	200.0	0.046	<0.015	0.046	2.7	---	---	5.78	1800	1800	42	---	2400	---	---	0.0058	---	
GWN-01-74	18-Sep-13	16053130918033	8.45	3900	8.0	7.3	992.0	6.0	165.0	230.0	<0.5	<0.5	<0.71	2.71	3.17	---	6.21	1790	2110	49.9	---	2480	6.2	---	0.0053	---	
GWN-01-74	01-Aug-14	16053140801004	8.39	3760	7.4	6.5	905.0	6.5	169.0	242.0	<0.1	<0.25	<0.27	3.52	---	---	5.79	1690	2010	45.2	---	2490	2350	10.1	---	0.0483	1720
GWN-01-74	04-Nov-14	16053141104035	9.08	3740	7.8	6.8	978.0	6.2	149.0	206.0	<0.1	<0.25	<0.27	2.54	---	---	6.58	1780	1790	47.6	---	1760	2420	7.6	<0.001	1010	
GWN-07-55	21-Sep-13	16053130921039	8.04	583	72.9	25.6	50.1	2.1	36.9	1.1	<0.05	<0.05	<0.071	0.102	---	---	6.15	278	339	287	---	355	5.5	<0.001	---		
GWN-07-55	05-Nov-13	16053131105034	7.98	598	78.9	22.2	12.7	2.0	13.2	5.5	<0.05	<0.05	<0.071	0.065	0.22	0.0086	---	312	381	288	---	322	6.3	0.001	---		
GWN-07-55	03-Aug-14	16053140803014	8.07	530	71.2	22.4	9.2	2.8	5.6	2.3	<0.02	<0.05	<0.054	0.243	---	---	6.62	281	342	270	268	282	6.7	---	0.0462	---	
GWN-07-55	01-Nov-14	16053141101022	8.17	463	67.9	22.9	9.4	2.7	4.3	5.2	<0.02	<0.05	<0.054	0.243	---	---	8.23	262	319	264	306	270	5.4	<0.001	---		
GWN-08-43	22-Feb-75	16053750222001	7.70	860	49.3	22.1	146.3	2.9	44.1	7.3	---	1.6982	---	---	---	---	---	---	517	---	---	444	---	---	---	---	
GWN-08-43	10-Sep-75	16053750910007	7.10	820	23.0	14.2	133.0	6.4	22.0	---	---	0.9996	---	---	---	---	---	---	444	---	---	474	---	---	---	---	
GWN-08-43	16-Jul-76	16053760716004	7.90	850	29.9	16.8	152.0	5.5	36.1	18.2	---	0.9996	---	---	---	---	---	---	466	---	---	500	---	---	---	---	
GWN-08-43	11-May-77	16053770511003	8.10	980	65.5	22.4	141.0	5.1	67.6	0.5	---	---	---	---	---	---	---	---	459	---	---	---	---	---	---	---	
GWN-08-43	08-Jul-77	16053770708009	8.20	815	35.6	15.8	132.4	5.6	52.1	0.5	---	---	---	---	---	---	---	---	396	---	---	---	---	---	---	---	
GWN-08-43	09-Jul-77	16053770709001	7.90	910	41.9	15.2	145.0	5.1	56.1	15.3	---	0.7994	---	---	---	---	---	---	425	---	---	526	---	---	---	---	
GWN-08-43	31-Aug-77	16053770831005	8.20	915	53.6	19.3	136.0	9.5	58.6	0.5	---	---	---	---	---	---	---	---	439	---	---	---	---	---	---	---	
GWN-08-43	23-Nov-77	16053771123001	7.80	1100	68.9	18.7	146.0	2.9	44.1	17.0	---	0.9996	---	---	---	---	---	---	542	---	---	632	---	---	---	---	
GWN-08-43	09-Jul-78	16053780709001	7.30	870	53.9	---	135.0	3.8	65.1	3.9	---	1.799	---	---	---	---	---	406.4	508	137	---	618	---	---	---	---	
GWN-08-43	29-Aug-79	16053790829003	7.30	760	40.9	16.4	146.0	2.1	30.0	15.8	---	0.4998	---	---	---	---	---	386.4	483	169	---	534	---	---	---	---	
GWN-08-43	24-Oct-79	16053791024003	7.20	790	46.9	15.3	143.0	4.2	20.0	12.2	---	0.4998	---	---	---	---	---	429.6	537	180	---	636	---	---	---	---	
GWN-08-43	21-Nov-79	16053791121003	7.30	770	36.9	14.3	141.0	5.1	26.0	11.5	---	0.4998	---	---	---	---	---	---	392	490	151	---	492	---	---	---	---
GWN-08-43	16-Jan-80	16053800116001	7.70	700	25.9	11.4	125.0	3.8	28.0	21.5	---	0.4998	---	---	---	---	---	351.2	439	111	---	602	---	---	---	---	
GWN-08-43	11-Mar-80	16053800311002	7.80	720	27.9	7.6	155.0	3.3	28.0	26.0	---	0.4004	---	---	---	---	---	394.4	493	101	---	514	---	---	---	---	
GWN-08-43	06-May-80	16053800506001	7.80	780	46.9	15.2	154.0	4.2	18.0	21.5	---	0.7	---	---	---	---	---	423.2	529	179	---	750	---	---	---	---	
GWN-08-43	08-Jul-80	16053800708001	8.00	850	69.9	15.0	150.0	8.4	28.0	5.0	---	---	---	---	---	---	---	---	425	---	---	563	---	---	---	---	
GWN-08-43	08-Jul-80	16053800708002	8.20	840	20.0	14.8	149.0	5.5	27.0	---	---	---	---	---	---	---	---	---	427	---	---	470	---	---	---	---	
GWN-08-43	27-Aug-80	16053800827003	8.10	830	49.9	141.1	151.0	3.8	25.0	439.7	---	---	---	---	---	---	---	---	442	---	---	494	---	---	---	---	
GWN-08-43	22-Oct-80	16053801022001	8.40	790	10.6	13.8	153.0	4.2	50.1	5.0	---	---	---	---	---	---	---	---	393	---	---	492	---	---	---	---	
GWN-08-43	13-May-82	16053820513002	8.40	750	20.0	14.0	140.0	5.1	19.0	2.0	---	---	<0.0284	---	---	---	---	371	450	107	---	426	---	---	---	---	
GWN-08-43	30-Sep-09	16053090930003	8.19	630	16.0	7.5	140.0	3.9	4.0	<1	<0.003	<0.003	<0.003	1.13	---	---	1.07	370	450	71	---	390	---	---	0.01	---	
GWN-08-43	20-Oct-12	16053121020001	8.63	690	13.0	11.0	150.0	2.8	1.5	<1.0	<0.003	0.009	0.009	0.68	---	---	1.82	390	440	79	---	410	---	---	0.0061	---	
GWN-08-43	17-Sep-13	16053130917031	9.03	735	14.6	13.6	162.0	3.5	1.2	<0.5	<0.05	<0.05	<0.071	0.922	1.66	---	2.01	424	421	92.5	---	449	16.8	---	0.0062	---	
GWN-08-43	02-Aug-14	16053140802006	8.40	734	11.8	7.6</																					

TABLE 6.

GROUNDWATER QUALITY RESULTS - GENERAL PARAMETERS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC μ S/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO ₄ mg/L	NO ₂ -N mg/L	NO ₃ -N mg/L	NO ₂ +NO ₃ -N mg/L	NH ₃ -N mg/L	TKN mg/L	PO ₄ -P-T mg/L	Si as SiO ₂ -D mg/L	T-Alkalinity mg/L	HCO ₃ mg/L	Hardness mg/L	TDS ^{grav} mg/L	TDS ^{calc} mg/L	TOC mg/L	Phenol mg/L	Turbidity NTU	
Surficial Sands																										
GWN-13-26	20-Feb-76	16053760220003	7.10	---	45.0	12.3	27.5	2.1	10.0	10.0	---	1.3	---	---	---	---	---	---	234	---	258	---	---	---	---	
GWN-13-26	20-Feb-76	16053760220004	7.10	---	44.9	12.3	27.5	2.1	10.0	10.0	---	1.2992	---	---	---	---	---	---	234	---	258	---	---	---	---	
GWN-13-26	19-Jul-76	16053760719005	7.40	500	61.0	16.1	30.0	2.1	10.0	1.3	---	0.9	---	---	---	---	5.18	---	305	64.9	308	---	---	---	---	
GWN-13-26	19-Jul-76	16053760719006	7.40	500	60.9	16.1	30.0	2.1	10.0	1.3	---	0.8988	---	---	---	---	---	---	305	---	308	---	---	---	---	
GWN-13-26	19-Jul-76	16053760719007	---	---	66.0	14.6	490.0	55.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
GWN-13-26	11-Jul-77	16053770711004	7.30	410	37.0	13.0	27.5	2.9	22.0	6.7	---	0.2	---	---	---	---	---	---	232	31	216	---	---	---	---	
GWN-13-26	11-Jul-77	16053770711005	7.30	410	36.9	13.0	27.5	2.9	22.0	6.7	---	0.2002	---	---	---	---	---	---	232	---	216	---	---	---	---	
GWN-13-26	10-Jul-78	16053780710005	6.40	336	32.0	10.8	30.0	3.3	22.0	4.9	---	3.5	---	---	---	---	---	---	200	23	242	---	---	---	---	
GWN-13-26	10-Jul-78	16053780710006	6.40	336	31.9	10.8	30.0	3.3	22.0	4.9	---	3.5	---	---	---	---	---	160	200	124	242	---	---	---	---	
GWN-13-26	10-Jul-79	16053790710004	8.30	398	40.0	7.6	43.8	0.4	46.0	12.7	---	0.2	---	---	---	---	---	---	195	29	238	---	---	---	---	
GWN-13-26	10-Jul-79	16053790710005	8.30	398	40.0	8.3	43.8	0.4	46.0	12.7	---	---	---	---	---	---	---	---	195	---	238	---	---	---	---	
GWN-13-26	07-Jul-80	16053800707007	8.20	250	19.5	9.1	33.0	2.5	12.0	7.0	---	0	---	---	---	---	---	---	137	16.4	138	---	---	---	---	
GWN-13-26	10-Jul-80	16053800710001	8.20	250	19.5	9.1	33.0	2.5	12.0	7.0	---	---	---	---	---	---	---	---	137	---	138	---	---	---	---	
GWN-13-26	08-Sep-09	16053090908002	7.84	430	79.0	7.0	2.2	0.9	2.0	21.0	<0.003	0.16	0.16	0.16	---	---	9.85	210	260	230	240	---	---	<0.002	---	
GWN-13-26	18-Nov-10	16053101118004	8.05	447	82.6	7.2	---	0.9	0.9	15.9	<0.05	0.253	0.253	<0.05	---	---	---	224	274	236	245	---	4.1	<0.001	---	
GWN-13-26	12-Feb-11	16053110212007	7.89	424	77.9	6.2	1.9	0.7	0.6	15.3	<0.05	0.291	0.291	<0.05	---	---	---	231	282	220	243	---	---	<0.001	---	
GWN-13-26	26-Aug-13	16053130826023	8.14	353	61.2	5.3	2.0	0.6	1.1	10.1	<0.05	0.06	<0.071	0.093	---	---	5.23	190	232	175	---	194	4.3	<0.001	190	
GWN-13-26	23-Nov-13	16053131123012	7.92	420	71.1	5.9	2.1	0.8	0.8	15.2	<0.05	0.163	0.163	0.075	---	---	8.48	207	253	202	---	221	3.8	0.0054	331	
GWN-13-26	07-Aug-14	16053140807036	8.24	383	72.6	5.6	3.4	0.7	2.6	8.2	<0.02	0.09	0.09	0.062	---	---	6.89	194	236	204	211	210	4.2	0.0016	157	
GWN-13-26	28-Oct-14	16053141028002	7.94	342	64.0	5.6	3.2	0.7	<0.5	1.9	<0.02	<0.05	<0.054	0.107	---	---	4.74	186	227	183	211	187	3.4	<0.001	182	
GWN-14-32	09-Feb-76	16053760209001	7.30	1900	121.0	73	204	6.7	14	410	---	0	---	---	---	---	---	---	627	---	1250	---	---	---	---	
GWN-14-32	09-Feb-76	16053760209002	7.30	1900	120.8	73	204	6.8	14	410	---	---	---	---	---	---	---	---	627	---	1250	---	---	---	---	
GWN-14-32	15-Jul-76	16053760715003	7.30	2000	112.0	71	266	6.7	90	535	---	0.5	---	---	---	---	5.68	---	522	112.2	1368	---	---	---	---	
GWN-14-32	15-Jul-76	16053760715004	7.30	2000	111.8	71	266	6.8	90	535	---	0.5	---	---	---	---	---	---	522	---	1368	---	---	---	---	
GWN-14-32	15-Jul-76	16053760715005	---	---	112.0	61	258	33.0	---	---	---	---	---	---	---	---	5.35	---	---	---	---	---	---	---	---	
GWN-14-32	15-Jul-76	16053760715007	---	---	114.0	58	244	99.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
GWN-14-32	07-Jul-77	16053770707003	7.70	1900	131.0	64	214	5.8	38	562	---	0	---	---	---	---	---	---	603	118	1218	---	---	---	---	
GWN-14-32	07-Jul-77	16053770707004	7.70	1900	130.7	64	214	5.9	38	562	---	---	---	---	---	---	---	---	603	---	1218	---	---	---	---	
GWN-14-32	07-Jul-78	16053780707003	7.10	1590	116.0	57	226	5.0	66	414	---	1.6	---	---	---	---	---	---	615	117	1208	---	---	---	---	
GWN-14-32	07-Jul-78	16053780707004	7.10	1590	115.8	57	226	5.1	66	414	---	1.6	---	---	---	---	---	492	615	524	1208	---	---	---	---	
GWN-14-32	05-Jul-79	16053790705003	7.60	1520	96.0	62	201	5.0	64	502	---	0.1	---	---	---	---	---	---	500	97	1136	---	---	---	---	
GWN-14-32	05-Jul-79	16053790705004	7.60	1520	97.0	62	201	5.0	64	502	---	---	---	---	---	---	---	---	500	---	1136	---	---	---	---	
GWN-14-32	05-Jul-80	16053800705003	8.30	1450	113.0	64	156	5.8	49	420	---	0	---	---	---	---	---	---	310	90	961	---	---	---	---	
GWN-14-32	05-Jul-80	16053800705004	8.30	1450	113.0	64	156	5.8	49	420	---	---	---	---	---	---	---	---	310	---	961	---	---	---	---	
GWN-14-32	14-Sep-09	16053090914001	7.71	2300	180.0	93	200	5.2	460	330	<0.003	<0.003	<0.003	0.86	---	---	8.35	390	480	820	1500	---	---	0.012	---	
GWN-14-32	16-Feb-11	16053110216003	7.46	1750	88.0	74	104	2.8	494	12	<0.05	<0.05	<0.071	0.217	---	---	---	107	130	524	839	---	---	0.0018	---	
GWN-14-32	24-Aug-13	16053130824016	7.67	1730	53.0	82	123	3.5	508	<0.5	<0.05	<0.05	<0.071	0.293	---	0.43	84.8	103	470	---	820	---	6.6	0.003	105	
GWN-14-32	28-Nov-13	16053131128025	7.29	1640	50.9	77	121	3.3	477	<5.0	<0.5	<0.5	<0.71	0.265	---	0.88	76.4	93	443	---	775	---	5.8	0.0069	103	
GWN-14-32	04-Aug-14	16053140804021	7.83	2730	186.0	105	219	5.4	580	226	<0.02	<0.05	<0.054	7.24	---	<11	340	415	897	2260	1530	8.3	0.04	>4000		
GWN-14-32	31-Oct-14	16053141031017	8.37	2410	114.0	90	178	5.4	547	167	<0.10	<0.25	<0.27	0.495	---	---	3.55	212	251	657	1300	1230	7.5	0.008	295	
GWN-16-22	18-Jul-76	16053760718003	7.60	1400	116.0	120	40.0	3.3	4.0	157	---	2.1	---	---	---	---	16.13	---	761	117.7	1056	---	---	---	---	
GWN-16-22	18-Jul-76	16053760718006	7.60	1400	115.8	120	40.0	3.3	4.0	156.9	---	2.1	---	---	---	---	---	---	761	---	1056	---	---	---	---	
GWN-16-22	18-Jul-76	16053760718011	---	---	133.0	130	41.8	44.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
GWN-16-22	08-Jul-77	16053770708003	7.30	550	34.0	36	25.0	2.1	30	54	---	1.5	---	---	---	---	---	---	244	31	372	---	---	---	---	
GWN-16-22	08-Jul-77	16053770708010	7.30	550	33.9	36	25.0	2.1	30	54	---	1.5	---	---	---	---	---	---	244	---	372	---	---	---	---	
GWN-16-22	04-Jul-78	16053780704005	7.60	690	35.0	48	59.0	1.3	62	31.0	---	0.7	---	---	---	---	---	---	393	30	472	---	---	---	---	
GWN-16-22	04-Jul-78	16053780704006	8.10	650	13.9	82	31.3	2.5	18	38.5	---	2.3	---	---	---	---	---	---	478	15.5	438	---	---	---	---	
GWN-16-22	04-Jul-78	16053780704007	8.10	650	13.9	82	31.3	2.5	18	38.5	---	2.3	---	---	---	---	---	382.4	478	372	438	---	---	---	---	
GWN-16-22	03-Jul-79	16053790703003	7.60	690	35.0	48																				

TABLE 6.

GROUNDWATER QUALITY RESULTS - GENERAL PARAMETERS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO ₄ mg/L	NO ₂ -N mg/L	NO ₃ -N mg/L	NO ₂ +NO ₃ -N mg/L	NH ₃ -N mg/L	TKN mg/L	PO ₄ -P-T mg/L	Si as SiO ₂ -D mg/L	T-Alkalinity mg/L	HCO ₃ mg/L	Hardness mg/L	TDS ^{grav} mg/L	TDS ^{calc} mg/L	TOC mg/L	Phenol mg/L	Turbidity NTU	
Surficial Sands																										
IOR-KRL-01	03-Mar-05	16053050303001	7.45	1110	75.8	24	33.7	85.3	139	36.4	---	---	0.027	---	---	---	10.28	292	357	290	---	570	---	0.345	---	
IOR-KRL-01	01-Mar-08	16053080301001	8.38	389	59.1	20	5.2	2.2	0.4	7.1	<0.05	<0.05	---	0.25	---	---	13.02	226	271	230	0	230	---	0.002	---	
IOR-KRL-01	24-Jul-09	16053090724001	8.08	391	60.6	20	2.1	0.9	0.5	7.6	<0.030	<0.005	<0.005	0.03	---	---	12.08	216	263	235	---	---	---	<0.002	---	
IOR-KRL-01	17-Oct-09	16053091017001	8.06	380	52.0	19	2.3	1.2	<1	9.0	<0.003	0.013	0.013	---	---	---	11.78	210	260	210	---	210	---	<0.002	---	
IOR-KRL-01	19-Aug-10	16053100819001	8.28	400	53.0	20	4.0	1.1	<1	11.0	<0.003	<0.003	<0.003	---	---	---	---	190	230	216	210	204	---	<0.002	---	
IOR-KRL-01	09-Oct-10	16053101009002	7.79	390	53.0	20	2.1	1.0	<1	10.0	<0.003	<0.003	<0.003	---	---	---	---	200	250	217	170	208	---	0.002	---	
IOR-KRL-01	23-Jul-11	16053110723001	7.93	390	51.0	19	2.6	1.1	<1	10.0	<0.003	0.016	0.016	<0.05	---	<0.1	10.28	200	250	210	220	210	---	<0.01	---	
IOR-KRL-01	22-Sep-11	16053110922002	8.06	390	49.0	20	2.1	1.1	<1	12.0	<0.003	0.004	0.004	0.06	---	<0.1	10.28	200	250	200	220	210	---	<0.002	---	
IOR-KRL-01	03-Jul-12	16053120703001	8.09	390	53.0	19	3.0	1.1	<1	12.0	<0.003	<0.003	<0.003	0.061	---	0.46	11.57	200	250	210	220	210	---	<0.002	---	
IOR-KRL-01	17-Oct-12	16053121017002	8.18	400	56.0	19	2.6	1.1	<1	10.0	<0.003	<0.003	<0.003	0.05	---	<0.1	11.35	210	250	220	220	210	---	0.0051	---	
IOR-KRL-01	17-Oct-12	16053121017003	8.17	400	56.0	20	2.8	1.0	<1	10.0	<0.003	<0.003	<0.003	<0.05	---	<0.1	11.57	210	250	220	210	220	---	<0.002	---	
IOR-KRL-03 (SS)	13-Mar-04	16053040313002	7.80	287	33.4	15	1.3	0.6	<1	8.0	---	---	<0.2	---	---	---	---	142	173	145	---	182	---	0.004	---	
IOR-KRL-03 (SS)	14-Feb-06	16053060214001	7.80	229	26.9	12	1.8	0.6	<1	9.0	---	---	<0.2	---	---	---	7.11	114	139	120	---	120	---	---	---	
IOR-KRL-03 (SS)	05-Feb-07	16053070205001	7.90	241	31.8	14	3.3	1.0	<0.5	8.3	---	---	0.103	---	---	---	7.07	124	151	140	---	133	---	0.003	---	
IOR-KRL-03 (SS)	16-Aug-10	16053100816001	7.31	230	26.0	13	0.9	0.7	1.0	10.0	<0.003	0.08	0.08	---	---	---	---	110	130	118	150	117	---	0.002	---	
IOR-KRL-03 (SS)	13-Oct-10	16053101013002	6.92	230	29.0	12	0.9	0.7	<1	8.0	<0.003	0.085	0.085	---	---	---	---	110	140	124	120	119	---	0.002	---	
IOR-KRL-03 (SS)	13-Oct-10	16053101013003	6.92	230	29.0	13	0.9	0.7	1.0	9.0	<0.003	0.092	0.092	---	---	---	---	110	140	124	140	122	---	<0.004	---	
IOR-KRL-03 (SS)	22-Jul-11	16053110722004	7.73	260	33.0	15	1.0	0.7	<1	9.0	<0.003	0.1	0.1	<0.05	---	0.2	8.14	130	160	140	100	140	---	0.003	---	
IOR-KRL-03 (SS)	24-Sep-11	16053110924001	7.86	260	30.0	14	1.1	0.7	<1	9.0	0.004	0.1	0.11	<0.05	---	0.1	6.85	130	150	130	130	130	---	0.007	---	
IOR-KRL-03 (SS)	24-Sep-11	16053110924002	7.90	260	30.0	14	1.1	0.7	<1	9.0	0.004	0.11	0.11	<0.05	---	<0.1	6.85	130	150	130	130	130	---	0.009	---	
IOR-KRL-03 (SS)	06-Jul-12	16053120706001	7.88	250	32.0	13	0.9	0.5	1.2	9.6	<0.003	0.088	0.088	0.081	---	<0.1	7.5	130	150	130	140	130	---	<0.002	---	
IOR-KRL-03 (SS)	19-Oct-12	16053121019007	7.71	240	31.0	13	1.1	0.6	2.4	12.0	<0.003	0.062	0.062	<0.05	---	0.12	7.71	120	150	130	160	130	---	0.0023	---	
IOR-KRL-04 (SS)	17-Mar-04	16053040317001	8.00	2470	198.0	67	195	9.6	<1	522	---	---	<0.2	---	---	---	---	529	645	771	---	1450	---	<0.001	---	
IOR-KRL-04 (SS)	01-Mar-06	16053060301001	8.00	1970	194.0	68	201	8.8	<1	652	---	---	<0.2	---	---	---	19.36	568	693	770	---	1470	---	---	---	
IOR-KRL-04 (SS)	06-Feb-07	16053070206001	7.98	1950	190.0	63	198	8.4	1.1	567	---	---	0.006	---	---	---	17.99	575	701	730	---	1380	---	<0.002	---	
IOR-KRL-04 (SS)	27-Jul-09	16053090727001	8.13	2030	199.0	65	226	13.3	1.3	659	<0.030	<0.005	0.005	2.36	---	---	22.7	602	734	763	---	---	---	0.007	---	
IOR-KRL-04 (SS)	18-Oct-09	16053091018001	7.93	2000	200.0	69	200	8.8	2.0	660	<0.003	0.003	0.003	---	---	---	23.56	580	700	780	---	1500	---	<0.002	---	
IOR-KRL-04 (SS)	09-Oct-10	16053101009003	7.74	2000	200.0	70	190	8.6	1.0	630	<0.003	<0.003	<0.003	---	---	---	---	560	680	782	1400	1450	---	<0.002	---	
IOR-KRL-04 (SS)	09-Oct-10	16053101009004	7.72	2000	190.0	68	190	8.5	1.0	640	<0.003	<0.003	<0.003	---	---	---	---	540	650	760	1400	1430	---	<0.002	---	
IOR-KRL-04 (SS)	17-Jul-11	16053110717001	7.68	2000	190.0	68	200	9.1	1.0	580	<0.003	0.008	0.008	2.2	---	0.7	19.7	560	680	750	1500	1400	---	<0.002	---	
IOR-KRL-04 (SS)	17-Jul-11	16053110717002	7.72	2000	190.0	67	200	9.0	<1	580	<0.003	0.008	0.008	2.3	---	0.6	19.49	550	670	740	1500	1400	---	<0.002	---	
IOR-KRL-04 (SS)	28-Sep-11	16053110928002	7.98	1900	200.0	64	180	7.7	1.0	580	<0.003	<0.003	<0.003	3.3	---	0.7	19.7	560	690	760	1500	1400	---	0.004	---	
IOR-KRL-04 (SS)	13-Jul-12	16053120713002	7.91	2100	210.0	68	190	8.8	1.6	610	<0.003	<0.003	<0.003	2.7	---	15	21.42	550	670	800	1400	1400	---	0.0021	---	
IOR-KRL-04 (SS)	15-Oct-12	16053121015001	8.00	2000	210.0	68	180	8.2	1.3	620	<0.003	<0.003	<0.003	2	---	2	21.42	560	690	800	1400	1400	---	<0.002	---	
IOR-KRL-05 (SS)	10-Oct-10	16053101010301	7.71	480	72.0	20	7.5	2.7	2.0	8.0	0.003	0.59	0.59	---	---	---	---	250	300	261	340	265	---	---	---	
IOR-KRL-05 (SS)	16-Jul-11	16053110716002	7.31	540	70.0	20	7.9	4.0	1.0	6.0	0.1	0.2	0.3	1.4	---	0.8	13.06	290	350	260	350	290	---	0.003	---	
IOR-KRL-05 (SS)	22-Sep-11	16053110922001	7.80	500	69.0	21	8.6	2.6	2.0	6.0	0.005	0.39	0.4	0.63	---	0.2	13.28	260	320	260	300	270	---	0.009	---	
IOR-KRL-05 (SS)	16-Aug-12	16053120816003	7.96	480	67.0	17	5.7	1.8	1.3	15.0	0.01	0.35	0.36	0.49	---	0.13	12.64	250	300	240	270	260	---	<0.002	---	
IOR-KRL-05 (SS)	14-Oct-12	16053121014005	7.79	460	68.0	17	5.6	1.7	<1	12.0	<0.003	0.35	0.35	0.44	---	0.11	13.06	240	300	240	280	250	---	0.0037	---	
IOR-KRL-06 (SS)	24-Jan-09	16053090124001	7.30	680	84.0	26	27.0	4.5	3.0	33.0	<0.003	0.14	0.14	---	---	---	14.78	330	400	320	---	380	---	0.005	---	
IOR-KRL-06 (SS)	21-Aug-10	16053100821002	7.56	720	92.0	23	5.7	1.5	2.0	<1	0.003	<0.003	0.003	---	---	---	---	370	450	324	410	357	---	<0.002	---	
IOR-KRL-06 (SS)	12-Oct-10	16053101012001	6.98	690	110.0	26	5.1	1.3	2.0	2.0	<0.003	<0.003	<0.003	---	---	---	---	380	460	370	450	377	---	<0.002	---	
IOR-KRL-06 (SS)	24-Jul-11	16053110724001	7.39	690	97.0	22	4.8	1.2	<1	<1	<0.003	0.004	0.004	3.8	---	0.2	14.35	380	460	330	400	360	---	<0.002	---	
IOR-KRL-06 (SS)	29-Sep-11	16053110929003	7.60	670	83.0	21	4.6	1.2	1.0	<1	<0.003	<0.003	<0.003	3.8	---	1.2	14.56	360	440	290	360	340	---	0.003	---	
IOR-KRL-06 (SS)	12-Jul-12	16053120712001	7.43	640	110.0	26	3.9	0.9	1.3	<1	<0.003	0.005	0.005	2.8	---	0.61	16.49	360	440	370	390	360	---	0.0024	---	
IOR-KRL-06 (SS)	12-Jul-12	16053120712002	7.47	640	110.0	26	3.9	1.0	1.3	<1	<0.003	0.008	0.008													

TABLE 6.

GROUNDWATER QUALITY RESULTS - GENERAL PARAMETERS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO ₄ mg/L	NO ₂ -N mg/L	NO ₃ -N mg/L	NO ₂ +NO ₃ -N mg/L	NH ₃ -N mg/L	TKN mg/L	PO ₄ -P-T mg/L	Si as SiO ₂ -D mg/L	T-Alkalinity mg/L	HCO ₃ mg/L	Hardness mg/L	TDS ^{grav} mg/L	TDS ^{calc} mg/L	TOC mg/L	Phenol mg/L	Turbidity NTU		
Surficial Sands																											
IOR-KRL-08	27-Jan-10	16053100127001	7.83	740	90	35	25.0	5.2	4.0	16.0	<0.003	0.007	0.007	---	---	---	18.85	400	490	370	500	420	---	---	---		
IOR-KRL-08	22-Aug-10	16053100822001	7.95	720	84	36	16.0	4.0	2.0	<1	<0.003	<0.003	<0.003	---	---	---	---	370	460	357	410	389	---	<0.004	---		
IOR-KRL-08	17-Oct-10	16053101017002	7.67	720	97	37	12.0	4.0	3.0	4.0	<0.003	<0.003	<0.003	---	---	---	---	400	490	396	450	407	---	0.002	---		
IOR-KRL-08	25-Jul-11	16053110725001	7.77	730	92	33	9.7	3.2	<1	6.0	<0.003	0.01	0.01	0.39	---	0.3	21.42	400	490	370	400	390	---	<0.002	---		
IOR-KRL-08	26-Sep-11	16053110926001	7.74	720	98	34	9.5	3.2	2.0	3.6	<0.003	0.005	0.005	0.38	---	0.1	23.56	400	490	380	410	400	---	0.003	---		
IOR-KRL-08	05-Jul-12	16053120705001	7.90	730	100	36	11.0	3.5	3.0	9.3	<0.003	0.004	0.004	0.52	---	1.7	25.7	410	500	400	420	420	---	<0.002	---		
IOR-KRL-08	19-Oct-12	16053121019005	7.79	710	97	34	8.4	2.7	1.5	8.9	<0.003	<0.003	<0.003	0.23	---	0.49	23.56	400	490	380	430	400	---	<0.002	---		
IOR-KRL-09	07-Feb-10	16053100207001	7.89	340	50	14.0	4.3	1.4	1.0	6.0	<0.003	0.009	0.009	---	---	---	10.07	190	230	180	200	190	---	---	---		
IOR-KRL-09	22-Aug-10	16053100822002	8.13	340	46	14	2.9	0.9	<1	5.0	<0.003	<0.003	<0.003	---	---	---	---	170	200	171	170	169	---	0.002	---		
IOR-KRL-09	22-Aug-10	16053100822003	7.95	340	45	14	2.9	1.0	<1	4.0	<0.003	0.004	0.004	---	---	---	---	170	200	171	160	168	---	<0.01	---		
IOR-KRL-09	15-Oct-10	16053101015001	7.99	340	49	14	2.4	1.0	<1	4.0	<0.003	<0.003	<0.003	---	---	---	---	180	220	180	190	177	---	<0.002	---		
IOR-KRL-09	22-Jul-11	16053110722001	8.07	340	51	14	2.2	1.0	<1	3.0	<0.003	<0.003	<0.003	0.05	---	<0.1	10.07	180	220	180	160	180	---	<0.002	---		
IOR-KRL-09	22-Jul-11	16053110722002	8.07	340	51	14	2.2	1.0	2.0	3.0	<0.003	0.005	0.005	0.05	---	<0.1	10.07	180	220	180	230	180	---	<0.002	---		
IOR-KRL-09	29-Sep-11	16053110929005	8.09	350	50	13	2.3	1.0	<1	4.0	<0.003	<0.003	<0.003	0.05	---	<0.1	9.64	190	230	180	200	180	---	0.003	---		
IOR-KRL-09	13-Jul-12	16053120713001	8.07	330	54	14	1.9	0.9	<1	3.3	<0.003	<0.003	<0.003	<0.05	---	<0.1	10.92	180	210	190	200	180	---	<0.002	---		
IOR-KRL-09	23-Oct-12	16053121023004	8.06	330	54	14	2.2	0.9	<1	3.9	<0.003	<0.003	<0.003	<0.05	---	<0.1	10.92	180	220	190	200	180	---	<0.002	---		
IOR-KRL-09	23-Oct-12	16053121023005	8.12	330	52	13	2.1	0.9	<1	3.7	<0.003	<0.003	<0.003	<0.05	---	<0.1	10.49	180	220	180	190	180	---	<0.002	---		
IOR-KRL-10	10-Feb-11	16053110210001	7.06	770	94	17	31.0	2.5	10.0	<1	<0.003	0.004	0.004	5	---	0.5	13.92	400	490	310	460	410	---	<0.002	---		
IOR-KRL-10	21-Jul-11	16053110721001	7.39	770	94	16	33.0	2.5	9.0	<1	<0.003	<0.003	<0.003	5	---	0.8	13.92	410	500	300	460	420	---	<0.002	---		
IOR-KRL-10	21-Jul-11	16053110721002	7.37	760	95	17	33.0	2.5	9.0	<1	<0.003	0.008	0.008	5.3	---	0.8	13.92	410	500	310	460	420	---	<0.002	---		
IOR-KRL-10	28-Sep-11	16053110928001	7.65	790	110	19	29.0	2.2	8.0	<1	<0.003	0.005	0.005	5.3	---	0.6	15.85	420	510	350	480	440	---	0.006	---		
IOR-KRL-10	17-Aug-12	16053120817003	7.55	840	95	17	46.0	2.7	12.0	<1	0.004	0.004	0.008	4.3	---	0.92	14.99	450	550	310	490	460	---	0.0049	---		
IOR-KRL-10	18-Oct-12	16053121018001	7.44	810	110	18	40.0	2.8	10.0	<1	<0.003	<0.003	<0.003	5.6	---	0.8	16.28	430	530	340	480	450	---	0.0024	---		
IOR-KRL-10	19-May-13	16053130519001	---	---	---	---	---	---	---	---	<0.003	0.0036	0.004	5.3	---	0.7	---	---	---	---	---	---	---	---	0.0066	---	
IOR-KRL-11	11-Feb-11	16053110211001	7.48	610	95	26.0	8.4	1.7	2.0	<1	<0.003	<0.003	<0.003	0.23	---	<0.1	12.42	340	410	350	270	340	---	<0.002	---		
IOR-KRL-11	18-Jul-11	16053110718002	7.72	630	85	25.0	11.0	1.7	2.0	<1	<0.003	0.004	0.004	0.28	---	1.4	11.57	350	420	320	330	330	---	<0.004	---		
IOR-KRL-11	23-Sep-11	16053110923002	7.91	630	83	25.0	9.8	1.7	2.0	<1	<0.003	0.003	0.003	0.27	---	2	11.14	340	410	310	360	320	---	0.005	---		
IOR-KRL-11	14-Jul-12	16053120714001	7.80	660	100	28.0	8.6	1.6	2.6	<1	<0.003	<0.003	<0.003	0.28	---	0.38	13.49	360	440	360	350	360	---	<0.002	---		
IOR-KRL-11	14-Oct-12	16053121014006	7.66	590	87	24.0	7.6	1.4	3.1	1.7	<0.003	<0.003	<0.003	0.23	---	0.49	11.99	350	420	320	340	330	---	0.0025	---		
TOT-EP-02 (SS)	15-Oct-10	16053101015002	7.84	824	120	32.5	29.1	1.7	2.6	37.7	<0.05	<0.05	<0.071	---	---	---	---	428	522	433	---	481	---	---	---	---	
GMF Interim Quality Triggers for NAOSA^{AA}			NS	NS	NS	NS	50	NS	20	50	NS	NS	NS	1	NS	NS	10	NS	NS	NS	600	600	NS	NS	NS		
Alberta Tier 1 - Natural Areas*			6.5-8.5^P	NS	NS	NS	200^P	NS	230^A	500^P	0.06^A	2.9^A	NS	pH/T^{A,***}	NS	NS	NS	NS	NS	NS	NS	500^P	500^P	NS	0.004^A	NS	
Buried Channels and Valleys - Birch Channel																											
AGS-02-97	09-Oct-96	16053961009002	7.86	1950	46.9	26.0	394	5.4	86	338	---	---	0.06	---	---	---	---	---	642	783	224	1679	1230	12.9	---	---	
AGS-02-97	09-Oct-96	16053961009007	---	---	47.5	---	---	---	---	289	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
AGS-02-97	15-Sep-09	16053090915002	8.24	1500	49.0	24.0	300	5.0	44	250	<0.003	0.013	0.013	2.2	---	---	11.78	640	780	220	1100	---	---	<0.002	---		
AGS-02-97	19-Nov-10	16053101119002	8.22	1820	48.0	27.0	350	5.7	52	278	<0.05	<0.05	<0.011	2.31	---	---	---	644	786	231	1150	---	---	8.7	<0.001	---	
AGS-02-97	24-Oct-12	16053121024002	8.2	1800	53.0	28.0	330	5.4	53	270	<0.003	0.0031	0.003	2.3	---	---	13.71	630	770	250	---	1100	---	<0.002	---		
AGS-02-97	23-Aug-13	16053130823015	8.15	1810	49.4	26.3	333	4.9	52	288	<0.05	<0.05	<0.071	1.92	---	---	---	674	822	232	---	1160	---	8.8	<0.001	459	
AGS-02-97	22-Nov-13	16053131122005	8.03	1860	48.2	25.6	348	4.7	54	294	<0.05	<0.05	<0.071	2.06	---	---	13.2	633	773	226	---	1150	---	7.9	<0.001	10.3	
AGS-02-97	06-Aug-14	16053140806029	8.64	1830	47.0	27.8	350	5.5	51	277	<0.02	<0.05	<0.054	2.21	---	---	12.6	642	706	232	1150	1140	9	<0.001	7.93		
AGS-02-97	30-Oct-14	16053141030013	8.77	1800	48.0	24.4	350	5.2	51	277	<0.02	<0.05	<0.054	1.99	---	---	13.5	665	694	220	1170	1150	8.2	<0.001	2.44		
AGS-03-17	09-Oct-96	16053961009009	---	---	---	---	---	---	---	85	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
AGS-03-17	09-Oct-96	16053961009013	7.43	712	59.1	23.1	74	4.7	18.4	92	---	---	<0.05	---	---	---	---	---	287	350	243	621	436	10.5	---	---	
AGS-03-17	17-Sep-09	16053090917003	7.96	690	78.0	30.0	46	5.6	2.0	69	<0.003	<0.003	<0.003	0.67	---	---	17.99	350	420	320	440	---	---	<0.002	---		
AGS-03-17	20-Nov-10	16053101120003	8.13	801	82.2	32.1	49	5.7	2.2	90	<0.05	<0.05	<0.011	0.656	---	---	---	362	441	337	478	---	---				

TABLE 6.

GROUNDWATER QUALITY RESULTS - GENERAL PARAMETERS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC μ S/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO ₄ mg/L	NO ₂ -N mg/L	NO ₃ -N mg/L	NO ₂ +NO ₃ -N mg/L	NH ₃ -N mg/L	TKN mg/L	PO ₄ -P-T mg/L	Si as SiO ₂ -D mg/L	T-Alkalinity mg/L	HCO ₃ mg/L	Hardness mg/L	TDS ^{grav} mg/L	TDS ^{calc} mg/L	TOC mg/L	Phenol mg/L	Turbidity NTU		
Buried Channels and Valleys - Kearn Channel																											
GWN-08-44	22-Feb-75	16053750222002	8.50	1100	19.6	6.6	239	13.4	54	97	---	1.9992	---	---	---	---	---	---	525	---	692	---	---	---	---	---	
GWN-08-44	03-Mar-75	16053750303001	8.70	727	27.9	7.0	380	---	---	4.0	---	---	---	---	---	---	---	---	247	---	560	---	---	---	---	---	
GWN-08-44	10-Sep-75	16053750910008	11.30	2900	8.0	---	249	118.2	94	6.0	---	0.9996	---	---	---	---	---	---	---	---	876	---	---	---	---	---	
GWN-08-44	17-Jul-76	16053760717003	11.70	2600	8.1	0.1	238	118.2	80	3.3	---	0.5992	---	---	---	---	---	---	---	---	792	---	---	---	---	---	
GWN-08-44	09-Jul-77	16053770709002	10.10	1080	3.2	1.9	210	42.9	22	7.7	---	0.0994	---	---	---	---	---	---	244	---	554	---	---	---	---	---	
GWN-08-44	09-Jul-78	16053780709002	11.10	1620	5.9	18.5	204	95.0	20	9.6	---	1.2992	---	---	---	---	---	600.5	---	90	710	---	---	---	---	---	
GWN-08-44	08-Jul-80	16053800708003	11.10	2250	5.7	0.1	218	111.1	14	---	---	---	---	---	---	---	---	---	---	---	772	---	---	---	---	---	
GWN-08-44	08-Jul-80	16053800708004	11.40	1950	1.0	---	218	118.2	15	6.0	---	---	---	---	---	---	---	---	---	---	819	---	---	---	---	---	
GWN-08-44	13-Sep-84	16053840913001	9.00	820	13.0	3.0	198	14.1	3.5	4.8	---	---	<0.02	---	---	---	---	466	517	45	516	---	---	---	---	---	
GWN-08-44	13-Sep-84	16053840913002	9.50	860	11.0	2.4	200	24.2	5.3	4.8	---	---	<0.02	---	---	---	---	478	426	38	535	---	---	---	---	---	
GWN-08-44	20-Oct-12	16053121020002	9.71	860	9.6	2.8	200	16.0	3.9	<1.0	<0.003	<0.003	<0.003	0.74	---	---	11.35	460	270	35	510	---	0.005	---	---		
GWN-08-44	17-Sep-13	16053130917030	9.21	830	12.8	2.7	196	11.6	2.6	<0.5	<0.05	<0.05	<0.071	0.657	1.1	---	13.88	489	461	43.2	519	---	12.5	0.0035	---		
GWN-08-44	02-Aug-14	16053140802008	8.43	869	13.3	4.0	197	6.4	1.5	0.9	<0.02	<0.05	<0.054	0.613	---	---	---	483	570	49.7	546	513	8.8	0.0017	1.97		
GWN-08-44	02-Nov-14	16053141102026	8.59	888	4.0	1.1	141	15.1	1.3	<0.5	<0.02	<0.05	<0.054	0.758	---	---	4.12	520	599	14.4	520	474	8.5	0.004	18.4		
GWN-Shell-PW2-63	05-Nov-09	16053091105001	7.36	530	97.0	14.0	3.8	1.4	1.0	<1	<0.003	<0.003	<0.003	0.55	---	---	20.99	320	390	300	340	---	---	0.003	---		
GWN-Shell-PW2-63	25-Nov-10	16053101125001	7.93	572	107.0	15.1	4.5	1.6	<0.5	<0.5	<0.05	<0.05	<0.071	---	---	---	---	335	409	329	---	329	---	0.0046	---		
GWN-Shell-PW2-63	23-Oct-12	16053121023001	7.84	230	26.0	12.0	6.2	2.2	3.4	3.0	0.0044	0.028	0.032	0.13	---	---	1.43	120	150	120	---	130	---	0.0044	---		
GWN-Shell-PW2-63	21-Aug-13	16053130821005	7.68	557	94.6	13.8	4.6	1.6	<0.5	<0.5	<0.05	<0.05	<0.071	0.527	---	---	21.85	320	391	293	---	307	29.5	0.0045	141		
GWN-Shell-PW2-63	25-Nov-13	16053131125014	7.77	413	47.2	10.8	4.8	1.9	2.0	<0.5	<0.05	<0.05	<0.071	0.431	---	---	5.31	219	267	162	---	198	17.7	0.0046	174		
GWN-Shell-PW2-63	03-Nov-14	16053141103028	8.33	556	102.0	15.1	5.0	1.6	<0.5	<0.5	<0.02	<0.05	<0.054	0.555	---	---	22.6	344	413	317	388	330	30	0.0023	229		
GWN-Shell-PW2-63	03-Nov-14	16053141103028	8.33	556	102.0	15.1	5.0	1.6	<0.5	<0.5	<0.02	<0.05	<0.054	0.555	---	---	22.6	344	413	317	388	330	30	0.0023	229		
IOR-KRL-02	13-Mar-04	16053040313001	8.00	604	76.4	36.5	3.3	1.0	<1	8.0	---	---	<0.2	---	---	---	---	278	339	341	---	368	---	0.004	---		
IOR-KRL-02	17-Aug-10	16053100817001	7.70	540	63.0	31.0	1.6	0.9	<1	9.0	<0.003	0.17	0.17	---	---	---	---	290	350	286	300	280	---	0.002	---		
IOR-KRL-02	13-Oct-10	16053101013001	7.43	560	74.0	32.0	1.7	0.9	1.0	9.0	<0.003	0.15	0.15	---	---	---	---	310	370	317	330	302	---	0.002	---		
IOR-KRL-02	22-Jul-11	16053110722003	7.83	570	73.0	31.0	1.8	1.0	<1	8.0	<0.003	0.14	0.14	<0.05	---	0.2	15.42	310	380	310	290	300	---	0.003	---		
IOR-KRL-02	25-Sep-11	16053110925001	7.95	580	74.0	34.0	2.0	0.9	<1	9.0	<0.003	0.16	0.16	<0.05	---	<0.1	14.99	310	380	330	290	310	---	0.004	---		
IOR-KRL-02	08-Jul-12	16053120708001	8.08	560	77.0	32.0	2.0	0.8	1.1	9.7	<0.003	0.19	0.19	<0.05	---	<0.1	16.28	320	390	320	330	310	---	<0.002	---		
IOR-KRL-02	19-Oct-12	16053121019006	7.87	550	73.0	31.0	1.7	0.7	1.1	9.6	<0.003	0.18	0.18	1.1	---	<0.1	15.85	310	370	310	320	300	---	0.0039	---		
GMF Interim Quality Triggers for NAOSA^^			NS	NS	NS	NS	150	NS	50	250	NS	NS	NS	1	NS	NS	10	NS	NS	NS	1000	1000	NS	NS	NS		
Alberta Tier 1 - Natural Areas*			6.5-8.5^P	NS	NS	NS	200^P	NS	230^A	500^P	0.06^A	2.9^A	NS	pH/T^{A,***}	NS	NS	NS	NS	NS	NS	NS	500^P	500^P	NS	0.004^A	NS	
Buried Channels and Valleys - Thickwood Channel																											
GWN-13-27	17-Jan-76	16053760117001	9.30	1220	3.0	1.5	220	12.9	186	60	---	0.4	---	---	---	---	---	---	244	---	952	---	---	---	---	---	
GWN-13-27	17-Jan-76	16053760117002	9.30	1220	3.0	1.5	220	13.0	186	60	---	0.4004	---	---	---	---	---	---	244	---	952	---	---	---	---	---	
GWN-13-27	19-Jul-76	16053760719004	10.10	1000	2.2	0.0	198	10.0	120	43	---	0.9	---	---	---	---	---	---	39	2.9	508	---	---	---	---	---	
GWN-13-27	19-Jul-76	16053760719008	10.10	1000	2.2	---	198	10.1	120	43	---	0.8988	---	---	---	---	---	---	39	---	508	---	---	---	---	---	
GWN-13-27	11-Jan-77	16053770111003	5.90	3400	63.9	22.8	373	12.2	152	73	---	---	---	---	---	---	---	---	68	---	4098	---	---	---	---	---	
GWN-13-27	11-Jul-77	16053770711006	6.00	5000	134.7	45.0	446	12.2	381	70.3	---	1.6982	---	---	---	---	---	---	161	---	5334	---	---	---	---	---	
GWN-13-27	10-Jul-78	16053780710004	5.50	2490	92.8	30.0	350	9.7	180	50.2	---	0.5992	---	---	---	---	---	56.8	71	356	3284	---	---	---	---	---	
GWN-13-27	10-Jul-79	16053790710006	4.30	1888	82.0	25.0	336	7.9	152	28.9	---	---	---	---	---	---	---	---	---	---	2442	---	---	---	---	---	
GWN-13-27	07-Jul-80	16053800707006	7.00	1870	77.0	23.1	301	7.9	120	31	---	---	---	---	---	---	---	---	85	---	2096	---	---	---	---	---	
GWN-13-27	08-Sep-09	16053090908001	8.12	1000	24.0	6.9	220	4.3	18	150	<0.003	<0.003	<0.003	3.00	---	---	13.71	400	480	88	670	---	---	0.004	---		
GWN-13-27	16-Nov-10	16053101116004	8.70	956	12.7	4.9	205	4.4	10	72.2	<0.05	<0.05	<0.071	2.19	---	---	---	442	489	52	574	---	9.6	0.0049	---		
GWN-13-27	12-Feb-11	16053110212006	8.46	880	11.1	3.9	192	3.8	6.7	45.7	<0.05	<0.05	<0.071	2.03	---	---	---	458	535	43.8	538	---	---	0.0035	---		
GWN-13-27	12-Feb-11	16053110212008	8.46	888	11.4	4.0	198	4.0	6.2	45.0	<0.05	<0.05	<0.071	2.08	---	---	---	458	535	44.9	544	---	---	---	---		
GWN-13-27	26-Aug-13	16053130826022	8.75	890	7.7	3.5	193	3.4	4.4	18.8	<0.05	<0.05	<0.071	1.34	---	---	1.05	496	543	33.4	---	528	9.2	<0.001	315		
GWN-13-27	23-Nov-13	16053131123011	8.31	853	9.8	3.1	193	3.5	1.1	5.2	<0.05	<0.05	<0.071	1.56	---	---	9.16	500	607	37.1	---	516	9.9	0.0018	---		
GWN-13-27	07-Aug-14	16053140807037	8.72	869	10.8	3.6	198	3.1	2.2	11.9	<0.02	<0.05	<0.054	1.52	---	---	2.27	466	515	41.6	528	509	17.7	<0.001	105		
GWN-13-27	28-Oct-14	16053141028004	8.86	846	9.3																						

TABLE 6.

GROUNDWATER QUALITY RESULTS - GENERAL PARAMETERS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC μ S/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO ₄ mg/L	NO ₂ -N mg/L	NO ₃ -N mg/L	NO ₂ +NO ₃ -N mg/L	NH ₃ -N mg/L	TKN mg/L	PO ₄ -P-T mg/L	Si as SiO ₂ -D mg/L	T-Alkalinity mg/L	HCO ₃ mg/L	Hardness mg/L	TDS ^{grav} mg/L	TDS ^{calc} mg/L	TOC mg/L	Phenol mg/L	Turbidity NTU		
Grand Rapids Formation																											
CVE-BOR-03	31-Jan-08	16053080131001	9.25	1220000	5.8	1.7	280	2.8	32.1	65.1	<0.02	<0.02	---	---	---	---	1.93	531	480	22	734	---	---	0.007	---		
CVE-BOR-03	01-Mar-10	16053100301001	9.61	2100	3.5	2.1	480	2.4	89	0.0	<0.003	0.61	0.61	---	---	---	0.43	1000	690	18	1210	---	---	0	---		
CVE-BOR-03	23-Jun-10	16053100623003	9.77	1600	3.3	1.2	360	2.4	48	30.0	<0.003	0.008	0.008	---	---	---	0.64	730	390	13.2	885	---	---	0.038	---		
CVE-BOR-03	09-Oct-10	16053101009001	9.81	1600	2.9	0.8	350	2.3	57	28.0	<0.003	<0.003	<0.003	---	---	---	5.35	750	410	10.5	887	---	---	0.043	---		
CVE-BOR-03	26-Jan-11	16053110126001	9.59	1900	3.9	1.6	390	2.3	76	2.0	<0.003	<0.003	<0.003	---	---	---	0.64	920	630	16	1000	---	---	0.055	---		
CVE-BOR-04	04-Mar-07	16053070304001	8.16	463	47.0	13.1	43.2	3.8	1.9	1.4	<0.05	<0.05	---	---	---	---	---	270	329	171	288	---	---	---	---		
CVE-WW10-13	03-Feb-11	16053110203001	9.42	1300	1.4	0.6	290	2.5	24	43	<0.003	<0.003	<0.003	---	---	---	2.78	630	490	6.1	740	---	---	0.004	---		
GWN-13-28	15-Jan-76	16053760115001	8.80	---	1.3	0.6	371	0.8	15	135.0	---	1.7	---	---	---	---	---	---	686	---	940	---	---	---	---		
GWN-13-28	15-Jan-76	16053760115002	8.80	---	1.3	0.6	371	0.8	15	134.9	---	1.6982	---	---	---	---	---	---	6684	---	940	---	---	---	---		
GWN-13-28	19-Jul-76	16053760719003	9.00	1500	1.3	0.3	395	2.5	14	114.0	---	0.6	---	---	---	---	---	---	688	1.5	940	---	---	---	---		
GWN-13-28	19-Jul-76	16053760719009	9.00	1500	1.3	0.3	395	2.5	14	113.9	---	0.5992	---	---	---	---	---	---	688	---	940	---	---	---	---		
GWN-13-28	11-Nov-76	16053761111001	8.60	1750	3.0	2.0	422	2.1	32	98.0	---	0.2	---	---	---	---	4.82	---	769	---	1130	---	---	---	---		
GWN-13-28	11-Nov-76	16053761111002	8.60	1750	3.0	2.0	422	2.1	32	97.9	---	0.2002	---	---	---	---	---	---	769	---	1130	---	---	---	---		
GWN-13-28	11-Nov-76	16053761111003	---	---	6.0	3.4	442	<0.150	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		
GWN-13-28	11-Jan-77	16053770111002	8.30	1530	2.4	1.5	396	1.7	20	117	---	0	---	---	---	---	---	---	795	---	1044	---	---	---	---		
GWN-13-28	11-Jan-77	16053770111004	8.30	1530	2.4	1.5	396	1.7	20	116.9	---	---	---	---	---	---	---	---	795	---	1044	---	---	---	---		
GWN-13-28	11-Jul-77	16053770711003	8.80	1600	1.0	0.5	398	2.1	22	31.5	---	1.2	---	---	---	---	---	---	776	1	952	---	---	---	---		
GWN-13-28	11-Jul-77	16053770711007	8.80	1600	1.0	0.5	398	2.1	22	31.5	---	1.1998	---	---	---	---	---	---	776	---	952	---	---	---	---		
GWN-13-28	10-Jul-78	16053780710003	8.70	1370	1.5	0.4	386	1.7	18	99.0	---	3.3	---	---	---	---	---	---	776	1.8	948	---	---	---	---		
GWN-13-28	10-Jul-78	16053780710007	8.70	1370	1.5	0.4	386	1.7	18	98.9	---	3.297	---	---	---	---	---	697	776	5	948	---	---	---	---		
GWN-13-28	10-Jul-79	16053790710003	9.20	1320	1.0	0.4	386	1.3	8	80	---	0.2	---	---	---	---	---	---	678	1.1	926	---	---	---	---		
GWN-13-28	07-Jul-80	16053800707005	9.10	1510	1.3	0.6	353	3.3	11	82	---	0	---	---	---	---	---	---	727	1.4	1008	---	---	---	---		
GWN-13-28	30-Jul-81	16053810730001	9.10	1390	0.9	0.5	416	1.5	6	106	---	0.1	---	---	---	---	---	---	673	1.2	919	---	---	---	---		
GWN-13-28	30-Jul-81	16053810730002	8.90	1390	0.9	0.5	417	1.5	4	111	---	0.3	---	---	---	---	---	---	715	1	925	---	---	---	---		
GWN-13-28	30-Jul-81	16053810730003	8.90	1410	1.0	0.5	418	1.8	6	115	---	0.3	---	---	---	---	---	---	708	1.2	977	---	---	---	---		
GWN-13-28	30-Jul-81	16053810730004	8.90	1400	0.9	0.5	412	1.5	2	112	---	0.3	---	---	---	---	---	---	717	1	966	---	---	---	---		
GWN-13-28	30-Jul-81	16053810730005	9.10	1400	0.9	0.5	414	1.5	4	112	---	0.3	---	---	---	---	---	---	724	1	917	---	---	---	---		
GWN-13-28	30-Jul-81	16053810730006	9.00	1400	0.9	0.5	413	1.5	4	112	---	0.3	---	---	---	---	---	---	720	1.1	921	---	---	---	---		
GWN-13-28	30-Jul-81	16053810730007	8.80	1400	0.9	0.5	416	1.5	4	112	---	0.3	---	---	---	---	---	---	722	1	920	---	---	---	---		
GWN-13-28	30-Jul-81	16053810730008	8.90	1400	0.9	0.5	412	1.4	4	112	---	0.3	---	---	---	---	---	---	700	1	914	---	---	---	---		
GWN-13-28	30-Jul-81	16053810730009	8.90	1400	0.9	0.5	413	1.5	4	111	---	0.3	---	---	---	---	---	---	712	1	920	---	---	---	---		
GWN-13-28	30-Jul-81	16053810730010	9.00	1400	0.9	0.5	412	1.5	4	111	---	0.3	---	---	---	---	---	---	708	1	966	---	---	---	---		
GWN-13-28	30-Jul-81	16053810730011	8.90	1400	0.9	0.5	413	1.5	4	111	---	0.3	---	---	---	---	---	---	716	1	930	---	---	---	---		
GWN-13-28	27-Aug-13	16053130827026	9.78	1500	<0.5	<0.1	386	1.9	3	2.4	<0.05	<0.05	<0.071	1.02	---	---	0.52	883	443	<1.0	---	923	7.5	0.0057	81.7		
GWN-13-28	23-Nov-13	16053131123008	9.04	1550	0.7	0.4	357	1.4	4.1	108.0	<0.05	<0.05	<0.071	1.19	---	---	5.12	722	723	3.4	---	905	7.6	<0.001	187		
GWN-13-28	07-Aug-14	16053140807035	9.18	1550	0.8	0.5	379	1.4	3.5	96.7	<0.02	<0.05	<0.054	1.02	---	---	1.61	740	690	4.1	955	926	7.9	0.0071	65.3		
GWN-13-28	28-Oct-14	16053141028001	9.20	1550	1.1	0.6	371	3.0	3.4	95.2	<0.02	<0.05	<0.054	1.09	---	---	4.58	787	717	5.2	944	947	6.8	<0.001	103		
Alberta Tier 1 - Natural Areas*			6.5-8.5^P	NS	NS	NS	200^P	NS	230^A	500^P	0.06^A	2.9^A	NS	pH/T^{A,***}	NS	NS	NS	NS	NS	NS	NS	500^P	500^P	NS	0.004^A	NS	
Clearwater Formation																											
AGS-02-108	09-Oct-96	16053961009001	7.53	2590	42.5	19.3	562	10.0	261	214	---	---	<0.05	---	---	---	---	---	777	948	186	2057	1550	44.4	---	---	
AGS-02-108	09-Oct-96	16053961009004	---	---	---	---	---	---	---	190	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
AGS-02-108	24-Oct-12	16053121024006	8.44	2800	26.0	13.0	450	5.0	240	260	<0.003	<0.003	<0.003	2.1	---	---	10.71	860	1000	120	---	1500	---	0.0033	---		
AGS-02-108	23-Aug-13	16053130823014	8.25	2790	9.6	6.1	621	4.6	247	258	<0.05	<0.05	<0.071	1.57	---	---	---	896	1090	49.1	---	1680	11.8	<0.001	19.9		
AGS-02-108	28-Nov-13	16053131128024	8.21	2660	9.6	6.4	639	5.0	244	253	<0.05	<0.05	<0.071	1.53	---	---	10	846	1030	50.5	---	1660	8	<0.001	14.9		
AGS-02-108	06-Aug-14	16053140806032	8.88	4800	12.4	9.4	1000	7.2	847	42	<0.10	<0.25	<0.27	3.69	---	---	8.3	1240	1290	69.7	2620	2660	8.9	0.0221	>4000		
AGS-03-30	09-Oct-96	16053961009010	---	---	---	---	---	---	---	242	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		
AGS-03-30	09-Oct-96	16053961009014	7.63	1630	30.6	14.0	354	7.3	36.9	242	---	---	<0.05	---	---	---	---	---	586	715	134	1400	1040	10.3	---		
AGS-03-30	17-Sep-09	16053090917002	8.25	1400	27.0	14.0	320	6.4	13.0	240	<0.003	<0.003	<0.003	<													

TABLE 6.

GROUNDWATER QUALITY RESULTS - GENERAL PARAMETERS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC μ S/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO ₄ mg/L	NO ₂ -N mg/L	NO ₃ -N mg/L	NO ₂ +NO ₃ -N mg/L	NH ₃ -N mg/L	TKN mg/L	PO ₄ -P-T mg/L	Si as SiO ₂ -D mg/L	T-Alkalinity mg/L	HCO ₃ mg/L	Hardness mg/L	TDS ^{grav} mg/L	TDS ^{calc} mg/L	TOC mg/L	Phenol mg/L	Turbidity NTU		
Clearwater Formation																											
GWN-08-45	23-Feb-75	16053750223002	12.10	5000	44.3	0.1	403	101.0	87.1	102.9	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
GWN-08-45	06-Mar-75	16053750306001	8.40	1800	33.9	3.2	700	118.2	4.0	5.7	---	39.2714	---	---	---	---	---	---	1897	---	---	1236	---	---	---	---	
GWN-08-45	17-Jul-76	16053760717001	8.40	78000	3.6	2.3	601	8.0	158.2	9.6	---	7.7938	---	---	---	---	---	---	1274	---	---	3058	---	---	---	---	
GWN-08-45	09-Jul-77	16053770709003	8.70	2700	7.9	2.1	638	5.9	184.3	33.8	---	3.6974	---	---	---	---	---	---	1340	---	---	1000	---	---	---	---	
GWN-08-45	09-Jul-78	16053780709003	8.30	2230	6.1	1.8	604	3.8	180.3	5.2	---	3.8976	---	---	---	---	---	1108.8	1386	22	---	1570	---	---	---	---	
GWN-08-45	08-Jul-80	16053800708005	8.70	2780	6.7	2.6	681	71.7	180.3	13.0	---	0.8988	---	---	---	---	---	---	1235	---	---	1540	---	---	---	---	
GWN-08-45	08-Jul-80	16053800708006	8.70	2800	3.7	2.1	669	7.2	175.2	---	---	0.0994	---	---	---	---	---	---	1269	---	---	1614	---	---	---	---	
GWN-08-45	30-Sep-09	16053090930002	8.55	2500	2.5	1.5	620	2.9	200.0	14.0	<0.003	<0.003	<0.003	1.62	---	---	1.07	1200	1400	13	---	1544	---	---	---	---	
GWN-08-45	20-Oct-12	16053121020003	8.56	2500	2.8	2.0	690	2.6	190.0	<1.0	0.007	<0.003	0.007	1.7	---	---	6.64	1200	1300	15	---	1600	---	---	<0.01	---	
GWN-08-45	17-Sep-13	16053130917029	8.59	2570	2.8	1.8	591	2.5	182.0	0.9	<0.05	<0.05	<0.071	1.42	1.81	---	5.53	1170	1340	14.5	---	1600	---	---	8.7	<0.001	
GWN-08-45	02-Aug-14	16053140802007	8.53	2570	2.9	1.8	605	3.4	180.0	<0.5	<0.02	<0.05	<0.054	1.66	---	---	5.1	1160	1330	14.5	---	1490	---	---	6.6	0.0013	
GWN-08-45	02-Nov-14	16053141102024	8.91	2700	2.6	1.8	550	2.5	183.0	<0.5	<0.02	<0.05	<0.054	1.64	---	---	5.82	1280	1340	13.8	---	1590	---	---	7.2	<0.001	
GWN-14-33	17-Feb-76	16053760217001	8.30	3300	14.7	6.5	737	7.1	594	13.9	---	5.2	---	---	---	---	---	---	995	---	---	1844	---	---	---	---	
GWN-14-33	17-Feb-76	16053760217002	8.30	3300	14.7	6.5	737	7.2	595	13.9	---	5.1968	---	---	---	---	---	---	995	---	---	1844	---	---	---	---	
GWN-14-33	15-Jul-76	16053760715002	8.20	6500	8.8	8.7	1450	7.9	1176	3.3	---	0.7	---	---	---	6.96	---	---	1837	9.2	---	3580	---	---	---	---	
GWN-14-33	15-Jul-76	16053760715006	8.20	6500	8.8	8.7	1450	8.0	1178	3.3	---	0.7	---	---	---	---	---	---	1836	---	---	3580	---	---	---	---	
GWN-14-33	15-Jul-76	16053760715008	---	---	11.3	10.7	1859	22.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
GWN-14-33	07-Jul-77	16053770707002	9.40	5000	2.9	3.6	1038	8.8	820	14.5	---	0	---	---	---	---	---	---	1274	17.5	---	2472	---	---	---	---	
GWN-14-33	07-Jul-77	16053770707005	9.40	5000	2.9	3.6	1038	8.9	821	14.5	---	---	---	---	---	---	---	---	---	1274	---	---	2472	---	---	---	---
GWN-14-33	07-Jul-78	16053780707002	8.40	5080	6.3	7.9	1438	0.0	1240	4.3	---	2.1	---	---	---	---	---	---	1862	6.5	---	3482	---	---	---	---	
GWN-14-33	07-Jul-78	16053780707005	8.40	5080	6.3	7.9	1438	---	1242	4.3	---	2.0986	---	---	---	---	---	1521.5	1861	48	---	3482	---	---	---	---	
GWN-14-33	05-Jul-79	16053790705002	9.30	3860	2.4	2.4	993	9.6	900	27.8	---	0.4	---	---	---	---	---	---	861	2.5	---	2200	---	---	---	---	
GWN-14-33	05-Jul-79	16053790705005	9.30	3860	2.5	2.4	993	9.6	900	27.8	---	---	---	---	---	---	---	---	861	---	---	2200	---	---	---	---	
GWN-14-33	05-Jul-80	16053800705002	8.60	7000	31.0	31.0	1556	22.0	2000	21.0	---	0	---	---	---	---	---	---	659	34	---	4005	---	---	---	---	
GWN-14-33	05-Jul-80	16053800705005	8.60	7000	34.0	31.0	1556	22.0	2000	21.0	---	---	---	---	---	---	---	---	659	---	---	4005	---	---	---	---	
GWN-14-33	24-Aug-13	16053130824017	9.00	6330	5.2	6.6	1350	7.6	1220	<5.0	<0.5	<0.5	<0.71	4.67	---	---	4.78	1740	1720	39.9	---	3630	---	---	3.3	<0.001	
GWN-14-33	28-Nov-13	16053131128026	9.39	5730	1.2	1.2	1430	11.9	1220	0.6	<0.05	<0.05	<0.071	13.7	---	---	<1.1	1490	1110	8	---	---	3560	---	---	3.9	<0.001
GWN-14-33	04-Aug-14	16053140804017	9.17	6280	5.2	5.5	1380	8.0	1190	<2.5	<0.1	<0.25	<0.27	6.06	---	---	4.3	1580	1410	35.8	---	3540	---	---	3.6	<0.001	
GWN-14-33	31-Oct-14	16053141031016	9.06	6510	7.4	8.5	1530	7.0	1210	<2.5	<0.10	<0.25	<0.27	3.33	---	---	6.8	1780	1690	53.6	---	3740	---	---	2.8	<0.001	
Alberta Tier 1 - Natural Areas*			6.5-8.5^P	NS	NS	NS	200^P	NS	230^A	500^P	0.06^A	2.9^A	NS	pH/T^{A,***}	NS	NS	NS	NS	NS	NS	500^P	500^P	NS	0.004^A	NS		
McMurray Formation Basal Aquifer - Aquifer Management Unit 1																											
CVE-02-04-LM	01-Feb-11	16053110201001	8.06	640	51.0	21.0	46	6.5	34	<1	<0.003	0.03	0.03	---	---	---	6.43	300	360	220	340	---	---	0.006	---	---	
GWN-06-60	18-Feb-75	16053750218001	8.10	640	99.8	22.0	6	0.8	44	10	---	3.0	---	---	---	---	---	---	378	---	---	458	---	---	---	---	
GWN-06-60	11-Sep-75	16053750911001	7.30	280	30.9	5.2	18	1.7	12	3.3	---	1.2	---	---	---	---	---	---	137	---	---	196	---	---	---	---	
GWN-06-60	16-Jul-76	16053760716001	7.10	1700	219.6	59.0	65	2.1	158	---	---	5.3	---	---	---	---	---	---	842	---	---	1138	---	---	---	---	
GWN-06-60	16-Jul-76	16053760716006	---	---	250.0	52.5	64	77.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
GWN-06-60	11-May-77	16053770511001	7.40	630	80.2	27.3	13	1.7	42	21.0	---	---	---	---	---	---	---	---	---	303	---	---	---	---	---	---	
GWN-06-60	11-May-77	16053770511002	7.40	630	80.4	27.3	13	1.7	42	21.0	---	---	---	---	---	---	---	---	---	303	---	---	---	---	---	---	
GWN-06-60	08-Jun-77	16053770608003	7.10	1050	124.0	40.0	46	1.3	68	30.8	---	1.3	---	---	---	---	---	---	---	537	111	---	674	---	---	---	
GWN-06-60	08-Jun-77	16053770608004	8.60	7000	144.7	45.0	37	1.7	28	24.8	---	0.6	---	---	---	---	---	---	---	643	---	---	650	---	---	---	
GWN-06-60	08-Jun-77	16053770608005	8.60	7000	145.0	45.0	38	1.7	28	24.8	---	0.6	---	---	---	---	---	---	---	643	---	---	650	---	---	---	
GWN-06-60	08-Jun-77	16053770608006	7.90	900	110.0	36.0	39	1.5	48	21.9	---	---	---	---	---	---	---	---	---	502	---	---	---	---	---	---	
GWN-06-60	08-Jul-77	16053770708004	7.10	1050	123.8	40.0	46	1.3	68	30.8	---	1.3	---	---	---	---	---	---	---	537	---	---	674	---	---	---	
GWN-06-60	08-Jul-77	16053770708005	7.90	900	109.8	36.0	39	1.5	48	21.9	---	---	---	---	---	---	---	---	---	502	---	---	---	---	---	---	
GWN-06-60	03-Aug-77	16053770803001	7.20	1200	147.7	44.0	35	2.5	32	---	---	6.2	---	---	---	---	---	---	---	710	---	---	738	---	---	---	
GWN-06-60	03-Aug-77	16053770803002	7.20	1200	148.0	44.0	35	2.5	32	0.0	---	6.2	---	---	---	---	---	---	---	710	---	---	738	---	---	---	
GWN-06-60	31-Aug-77	16053770831001	7.40	1080	179.6	40.0	36	2.3	92	0.5	---	---	---	---	---	---	---	---	---	635	---	---	---	---	---	---	
GWN-06-60	31-Aug-77	16053770831002	7.20	1180	135.7	40.0	40																				

TABLE 6.

GROUNDWATER QUALITY RESULTS - GENERAL PARAMETERS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC μ S/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO ₄ mg/L	NO ₂ -N mg/L	NO ₃ -N mg/L	NO ₂ +NO ₃ -N mg/L	NH ₃ -N mg/L	TKN mg/L	PO ₄ -P-T mg/L	Si as SiO ₂ -D mg/L	T-Alkalinity mg/L	HCO ₃ mg/L	Hardness mg/L	TDS ^{grav} mg/L	TDS ^{calc} mg/L	TOC mg/L	Phenol mg/L	Turbidity NTU	
McMurray Formation Basal Aquifer - Aquifer Management Unit 1																										
GWN-06-60	22-Nov-77	16053771122001	8.20	1130	164.7	43.0	31	1.3	52	9.3	---	1.0	---	---	---	---	---	---	678	---	---	658	---	---	---	---
GWN-06-60	22-Nov-77	16053771122002	8.00	1100	150.7	40.0	34	0.8	50	8.0	---	0.1	---	---	---	---	---	---	661	---	---	654	---	---	---	---
GWN-06-60	22-Nov-77	16053771122003	8.20	1130	165.0	43.0	31	1.3	52	9.3	---	1.0	---	---	---	---	---	---	678	---	---	658	---	---	---	---
GWN-06-60	22-Nov-77	16053771122004	8.00	1100	151.0	40.0	34	0.8	50	8.0	---	0.1	---	---	---	---	---	---	661	---	---	654	---	---	---	---
GWN-06-60	20-Dec-77	16053771220001	7.20	1130	145.7	39.0	34	2.1	50	13.5	---	0.8	---	---	---	---	---	---	632	---	---	670	---	---	---	---
GWN-06-60	20-Dec-77	16053771220002	7.20	1130	146.0	39.0	34	2.1	50	13.5	---	0.8	---	---	---	---	---	---	632	---	---	670	---	---	---	---
GWN-06-60	18-Jan-78	16053780118001	7.00	1200	178.0	41.0	44	2.1	126	9.6	---	---	---	---	---	---	---	---	561	---	---	764	---	---	---	---
GWN-06-60	18-Jan-78	16053780118002	7.00	1200	178.0	41.0	44	2.1	126	9.6	---	0.6	---	---	---	---	---	---	561	---	---	764	---	---	---	---
GWN-06-60	14-Feb-78	16053780214001	8.90	1090	146.0	44.0	16	0.8	132	5.2	---	---	---	---	---	---	---	---	512	---	---	742	---	---	---	---
GWN-06-60	14-Feb-78	16053780214002	8.90	1090	146.0	44.0	16	0.8	132	5.2	---	0.7	---	---	---	---	---	---	512	---	---	742	---	---	---	---
GWN-06-60	15-Mar-78	16053780315001	7.00	1030	157.0	39.0	18	1.3	94	---	---	---	---	---	---	---	---	---	573	---	---	594	---	---	---	---
GWN-06-60	15-Mar-78	16053780315002	7.00	1030	157.0	39.0	18	1.3	94	0.0	---	2.6	---	---	---	---	---	---	573	---	---	594	---	---	---	---
GWN-06-60	12-Apr-78	16053780412001	7.20	362	71.0	11.7	4	0.8	10	35.0	---	---	---	---	---	---	---	---	181	---	---	322	---	---	---	---
GWN-06-60	12-Apr-78	16053780412002	7.20	362	71.0	11.7	4	0.8	10	35.0	---	2	---	---	---	---	---	---	181	---	---	322	---	---	---	---
GWN-06-60	10-May-78	16053780510001	6.60	282	38.0	9.6	5	1.3	16	28.7	---	---	---	---	---	---	---	---	105	---	---	210	---	---	---	---
GWN-06-60	10-May-78	16053780510002	6.60	282	38.0	9.6	5	1.3	16	28.7	---	6.1	---	---	---	---	---	---	105	---	---	210	---	---	---	---
GWN-06-60	06-Jun-78	16053780606001	7.70	590	67.0	26.0	33	2.1	24	38.0	---	---	---	---	---	---	---	---	339	---	---	384	---	---	---	---
GWN-06-60	06-Jun-78	16053780606002	7.70	590	67.0	26.0	33	2.1	24	38.0	---	0	---	---	---	---	---	---	339	---	---	384	---	---	---	---
GWN-06-60	08-Jul-78	16053780708006	7.90	905	135.7	43.0	63	0.4	52	14.5	---	0.7994	---	---	---	---	---	524.8	656	516	---	646	---	---	---	---
GWN-06-60	08-Jul-78	16053780708007	7.90	905	136.0	43.0	63	0.4	52	14.5	---	0.8	---	---	---	---	---	---	656	122	---	646	---	---	---	---
GWN-06-60	01-Aug-78	16053780801001	7.40	950	135.0	41.0	45	1.3	46	11.7	---	---	---	---	---	---	---	---	649	---	---	652	---	---	---	---
GWN-06-60	01-Aug-78	16053780801002	7.40	950	135.0	41.0	45	1.3	46	11.7	---	0	---	---	---	---	---	---	649	---	---	652	---	---	---	---
GWN-06-60	29-Aug-78	16053780829001	7.70	690	95.0	35.0	33	---	26	21.5	---	---	---	---	---	---	---	---	466	---	---	412	---	---	---	---
GWN-06-60	29-Aug-78	16053780829002	7.70	690	95.0	35.0	33	0.0	26	21.5	---	0	---	---	---	---	---	---	466	---	---	412	---	---	---	---
GWN-06-60	27-Sep-78	16053780927001	7.00	332	47.0	12.5	9	2.9	2	26.0	---	---	---	---	---	---	---	---	210	---	---	230	---	---	---	---
GWN-06-60	27-Sep-78	16053780927002	7.00	332	47.0	12.5	9	2.9	2	26.0	---	0.5	---	---	---	---	---	---	210	---	---	230	---	---	---	---
GWN-06-60	25-Oct-78	16053781025001	6.70	520	77.0	23.0	14	---	4	10.9	---	---	---	---	---	---	---	---	356	---	---	328	---	---	---	---
GWN-06-60	25-Oct-78	16053781025002	6.70	520	77.0	23.0	14	0.0	4	10.9	---	0.1	---	---	---	---	---	---	356	---	---	328	---	---	---	---
GWN-06-60	22-Nov-78	16053781122001	6.70	865	134.0	40.0	30	---	18	4.6	---	---	---	---	---	---	---	---	603	---	---	580	---	---	---	---
GWN-06-60	22-Nov-78	16053781122002	6.70	865	134.0	40.0	30	0.0	18	4.6	---	0	---	---	---	---	---	---	603	---	---	580	---	---	---	---
GWN-06-60	20-Dec-78	16053781220001	7.60	970	160.0	45.0	38	0.8	24	11.1	---	---	---	---	---	---	---	---	688	---	---	650	---	---	---	---
GWN-06-60	20-Dec-78	16053781220002	7.60	970	160.0	45.0	38	0.8	24	11.1	---	0	---	---	---	---	---	---	688	---	---	650	---	---	---	---
GWN-06-60	16-Jan-79	16053790116001	7.50	950	116.0	41.0	36	2.5	36	8.9	---	---	---	---	---	---	---	---	595	---	---	600	---	---	---	---
GWN-06-60	16-Jan-79	16053790116002	7.50	950	116.0	41.0	36	2.5	36	8.9	---	0	---	---	---	---	---	---	595	---	---	600	---	---	---	---
GWN-06-60	14-Mar-79	16053790314001	7.80	830	124.0	35.0	25	0.8	46	15.0	---	---	---	---	---	---	---	---	493	---	---	558	---	---	---	---
GWN-06-60	14-Mar-79	16053790314002	7.80	830	124.0	35.0	25	0.8	46	15.0	---	0.5	---	---	---	---	---	---	493	---	---	558	---	---	---	---
GWN-06-60	10-Apr-79	16053790410001	7.30	800	112.0	30.0	20	1.2	42	2.1	---	---	---	---	---	---	---	---	437	---	---	528	---	---	---	---
GWN-06-60	10-Apr-79	16053790410002	7.30	800	112.0	30.0	20	1.2	42	2.1	---	0.4	---	---	---	---	---	---	437	---	---	528	---	---	---	---
GWN-06-60	09-May-79	16053790509001	7.20	740	105.0	3.7	23	2.9	18	10.3	---	---	---	---	---	---	---	---	490	---	---	512	---	---	---	---
GWN-06-60	07-Jun-79	16053790607001	6.80	367	54.0	15.0	9	0.8	4	12.0	---	---	---	---	---	---	---	---	256	---	---	314	---	---	---	---
GWN-06-60	07-Jun-79	16053790607002	6.80	367	54.0	15.0	9	0.8	4	12.0	---	0.2	---	---	---	---	---	---	256	---	---	314	---	---	---	---
GWN-06-60	06-Jul-79	16053790706003	8.00	590	73.0	36.0	1.7	24	16.3	---	---	1.9	---	---	---	---	---	---	449	105	---	472	---	---	---	---
GWN-06-60	06-Jul-79	16053790706004	8.00	590	105.0	37.0	36	1.7	24	16.3	---	---	---	---	---	---	---	---	449	---	---	472	---	---	---	---
GWN-06-60	03-Aug-79	16053790803001	7.40	815	123.8	39.0	30	2.1	28	12.0	---	0.4	---	---	---	---	---	486.4	608	469	---	612	---	---	---	---
GWN-06-60	03-Aug-79	16053790803002	7.40	815	124.0	39.0	30	2.1	28	12.0	---	0.4	---	---	---	---	---	---	608	0	---	612	---	---	---	---
GWN-06-60	29-Aug-79	16053790829001	8.10	770	120.8	40.0	26	---	20	14.3	---	0.6	---	---	---	---	---	466.4	583	466	---	554	---	---	---	---
GWN-06-60	29-Aug-79	16053790829002	8.10	770	121.0	40.0	26	0.0	20	14.3	---	0.6	---	---	---	---	---	---	583	---	---	554	---	---	---	---
GWN-06-60	25-Sep-79	16053790925001	7.20	745	101.8	34.0	25	1.3	22	13.8	---	0.3	---	---	---	---	---	439.2	549	394	---	542	---	---	---	---
GWN-06-60	25-Sep-79	16053790925002	7.20	745	102.0	34.0	25	1.3	22	13.8	---	0.3	---	---	---	---	---	---	549	0	---	542	---	---	---	---
GWN-06-60	24-Oct-79	16053791024001	7.00	745	101.8	39.0	26	0.8	14	14.5	---	0.4	---	---	---	---	---	439.2	549	415	---	522	---	---	---	---
GWN-06-60	24-Oct-79	16053791024002	7.00	745	102.0	39.0	26	0.8	14.0	14.5	---	0.4	---	---	---	---	---	---	549	---	---	522	---	---	---	---
GWN-06-60	21-Nov-79	16053791121001	7.10	830	108.8	37.0	37	2.1	12.0	10.4	---	0.6	---	---	---	---	---	486.4	608	424	---	398	---	---	---	---
GWN-06-60	21-Nov-79	16053791121002	7.10	830	109.0	37.0	31	2.1	12.0	10.4	---	0.6	---	---	---	---	---	---	608	---	---	398	---	---	---	---
GWN-06-60	19-Dec-79	16053791219001	7.00	730	105.8	38.0	28	0.8	10.0	10.8	---	0.5	---	---	---	---	---	447.2	559	420	---	576	---	---	---	---
GWN-06-60	19-Dec-79	16053791219002	7.00	730	106.0	38.0	28	0.8	10.0	10.8	---	0.5	---	---	---	---	---	---	559	---	---	576	---	---	---	---
GWN-06-60	17-Jan-80	16053800117001	7.10	79	116.8	33.0	23	1.7	14.0	9.4	---	0.4	---	---	---	---	---	435.2	544	427	---	372	---	---	---	---
GWN-06-60	17-Jan-80	16053800117002	7.10	790	117.0	33.0	23	1.7	14.0	9.4	---	0.4	---	---	---	---	---	---	544	---	---	372	---	---	---	---
GWN-06-60	13-Feb-80	16053800213001	7.80	735	85.8	28.0	29	0.8	26.0	13.0	---	0.3	---	---	---	---	---	420	525	329	---	500	---	---	---	---
GWN-06-60	13-Feb-80	16053800213002	7.80	735	86.																					

TABLE 6.

GROUNDWATER QUALITY RESULTS - GENERAL PARAMETERS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO ₄ mg/L	NO ₂ -N mg/L	NO ₃ -N mg/L	NO ₂ +NO ₃ -N mg/L	NH ₃ -N mg/L	TKN mg/L	PO ₄ -P-T mg/L	Si as SiO ₂ -D mg/L	T-Alkalinity mg/L	HCO ₃ mg/L	Hardness mg/L	TDS ^{grav} mg/L	TDS ^{calc} mg/L	TOC mg/L	Phenol mg/L	Turbidity NTU		
McMurray Formation Basal Aquifer - Aquifer Management Unit 1																											
GWN-06-60	11-Mar-80	16053800311001	7.40	720	99.8	21.0	26	0.8	26.0	8.0	---	0.3	---	---	---	---	---	---	489.6	612	335	476	---	---	---	---	
GWN-06-60	09-Apr-80	16053800409001	7.00	710	102.8	24.0	24	2.1	18.0	9.5	---	0.3	---	---	---	---	---	---	357.6	447	355	406	---	---	---	---	
GWN-06-60	09-Apr-80	16053800409002	7.00	710	103.0	24.0	18	2.1	18.0	9.5	---	0.3	---	---	---	---	---	---	---	447	---	406	---	---	---	---	
GWN-06-60	07-May-80	16053800507001	7.40	493	75.8	19.0	14	---	6.0	32.0	---	1.3	---	---	---	---	---	---	256	320	267	326	---	---	---	---	
GWN-06-60	07-May-80	16053800507002	7.40	493	76.0	19.0	14	0.0	6.0	32.0	---	1.3	---	---	---	---	---	---	---	320	---	326	---	---	---	---	
GWN-06-60	04-Jun-80	16053800604001	7.70	640	86.8	27.0	20	1.3	6.0	28.0	---	0.3	---	---	---	---	---	---	---	432	---	364	---	---	---	---	
GWN-06-60	04-Jun-80	16053800604002	7.70	640	87.0	27.0	20	1.3	6.0	28.0	---	0.3	---	---	---	---	---	---	---	432	---	364	---	---	---	---	
GWN-06-60	06-Jul-80	16053800706006	8.10	640	80.0	34.9	33	2.9	17.0	12.0	---	0.6	---	---	---	---	---	---	---	388	84	377	---	---	---	---	
GWN-06-60	06-Jul-80	16053800706007	8.10	640	79.8	34.9	33	2.9	17.0	12.0	---	0.6	---	---	---	---	---	---	---	388	---	377	---	---	---	---	
GWN-06-60	06-Jul-80	16053800706008	8.10	640	62.4	32.3	33	2.5	19.0	---	---	---	---	---	---	---	---	---	---	393	---	439	---	---	---	---	
GWN-06-60	30-Jul-80	16053800730001	8.30	910	189.6	34.0	21	6.4	13.0	10.0	---	0.6	---	---	---	---	---	---	---	547	---	539	---	---	---	---	
GWN-06-60	27-Aug-80	16053800827001	8.30	740	16.0	63.1	23	0.8	7.0	17.0	---	0.5	---	---	---	---	---	---	---	383	---	394	---	---	---	---	
GWN-06-60	27-Aug-80	16053800827002	8.30	740	16.0	63.0	23	0.8	7.0	17.0	---	0.5	---	---	---	---	---	---	---	383	---	394	---	---	---	---	
GWN-06-60	24-Sep-80	16053800924001	8.20	465	126.7	37.2	14	0.8	60.1	20.0	---	0.1	---	---	---	---	---	---	---	303	---	283	---	---	---	---	
GWN-06-60	21-Oct-80	16053801021001	8.20	680	143.7	62.1	18	0.8	2.8	17.0	---	0.2	---	---	---	---	---	---	---	407	---	349	---	---	---	---	
GWN-06-60	18-Nov-80	16053801118001	8.40	625	64.9	65.1	30	1.7	6.1	11.0	---	---	---	---	---	---	---	---	---	322	---	314	---	---	---	---	
GWN-06-60	16-Jan-81	16053810116001	8.40	440	25.4	32.2	21	1.3	22.0	20.5	---	0.8	---	---	---	---	---	---	---	254	---	286	---	---	---	---	
GWN-06-60	16-Jan-81	16053810116002	8.40	440	25.4	32.2	21	1.3	22.0	20.5	---	---	---	---	---	---	---	---	---	254	---	286	---	---	---	---	
GWN-06-60	11-Mar-81	16053810311001	7.60	770	100.0	29.8	19	0.8	16.0	13.0	---	0.5	---	---	---	---	---	---	---	481	---	449	---	---	---	---	
GWN-06-60	11-Mar-81	16053810311002	7.60	770	100.0	29.8	19	0.8	16.0	13.0	---	---	---	---	---	---	---	---	---	481	---	449	---	---	---	---	
GWN-06-60	05-May-81	16053810505001	7.70	840	110.0	36.9	24	1.7	13.0	25.8	---	0.4	---	---	---	---	---	---	---	559	---	602	---	---	---	---	
GWN-06-60	05-May-81	16053810505002	7.70	840	110.0	36.9	24	1.7	13.0	25.8	---	---	---	---	---	---	---	---	---	559	---	602	---	---	---	---	
GWN-06-60	01-Jul-81	16053810701001	7.30	795	110.0	34.8	20	1.0	2.0	33.0	---	0.2	---	---	---	---	---	---	---	549	---	387	---	---	---	---	
GWN-06-60	01-Jul-81	16053810701002	7.30	795	110.0	34.8	20	1.0	2.0	33.0	---	---	---	---	---	---	---	---	---	549	---	387	---	---	---	---	
GWN-06-60	29-Jul-81	16053810729001	8.10	750	102.0	32.8	20	1.9	10.0	10.3	---	0.2	---	---	---	---	---	---	---	554	---	446	---	---	---	---	
GWN-06-60	29-Jul-81	16053810729002	8.10	750	102.0	32.8	20	1.9	10.0	10.3	---	---	---	---	---	---	---	---	---	554	---	446	---	---	---	---	
GWN-06-60	26-Aug-81	16053810826001	8.10	724	27.1	15.0	150	4.6	20.2	---	---	0.3	---	---	---	---	---	---	---	476	---	580	---	---	---	---	
GWN-06-60	26-Aug-81	16053810826002	8.10	724	27.1	15.0	150	4.6	20.2	---	---	---	---	---	---	---	---	---	---	476	---	580	---	---	---	---	
GWN-06-60	23-Sep-81	16053810923001	7.70	740	106.0	33.7	20	2.1	6.6	7.2	---	0.7	---	---	---	---	---	---	---	522	---	420	---	---	---	---	
GWN-06-60	23-Sep-81	16053810923002	7.70	740	106.0	33.7	20	2.1	6.6	7.2	---	---	---	---	---	---	---	---	---	522	---	420	---	---	---	---	
GWN-06-60	13-May-82	16053820513001	7.80	750	106.8	33.0	12	2.0	7.0	24.0	---	---	<0.0028	---	---	---	---	---	407	497	405	430	---	---	---	---	
GWN-06-60	20-Sep-83	16053830920001	8.00	772	96.8	33.0	18	2.0	3.0	35.0	<0.054	---	<0.0144	---	---	---	---	---	370	451	378	410	---	---	---	---	
GWN-06-60	26-Sep-09	16053090926001	7.38	600	82.0	18.0	7	0.4	1.0	<1	<0.003	<0.003	<0.003	0.14	---	---	8.78	340	410	280	330	---	---	<0.002	---		
GWN-06-60	21-Nov-10	16053101121004	7.86	593	94.0	23.8	4	<0.5	5.1	4.1	<0.05	<0.05	<0.071	0.07	---	---	---	334	407	333	331	---	12.6	0.0278	---		
GWN-06-60	14-Feb-11	16053110214005	7.63	566	84.6	21.3	3	<0.5	<0.5	3.3	<0.05	<0.05	<0.071	0.053	---	---	---	334	407	299	313	---	---	0.0037	---		
GWN-06-60	16-Oct-12	16053121016001	7.51	590	91.0	20.0	3	<0.30	3.2	15.0	<0.003	0.005	0.005	---	---	---	9	320	390	310	---	340	---	<0.002	---		
GWN-06-60	21-Aug-13	16053130821007	7.49	580	90.9	20.1	3	0.3	0.6	32.6	<0.05	<0.05	<0.071	0.096	---	---	10.11	298	364	310	---	327	15.6	0.0037	249		
GWN-06-60	26-Nov-13	16053131126015	7.67	692	104.0	24.0	4	<0.5	0.8	29.5	<0.05	<0.05	<0.071	0.082	---	---	10.4	359	438	359	---	377	13.2	0.0011	809		
GWN-06-60	03-Nov-14	16053141103029	8.21	514	97.9	22.2	3	0.4	<0.5	4.7	<0.02	<0.05	<0.054	0.118	---	---	9.21	293	357	336	374	304	12.4	0.0047	473		
GWN-17-50	26-Feb-76	16053760226001	6.90	---	67.0	10.4	75	0.8	52	12.1	---	0.4	---	---	---	---	---	---	---	320	---	396	---	---	---	---	
GWN-17-50	26-Feb-76	16053760226003	6.90	---	66.9	10.4	75	0.8	52	12.1	---	0.4	---	---	---	---	---	---	---	320	---	396	---	---	---	---	
GWN-17-50	13-Jul-76	16053760713002	7.60	1100	56.0	12.0	154	4.2	132	3.3	---	0.8	---	---	---	---	5.91	---	425	59.4	596	---	---	---	---		
GWN-17-50	13-Jul-76	16053760713011	7.60	1100	55.9	12.0	154	4.2	132	3.3	---	0.8	---	---	---	---	---	---	425	---	596	---	---	---	---	---	
GWN-17-50	13-Jul-76	16053760713014	---	---	60.8	12.7	183	33.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
GWN-17-50	04-Jul-77	16053770704002	7.50	1000	52.9	11.8	176	134.4	138	20.2	---	1.0	---	---	---	---	---	---	---	449	---	668	---	---	---	---	
GWN-17-50	04-Jul-78	16053780704002	7.00	805	46.0	9.0	146	5.4	104	9.6	---	2.4	---	---	---	---	---	---	---	415	48	514	---	---	---	---	
GWN-17-50	04-Jul-78	16053780704010	7.00	805	45.9	9.0	146	5.5	104	9.6	---	2.4	---	---	---	---	---	---	332	415	151	514	---	---	---	---	
GWN-17-50	10-Jul-79	16053790710002	7.30	900	47.0	8.9	168	2.9	148	8.1	---	0.2	---	---	---	---	---	---	---	359	61	546	---	---	---	---	
GWN-17-50	10-Jul-79	16053790710007	7.30	900	46.9	8.9	168	2.9	148	8.1	---	0.2	---	---	---	---	---	---	287.2	359	153	546	---	---	---	---	
GWN-17-50	30-Jun-80	16053800630002	8.10	870	53.0	18.4	120	3.3	105	6.0	---	0	---	---	---	---	---	---	---	356	44	483	---	---	---	---	
GWN-17-50	10-Sep-09	16053090910001	7.63	640	47.0	8.1	89	2.5	52	2.0	<0.003	<0.003	<0.003	0.77	---	---	10.07	270	330	150	370	---	---	0.004	---		
GWN-17-50	23-Oct-12	16053121023002	7.98	640	53.0	8.9	85	2.8	47	<1.0	0.0093	0.0	0.021	0.85	---	---	8.14	280	340	170	---	380	---	0.0035	---		
GWN-17-50	26-Aug-13	16053130826020	8.35	644	49.7	7.8	72	2.5	43	<0.5	<0.05	<0.05	<0.071	0.727	---	---	7.26	294	353	156	---	351	20.9	0.0053	130		
GWN-17-50	19-Nov-13	16053131119002	8.00	680	44.8	7.8	95	2.8	78	<0.5	<0.05	<0.05	<0.071	0.643	---	---	11.7	233	284	144	---	368	19.2	0.0034	30.4		
GWN-17-50	05-Aug-14	16053140805022	8.44	705	44.6	7.0	87	2.6	58	<0.5	<0.02	<0.05	<0.054	0.631	---	---	11.1	280	328	140	608	367	22.3	0.0034	11.7		
GWN-17-50	29-Oct-14	16053141029008	8.67	714	47.1	7.9	80	2.6	59	<0.5	<0.02																

TABLE 6.

GROUNDWATER QUALITY RESULTS - GENERAL PARAMETERS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO ₄ mg/L	NO ₂ -N mg/L	NO ₃ -N mg/L	NO ₂ +NO ₃ -N mg/L	NH ₃ -N mg/L	TKN mg/L	PO ₄ -P-T mg/L	Si as SiO ₂ -D mg/L	T-Alkalinity mg/L	HCO ₃ mg/L	Hardness mg/L	TDS ^{grav} mg/L	TDS ^{calc} mg/L	TOC mg/L	Phenol mg/L	Turbidity NTU		
McMurray Formation Basal Aquifer - Aquifer Management Unit 2																											
GWN-01-75	13-Jan-75	16053750113003	12.40	7000	713.6	0.1	138	72.4	523	81.5	---	7	---	---	---	---	---	---	---	---	---	1974	---	---	---	---	
GWN-01-75	10-Sep-75	16053750910002	11.20	440	6.1	---	575	66.7	653	62.0	---	---	---	---	---	---	---	---	---	---	---	1680	---	---	---	---	
GWN-01-75	13-Jul-76	16053760713004	8.90	1200	8.9	21.2	168	94.0	56	13.4	---	2.5	---	---	---	---	3.41	---	561	---	---	718	---	---	---	---	
GWN-01-75	13-Jul-76	16053760713008	---	---	11.3	22.7	184	99.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
GWN-01-75	05-Jul-77	16053770705004	8.70	970	10.5	21.6	151	135.0	30	15.7	---	0.7	---	---	---	---	---	---	542	11.2	---	610	---	---	---	---	
GWN-01-75	05-Jul-77	16053770705007	8.70	970	10.5	21.6	151	136.4	30	15.7	---	0.7	---	---	---	---	---	---	542	---	---	610	---	---	---	---	
GWN-01-75	05-Jul-78	16053780705005	8.50	830	9.2	25.0	139	62.0	40	10.2	---	1.4	---	---	---	---	---	---	554	9	---	496	---	---	---	---	
GWN-01-75	05-Jul-78	16053780705008	8.50	830	9.2	25.0	139	62.6	40	10.2	---	1.4	---	---	---	---	---	471.1	554	125	---	496	---	---	---	---	
GWN-01-75	08-Jul-79	16053790708006	8.00	1315	42.0	26.0	228	43.8	204	9.9	---	0.6	---	---	---	---	---	---	605	40	---	852	---	---	---	---	
GWN-01-75	08-Jul-79	16053790708009	8.00	1315	41.9	26.0	228	44.2	204	9.9	---	0.6	---	---	---	---	---	---	484	605	211	852	---	---	---	---	
GWN-01-75	01-Jul-80	16053800701004	8.40	10000	21.0	28.0	150	49.0	54	2.0	---	0.5	---	---	---	---	---	---	559	17.9	---	570	---	---	---	---	
GWN-01-75	01-Jul-80	16053800701008	8.70	13200	10.6	28.0	154	52.5	58	10.0	---	1.3	---	---	---	---	---	---	505	---	---	582	---	---	---	---	
GWN-01-75	01-Jul-80	16053800701009	8.40	10000	21.0	28.0	150	49.5	54	2.0	---	0.5	---	---	---	---	---	---	559	---	---	570	---	---	---	---	
GWN-01-75	13-Dec-10	16053101213001	7.93	936	64.2	39.6	76	6.2	17	<0.5	<0.05	<0.05	<0.071	1.29	---	---	---	522	637	323	---	516	---	0.0014	---		
GWN-01-75	01-Aug-14	16053140801005	7.97	870	68.4	43.0	69	6.8	1	<0.5	<0.02	<0.05	<0.054	1.14	---	---	5.76	499	609	348	519	488	20.6	0.0034	175		
GWN-01-75	04-Nov-14	16053141104034	8.37	833	71.8	38.9	70	6.3	7	<0.5	<0.02	<0.05	<0.054	1.17	---	---	9.28	442	530	339	609	459	16.8	0.002	273		
GWN-06-61	18-Feb-75	16053750218002	9.00	6500	6.8	22.8	1431	19.0	1322	73.5	---	11	---	---	---	---	---	---	1714	---	---	3910	---	---	---	---	
GWN-06-61	11-Sep-75	16053750911002	8.70	---	6.9	21.1	1400	126.3	659	2.5	---	0.5	---	---	---	---	---	---	2078	---	---	3988	---	---	---	---	
GWN-06-61	16-Jul-76	16053760716002	8.70	7000	39.9	24.0	1450	134.4	1202	11.2	---	0.7	---	---	---	---	3.94	---	1968	---	---	3908	---	---	---	---	
GWN-06-61	16-Jul-76	16053760716007	---	---	10.2	21.2	1452	132.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
GWN-06-61	08-Jun-77	16053770608002	8.60	7000	7.2	19.7	1500	104.0	1220	4.2	---	0.7	---	---	---	---	---	---	2113	7.7	---	3794	---	---	---	---	
GWN-06-61	08-Jun-77	16053770608007	8.50	6000	9.1	21.0	1340	14.0	1112	15.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
GWN-06-61	08-Jul-77	16053770708006	8.60	7000	7.2	19.7	1500	105.1	1222	4.2	---	0.7	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
GWN-06-61	08-Jul-77	16053770708007	8.50	6000	9.1	21.0	1340	14.1	1114	15.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
GWN-06-61	08-Jul-78	16053780708005	8.10	5050	16.1	26.0	1438	50.5	1122	3.0	---	1.1	---	---	---	---	---	1751.2	2188	147	---	3796	---	---	---	---	
GWN-06-61	08-Jul-78	16053780708008	8.10	5050	16.1	26.0	1438	50.0	1120	3.0	---	1.1	---	---	---	---	---	---	2189	14.8	---	3796	---	---	---	---	
GWN-06-61	06-Jul-79	16053790706002	8.70	5300	4.4	19.0	1406	48.0	1260	8.6	---	0.4	---	---	---	---	---	---	1967	3.7	---	3844	---	---	---	---	
GWN-06-61	06-Jul-80	16053800706005	9.20	6400	6.0	20.8	1625	79.0	1162	16.0	---	0.0	---	---	---	---	---	---	1628	12.4	---	3906	---	---	---	---	
GWN-06-61	06-Jul-80	16053800706009	9.20	6400	6.0	20.8	1625	79.8	1164	16.0	---	---	---	---	---	---	---	---	1627	---	---	3906	---	---	---	---	
GWN-06-61	06-Jul-80	16053800706010	8.80	6200	6.8	21.6	1556	83.9	1202	---	---	---	---	---	---	---	---	---	1912	---	---	3893	---	---	---	---	
GWN-06-61	20-Sep-83	16053830920002	9.50	5260	2.0	10.0	1005	100.0	901	15.0	<0.054	---	<0.0144	---	---	---	---	1293	1032	46	---	2807	---	---	---	---	
GWN-06-61	23-Nov-10	16053101123002	8.66	5860	6.3	20.0	1340	22.6	1090	7.6	<0.05	<0.05	<0.071	2.56	---	---	---	1550	1740	98	---	3420	---	33.1	---		
GWN-06-61	23-Nov-10	16053101123005	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
GWN-06-61	16-Oct-12	16053121016002	8.17	6300	24.0	17.0	1400	13.0	1200	<1.0	<0.003	0.009	0.009	---	---	---	4.28	1700	2100	130	---	3700	---	<0.001	---		
GWN-06-61	21-Aug-13	16053130821006	8.69	5830	3.7	17.3	1310	21.1	1060	<5.0	<0.5	<0.5	<0.71	1.89	---	---	2.87	1600	1770	80.6	---	3370	18.8	0.0015	13.5		
GWN-06-61	26-Nov-13	16053131126018	8.34	6290	33.2	23.1	1440	17.3	1180	<5.0	<0.5	<0.5	<0.71	2.72	---	---	5.5	1740	2110	178	---	3740	17.7	<0.001	45		
GWN-06-61	03-Nov-14	16053141103031	8.96	6240	32.5	23.2	1350	15.7	1110	<2.5	<0.1	<0.25	<0.27	2.29	---	---	5.3	1840	1910	177	---	3820	3640	34.3	<0.001	126	
GWN-07-56	03-Aug-14	16053140803015	9.95	1260	1.5	1.0	256	37.8	76	0.8	<0.02	<0.05	<0.054	3.59	---	---	0.13	509	203	8	718	678	22.6	0.003	19.9		
GWN-07-56	01-Nov-14	16053141101021	8.80	1420	2.2	12.6	311	22.4	45	<0.5	<0.02	<0.05	<0.054	3.93	---	---	3.19	760	829	57.4	879	849	26	<0.001	35.6		
GWN-07-57	06-Feb-75	16053750206001	8.50	2780	9.2	28.7	583	22.3	321	12.7	---	2.0	---	---	---	---	---	---	1235	---	---	1572	---	---	---	---	
GWN-07-57	07-Feb-75	16053750207001	8.20	2900	42.4	29.0	586	22.3	315	10.5	---	0.5	---	---	---	---	---	---	1369	---	---	1648	---	---	---	---	
GWN-07-57	08-Feb-75	16053750208001	8.90	2780	7.0	28.0	585	22.3	323	12.2	---	0.3	---	---	---	---	---	---	1171	---	---	1556	---	---	---	---	
GWN-07-57	09-Sep-75	16053750909002	8.20	3200	14.7	28.0	575	22.3	218	2.7	---	16.5	---	---	---	---	---	---	1239	---	---	1584	---	---	---	---	
GWN-07-57	18-Jul-76	16053760718004	8.50	2700	6.6	25.0	599	23.5	399	3.7	---	0.4	---	---	---	---	---	---	1154	---	---	1618	---	---	---	---	
GWN-07-57	18-Jul-76	16053760718005	---	---	7.9	29.8	604	33.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
GWN-07-57	10-Jul-77	16053770710003	7.80	3000	28.0	26.0	601	22.9	324	3.8	---	0.5	---	---	---	---	---	---	1325	24	---	1636	---	---	---	---	
GWN-07-57	08-Jul-78	16053780708003	8.20	2510	8.7	23.0	596	22.2	340	2.0	---	1.7	---	---	---	---	---	997.6	1247	116	---	1582	---	---	---	---	
GWN-07-57	08-Jul-78	16053780708010	8.20	2510	8.7	23.0	596	22.0	340	2.0	---	1.7	---	---	---	---	---	---	1247	8.8	---	1582	---	---	---	---	
GWN-07-57	08-Jul-79	16053790708001	8.70	2420	8.1	25.0	588	20.0	322	8.1	---	1.0	---	---	---	---	---	---	1127	7	---	1638	---	---	---	---	

TABLE 6.

GROUNDWATER QUALITY RESULTS - GENERAL PARAMETERS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO ₄ mg/L	NO ₂ -N mg/L	NO ₃ -N mg/L	NO ₂ +NO ₃ -N mg/L	NH ₃ -N mg/L	TKN mg/L	PO ₄ -P-T mg/L	Si as SiO ₂ -D mg/L	T-Alkalinity mg/L	HCO ₃ mg/L	Hardness mg/L	TDS ^{grav} mg/L	TDS ^{calc} mg/L	TOC mg/L	Phenol mg/L	Turbidity NTU	
McMurray Formation Basal Aquifer - Aquifer Management Unit 2																										
GWN-07-57	21-Sep-13	16053130921040	8.54	2750	16.2	32.1	613	24.8	305	<0.5	<0.05	<0.05	<0.071	3.36	---	---	5.4	1160	1340	173	---	1690	18.2	<0.001	---	
GWN-07-57	05-Nov-13	16053131105033	8.37	2870	19.9	29.6	556	22.0	311	<0.5	<0.05	<0.05	<0.071	4.12	4.32	0.0424	---	1190	1420	172	---	1650	15.5	0.0011	---	
GWN-07-57	03-Aug-14	16053140803010	8.08	2850	36.5	32.1	571	24.2	313	<0.5	<0.02	<0.05	<0.054	3.74	---	---	5.67	1120	1370	223	1640	1650	16.9	<0.001	1.82	
GWN-07-57	01-Nov-14	16053141101020	8.84	2850	23.8	32.3	564	23.4	302	<0.5	<0.02	<0.05	<0.054	3.94	---	---	6.18	1180	1230	192	1730	1650	21	<0.001	203	
GWN-08-46	23-Feb-75	16053750223001	8.40	1710	17.9	7.0	409	15.6	27	116.9	---	4.6	---	---	---	---	---	---	1054	---	1258	---	---	---	---	
GWN-08-46	16-Jul-76	16053760716005	7.80	2400	2.0	1.0	415	256.6	40	6.3	---	0.8	---	---	---	---	---	---	1449	---	1560	---	---	---	---	
GWN-08-46	09-Jul-77	16053770709004	5.10	8000	196.6	80.1	1100	122.2	1242	15.7	---	---	---	---	---	---	---	---	---	---	9766	---	---	---	---	
GWN-08-46	09-Jul-78	16053780709004	4.30	535	139.7	54.0	850	215.2	---	9.6	---	1.4	---	---	---	---	---	---	---	571	6418	---	---	---	---	
GWN-08-46	08-Jul-80	16053800708007	7.90	4450	76.8	35.9	763	273.8	501	---	---	---	---	---	---	---	---	---	156	---	4253	---	---	---	---	
GWN-08-46	08-Jul-80	16053800708008	8.10	4540	82.8	32.0	763	265.7	501	10.0	---	---	---	---	---	---	---	---	154	---	4351	---	---	---	---	
GWN-08-46	20-Oct-12	16053121020004	8.24	970	10.0	0.5	180	98.0	10	4.8	0.004	<0.003	0.004	4.3	---	---	<0.21	500	610	27	---	600	---	0.0023	---	
GWN-08-46	17-Sep-13	16053130917032	8.29	962	11.1	0.5	177	102.0	8	3.8	<0.05	<0.05	<0.071	3.19	4.66	---	<0.11	490	598	29.8	---	597	6.6	0.003	---	
GWN-08-46	04-Nov-13	16053131104031	8.35	978	10.0	0.4	158	85.3	9	3.1	<0.05	<0.05	<0.071	3.7	4.18	0.0089	---	509	611	26.8	---	571	6	0.0022	---	
GWN-08-46	02-Aug-14	16053140802009	8.37	937	11.4	0.6	163	90.7	8	3.6	<0.02	<0.05	<0.054	---	---	---	<0.11	481	573	31	620	566	---	---	42.2	
GWN-08-46	02-Nov-14	16053141102023	8.55	940	10.7	0.4	152	84.6	8	2.4	<0.02	<0.05	<0.054	3.09	---	---	<0.11	514	597	28.5	582	567	6.1	0.0012	60.6	
GWN-13-29	20-Feb-76	16053760220002	11.20	---	62.9	0.7	150	14.3	224	33.4	---	3.0	---	---	---	---	---	---	---	---	596	---	---	---	---	
GWN-13-29	19-Jul-76	16053760719002	11.30	4200	81.0	0.0	725	14.6	1118	91.0	---	1.2	---	---	---	---	---	---	0	89.1	2100	---	---	---	---	
GWN-13-29	19-Jul-76	16053760719010	11.30	4200	80.8	---	725	14.7	1120	90.9	---	1.2	---	---	---	---	---	---	---	---	2100	---	---	---	---	
GWN-13-29	11-Jul-77	16053770711002	11.30	1730	65.0	0.0	198	13.3	268	69.0	---	0.7	---	---	---	---	---	---	---	0	68	704	---	---	---	
GWN-13-29	11-Jul-77	16053770711008	11.30	1730	64.9	---	198	13.4	268	69.0	---	0.7	---	---	---	---	---	---	---	---	704	---	---	---	---	
GWN-13-29	10-Jul-78	16053780710002	11.10	1445	49.0	0.0	216	13.3	296	54.0	---	0.0	---	---	---	---	---	---	0	62	776	---	---	---	---	
GWN-13-29	10-Jul-78	16053780710008	11.10	1445	48.9	---	216	13.4	296	54.0	---	---	---	---	---	---	---	179.7	---	122	776	---	---	---	---	
GWN-13-29	09-Jul-79	16053790709001	8.30	1370	13.4	0.3	275	15.0	382	57.0	---	0.5	---	---	---	---	---	---	146	50	852	---	---	---	---	
GWN-13-29	09-Jul-79	16053790709002	8.30	1370	50.0	0.3	275	15.0	382	57.0	---	---	---	---	---	---	---	---	146	---	852	---	---	---	---	
GWN-13-29	07-Jul-80	16053800707004	8.20	1800	10.7	0.5	305	85.0	420	56.0	---	0.0	---	---	---	---	---	---	178	34	984	---	---	---	---	
GWN-13-29	07-Jul-80	16053800707008	8.20	1800	10.7	0.5	305	85.0	420	56.0	---	---	---	---	---	---	---	---	178	---	984	---	---	---	---	
GWN-13-30	20-Feb-76	16053760220001	11.70	>8000	66.0	0.8	1062	28.7	2000	52.0	---	0.0	---	---	---	---	---	---	0	---	3470	---	---	---	---	
GWN-13-30	20-Feb-76	16053760220005	11.70	8000	65.9	0.8	1062	29.0	2003	52.0	---	---	---	---	---	---	---	---	---	---	3470	---	---	---	---	
GWN-13-30	19-Jul-76	16053760719001	12.00	5400	153.7	---	713	26.1	1009	55.0	---	0.4	---	---	---	---	---	---	---	---	2120	---	---	---	---	
GWN-13-30	11-Jul-77	16053770711001	9.80	>8000	3.6	9.7	2675	19.6	3520	111.0	---	0.1	---	---	---	---	---	---	444	7.3	6900	---	---	---	---	
GWN-13-30	11-Jul-77	16053770711009	9.80	8000	3.6	9.7	2675	19.8	3525	110.9	---	0.1	---	---	---	---	---	---	444	---	6900	---	---	---	---	
GWN-13-30	10-Jul-78	16053780710001	11.30	6300	14.7	0.2	1338	28.3	1940	60.0	---	1.9	---	---	---	---	---	---	0	15.9	3656	---	---	---	---	
GWN-13-30	10-Jul-78	16053780710009	11.30	6300	14.7	0.2	1338	28.6	1943	60.0	---	1.9	---	---	---	---	---	350	---	---	3656	---	---	---	---	
IOR-KRL-03 (BAS)	28-Feb-98	16053980228001	7.42	501	67.6	21.7	5	1.5	2	4.0	---	---	0.078	---	---	---	---	281	343	258	---	272	---	<0.001	---	
IOR-KRL-03 (BAS)	01-Mar-98	16053980301001	12.53	8452	138.0	<0.1	588	40.4	13	12.6	---	---	0.223	---	---	---	---	1892	<0.5	345	---	1461	---	<0.001	---	
IOR-KRL-03 (BAS)	02-Nov-98	16053981102001	7.02	568	82.6	25.5	8	1.7	1	1.8	---	---	0.082	---	---	---	---	344	420	310	---	327	---	0.012	---	
IOR-KRL-03 (BAS)	02-Nov-98	16053981102002	7.33	1190	47.9	19.3	186	9.1	41	8.4	---	---	<0.003	---	---	---	---	556	678	200	---	645	---	<0.002	---	
IOR-KRL-03 (BAS)	04-Mar-06	16053060304001	11.40	1000	62.2	0.2	71	10.1	20	31.0	---	---	<0.2	---	---	---	---	244	<1	160	356	341	---	---	---	
IOR-KRL-03 (BAS)	07-Feb-07	16053070207001	8.13	1090	45.6	15.9	176	8.6	51	7.0	---	---	0.034	---	---	---	---	543	663	180	656	632	---	<0.01	---	
IOR-KRL-03 (BAS)	07-Feb-07	16053070207002	8.15	1090	43.3	15.1	166	8.2	48	7.5	---	---	<0.03	---	---	---	---	543	663	170	652	617	---	<0.01	---	
IOR-KRL-03 (BAS)	15-Mar-08	16053080315001	11.40	803	45.8	<0.05	73	10.1	19	43.5	<0.05	<0.05	---	1.58	---	---	39.19	190	<1	114	332	307	---	0.002	---	
IOR-KRL-03 (BAS)	21-Aug-10	16053100821004	8.10	1200	61.0	20.0	200	9.6	51	2.0	<0.003	0.15	0.15	1.3	---	0.2	---	540	660	233	700	671	---	<0.004	---	
IOR-KRL-03 (BAS)	11-Oct-10	16053101011001	7.87	1200	48.0	19.0	190	8.9	56	<1	<0.003	<0.003	<0.003	1.2	---	0.2	---	570	700	196	800	667	---	<0.01	---	
IOR-KRL-03 (BAS)	18-Jul-11	16053110718001	7.84	1200	45.0	18.0	190	8.8	50	<1	<0.003	<0.003	<0.003	1.3	---	0.1	5.14	570	700	180	670	660	---	<0.01	---	
IOR-KRL-03 (BAS)	23-Sep-11	16053110923001	8.09	1200	42.0	17.0	190	8.3	53	3.0	<0.003	0.004	0.004	1.3	---	<0.1	4.93	560	690	170	700	650	---	0.003	---	
IOR-KRL-03 (BAS)	17-Aug-12	16053120817002	7.96	1200	39.0	16.0	180	8.2	50	1.1	<0.003	<0.003	<0.003	1.1	---	0.1	4.93	570	700	160	680	640	---	<0.02	---	
IOR-KRL-03 (BAS)	14-Oct-12	16053121014002	7.85	11																						

TABLE 6.

GROUNDWATER QUALITY RESULTS - GENERAL PARAMETERS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC μ S/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO ₄ mg/L	NO ₂ -N mg/L	NO ₃ -N mg/L	NO ₂ +NO ₃ -N mg/L	NH ₃ -N mg/L	TKN mg/L	PO ₄ -P-T mg/L	Si as SiO ₂ -D mg/L	T-Alkalinity mg/L	HCO ₃ mg/L	Hardness mg/L	TDS ^{grav} mg/L	TDS ^{calc} mg/L	TOC mg/L	Phenol mg/L	Turbidity NTU		
McMurray Formation Basal Aquifer - Aquifer Management Unit 2																											
IOR-KRL-04 (BAS)	26-Feb-98	16053980226001	7.23	3990	69.2	39.4	684	23.3	605	3.8	---	---	0.011	---	---	---	---	1065	1298	335	---	2074	---	<0.001	---		
IOR-KRL-04 (BAS)	26-Feb-98	16053980226002	---	---	42.6	22.8	540	13.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<0.001	---		
IOR-KRL-04 (BAS)	03-Mar-06	16053060303001	8.00	4170	67.3	40.6	852	23.6	976	6.0	---	---	0.3	---	---	---	6.13	1100	1340	340	---	2380	---	---	---		
IOR-KRL-04 (BAS)	21-Aug-10	16053100821001	7.96	4000	58.0	34.0	850	21.0	690	4.0	<0.003	0.01	0.007	---	---	---	---	980	1200	285	2200	2250	---	<0.004	---		
IOR-KRL-04 (BAS)	10-Oct-10	16053101010001	7.85	4000	67.0	39.0	750	22.0	660	2.0	<0.003	0.08	0.077	---	---	---	---	1000	1300	328	2200	2170	---	<0.002	---		
IOR-KRL-04 (BAS)	16-Jul-11	16053110716001	7.60	3800	61.0	35.0	830	21.0	660	<1	<0.03	0.17	0.17	2.9	---	0.5	4.93	1000	1200	300	2300	2200	---	<0.002	---		
IOR-KRL-04 (BAS)	29-Sep-11	16053110929001	7.95	4000	69.0	37.0	660	21.0	620	<1	<0.003	<0.003	<0.003	2.9	---	0.3	5.14	1000	1300	330	2300	2000	---	0.005	---		
IOR-KRL-04 (BAS)	17-Aug-12	16053120817001	7.27	3900	57.0	30.0	750	18.0	700	<1	<0.003	<0.003	<0.003	2.3	---	0.42	4.5	1000	1300	260	2200	2200	---	0.0093	---		
IOR-KRL-04 (BAS)	14-Oct-12	16053121014001	7.72	3900	57.0	31.0	740	20.0	670	<1	<0.003	<0.003	<0.003	2.6	---	0.36	4.71	1000	1200	270	2100	2100	---	0.011	---		
IOR-KRL-05 (BAS)	26-Feb-98	16053980226003	7.31	2820	55.6	31.7	503	20.2	292	20.4	---	---	0.008	---	---	---	---	1114	1358	269	---	1602	---	<0.001	---		
IOR-KRL-05 (BAS)	26-Feb-98	16053980226004	---	---	52.1	32.0	401	20.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<0.001	---		
IOR-KRL-05 (BAS)	03-Nov-98	16053981103001	7.23	2980	50.2	31.0	524	19.3	341	13.9	---	---	<0.003	---	---	---	---	1060	1300	260	---	1600	---	0.061	---		
IOR-KRL-05 (BAS)	03-Nov-98	16053981103002	---	---	52.0	32.2	539	20.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.024	---		
IOR-KRL-05 (BAS)	17-Jul-09	16053090717001	8.20	3020	49.5	28.3	585	34.1	347	7.4	<0.50	<0.05	<0.005	3.73	---	---	6.4	1160	1410	240	---	---	---	0.018	---		
IOR-KRL-05 (BAS)	20-Oct-09	16053091020002	7.87	2700	50.0	32.0	600	21.0	320	27.0	0.012	0.240	0.25	---	---	---	6.85	1100	1400	250	---	1700	1700	0.015	---		
IOR-KRL-05 (BAS)	20-Aug-10	16053100820001	7.74	2900	41.0	26.0	640	18.0	300	20.0	<0.003	<0.003	<0.003	---	---	---	---	960	1200	209	1700	1630	---	<0.004	---		
IOR-KRL-05 (BAS)	10-Oct-10	16053101010002	7.89	2900	49.0	32.0	590	20.0	300	20.0	<0.003	<0.003	<0.003	---	---	---	---	1000	1300	254	1700	1640	---	<0.004	---		
IOR-KRL-05 (BAS)	10-Oct-10	16053101010003	7.97	2800	49.0	31.0	580	20.0	310	18.0	<0.003	<0.003	<0.003	---	---	---	---	1000	1300	251	1700	1630	---	<0.002	---		
IOR-KRL-05 (BAS)	10-Oct-10	16053101010004	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<0.004	---		
IOR-KRL-05 (BAS)	15-Jul-11	16053110715001	7.74	2800	42.0	24.0	440	16.0	310	7.0	<0.003	<0.003	<0.003	3	---	0.4	4.93	1100	1300	200	1700	1500	---	<0.002	---		
IOR-KRL-05 (BAS)	29-Sep-11	16053110929002	7.96	2900	51.0	29.0	520	19.0	270	11.0	<0.003	<0.003	<0.003	3.1	---	1	5.78	1100	1300	250	1700	1500	---	0.004	---		
IOR-KRL-05 (BAS)	16-Aug-12	16053120816001	7.98	2800	46.0	27.0	490	18.0	310	25.0	0.006	<0.003	0.006	2.5	---	0.7	5.35	1100	1300	230	1500	1600	---	0.0024	---		
IOR-KRL-05 (BAS)	16-Aug-12	16053120816002	7.88	2900	44.0	27.0	490	18.0	310	16.0	<0.003	<0.003	<0.003	2.3	---	0.72	4.93	1100	1300	220	1400	1500	---	0.0022	---		
IOR-KRL-05 (BAS)	14-Oct-12	16053121014004	7.73	2800	42.0	24.0	600	18.0	290	<1	<0.003	0.015	0.015	2.8	---	0.73	5.57	1100	1300	200	1100	1600	---	0.0031	---		
SHL-ALB-01	20-Oct-09	16053091020001	7.98	4360	28.1	21.0	970	19.1	732	9.9	<0.5	<0.5	<0.71	---	---	---	---	1370	1670	157	---	2600	---	0.0053	---		
SHL-ALB-01	03-Nov-09	16053091103001	7.70	4500	25.0	17.0	950	15.0	720	<1	<0.003	<0.003	<0.003	2.8	---	---	4.93	1300	1600	130	2500	---	---	0.009	---		
SHL-ALB-01	19-May-10	16053100519001	7.84	4290	28.7	21.0	948	17.4	696	<0.5	<0.05	<0.05	<0.071	---	---	---	---	1350	1640	158	---	2520	---	0.0016	---		
SHL-ALB-01	30-May-11	16053110530001	7.99	4410	27.7	21.0	1010	17.2	682	<0.5	<0.05	<0.05	<0.071	---	---	---	---	1360	1660	156	---	2570	---	<0.001	---		
SHL-ALB-01	26-Jun-12	16053120626001	8.11	4390	27.6	20.8	1040	18.7	689	<5.0	<0.5	<0.5	<0.71	---	---	---	---	1390	1690	155	---	2630	---	<0.001	---		
SHL-ALB-01	26-Jun-12	16053120626002	8.17	4410	26.7	19.7	1040	19.4	715	<5.0	<0.5	<0.5	<0.71	---	---	---	---	1380	1690	148	---	2650	---	<0.001	---		
SHL-ALB-02	02-Nov-09	16053091102001	7.77	4400	53.2	29.0	878	15.6	793	1.6	<0.05	<0.05	<0.071	---	---	---	---	1130	1370	252	---	2450	---	0.027	---		
SHL-ALB-02	02-Nov-09	16053091102002	7.73	4400	44.0	21.0	890	13.0	800	<1	<0.003	<0.003	<0.003	2.1	---	---	4.71	1000	1300	200	2400	---	---	0.02	---		
SHL-ALB-02	27-May-10	16053100527001	8.12	4390	46.8	24.2	872	14.0	798	2.1	<0.05	<0.05	<0.071	---	---	---	---	1110	1360	217	---	2420	---	0.0242	---		
SHL-ALB-02	14-Oct-10	16053101014001	7.97	4320	47.6	24.9	914	15.5	806	1.5	<0.05	<0.05	<0.071	---	---	---	---	1100	1340	221	---	2470	---	0.0189	---		
SHL-ALB-03	15-Feb-01	16053010215001	8.70	3940	9.9	9.1	989	19.8	603	15.8	---	---	0.2	---	---	---	---	1320	1440	62	---	2440	---	0.01	---		
SHL-ALB-03	02-Apr-02	16053020402001	8.30	4060	5.1	10.6	943	18.2	596	9.6	<0.05	<0.1	<0.1	---	---	---	---	1330	1610	56	---	2380	---	<0.001	---		
SHL-ALB-03	23-Mar-03	16053030323001	7.80	4030	33.9	17.2	966	14.4	595	16.4	<0.05	<0.1	<0.1	---	---	---	7.5	1300	1590	89	---	2400	---	<0.001	---		
SHL-ALB-03	28-Jul-04	16053040728001	10.50	5110	2.2	6.7	1240	18.7	781	11.3	<0.05	<0.1	<0.1	---	---	---	---	1660	186	33	---	3060	---	---	---		
SHL-ALB-03	16-Jun-05	16053050616001	12.10	5640	4.6	<0.1	1270	18.6	937	60.9	<0.05	<0.1	<0.1	---	---	---	---	1420	<5	11	---	3140	---	---	---		
SHL-ALB-03	12-Dec-06	16053061212001	11.80	6670	1.5	0.4	1290	21.0	729	152.0	<0.05	<0.1	<0.1	---	---	---	---	1890	<5	5	---	3330	---	---	---		
SHL-ALB-03	07-Dec-07	16053071207001	12.10	7630	1.1	<0.1	1100	15.3	714	57.7	<0.05	<0.1	<0.1	---	---	---	---	1280	<5	3	---	2660	---	---	---		
SHL-ALB-03	11-Jun-08	16053080611001	11.90	5320	13.2	<0.1	792	14.5	626	76.7	0.22	<0.1	0.3	---	---	---	---	912	<5	33	---	2070	---	---	---		
SHL-ALB-03	30-Mar-09	16053090330001	10.53	4470	3.4	5.7	945	13.4	705	20.5	<0.05	<0.05	<0.071	---	---	---	---	1210	132	32.1	---	2420	---	---	---		
SHL-ALB-03	16-Jun-09	16053090616001	8.30	4530	20.4	15.0	989	16.0	718																		

TABLE 6.

GROUNDWATER QUALITY RESULTS - GENERAL PARAMETERS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC μ S/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO ₄ mg/L	NO ₂ -N mg/L	NO ₃ -N mg/L	NO ₂ +NO ₃ -N mg/L	NH ₃ -N mg/L	TKN mg/L	PO ₄ -P-T mg/L	Si as SiO ₂ -D mg/L	T-Alkalinity mg/L	HCO ₃ mg/L	Hardness mg/L	TDS ^{grav} mg/L	TDS ^{calc} mg/L	TOC mg/L	Phenol mg/L	Turbidity NTU		
McMurray Formation Basal Aquifer - Aquifer Management Unit 2																											
SHL-JKP-01	27-Sep-01	16053010927001	7.70	3990	55.7	33.2	789	17.3	755	33.1	---	---	<0.1	---	---	---	---	1080	1320	276	2330	2330	---	0.003	---		
SHL-JKP-01	21-Dec-07	16053071221001	7.72	1120	91.0	24.0	95	3.9	80	0.7	0.013	0.022	0.035	---	---	---	---	515	628	330	606	606	---	<0.002	---		
SHL-JKP-01	20-Sep-08	16053080920001	7.60	3800	53.0	27.0	790	14.0	770	<0.5	0.003	<0.003	0.003	---	---	---	4.71	1100	1300	240	2300	2300	---	0.015	---		
SHL-JKP-01	15-May-09	16053090515001	7.81	4200	54.0	28.0	880	14.0	750	24.0	<0.003	<0.003	<0.003	---	---	---	4.71	1100	1400	250	2400	2400	---	<0.01	---		
SHL-JKP-01	25-Nov-09	16053091125001	7.64	4200	58.0	31.0	---	14.0	730	<1	<0.003	<0.003	<0.003	2.6	---	---	5.14	1100	1400	270	---	2300	---	0.01	---		
SHL-JKP-01	25-Nov-09	16053091125002	7.64	4200	58.0	31.0	830	14.0	730	<1	<0.003	<0.003	<0.003	2.6	---	---	5.14	1100	1400	270	2300	---	---	0.01	---		
SHL-JKP-01	23-Jun-10	16053100623001	7.96	4180	59.7	33.9	840	16.4	732	1.7	<0.05	<0.05	<0.071	---	---	---	---	1110	1350	289	2350	2350	---	0.0045	---		
SHL-JKP-01	23-Jun-10	16053100623005	7.96	4190	59.0	33.7	842	17.0	739	2.0	<0.05	<0.05	<0.071	---	---	---	---	1110	1350	286	2360	2360	---	0.0042	---		
SHL-JKP-01	26-Oct-10	16053101026001	7.75	4160	63.1	35.4	853	14.0	762	1.2	<0.05	<0.05	<0.071	---	---	---	---	1130	1370	303	2410	2410	---	---	---		
SHL-JKP-01	27-Oct-10	16053101027001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
SHL-JKP-01	10-Jun-11	16053110610001	8.15	4250	52.6	30.9	708	13.5	755	17.0	<0.05	<0.05	<0.071	---	---	---	---	1150	1400	259	2270	---	---	---	---		
SHL-JKP-01	10-Jun-11	16053110610002	8.29	4230	62.4	37.1	842	15.8	755	17.5	<0.05	<0.05	<0.071	---	---	---	---	1140	1390	309	2420	---	---	---	---		
SHL-JKP-01	23-Nov-11	16053111123001	7.93	3890	70.7	41.3	871	16.6	785	<5.0	<0.5	<0.5	<0.71	---	---	---	---	1120	1370	347	2460	---	---	---	---		
SHL-JKP-01	25-Jun-12	16053120625001	8.26	4240	62.0	36.6	906	16.6	762	16.8	<0.05	<0.05	<0.071	---	---	---	---	1210	1480	306	2530	---	---	---	---		
SHL-JKP-01	06-Nov-12	16053121106001	7.74	4240	64.7	32.9	827	17.6	752	89.7	<0.5	<0.5	<0.71	---	---	---	---	1120	1370	297	2460	---	---	---	---		
GMF Interim Quality Triggers for NAOSA^^			NS	NS	NS	NS	1000	NS	1100	400	NS	NS	NS	2	NS	NS	10	NS	NS	NS	3700	3700	NS	NS	NS		
Alberta Tier 1 - Natural Areas*			6.5-8.5^P	NS	NS	NS	200^P	NS	230^A	500^P	0.06^A	2.9^A	NS	pH/T^{A,***}	NS	NS	NS	NS	NS	NS	500^P	500^P	NS	0.004^A	NS		
McMurray Formation Basal Aquifer - Aquifer Management Unit 3																											
CNR-H02-002	11-Nov-10	16053101111001	8.51	22400	17.4	108.0	5180	141	7360	<5.0	<0.5	<0.05	<0.5	9.7	---	---	<1.1	1180	1340	488	---	13500	---	0.0298	---		
CNR-H02-002	17-Jun-11	16053110617001	8.62	21600	11.7	97.0	4720	137	7200	<5.0	<0.5	<0.5	<0.71	9.29	11.5	---	---	1180	1270	429	13300	12900	---	0.029	---		
CNR-H02-002	07-Nov-11	16053111107001	8.55	20900	7.8	84.2	4380	129	6790	<10	<1.0	<1.0	<1.4	13.1	12.1	---	---	1170	1290	366	---	12100	---	0.0467	---		
CNR-H02-002	06-May-12	16053120506001	8.55	26900	49.4	146.0	5990	93	9110	54.0	<1.0	<1.0	<1.4	13.4	13.9	---	---	758	817	725	15900	---	---	0.055	---		
CNR-H02-002	24-Oct-12	16053121024001	8.50	29300	46.0	146.0	5971	146	10300	78.0	<2.0	<2.0	<2.8	11.5	12.2	---	---	560	625	716	17000	---	---	0.0449	---		
CNR-H02-002	30-May-13	16053130530001	8.79	21900	52.7	148.0	6350	100	7270	<20	<2.0	<2.0	<2.8	12.8	16.5	---	---	1130	1140	741	14600	---	---	0.0406	---		
CNR-H02-002	19-Dec-13	16053131219001	8.00	29000	<30	100.0	6300	120	9700	59.0	<0.030	<0.030	<0.030	11	11	---	<21	940	1200	410	---	17000	---	0.33	---		
GWN-16-24	05-Mar-76	16053760305001	8.00	>8000	19.0	16.9	2025	25.4	2880	37.4	---	2.2	---	---	---	---	---	---	813	---	5290	---	---	---	---		
GWN-16-24	05-Mar-76	16053760305002	8.00	8000	19.0	16.9	2025	25.7	2884	37.4	---	2.198	---	---	---	---	---	---	813	---	5290	---	---	---	---		
GWN-16-24	18-Jul-76	16053760718002	9.30	78000	4.0	16.0	2150	38.3	3058	45.7	---	0.8	---	---	---	---	---	---	603	7.3	5824	---	---	---	---		
GWN-16-24	18-Jul-76	16053760718007	9.30	78000	4.0	16.0	2150	38.7	3062	45.7	---	0.7994	---	---	---	---	---	---	603	---	5824	---	---	---	---		
GWN-16-24	18-Jul-76	16053760718012	---	---	7.7	17.1	2541	99.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		
GWN-16-24	08-Jul-77	16053770708002	9.40	>8000	2.4	14.0	2138	41.3	3500	45.8	---	0.3	---	---	---	---	---	---	632	4.3	5596	---	---	---	---		
GWN-16-24	08-Jul-77	16053770708011	9.40	8000	2.4	14.0	2138	41.7	3505	45.8	---	0.2996	---	---	---	---	---	---	632	---	5596	---	---	---	---		
GWN-16-24	04-Jul-78	16053780704004	9.10	8350	1.5	10.4	2125	42.5	3100	37.7	---	0.4	---	---	---	---	---	---	678	3.9	5460	---	---	---	---		
GWN-16-24	04-Jul-78	16053780704008	9.10	8350	1.5	10.4	2125	42.9	3104	37.7	---	0.4004	---	---	---	---	---	852.8	678	47	5460	---	---	---	---		
GWN-16-24	03-Jul-79	16053790703002	9.30	8700	3.6	11.4	2150	37.5	2820	37.0	---	---	---	---	---	---	---	---	725	---	5426	---	---	---	---		
GWN-16-24	03-Jul-79	16053790703004	9.30	8700	2.2	11.4	2150	37.5	2820	37.0	---	0.5	---	---	---	---	---	---	725	3.6	5426	---	---	---	---		
GWN-16-24	07-Jul-80	16053800707002	9.40	9800	3.4	11.0	2162	48.0	2650	18.0	---	---	---	---	---	---	---	---	854	---	5356	---	---	---	---		
GWN-16-24	07-Jul-80	16053800707010	9.40	9800	2.0	11.0	2162	48.0	2650	18.0	---	0.5	---	---	---	---	---	---	854	3.4	5356	---	---	---	---		
GWN-16-24	25-Sep-84	16053840925001	7.67	189	36.9	48.0	4232	22.2	5503	2.0	---	---	<0.02	6.2958	---	---	---	2057	2508	290	11079	---	---	---	---		
GWN-16-24	19-Oct-12	16053121019003	8.71	11000	0.6	15.0	2700	16.0	2600	<1.0	<0.030	<0.030	<0.030	3.8	---	---	2.1	2300	2500	65	---	6700	---	<0.040	---		
GWN-16-24	19-Aug-13	16053130819002	8.70	11100	<2.0	16.7	2950	18.0	2690	<10	<1.0	<1.0	<1.4	3.15	---	---	<11	2310	2540	68.8	---	7060	22.8	0.0013	60.1		
GWN-16-24	21-Nov-13	16053131121003	8.76	11700	<2.0	16.7	3170	21.8	2860	<5.0	<0.5	<0.5	<0.71	4.62	---	---	<11	2240	2430	68.8	---	7410	22.4	<0.001	10.6		
GWN-16-24	08-Aug-14	16053140808039	8.80	11200	2.4	13.8	2550	16.1	2670	<10	<0.4	<1.0	<1.1	3.93	---	---	<11	2230	2340	62.8	6680	6590	28.6	<0.001	20.2		
GWN-16-24	29-Oct-14	16053141029005	9.21	11300	<2.0	14.1	2820	16.7	2870	<5.0	<0.20	<0.5	<0.54	4.08	---	---	<11	2390	2090	58.1	6640	7150	24.2	<0.001	3.71		
TOT-EP-02 (BAS)	11-Mar-04	16053040311001	8.20	27400	115.0	178.0	6940	57.7																			

TABLE 6.

GROUNDWATER QUALITY RESULTS - GENERAL PARAMETERS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO ₄ mg/L	NO ₂ -N mg/L	NO ₃ -N mg/L	NO ₂ +NO ₃ -N mg/L	NH ₃ -N mg/L	TKN mg/L	PO ₄ -P-T mg/L	Si as SiO ₂ -D mg/L	T-Alkalinity mg/L	HCO ₃ mg/L	Hardness mg/L	TDS ^{grav} mg/L	TDS ^{calc} mg/L	TOC mg/L	Phenol mg/L	Turbidity NTU		
McMurray Formation Basal Aquifer - Aquifer Management Unit 4																											
CNR-HRZ-01	20-Jan-10	16053100120001	7.02	195000	1010	233	<u>68400</u>	112	<u>116000</u>	<u>2600</u>	<50	<50	<71	---	---	---	---	---	683	833	3480	---	<u>189000</u>	---	---	---	
CNR-HRZ-01	08-Feb-10	16053100208001	6.94	138000	1270	286	<u>81900</u>	---	<u>136000</u>	<u>2870</u>	<50	<0.05	<50	---	---	---	<4.3	---	672	820	4350	---	<u>223000</u>	---	<u>0.232</u>	---	
CNR-HRZ-01	07-Nov-10	16053101107001	7.16	187000	925	215	<u>72100</u>	136	<u>107000</u>	<u>2450</u>	<5.0	<5.0	<7.1	7.24	---	---	<1.1	---	718	876	3200	---	<u>183000</u>	---	<u>0.085</u>	---	
CNR-HRZ-01	08-Nov-10	16053101108001	7.32	178000	895	206	<u>61000</u>	127	<u>97800</u>	<u>2240</u>	<5.0	<5.0	<7.1	8.1	---	---	<1.1	---	769	939	3080	---	<u>163000</u>	---	<u>0.079</u>	---	
CNR-HRZ-01	15-Jun-11	16053110615001	7.35	210000	1190	267	<u>75700</u>	100	<u>122000</u>	<u>3080</u>	<50	<50	<71	7.39	8.19	---	---	---	680	829	4070	<u>204000</u>	<u>203000</u>	---	<u>0.0976</u>	---	
CNR-HRZ-01	05-Nov-11	16053111105001	7.45	178000	979	223	<u>68800</u>	104	<u>110000</u>	<u>2310</u>	<20	<20	<28	7.53	7.77	---	---	---	602	735	3360	---	<u>183000</u>	---	<0.1	---	
CNR-HRZ-01	05-May-12	16053120505001	7.21	199000	1170	258	<u>79100</u>	116	<u>120000</u>	<u>2740</u>	<10	<10	<14	7.43	7.09	---	---	---	660	805	3980	<u>204000</u>	---	---	<u>0.369</u>	---	
CNR-HRZ-01	21-Oct-12	16053121021001	6.84	213000	1050	239	<u>71600</u>	88	<u>122000</u>	<u>2600</u>	<10	<10	<14	7.52	7.32	---	---	---	635	775	3610	<u>198000</u>	---	---	<u>0.073</u>	---	
CNR-HRZ-01	21-Oct-12	16053121021002	6.82	212000	1110	235	<u>73600</u>	110	<u>125000</u>	<u>2790</u>	<10	<10	<14	7.49	7.73	---	---	---	644	786	---	---	---	---	<u>0.088</u>	---	
CNR-HRZ-01	05-May-13	16053130505001	7.31	162000	1100	230	<u>74800</u>	97	<u>122000</u>	<u>2530</u>	<5.0	<5.0	<7.1	7.43	6.86	---	---	---	671	819	3690	<u>201000</u>	---	---	<u>0.144</u>	---	
CNR-HRZ-01	21-Dec-13	16053131221001	7.08	>110000	990	200	<u>69000</u>	95	<u>110000</u>	<u>2900</u>	<0.030	<0.030	<0.030	6.6	1.7	---	<21	---	660	810	3300	---	<u>180000</u>	---	<u>5.1</u>	---	
CNR-HRZ-01	21-Dec-13	16053131221002	7.33	>110000	970	200	<u>69000</u>	88	<u>110000</u>	<u>2900</u>	<0.030	<0.030	<0.030	7	2.5	---	<21	---	590	720	3200	---	<u>180000</u>	---	<u>6.6</u>	---	
GWN-01-76	13-Jan-75	16053750113004	8.20	600	75	15	32	3	18	154	---	0.2	---	---	---	---	---	---	227	---	394	---	---	---	---	---	
GWN-01-76	14-Feb-75	16053750214002	7.20	8000	976	318	---	100	---	<u>3373</u>	---	0.3	---	---	---	---	---	---	281	---	<u>220440</u>	---	---	---	---	---	
GWN-01-76	13-Mar-75	16053750313001	7.10	8000	1082	252	---	118	<u>30363</u>	<u>3658</u>	---	0.7	---	---	---	---	---	---	249	---	<u>251680</u>	---	---	---	---	---	
GWN-01-76	10-Sep-75	16053750910003	<u>6.40</u>	---	1397	205	---	109	<u>88122</u>	344	---	<u>44.0</u>	---	---	---	---	---	---	---	220	---	<u>263380</u>	---	---	---	---	---
GWN-01-76	24-Feb-76	16053760224001	6.80	8000	1297	181	---	82	---	<u>2898</u>	---	---	---	---	---	---	---	---	---	254	---	<u>275720</u>	---	---	---	---	---
GWN-01-76	13-Jul-76	16053760713005	6.70	78000	1317	293	---	109	---	<u>2688</u>	---	0.8988	---	---	---	---	---	---	---	403	---	<u>270340</u>	---	---	---	---	---
GWN-01-76	13-Jul-76	16053760713009	---	---	1188	231	<u>99330</u>	880	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
GWN-01-76	05-Jul-77	16053770705003	<u>5.80</u>	78000	1280	247	<u>105250</u>	188	<u>165200</u>	<u>3260</u>	---	<u>4.3</u>	---	---	---	---	---	---	---	193	1070	<u>275520</u>	---	---	---	---	---
GWN-01-76	05-Jul-77	16053770705008	<u>5.80</u>	78000	1277	247	---	190	---	<u>3258</u>	---	<u>4.3</u>	---	---	---	---	---	---	---	193	---	<u>275520</u>	---	---	---	---	---
GWN-01-76	05-Jul-78	16053780705004	<u>5.40</u>	99999	1058	280	---	169	---	<u>3278</u>	---	---	---	---	---	---	---	52.8	66	3797	<u>266300</u>	---	---	---	---	---	---
GWN-01-76	05-Jul-78	16053780705009	<u>5.40</u>	---	1060	280	<u>103750</u>	167	<u>161000</u>	<u>3280</u>	---	0	---	---	---	---	---	---	66	990	<u>266300</u>	---	---	---	---	---	---
GWN-01-76	08-Jul-79	16053790708005	<u>3.00</u>	19500	1040	240	<u>111250</u>	133	<u>168500</u>	<u>3660</u>	---	<u>5.4</u>	---	---	---	---	---	---	0	1010	<u>275600</u>	---	---	---	---	---	---
GWN-01-76	08-Jul-79	16053790708010	<u>3.00</u>	19500	1038	240	---	134	---	<u>3658</u>	---	<u>5.4</u>	---	---	---	---	---	---	---	3582	<u>275600</u>	---	---	---	---	---	---
GWN-01-76	01-Jul-80	16053800701003	<u>2.70</u>	21400	1030	246	<u>101563</u>	113	<u>171800</u>	<u>3900</u>	---	0.1	---	---	---	---	---	---	0	970	<u>278340</u>	---	---	---	---	---	---
GWN-01-76	01-Jul-80	16053800701010	<u>2.70</u>	21400	1028	246	---	114	---	<u>3898</u>	---	0.1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
GWN-01-76	01-Jul-80	16053800701011	<u>2.80</u>	0	1010	276	---	126	---	<u>5497</u>	---	2.4	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
GWN-01-76	27-Oct-12	16053121027003	<u>4.75</u>	<1.0	1200	130	<u>100000</u>	110	<u>150000</u>	<u>3600</u>	<0.060	<0.060	<0.060	12	---	---	<0.21	---	<0.5	<0.5	3600	---	<u>260000</u>	---	---	<u>1.1</u>	---
GWN-01-76	18-Sep-13	16053130918035	<u>4.82</u>	240000	1200	269	<u>105000</u>	120	<u>172000</u>	<u>3660</u>	<2.0	<2.0	<2.8	11.4	11.6	---	<110	---	<2.0	<5.0	4100	---	<u>282000</u>	9.3	<u>0.239</u>	---	
GWN-01-76	27-Nov-13	16053131127019	---	---	1040	255	<u>100000</u>	111	---	---	---	---	---	14.5	---	---	<110	---	---	---	---	---	---	9.6	<u>0.131</u>	122	
GWN-01-76	04-Nov-14	16053141104033	<u>4.09</u>	229000	1200	278	<u>103000</u>	107	<u>163000</u>	<u>3660</u>	<0.80	<2.0	<2.2	10.7	---	---	<11	---	<2.0	<5.0	4140	<u>275000</u>	<u>271000</u>	9.5	<u>0.196</u>	80.3	
SUN-MW-07-110	14-Apr-09	16053090414001	6.82	>100000	---	---	---	---	<u>170000</u>	<u>3500</u>	<0.3	<0.3	<0.3	4.3	---	---	---	---	350	420	3400	<u>280000</u>	---	---	---	---	---
SUN-MW-07-111	28-May-08	16053080528001	7.50	61000	---	---	---	---	<u>24000</u>	<u>3900</u>	<0.06	<0.06	<0.06	3.3	---	---	---	---	490	600	4300	<u>44000</u>	---	---	---	---	---
SUN-MW-07-111	28-Mar-09	16053090328001	6.76	58000	---	---	---	---	<u>23000</u>	<u>4400</u>	<0.03	<0.03	<0.03	---	---	---	---	---	520	630	4000	<u>44000</u>	---	---	---	---	---
SUN-MW-07-112	12-May-08	16053080512001	---	>111900	---	---	---	---	<u>110000</u>	<u>4000</u>	<0.06	<0.06	<0.06	2.6	---	---	---	---	460	560	4100	<u>190000</u>	---	---	---	---	---
Alberta Tier 1 - Natural Areas*			6.5-8.5^P	NS	NS	NS	200^P	NS	230^A	500^P	0.06^A	2.9^A	NS	pH/T^{A,***}	NS	NS	NS	NS	NS	NS	NS	500^P	500^P	NS	0.004^A	NS	

TABLE 6.

GROUNDWATER QUALITY RESULTS - GENERAL PARAMETERS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC μ S/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO ₄ mg/L	NO ₂ -N mg/L	NO ₃ -N mg/L	NO ₂ +NO ₃ -N mg/L	NH ₃ -N mg/L	TKN mg/L	PO ₄ -P-T mg/L	Si as SiO ₂ -D mg/L	T-Alkalinity mg/L	HCO ₃ mg/L	Hardness mg/L	TDS ^{grav} mg/L	TDS ^{calc} mg/L	TOC mg/L	Phenol mg/L	Turbidity NTU	
Prairie Evaporite/Beaverhill Lake/Methy (Keg River) Formations																										
CNR-H02-007	19-Jan-10	16053100119001	8.04	9650	21.9	20.4	2420	57.4	1430	<5.0	<0.5	<0.5	<0.71	---	---	---	---	3650	4460	139	---	6140	---	0.0112	---	
GWN-01-77	13-Jan-75	16053750113005	11.60	8000	928	0.3	---	86.9	48068	1534	---	0.2	---	---	---	---	---	---	---	---	73300	---	---	---	---	
GWN-01-77	14-Feb-75	16053750214001	6.70	8000	1082	380.3	---	109.1	---	4147	---	0.3	---	---	---	---	---	---	264	---	274280	---	---	---	---	
GWN-01-77	13-Mar-75	16053750313002	7.50	8000	998	340.3	---	151.5	---	3733	---	1.0	---	---	---	---	---	---	44	---	259760	---	---	---	---	
GWN-01-77	10-Sep-75	16053750910004	4.10	---	1238	252.2	---	120.2	---	3998	---	339.8	---	---	---	---	---	---	---	---	268810	---	---	---	---	
GWN-01-77	24-Feb-76	16053760224002	7.50	8000	1198	174.1	---	139.4	---	2598	---	0.4	---	---	---	---	---	---	46	---	272200	---	---	---	---	
GWN-01-77	13-Jul-76	16053760713013	10.80	78000	1527	0.1	---	96.0	---	2688	---	0.4	---	---	---	---	---	---	---	---	217700	---	---	---	---	
GWN-01-77	05-Jul-77	16053770705002	8.70	>8000	1430	1.7	70000	178.0	106200	2150	---	0	---	---	---	---	---	---	10	1300	181260	---	---	---	---	
GWN-01-77	05-Jul-77	16053770705009	8.70	8000	1427	1.7	---	179.8	---	2149	---	---	---	---	---	---	---	---	10	---	181260	---	---	---	---	
GWN-01-77	05-Jul-78	16053780705003	8.30	---	1260	6.0	62125	229.0	102000	1800	---	0	---	---	---	---	---	---	32	1270	161400	---	---	---	---	
GWN-01-77	05-Jul-78	16053780705010	8.30	---	1257	6.0	---	231.3	---	1799	---	---	---	---	---	---	---	25.4	32	3168	161400	---	---	---	---	
GWN-01-77	08-Jul-79	16053790708004	6.70	15500	1240	23.0	60750	192.0	101000	1425	---	0.5	---	---	---	---	---	---	2	1310	164700	---	---	---	---	
GWN-01-77	08-Jul-79	16053790708011	6.70	15500	1238	23.0	---	194.0	---	1424	---	0.5	---	---	---	---	---	1.9	2	3188	164700	---	---	---	---	
GWN-01-77	01-Jul-80	16053800701002	4.10	165000	1370	29.0	59000	187.0	94400	1650	---	0.8	---	---	---	---	---	---	0	1240	156080	---	---	---	---	
GWN-01-77	01-Jul-80	16053800701012	4.10	0	1367	29.0	---	188.9	94533	1649	---	0.8	---	---	---	---	---	---	---	---	156080	---	---	---	---	
GWN-01-77	01-Jul-80	16053800701013	4.40	---	1315	39.0	---	168.7	94133	1724	---	1.8	---	---	---	---	---	---	---	---	154909	---	---	---	---	
GWN-01-77	29-Oct-12	16053121027002	6.77	<1.0	1500	120.0	52000	170.0	77000	1200	<0.060	<0.060	<0.060	24	---	---	<0.21	8	10	4200	---	130000	---	0.68	---	
GWN-01-77	18-Sep-13	16053130918034	5.84	159000	1490	221.0	50100	176.0	83500	1320	<2.0	<2.0	<2.8	20.3	19.4	---	---	4.4	5	4630	---	137000	8.1	0.09	---	
GWN-01-77	27-Nov-13	16053131127020	8.92	149000	1330	10.3	45600	168.0	75900	1350	<2.0	<2.0	<2.8	26.9	---	---	<110	47.8	17	3360	---	124000	9.1	0.142	60.1	
GWN-01-78	13-Jan-75	16053750113006	12.00	8000	972	0.3	534	57.6	851	1414	---	1.2	---	---	---	---	---	---	---	---	4264	---	---	---	---	
GWN-01-78	14-Feb-75	16053750214003	12.00	8000	990	0.1	1200	76.8	2043	1409	---	1.0	---	---	---	---	---	---	---	---	6692	---	---	---	---	
GWN-01-78	18-Mar-75	16053750318001	11.90	7000	840	0.3	361	62.6	875	1289	---	5.5	---	---	---	---	---	---	---	---	3970	---	---	---	---	
GWN-01-78	09-Sep-75	16053750909001	11.80	---	948	---	2269	77.8	2103	2249	---	27.5	---	---	---	---	---	---	---	---	9528	---	---	---	---	
GWN-01-78	25-Feb-76	16053760225001	10.70	8000	788	0.3	1275	130.3	1923	1119	---	1.3	---	---	---	---	---	---	---	---	6000	---	---	---	---	
GWN-01-78	05-Jul-77	16053770705010	7.40	8000	758	60.0	1112	127.3	1512	1329	---	0.6	---	---	---	---	---	---	354	---	6864	---	---	---	---	
GWN-01-78	05-Jul-77	16053780705002	7.50	8700	500	6.1	1700	63.0	2320	1128	---	0.7	---	---	---	---	---	---	173	515	7598	---	---	---	---	
GWN-01-78	05-Jul-78	16053780705011	7.50	8700	499	6.1	1700	63.6	2323	1127	---	0.7	---	---	---	---	---	138.41	173	1272	7598	---	---	---	---	
GWN-01-78	08-Jul-79	16053790708003	7.20	6000	276	26.0	1175	40.8	1740	600	---	0.2	---	---	---	---	---	---	2	266	4738	---	---	---	---	
GWN-01-78	08-Jul-79	16053790708012	7.20	6000	275	26.0	1175	41.2	1742	600	---	0.2	---	---	---	---	---	1.6	2	795	4738	---	---	---	---	
GWN-01-78	01-Jul-80	16053800701001	8.60	96000	340	9.4	1812	87.0	2750	800	---	0.1	---	---	---	---	---	---	37	324	6678	---	---	---	---	
GWN-01-78	01-Jul-80	16053800701014	10.20	11800	365	11.0	1994	84.9	2814	1061	---	0.7	---	---	---	---	---	---	46	---	6886	---	---	---	---	
GWN-01-78	01-Jul-80	16053800701015	8.60	96000	339	9.4	1812	87.9	2754	800	---	0.1	---	---	---	---	---	---	37	---	6678	---	---	---	---	
GWN-01-78	27-Oct-12	16053121027001	11.50	51000	1900	<0.20	10000	240.0	17000	2300	0.23	<0.060	0.23	130	---	---	0.73	510	<0.5	4900	---	32000	---	0.61	---	
GWN-01-79	24-Feb-76	16053760224003	7.20	8000	1647	72.1	---	27.8	---	3638	---	1.3	---	---	---	---	---	---	190	---	50660	---	---	---	---	
GWN-01-79	26-Feb-76	16053760226002	7.00	8000	1367	105.1	7500	42.1	12417	2758	---	0.9	---	---	---	---	---	---	68	---	24700	---	---	---	---	
GWN-01-79	13-Jul-76	16053760713006	8.90	78000	3493	320.3	---	176.8	---	2508	---	0.9	---	---	---	---	---	---	12	---	241840	---	---	---	---	
GWN-01-79	13-Jul-76	16053760713010	---	---	3410	262.0	77550	1870.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
GWN-01-79	05-Jul-77	16053770705001	9.30	>8000	3980	110.0	90000	160.0	139800	2450	---	0.7	---	---	---	---	---	---	0	3480	241500	---	---	---	---	
GWN-01-79	05-Jul-77	16053770705011	9.30	8000	3972	110.1	---	161.6	---	2448	---	0.7	---	---	---	---	---	---	---	---	241500	---	---	---	---	
GWN-01-79	05-Jul-78	16053780705001	9.20	---	3450	121.0	85750	83.0	150000	2405	---	12.1	---	---	---	---	---	---	0	1700	244000	---	---	---	---	
GWN-01-79	05-Jul-78	16053780705012	9.20	---	3443	121.1	---	83.9	---	2403	---	12.1	---	---	---	---	---	59.9	---	9105	244000	---	---	---	---	
GWN-01-79	08-Jul-79	16053790708002	9.00	18400	3650	50.0	101250	225.0	155000	2410	---	0	---	---	---	---	---	---	17	3500	245900	---	---	---	---	
GWN-01-79	08-Jul-79	16053790708013	9.00	18400	3643	50.0	---	227.3	---	2408	---	---	---	---	---	---	---	65.1	17	9312	245900	---	---	---	---	
GWN-01-79	01-Jul-80	16053800701016	8.20	---	3457	100.1	---	168.7	---	1699	---	0.2	---	---	---	---	---	---	44	---	246559	---	---	---	---	
GWN-01-79	01-Jul-80	16053800701017	8.30	0	3862	91.1	---	3.5	14821	2448	---	0.3	---	---	---	---	---	---	44	---	252100	---	---	---	---	
Alberta Tier 1 - Natural Areas*			6.5-8.5^P	NS	NS	NS	200^P	NS	230^A	500^P	0.06^A	2.9^A	NS	pH/T^{A,***}	NS	NS	NS	NS	NS	NS	500^P	500^P	NS	0.004^A	NS	

TABLE 6.**GROUNDWATER QUALITY RESULTS - GENERAL PARAMETERS**Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC μ S/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO ₄ mg/L	NO ₂ -N mg/L	NO ₃ -N mg/L	NO ₂ +NO ₃ -N mg/L	NH ₃ -N mg/L	TKN mg/L	PO ₄ -P-T mg/L	Si as SiO ₂ -D mg/L	T-Alkalinity mg/L	HCO ₃ mg/L	Hardness mg/L	TDS ^{grav} mg/L	TDS ^{calc} mg/L	TOC mg/L	Phenol mg/L	Turbidity NTU			
Prairie Evaporite/Beaverhill Lake/Methy (Keg River) Formations																												
GWN-06-62	10-Feb-75	16053750210001	8.50	6800	9.2	27.3	1469	38.4	1482	122.9	---	2.0	---	---	---	---	---	---	1719	---	4022	---	---	---	---	---		
GWN-06-62	19-Feb-75	16053750219001	8.90	7000	5.4	27.5	1563	21.0	1442	25.0	---	1.5	---	---	---	---	---	---	1707	---	4138	---	---	---	---	---		
GWN-06-62	11-Sep-75	16053750911003	8.00	---	116.8	144.1	2850	77.8	2241	43.7	---	17.0	---	---	---	---	---	---	1995	---	8532	---	---	---	---	---		
GWN-06-62	16-Jul-76	16053760716003	7.90	78000	110.8	233	3475	78.8	5468	17.7	---	0.3	---	---	---	---	9.57	---	869	---	10340	---	---	---	---	---		
GWN-06-62	16-Jul-76	16053760716008	---	---	116.6	226	3740	165.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		
GWN-06-62	08-Jun-77	16053770608001	7.20	>8000	149.0	254	4050	93.0	6040	17.4	---	0	---	---	---	---	---	---	2274	133	11616	---	---	---	---	---		
GWN-06-62	08-Jul-77	16053770708008	7.20	8000	148.7	254	4050	94.0	6049	17.4	---	---	---	---	---	---	---	---	2273	---	11616	---	---	---	---	---		
GWN-06-62	08-Jul-78	16053780708004	7.50	16400	102.8	246	3913	6.4	16008	9.6	---	0.5	---	---	---	---	---	1768.8	2210	1269	11250	---	---	---	---	---		
GWN-06-62	08-Jul-78	16053780708009	7.50	16400	103.0	246	3913	6.3	6000	9.6	---	0.5	---	---	---	---	---	---	2211	69	11250	---	---	---	---	---		
GWN-06-62	06-Jul-79	16053790706001	8.00	15400	73.0	256	3800	84.0	6040	15.8	---	0	---	---	---	---	---	---	2137	78	11124	---	---	---	---	---		
GWN-06-62	06-Jul-80	16053800706004	8.40	19399	105.0	236	4813	86.0	6243	11.0	---	0	---	---	---	---	---	---	1435	97	11773	---	---	---	---	---		
GWN-06-62	06-Jul-80	16053800706011	8.40	19399	104.8	236	4813	86.9	6252	11.0	---	---	---	---	---	---	---	---	1435	---	11773	---	---	---	---	---		
GWN-06-62	06-Jul-80	16053800706012	8.70	18999	6.4	262	4689	97.0	6008	---	---	---	---	---	---	---	---	---	639	---	11912	---	---	---	---	---		
GWN-06-62	20-Sep-83	16053830920003	11.80	5560	<0.998	<1	875	475.8	741	104.9	<0.054	---	<0.0144	---	---	---	---	1257	---	<5	2947	---	---	---	---	---		
GWN-06-62	17-Oct-12	16053121017001	7.81	18000	68.0	200.0	3600	52.0	5500	<1.0	<0.030	<0.030	<0.030	8.9	---	---	9.42	1600	1900	1000	---	10000	---	<0.040	---			
GWN-06-62	21-Aug-13	16053130821004	9.47	5140	1.3	11.8	1110	46.2	926	<5.0	<0.5	<0.5	<0.71	17.7	---	---	<1.1	1450	1020	51.9	---	2970	23	0.0032	13.2			
GWN-06-62	26-Nov-13	16053131126016	9.29	6050	3.8	23.1	1310	40.1	1190	<5.0	<0.5	<0.5	<0.71	27.4	---	---	1.9	1500	1300	105	---	3470	36.1	0.0113	93.5			
GWN-07-58	19-Feb-75	16053750219002	7.80	8000	379.2	346.3	1688	67.7	2879	2498	---	1.0	---	---	---	---	---	---	422	---	7634	---	---	---	---	---		
GWN-07-58	12-Mar-75	16053750312001	11.40	2850	3.4	0.4	309	404.1	365	117	---	1.5	---	---	---	---	---	---	---	---	1418	---	---	---	---	---		
GWN-07-58	10-Sep-75	16053750910005	12.20	8000	79.8	---	590	812.2	507	148	---	---	---	---	---	---	---	---	---	---	3196	---	---	---	---	---		
GWN-07-58	18-Jul-76	16053760718009	12.50	78000	106.8	---	750	787.0	641	201	---	1.2	---	---	---	---	---	---	---	---	3574	---	---	---	---	---		
GWN-07-58	10-Jul-77	16053770710002	6.90	>8000	505.0	420.0	2125	200.0	3380	1980	---	0.1	---	---	---	---	---	---	---	473	475	10150	---	---	---	---		
GWN-07-58	10-Jul-77	16053770710004	6.90	8000	504.0	420.3	2125	202.0	3385	1979	---	0.1	---	---	---	---	---	---	---	473	---	10150	---	---	---	---		
GWN-07-58	08-Jul-78	16053780708002	7.30	11700	359.3	342.3	2013	206.1	3455	1884	---	---	---	---	---	---	---	259.2	324	2305	9818	---	---	---	---	---		
GWN-07-58	08-Jul-78	16053780708011	7.30	11700	360.0	342.0	2013	204.0	3450	1885	---	0	---	---	---	---	---	---	324	332	9818	---	---	---	---	---		
GWN-07-58	07-Jul-79	16053790707002	7.60	11300	306.0	290.0	1950	208.0	3300	1605	---	0.1	---	---	---	---	---	---	185	336	9700	---	---	---	---	---		
GWN-07-58	06-Jul-80	16053800706002	7.90	12700	620.0	342.0	2125	233.0	3200	1800	---	0	---	---	---	---	---	---	129	266	9770	---	---	---	---	---		
GWN-07-58	06-Jul-80	16053800706015	7.90	12700	618.8	342.3	2125	235.4	3205	1799	---	---	---	---	---	---	---	---	129	---	9770	---	---	---	---	---		
GWN-07-58	06-Jul-80	16053800706016	8.00	13800	308.4	344.3	2038	218.2	3205	1799	---	---	---	---	---	---	---	---	139	---	9435	---	---	---	---	---		
GWN-07-58	20-Sep-83	16053830920005	12.10	8090	<0.998	<1.0008	800	508.1	521	105	<0.054	---	<0.0144	---	---	---	---	1303	---	<5	2712	---	---	---	---	---		
GWN-07-58	21-Sep-13	16053130921041	9.01	11900	167.0	312.0	2000	123.0	3290	1390	<0.5	<0.5	<0.71	14.5	---	---	<11	49.4	14	1700	---	7310	8.7	0.0146	---			
GWN-07-58	03-Aug-14	16053140803013	8.88	11300	251.0	232.0	1710	156.0	3060	1260	<0.4	<1.0	<1.1	16.2	---	---	<11	49.2	17	1580	7790	6700	10.5	0.0119	46.6			
GWN-07-59	19-Feb-75	16053750219003	11.80	4100	437.1	0.4	306	44.2	483	865	---	1.20	---	---	---	---	---	---	---	---	2340	---	---	---	---	---		
GWN-07-59	11-Mar-75	16053750311001	9.00	1480	25.4	1.5	251	76.8	300	134	---	3.40	---	---	---	---	---	---	146	---	904	---	---	---	---	---		
GWN-07-59	10-Sep-75	16053750910006	12.00	---	1437.1	0.4	4050	118.2	4284	1849	---	39.97	---	---	---	---	---	---	---	---	16100	---	---	---	---	---		
GWN-07-59	18-Jul-76	16053760718010	12.00	7000	389.2	---	750	109.1	1140	747	---	0.8988	---	---	---	---	---	---	---	---	3388	---	---	---	---	---		
GWN-07-59	10-Jul-77	16053770710001	9.10	>8000	2480.0	67.0	8875	94.0	16400	1815	---	---	---	---	---	---	---	---	10	2080	34430	---	---	---	---	---		
GWN-07-59	10-Jul-77	16053770710005	9.10	8000	2475.1	67.1	8875	95.0	16423	1814	---	0.7	---	---	---	---	---	---	10	---	34430	---	---	---	---	---		
GWN-07-59	08-Jul-78	16053780708001	6.40	3630	325.4	17.8	516	33.3	701	907	---	0.8988	---	---	---	---	---	62.4	78	886	3032	---	---	---	---	---		
GWN-07-59	08-Jul-78	16053780708012	6.40	3630	326.0	17.8	516	33.0	700	908	---	0.9	---	---	---	---	---	---	78	304	3032	---	---	---	---	---		
GWN-07-59	07-Jul-79	16053790707001	7.80	1450	128.0	1.0	195	14.2	248	307	---	0.4	---	---	---	---	---	---	58	115	1122	---	---	---	---	---		
GWN-07-59	06-Jul-80	16053800706001	7.70	1030	51.0	3.1	129	30.0	84	250	---	0	---	---	---	---	---	---	54	42	671	---	---	---	---	---		
GWN-07-59	06-Jul-80	16053800706017	7.70	1030	50.9	3.1	129	30.3	84	250	---	---	---	---	---	---	---	---	54	---	671	---	---	---	---	---		
GWN-07-59	06-Jul-80	16053800706018	7.50	1035	45.3	3.9	135	28.3	90	250	---	---	---	---	---	---	---	---	49	---	649	---	---	---	---	---		
GWN-07-59	21-Sep-13	16053130921042	11.50	2880	241.0	<0.1	361	94.7	314	517	<0.5	<0.5	<0.71	3.12	---	---	<0.53	214	<5.0	602	---	1660	15.9	0.0646	---			
GWN-07-59	03-Aug-14	16053140803016	11.72	3730	195.0	<0.1	264	114.0	202	333	<0.1	<0.25	<0.27	3.89	---	---	<0.53	563	<5.0	487	1610	1450	19.1	0.0677	7.49			
GWN-08-47	20-Oct-12	16053121020005	8.14	3200	13.0	21.0	620	27.0	430	<1.0	<0.003	<0.003	<0.003	5.4	---	---	5.14	1000	1200	120	---	1700	---	0.0038	---			
GWN-08-47	20-Sep-13	16053130920036	8.19	3420	32.7	29.8	787	17.7	472	1.2	<0.05	<0.05	<0.071	3.91	---	---	6.32	1200	1470	204	---	2060	18	0.0055	---			
Alberta Tier 1 - Natural Areas*			6.5-8.5^p	NS	NS	NS	200^p	NS	230^A	500^p	0.06^A	2.9^A	NS	pH/T^{A,***}	NS	NS	NS	NS	NS	NS	500^p	500^p	NS	0.004^A	NS			

TABLE 6.

GROUNDWATER QUALITY RESULTS - GENERAL PARAMETERS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO ₄ mg/L	NO ₂ -N mg/L	NO ₃ -N mg/L	NO ₂ +NO ₃ -N mg/L	NH ₃ -N mg/L	TKN mg/L	PO ₄ -P-T mg/L	Si as SiO ₂ -D mg/L	T-Alkalinity mg/L	HCO ₃ mg/L	Hardness mg/L	TDS ^{grav} mg/L	TDS ^{calc} mg/L	TOC mg/L	Phenol mg/L	Turbidity NTU		
Prairie Evaporite/Beaverhill Lake/Methy (Keg River) Formations																											
GWN-08-48	24-Feb-75	16053750224001	12.00	2550	166.7	---	69	47.6	27	22	---	1.50	---	---	---	---	---	---	---	---	654	---	---	---	---	---	
GWN-08-48	07-Mar-75	16053750307001	9.60	---	7.5	10.3	738	49.7	896	81	---	0.80	---	---	---	---	---	---	215	---	---	2050	---	---	---	---	
GWN-08-48	10-Sep-75	16053750910009	7.90	---	46.9	142.1	2125	50.5	2842	160	---	---	---	---	---	---	---	---	1491	---	---	6014	---	---	---	---	
GWN-08-48	17-Jul-76	16053760717002	8.30	78000	36.9	141.1	2050	54.6	2604	227	---	7.4942	---	---	---	---	---	---	1536	---	---	6020	---	---	---	---	
GWN-08-48	09-Jul-77	16053770709005	6.80	8000	1536.9	225.2	3025	48.4	4186	331	---	0.8988	---	---	---	---	---	---	622	---	---	20430	---	---	---	---	
GWN-08-48	09-Jul-78	16053780709005	7.00	13100	698.6	190.2	2588	49.7	3765	156	---	0.7	---	---	---	---	---	374.4	468	2528	---	---	---	---	---	---	
GWN-08-48	08-Jul-80	16053800708009	7.30	15000	573.9	340.3	2563	53.5	3305	330	---	---	---	---	---	---	---	---	163	---	---	---	---	---	---	---	
GWN-08-48	08-Jul-80	16053800708010	7.50	14200	509.0	186.2	2888	55.6	3305	150	---	---	---	---	---	---	---	---	149	---	---	---	---	---	---	---	
GWN-08-48	20-Oct-12	16053121020006	10.50	3100	0.7	2.1	450	220.0	150	28	0	<0.003	0.012	19	---	---	0.66	1300	170	10	---	---	---	---	0.023	---	
GWN-08-48	20-Sep-13	16053130920037	10.23	3720	2.9	7.4	535	202.0	536	12	<0.5	<0.5	<0.71	15.5	---	---	0.92	970	214	37.7	---	1700	---	---	---	0.0513	---
GWN-14-35	25-Aug-13	16053130825018	7.92	25900	52.8	131.0	5550	34.6	7880	2180	<2.0	<2.0	<2.8	7.39	---	---	<11	1020	1250	671	---	---	---	---	138		
GWN-14-35	04-Aug-14	16053140804020	8.78	21700	7.2	88.8	5120	33.0	6620	1160	<0.1	<0.25	<0.27	0.75	---	---	<0.53	1180	1180	384	13200	13700	19.5	0.0223	48.7		
GWN-14-36	13-Feb-76	16053760213001	7.10	>8000	1700	190	96750	58.0	164400	3890	---	0	---	---	---	---	---	---	90	---	---	288960	---	---	---	---	
GWN-14-36	13-Feb-76	16053760213002	7.10	8000	1697	190	---	58.6	---	3888	---	---	---	---	---	---	---	---	90	---	---	288960	---	---	---	---	
GWN-14-36	14-Feb-76	16053760214001	7.10	>8000	1710	220	102500	60.0	170000	2960	---	1.9	---	---	---	---	---	---	102	---	---	284560	---	---	---	---	
GWN-14-36	14-Feb-76	16053760214002	7.10	8000	1707	220	---	60.6	---	2958	---	1.90	---	---	---	---	---	---	102	---	---	284560	---	---	---	---	
GWN-14-36	15-Feb-76	16053760215001	7.30	8000	55.9	6.7	1512	22.3	3405	163	---	2.70	---	---	---	---	---	---	237	---	---	5000	---	---	---	---	
GWN-14-36	15-Jul-76	16053760715001	7.10	78000	3353	6305	---	1767.9	---	258	---	1.20	---	---	---	11.31	---	---	395	---	---	354240	---	---	---	---	
GWN-14-36	15-Jul-76	16053760715009	---	---	33990	5412	68530	8140.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
GWN-14-36	07-Jul-77	16053770707001	7.90	8000	3343	5485	---	1705.3	---	297	---	0.90	---	---	---	---	---	---	---	549	---	---	364660	---	---	---	
GWN-14-36	07-Jul-78	16053780707001	8.00	99999	9979	5505	---	631.4	---	281	---	35.574	---	---	---	---	---	408	510	---	---	337600	---	---	---	---	
GWN-14-36	05-Jul-79	16053790705001	7.70	18800	3340	4400	71250	1667.0	200000	278	---	---	---	---	---	---	---	---	---	454	---	---	341900	---	---	---	
GWN-14-36	05-Jul-80	16053800705001	7.50	210000	3430	4600	36563	1875.0	190000	220	---	---	---	---	---	---	---	---	---	403	---	---	405587	---	---	---	---
GWN-14-36	04-Aug-14	16053140804018	8.53	36900	21.4	201	8110	41.1	13100	<10	<0.4	<1.0	<1.1	10.3	---	---	<11	1460	1600	881	22600	22300	12.8	0.0054	115		
GWN-16-25	18-Jul-76	16053760718001	8.10	7000	42.0	14.0	1450	27.1	1920	477	---	2.7	---	---	---	---	16.11	---	127	44	---	3520	---	---	---	---	
GWN-16-25	18-Jul-76	16053760718008	8.10	7000	41.9	14.0	1450	27.4	1923	477	---	2.7	---	---	---	---	---	---	127	---	---	3520	---	---	---	---	
GWN-16-25	18-Jul-76	16053760718013	---	---	50.1	13.1	1463	66.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
GWN-16-25	08-Jul-77	16053770708001	7.80	>8000	65.0	55.0	2638	29.2	3780	842	---	0.2	---	---	---	---	---	---	310	65	---	7558	---	---	---	---	
GWN-16-25	08-Jul-77	16053770708012	7.80	8000	64.9	55.0	2638	29.5	3785	841	---	0.2	---	---	---	---	---	---	310	---	---	7558	---	---	---	---	
GWN-16-25	04-Jul-78	16053780704003	7.50	15600	76.0	73.0	3938	31.7	6000	910	---	0.9	---	---	---	---	---	---	505	100	---	10788	---	---	---	---	
GWN-16-25	04-Jul-78	16053780704009	7.50	15600	75.8	73.1	3938	32.0	6008	909	---	0.9	---	---	---	---	---	404	505	490	---	10788	---	---	---	---	
GWN-16-25	03-Jul-79	16053790703001	8.00	12300	88.0	96.0	4875	33.3	6700	1150	---	0.1	---	---	---	---	---	---	561	82	---	12444	---	---	---	---	
GWN-16-25	07-Jul-80	16053800707001	8.50	21999	85.0	108.0	5025	41.0	7500	950	---	0	---	---	---	---	---	---	456	70	---	13848	---	---	---	---	
GWN-16-25	23-Aug-84	16053840823001	8.32	286	85.8	158.1	6280	47.5	8983	815	---	---	<0.0144	9.793	---	---	---	755	910	865	---	16800	---	---	---	---	
GWN-16-25	25-Sep-84	16053840925002	7.94	287	79.8	158.1	6210	45.5	9231	805	---	---	<0.02	9.793	---	---	---	740	902	850	---	16974	---	---	---	---	
GWN-16-25	19-Oct-12	16053121019004	8.84	38000	16.0	160.0	8200	54.0	13000	160	<0.060	<0.060	<0.060	11	---	0.26	---	610	540	710	---	22000	---	---	0.06	---	
GWN-16-25	08-Aug-14	16053140808038	8.81	38100	19.8	158.0	8370	50.0	13900	130	<0.4	<1.0	<1.1	---	---	---	---	615	555	700	---	23000	---	---	---	---	
GWN-17-51	23-Feb-76	16053760223001	8.00	>8000	56.0	96.0	7750	11.7	12200	87	---	0.3	---	---	---	---	---	---	1659	0	---	19680	---	---	---	---	
GWN-17-51	23-Feb-76	16053760223002	8.00	8000	55.9	96.1	7750	11.8	12217	87	---	0.3	---	---	---	---	---	---	1658	---	---	19680	---	---	---	---	
GWN-17-51	13-Jul-76	16053760713001	8.60	78000	20.0	177.0	8750	55.4	12200	71	---	0.3	---	---	---	---	9.25	---	2096	26.4	---	22600	---	---	---	---	
GWN-17-51	13-Jul-76	16053760713012	8.60	78000	20.0	177.1	8750	56.0	13018	71	---	0.3	---	---	---	---	---	---	2095	---	---	22600	---	---	---	---	
GWN-17-51	13-Jul-76	16053760713015	---	---	19.5	142.0	8184	143.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
GWN-17-51	04-Jul-77	16053770704001	7.70	>8000	55.0	160.0	9300	134.0	13500	60	---	0	---	---	---	---	---	---	2550	50	---	23984	---	---	---	---	
GWN-17-51	04-Jul-77	16053770704003	7.70	8000	54.9	160.1	9300	135.4	13519	60	---	---	---	---	---	---	---	---	---	2549	---	23984	---	---	---	---	
GWN-17-51	04-Jul-78	16053780704001	7.60	32800	47.0	140.0	9250	46.7	13600	66	---	0	---	---	---	---	---	---	---	2586	46	---	23870	---	---	---	---
GWN-17-51	04-Jul-78	16053780704011	7.60	32800	46.9	140.1	9250	47.2	113619	66	---	---	---	---	---	---	---	2068.8	2585	693	---	23870	---	---	---	---	
GWN-17-51	10																										

TABLE 6.

GROUNDWATER QUALITY RESULTS - GENERAL PARAMETERS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC μ S/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO ₄ mg/L	NO ₂ -N mg/L	NO ₃ -N mg/L	NO ₂ +NO ₃ -N mg/L	NH ₃ -N mg/L	TKN mg/L	PO ₄ -P-T mg/L	Si as SiO ₂ -D mg/L	T-Alkalinity mg/L	HCO ₃ mg/L	Hardness mg/L	TDS ^{grav} mg/L	TDS ^{calc} mg/L	TOC mg/L	Phenol mg/L	Turbidity NTU		
McMurray Formation																											
CVE-10-05-TW	31-Jan-11	16053110131001	8.23	470	64.0	19.0	6.6	2.4	2.0	17.0	<0.003	<0.003	<0.003	---	---	---	---	240	290	240	260	---	---	0.004	---		
CVE-10-05-TW	07-Feb-11	16053110207001	8.15	440	60.0	19.0	6.4	2.7	2.0	19.0	<0.003	<0.003	<0.003	---	---	---	---	260	320	230	270	---	---	0.004	---		
Test 1	25-Oct-12	16053121025001	7.65	700	92.0	37.0	6.4	0.8	1.4	9.1	<0.003	<0.003	<0.003	<0.05	---	---	---	390	480	380	---	380	---	<0.002	---		
Test 2	30-Oct-12	16053121030005	<u>6.28</u>	2.3	<0.30	<0.20	<0.5	<0.30	<1.0	<1.0	<0.003	<0.003	<0.003	<0.05	---	---	---	0.9	1.1	<0.5	---	<10	---	<0.002	---		
Alberta Tier 1 - Natural Areas*			<u>6.5-8.5^P</u>	NS	NS	NS	200 ^P	NS	230 ^A	500 ^P	0.06 ^A	2.9 ^A	NS	pH/T ^{A,***}	NS	NS	NS	NS	NS	NS	500 ^P	500 ^P	NS	0.004 ^A	NS		

Notes:

- - not analyzed
- NS - not specified
- ^A - indicates guideline for Aquatic Life exposure pathway
- ^P - indicates guideline for Potable Groundwater exposure pathway
- AO - aesthetic objective
- MAC - maximum acceptable concentration
- calc - calculated value
- grav - gravimetric measured value
- pH/T - most stringent value, guideline pH and temperature dependant, see CCME factsheet for guideline information
- ^{^^} - Groundwater Management Framework Interim Quality Triggers for the North Athabasca Oil Sands Area
- * - Alberta Tier 1 Soil and Groundwater Remediation Guidelines (AENV 2010)
- *** - Water Quality Guidelines for the Protection of Aquatic Life (CCME accessed on line March 2014)
- insufficient information to calculate Alberta Tier 1 Natural Areas guideline
- Underline - indicates values do not meet Alberta Tier 1 Natural Areas guideline
- Italics* - indicates values do not meet GMF Interim Quality Triggers

TABLE 7.
GROUNDWATER QUALITY RESULTS - METALS
 Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Total or Dissolved	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	B mg/L	Cd mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mn mg/L	Hg mg/L	Mo mg/L	Ni mg/L	P mg/L	Se mg/L	Si mg/L	Ag mg/L	Sr mg/L	S mg/L	Tl mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L				
Surficial Sands																																				
AGS-01-WT	09-Oct-96	16053961009012	Dissolved	---	---	---	---	---	---	---	---	---	---	<0.04	---	---	0.003	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			
AGS-01-WT	16-Sep-09	16053090916001	Dissolved	0.006	<0.0002	0.0005	0.14	<0.001	0.05	0.000016	<0.001	0.0005	0.0009	0.09	<0.0002	<0.02	0.088	---	0.0004	0.0019	0.1	<0.0002	9.2	<0.0001	0.17	2.8	<0.0002	<0.001	<0.001	0.0008	<0.001	0.011				
AGS-01-WT	25-Oct-12	16053121025003	Dissolved	0.0021	<0.0006	0.00028	0.13	<0.001	0.056	0.000017	<0.001	<0.0003	0.00065	<0.060	<0.0002	<0.02	0.041	<0.000005	<0.0002	0.0015	0.39	<0.00039	11	<0.0001	0.17	2.4	<0.0002	<0.001	<0.001	0.00054	<0.001	<0.003				
AGS-02-20	15-Sep-09	16053090915004	Dissolved	0.007	<0.0002	0.001	0.06	<0.001	1.1	0.000036	<0.001	0.0016	0.0005	2.3	<0.0002	0.22	0.33	---	0.0017	0.0025	0.7	<0.0002	6.3	<0.0001	2.1	35	<0.0002	<0.001	<0.001	0.0002	<0.001	0.006				
AGS-02-20	19-Nov-10	16053101119004	Dissolved	<0.01	<0.0004	0.00071	0.0439	<0.001	1.15	<0.00005	<0.005	<0.002	<0.001	2.69	<0.0001	0.223	0.204	<0.0001	<0.005	0.0022	---	<0.0004	---	<0.0001	---	---	<0.0001	<0.05	<0.001	0.00013	<0.001	0.0051				
AGS-02-20	15-Feb-11	16053110215004	Dissolved	<0.01	<0.0004	0.00078	0.0448	<0.001	1.06	<0.00005	<0.005	<0.002	0.0021	2.65	<0.0001	0.206	0.206	<0.0001	<0.005	0.0021	---	<0.0004	---	<0.0001	---	---	<0.0001	<0.05	<0.001	0.00011	<0.001	0.0068				
AGS-02-20	15-Feb-11	16053110215006	Dissolved	<0.01	<0.0004	0.00076	0.0414	<0.001	0.979	<0.00005	<0.005	<0.002	<0.001	2.98	<0.0001	0.189	0.205	<0.0001	<0.005	<0.002	---	<0.0004	---	<0.0001	---	---	<0.0001	<0.05	<0.001	0.0001	<0.001	0.0023				
AGS-02-20	24-Oct-12	16053121024005	Dissolved	0.0044	<0.0006	0.00056	0.05	<0.001	1.2	<0.000005	<0.001	0.0016	0.00031	3.9	<0.0002	0.23	0.25	<0.000005	0.00089	0.00059	0.91	0.0015	7.6	<0.0001	2.1	41	<0.0002	<0.001	<0.001	0.00014	<0.001	<0.003				
AGS-02-20	23-Aug-13	16053130823011	Total	<0.02	<0.0004	0.00076	0.0708	<0.001	1.24	<0.0002	<0.0008	0.0004	<0.001	2.97	<0.0001	---	0.446	<0.0001	0.00165	0.00095	---	<0.0004	6.68	<0.0004	2.25	---	<0.0001	<0.0004	<0.005	0.00035	<0.0005	<0.0040				
AGS-02-20	23-Aug-13	16053130823013	Total	<0.02	<0.0004	0.00068	0.0689	<0.001	1.18	<0.0002	<0.0008	0.0004	<0.001	2.89	<0.0001	---	0.449	<0.0001	0.00169	0.00087	---	<0.0004	6.59	<0.0004	2.22	---	<0.0001	<0.0004	<0.005	0.00036	<0.0005	<0.0040				
AGS-02-20	22-Nov-13	16053131122006	Dissolved	<0.001	<0.0004	0.00191	0.0498	<0.0005	1.14	<0.0001	<0.0004	0.001	0.00067	0.062	<0.0001	---	0.202	<0.00002	0.00202	0.0023	---	<0.0004	7.61	<0.00001	2	---	<0.00005	<0.0002	<0.0003	0.000199	0.00092	0.004				
AGS-02-20	06-Aug-14	16053140806030	Dissolved	<0.005	<0.0004	0.00074	0.0429	---	1.18	<0.0001	<0.005	---	<0.001	2.37	<0.0001	---	0.184	<0.000005	---	<0.002	---	<0.0004	7.27	<0.0001	---	---	---	---	0.00014	---	<0.003					
AGS-02-20	06-Aug-14	16053140806030	Total	4.78	<0.0004	0.00711	0.141	---	1.27	0.00082	0.0077	---	0.0209	20.5	0.01	---	0.488	0.0000347	---	0.0183	---	<0.00057	---	<0.0004	---	---	---	---	0.00201	---	0.0626					
AGS-02-20	30-Oct-14	16053141030014	Dissolved	<0.005	<0.0004	0.00074	0.0448	---	1.32	<0.0001	<0.005	<0.0004	<0.001	4.88	<0.0001	---	0.233	<0.000005	---	0.0023	---	<0.0004	7.83	<0.0001	---	---	---	---	---	0.00019	---	<0.003				
AGS-02-20	30-Oct-14	16053141030014	Total	4.49	<0.0004	0.00711	0.114	---	1.25	0.00035	0.008	---	0.0158	16.2	0.00829	---	0.417	0.0000482	---	0.0173	---	0.0006	14.9	<0.0004	---	---	---	---	0.00145	---	0.0496					
AGS-02-50	15-Sep-09	16053090915003	Dissolved	0.011	<0.0002	0.0018	0.02	<0.001	1.2	0.000018	<0.001	<0.0003	0.0007	2.8	<0.0002	0.25	0.049	---	0.0015	0.0013	0.4	<0.0002	8.2	<0.0001	2.9	96	<0.0002	<0.001	<0.001	<0.0001	<0.001	0.004				
AGS-02-WT	15-Sep-09	16053090915001	Dissolved	<0.001	<0.0002	0.0014	0.14	<0.001	0.09	0.000019	<0.001	0.0025	0.0006	1.4	<0.0002	0.06	0.5	---	0.0008	0.0073	<0.1	<0.0002	6.8	<0.0001	0.49	31	<0.0002	<0.001	<0.001	0.0036	<0.001	0.005				
AGS-02-WT	19-Nov-10	16053101119001	Dissolved	<0.01	<0.0004	<0.0004	0.154	<0.001	0.108	0.000092	<0.005	<0.002	0.0019	0.311	<0.0001	0.0585	0.241	<0.0001	<0.005	0.0057	---	<0.0004	---	<0.0001	---	---	<0.0001	<0.05	<0.001	0.00468	<0.001	0.0081				
AGS-02-WT	24-Oct-12	16053121024004	Dissolved	0.0018	<0.0006	0.00025	0.16	<0.001	0.12	0.00003	<0.001	0.00034	0.00082	0.076	<0.0002	0.064	0.14	<0.000005	0.00034	0.0029	<0.10	0.00084	7.8	<0.0001	0.49	30	<0.0002	<0.001	<0.001	0.0052	<0.001	<0.003				
AGS-02-WT	23-Aug-13	16053130823012	Total	<0.02	<0.0004	0.00297	0.142	<0.001	0.145	<0.0002	<0.0008	0.00089	<0.001	5.14	<0.0001	---	0.456	<0.0001	0.0013	0.00306	---	<0.0004	9.1	<0.0004	0.85	---	<0.0001	<0.0004	<0.005	0.00582	<0.0005	0.0045				
AGS-02-WT	22-Nov-13	16053131122007	Dissolved	0.0011	<0.0006	0.00112	0.157	<0.0005	0.121	<0.0001	<0.0004	0.00493	0.001	0.055	<0.0001	---	0.221	<0.00002	0.00155	0.014	---	<0.0004	7.38	<0.00001	0.537	---	<0.00005	<0.0002	<0.0003	0.01	0.00026	0.0058				
AGS-02-WT	06-Aug-14	16053140806028	Dissolved	<0.005	<0.0004	0.00057	0.178	---	0.126	<0.0001	<0.005	---	0.0012	0.83	<0.0001	---	0.156	<0.000005	---	0.0027	---	0.00063	7.28	<0.0001	---	---	---	---	0.00413	---	0.0356					
AGS-02-WT	06-Aug-14	16053140806028	Total	1.04	<0.0004	0.00274	0.222	---	0.13	<0.0002	<0.005	---	0.0046	6.67	0.0044	---	0.433	0.000007	---	0.0088	---	0.00077	---	<0.0004	---	---	---	---	0.00518	---	0.402					
AGS-02-WT	30-Oct-14	16053141030015	Dissolved	<0.005	<0.0004	0.00164	0.19	---	0.197	<0.0001	<0.005	<0.001	<0.001	4.54	<0.0001	---	0.351	<0.000005	---	0.004	---	<0.0004	9.06	<0.0001	---	---	---	---	0.00585	---	1.41					
AGS-02-WT	30-Oct-14	16053141030015	Total	2.06	0.00068	0.00539	0.254	---	0.172	0.00059	<0.005	---	0.0072	9.72	0.00759	---	0.519	0.0000153	---	0.0152	---	0.0005	11.8	<0.0004	---	---	---	---	0.0077	---	0.567					
AGS-03-WT	09-Oct-96	16053961009015	Dissolved	---	---	---	---	---	---	---	---	---	---	<0.04	---	---	0.402	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				
AGS-03-WT	17-Sep-09	16053090917001	Dissolved	0.004	<0.0002	0.0004	0.07	<0.001	0.37	0.000015	<0.001	<0.0003	0.0004	1.9	<0.0002	0.08	0.47	---	0.0012	0.0011	0.2	<0.0002	6.7	<0.0001	0.93	48	<0.0002	<0.001	<0.001	0.0015	<0.001	0.009				
AGS-03-WT	20-Nov-10	16053101120001	Dissolved	<0.01	<0.0004	<0.0004	0.0525	<0.001	0.308	<0.00005	<0.005	<0.002	<0.001	1.99	<0.0001	0.0688	0.454	<0.0001	<0.005	<0.002	---	<0.0004	---	<0.0001	---	---	<0.0001	<0.05	<0.001	0.00113	<0.001	<0.002				
AGS-03-WT	20-Nov-10	16053101120004	Dissolved	<0.01	<0.0004	<0.0004	0.0526	<0.001	0.308	<0.00005	<0.005	<0.002	<0.001	1.92	<0.0001	0.077	0.431	<0.0001	<0.005	<0.002	---	<0.0004	---	<0.0001	---	---	<0.0001	<0.05	<0.001	0.00114	<0.001	<0.002				
AGS-03-WT	16-Feb-11	16053110216004	Dissolved	<0.01	<0.0004	<0.0004	0.0506	<0.001	0.25	<0.00005	<0.005	<0.002	<0.001	1.83	<0.0001	0.0657	0.437	<0.0001	<0.005	<0.002	---	<0.0004	---	<0.0001	---	---	<0.0001	<0.05	<0.001	0.00135	<0.001	<0.002				
AGS-03-WT	22-Aug-13	16053130822009	Dissolved	<0.01	<0.0004	0.00046	0.051	<0.0005	0.306	<0.0001	<0.0004	0.00014	<0.0006	1.88	<0.0001	---	0.448	<0.0001	0.00246</																	

TABLE 7.
GROUNDWATER QUALITY RESULTS - METALS
 Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Total or Dissolved	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	B mg/L	Cd mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mn mg/L	Hg mg/L	Mo mg/L	Ni mg/L	P mg/L	Se mg/L	Si mg/L	Ag mg/L	Sr mg/L	S mg/L	Tl mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L				
Surficial Sands																																				
GWN-07-55	21-Sep-13	16053130921039	Dissolved	0.0087	<0.0004	0.00089	0.143	<0.0005	0.0677	<0.0001	<0.0004	0.00034	0.00088	7.27	<0.0001	---	0.16	<0.0002	0.0172	0.00533	---	<0.0004	2.87	<0.00001	0.319	---	<0.00005	<0.0002	<0.0003	0.000033	<0.0001	0.166				
GWN-07-55	05-Nov-13	16053131105034	Dissolved	0.0028	<0.0004	<0.0004	0.128	<0.0005	0.0568	<0.0001	<0.0004	0.00014	<0.0006	4.42	<0.0001	---	0.209	<0.0002	0.00593	0.00417	---	<0.0004	---	<0.00001	0.261	---	<0.00005	<0.0002	<0.0003	0.000392	<0.0001	0.002				
GWN-07-55	03-Aug-14	16053140803014	Dissolved	0.0151	<0.0004	0.00058	0.167	---	0.059	<0.0001	<0.0005	---	<0.0001	0.069	<0.0001	---	0.0506	<0.00005	---	0.0077	---	<0.0004	3.1	<0.0001	---	---	---	---	0.00133	---	0.0033					
GWN-07-55	03-Aug-14	16053140803014	Total	53.8	<0.0004	0.0227	1.64	---	0.104	0.00048	0.118	---	0.193	345	0.0916	---	5.23	0.0000104	---	0.341	---	0.0005	87.5	0.00053	---	---	---	---	0.00684	---	0.466					
GWN-07-55	01-Nov-14	16053141101022	Dissolved	<0.0005	<0.0004	0.00051	0.135	---	0.113	<0.0001	<0.0005	---	<0.001	3.13	<0.0001	---	0.297	0.0000059	---	0.0063	---	<0.0004	3.85	<0.0001	---	---	---	---	0.00043	---	<0.003					
GWN-07-55	01-Nov-14	16053141101022	Total	14.4	<0.0004	0.00627	0.347	---	0.104	<0.0002	0.0285	---	0.0496	63.1	0.0184	---	0.936	0.0000155	---	0.0708	---	<0.0004	35.4	<0.0004	---	---	---	---	0.00134	---	0.0728					
GWN-08-43	16-Jul-76	16053760716004	Total	---	---	<0.038	<0.2	<0.001	---	<0.002	<0.006	<0.01	0.039	---	---	---	0.04	---	<0.006	<0.01	---	<0.06	---	---	0.195	---	---	---	---	---	0.066					
GWN-08-43	30-Sep-09	16053090930003	Dissolved	0.036	0.0009	0.0011	0.01	<0.001	0.7	0.00032	<0.001	<0.0003	0.0009	0.19	<0.0002	0.02	0.004	---	0.042	0.013	0.3	0.0014	0.5	<0.0001	0.04	<0.2	<0.0002	<0.001	<0.001	0.0002	<0.001	0.017				
GWN-08-43	20-Oct-12	16053121020001	Dissolved	0.011	<0.0006	0.00045	0.028	<0.001	0.84	0.000079	<0.001	0.00037	0.00028	0.46	<0.0002	0.031	0.029	0.000011	0.046	0.0033	<0.10	<0.0002	0.85	<0.0001	0.13	0.21	<0.0002	<0.001	0.0013	<0.0001	<0.001	<0.003				
GWN-08-43	17-Sep-13	16053130917031	Dissolved	<0.01	<0.0004	0.00066	0.0311	<0.0005	---	<0.0001	<0.0004	<0.0001	0.0007	0.066	<0.0001	---	0.0153	<0.0001	0.0402	0.00175	---	<0.0004	0.94	<0.0002	0.127	---	<0.0005	<0.0002	0.00033	<0.0001	0.00015	0.008				
GWN-08-43	02-Aug-14	16053140802006	Dissolved	0.0381	0.00123	0.00158	0.0428	<0.0005	0.931	0.000016	<0.0001	0.00023	0.00023	0.108	0.000079	0.0382	0.0195	<0.00005	0.0338	0.00392	---	<0.0001	1	<0.00001	0.077	---	<0.0005	<0.0001	0.00052	0.000598	0.00036	<0.005				
GWN-08-43	02-Aug-14	16053140802006	Total	224	<0.01	0.1	6.24	---	2	0.0206	0.581	---	1.79	1710	1.99	---	31.8	0.000058	---	2.06	---	<0.01	264	0.0058	---	---	---	---	0.0419	---	8.79					
GWN-08-43	02-Nov-14	16053141102025	Dissolved	<0.0005	<0.0004	0.00079	0.0545	---	0.879	<0.0001	<0.0005	---	<0.001	0.506	<0.0001	---	0.0591	<0.00005	---	0.0028	---	<0.0004	2.14	<0.0001	---	---	---	---	<0.0001	---	<0.003					
GWN-08-43	02-Nov-14	16053141102025	Total	3.79	0.00122	0.00448	0.148	---	0.915	0.00032	0.0091	---	0.0356	40.9	0.037	---	0.604	0.000104	---	0.0633	---	<0.0004	11.1	<0.0004	---	---	---	---	---	0.00039	---	0.0728				
GWN-13-26	19-Jul-76	16053760719005	Dissolved	<0.002	---	<0.038	<0.20	<0.001	0.131	<0.002	<0.006	<0.01	0.012	---	<0.088	---	---	---	<0.006	<0.01	<0.110	<0.060	2.42	<0.002	0.26	---	---	<0.045	<0.0009	<0.02	0.009	0.044				
GWN-13-26	19-Jul-76	16053760719007	Dissolved	---	---	---	---	---	---	---	---	---	0.39	---	---	---	1.63	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				
GWN-13-26	19-Jul-76	16053760719005	Total	---	---	<0.038	<0.2	<0.001	---	<0.002	<0.006	<0.01	0.012	---	---	---	1.63	---	<0.006	<0.01	---	<0.06	---	---	0.26	---	---	---	---	---	---	0.044				
GWN-13-26	08-Sep-09	16053090908002	Dissolved	0.002	<0.0002	0.0012	0.2	<0.001	<0.02	0.000025	<0.001	0.0008	<0.0002	3.1	<0.0002	<0.02	---	0.18	---	0.0018	0.089	<0.1	<0.0002	4.6	<0.0001	0.08	6.4	<0.0002	<0.001	<0.001	0.0007	<0.001	<0.003			
GWN-13-26	18-Nov-10	16053101118004	Dissolved	<0.01	<0.0004	0.00124	0.195	<0.001	<0.05	<0.00005	<0.005	<0.002	0.001	4.76	<0.0001	<0.003	0.114	<0.0001	<0.005	0.0156	---	<0.0004	---	<0.0001	---	---	---	<0.0001	<0.05	<0.001	0.00044	<0.001	0.0097			
GWN-13-26	12-Feb-11	16053110212007	Dissolved	<0.01	<0.0004	0.00134	0.193	<0.001	<0.05	<0.00005	<0.005	<0.002	<0.001	5.35	<0.0001	<0.003	0.0759	<0.0001	<0.005	0.0033	---	<0.0004	---	<0.0001	---	---	---	<0.0001	<0.05	0.0011	0.00049	<0.001	<0.002			
GWN-13-26	26-Aug-13	16053130826023	Dissolved	<0.01	<0.0004	0.00091	0.118	<0.0005	0.0096	<0.0001	<0.0004	<0.0001	<0.0006	9.7	0.00011	---	0.265	<0.0001	0.00054	0.0012	---	<0.0004	2.44	<0.0002	0.0711	---	<0.0005	<0.0002	<0.0003	0.00011	<0.0001	0.0075				
GWN-13-26	23-Nov-13	16053131123012	Dissolved	<0.001	<0.0004	0.00094	0.155	<0.0005	0.0099	<0.0001	<0.0004	0.00092	<0.0006	1.86	<0.0001	---	0.172	<0.00002	0.00064	0.0167	---	<0.0004	3.96	<0.00001	0.0748	---	<0.0005	<0.0002	<0.0003	0.000572	<0.0001	0.0066				
GWN-13-26	07-Aug-14	16053140807036	Dissolved	<0.005	<0.0004	0.00057	0.136	---	<0.05	<0.0001	<0.005	---	<0.001	2.92	<0.0001	---	0.249	<0.00005	---	0.0026	---	<0.0004	3.22	<0.0001	---	---	---	---	0.00021	---	0.0038					
GWN-13-26	07-Aug-14	16053140807036	Total	0.287	<0.0004	0.00225	0.15	---	<0.05	<0.0002	<0.005	---	0.0176	16.8	0.0392	---	0.385	0.0000067	---	0.0201	---	<0.0004	3.7	<0.0004	---	---	---	---	0.00028	---	0.105					
GWN-13-26	28-Oct-14	16053141028002	Dissolved	<0.005	<0.0004	0.00048	0.112	---	<0.05	<0.0001	<0.005	---	<0.001	3.61	<0.0001	---	0.261	<0.00005	---	<0.002	---	<0.0004	2.22	<0.0001	---	---	---	---	<0.0001	---	0.0033					
GWN-13-26	28-Oct-14	16053141028002	Total	0.197	0.00041	0.00468	0.111	---	<0.050	<0.0002	0.0121	---	0.0495	30.7	0.0521	---	0.513	<0.00005	---	0.0232	---	<0.0004	2.09	<0.0004	---	---	---	---	0.00012	---	0.116					
GWN-14-32	15-Jul-76	16053760715003	Dissolved	0.22	---	<0.038	<0.20	<0.001	0.554	<0.002	<0.006	<0.01	<0.0004	---	<0.088	---	---	---	<0.006	<0.01	<0.110	<0.060	2.65	<0.002	1.17	---	---	<0.045	<0.0009	<0.02	0.006	0.088				
GWN-14-32	15-Jul-76	16053760715005	Dissolved	0.22	---	<0.038	<0.20	0.003	0.518	<0.002	<0.006	<0.01	0.013	1.64	<0.088	---	0.338	---	<0.006	<0.01	<0.110	<0.060	2.5	<0.002	1.08	---	---	<0.045	0.003	<0.02	0.013	0.099				
GWN-14-32	15-Jul-76	16053760715003	Total	---	---	<0.038	<0.2	<0.001	---	<0.002	<0.006	<0.01	<0.0004	---	---	---	0.338	---	<0.006	<0.01	---	<0.06	---	---	1.17	---	---	---	---	---	0.088					
GWN-14-32	14-Sep-09	16053090914001	Dissolved	<0.001	<0.0002	<0.0002	0.03	<0.001	0.45	0.000008	<0.001	0.0004	0.0003	21	<0.0002	0.18	---	---	<0.0002	0.0016	<0.1	0.0006	3.9	<0.0001	1.9	91	<0.0002	<0.001	<0.001	0.0004	<0.001	0.01				
GWN-14-32	16-Feb-11	16053110216003	Dissolved	---	---	---	---	---	---	---	---	---	59.2	---	---	---	1.14	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				
GWN-14-32	19-Feb-11	16053110219001	Dissolved	<0.01	<0.0004	0.00098	0.0201	<0.001	0.227	<0.00005	<0.005	0.002	<0.001	---	<0.0001	0.105	---	<0.0001	<0.005	0.0126	---	<0.0004	---	<0.0001	---	---	<0.0001	<0.05	<0.001	<0.001	<0.001	0.0052				
GWN-14-32	24-Aug-13	16053130824016	Dissolved	<0.01	<0.0004	<0.0004	0.00579	<0.001	0.272	<0.0001	<0.0004	<0.0002	<0.0006	7.63	<0.0001	---	1.08	<0.0001	<0.0001	0.00044	---	<0.0004	0.2	<0.0002	0.388	---	<0.0001	<0.0002	<0.0006							

TABLE 7.

GROUNDWATER QUALITY RESULTS - METALS

Alberta Environment and Sustainable Resource Development

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Table with columns for Monitoring Well, Sample Date, MSI Sample Number, Total or Dissolved, and concentrations of 28 metals (Al, Sb, As, Ba, Be, B, Cd, Cr, Co, Cu, Fe, Pb, Li, Mn, Hg, Mo, Ni, P, Se, Si, Ag, Sr, S, Tl, Sn, Ti, U, V, Zn) in mg/L. Includes summary rows for GMF Interim Quality Triggers and Alberta Tier 1 - Natural Areas.

TABLE 7.
GROUNDWATER QUALITY RESULTS - METALS
 Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Total or Dissolved	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	B mg/L	Cd mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mn mg/L	Hg mg/L	Mo mg/L	Ni mg/L	P mg/L	Se mg/L	Si mg/L	Ag mg/L	Sr mg/L	S mg/L	Tl mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L				
Surficial Sands																																				
IOR-KRL-06 (SS)	24-Jan-09	16053090124001	Dissolved	0.007	<0.0002	<0.0002	0.08	<0.001	0.07	<0.00001	<0.001	0.0023	0.0017	1.5	0.0005	0.03	0.4	0.000002	0.0073	0.0028	<0.1	<0.0002	6.9	<0.0001	0.26	13	0.0003	<0.001	<0.001	0.0009	<0.001	0.01				
IOR-KRL-06 (SS)	24-Jan-09	16053090124001	Total	0.43	<0.0002	0.0049	0.1	<0.001	0.04	0.00032	0.004	0.0027	0.0044	2.9	0.0017	<0.02	0.37	0.000008	0.002	0.0037	0.2	<0.0002	8.7	<0.0001	0.19	4.6	0.0003	<0.001	0.014	0.0004	0.004	0.017				
IOR-KRL-06 (SS)	21-Aug-10	16053100821002	Dissolved	0.059	<0.0002	<0.0002	0.07	<0.001	0.02	<0.00003	0.002	0.0006	<0.0002	4.9	<0.0002	<0.02	0.25	0.000004	<0.0002	0.0007	0.2	<0.0002	---	<0.0001	0.16	2.5	<0.0002	<0.001	0.003	<0.0001	0.003	0.012				
IOR-KRL-06 (SS)	21-Aug-10	16053100821002	Total	0.55	<0.0002	0.0009	0.08	<0.001	0.03	<0.00003	0.005	0.0016	0.0011	6.5	0.0006	<0.02	0.31	0.000003	0.0004	0.0028	0.2	<0.0002	---	<0.0001	0.18	1.3	<0.0002	<0.001	0.014	0.0001	0.005	0.013				
IOR-KRL-06 (SS)	12-Oct-10	16053101012001	Dissolved	0.032	<0.0002	0.0005	0.07	<0.001	<0.02	<0.00003	0.002	0.0006	0.0008	5.9	<0.0002	<0.02	0.3	<0.000002	0.021	<0.0005	0.3	<0.0002	---	<0.0001	0.17	1.8	<0.0002	<0.001	0.003	<0.0001	0.006	<0.003				
IOR-KRL-06 (SS)	12-Oct-10	16053101012001	Total	4.1	<0.0002	0.0052	0.08	<0.001	<0.02	<0.00016	0.031	0.0091	0.0087	7.8	<0.0002	<0.02	0.34	0.000006	0.0038	0.015	0.2	<0.0002	---	<0.0001	0.18	1.3	<0.0002	<0.001	0.13	0.0008	0.038	0.024				
IOR-KRL-06 (SS)	24-Jul-11	16053110724001	Dissolved	0.039	<0.0006	0.0003	0.07	<0.001	0.02	<0.00003	0.002	0.0005	<0.0002	5.6	<0.0002	<0.02	0.28	<0.000002	<0.0002	<0.0005	---	<0.0002	6.7	<0.0001	0.16	4.1	<0.0002	<0.001	0.003	<0.0001	0.004	<0.003				
IOR-KRL-06 (SS)	24-Jul-11	16053110724001	Total	0.85	<0.006	<0.002	0.07	<0.01	0.03	<0.00005	<0.01	<0.003	<0.002	6.7	<0.002	<0.02	0.3	0.000008	<0.002	<0.005	---	<0.002	8.2	<0.001	0.17	1.2	<0.002	<0.01	0.03	<0.001	<0.01	<0.03				
IOR-KRL-06 (SS)	29-Sep-11	16053110929003	Dissolved	2.8	<0.0006	0.0043	0.06	<0.001	0.03	0.00085	0.01	0.0058	0.0043	5.1	0.016	<0.02	0.24	<0.000002	<0.0002	0.011	---	<0.0002	6.8	<0.0001	0.15	3.6	0.0003	<0.001	0.029	0.0009	0.019	0.056				
IOR-KRL-06 (SS)	29-Sep-11	16053110929003	Total	14	<0.006	0.013	0.18	<0.01	0.05	0.00097	0.05	0.027	0.034	37	0.028	0.03	0.7	0.000008	0.003	0.052	---	<0.002	29	<0.001	0.27	16	<0.002	<0.01	0.7	0.002	0.06	0.1				
IOR-KRL-06 (SS)	12-Jul-12	16053120712001	Dissolved	0.03	<0.0006	0.00046	0.064	<0.001	0.024	<0.000005	0.002	0.00032	<0.0002	6.7	<0.0002	<0.02	0.28	<0.000002	<0.0002	<0.0005	---	0.0014	7.7	<0.0001	0.15	1.4	<0.0002	<0.001	0.0024	<0.0001	0.0053	<0.003				
IOR-KRL-06 (SS)	12-Jul-12	16053120712002	Dissolved	0.03	<0.0006	0.00048	0.065	<0.001	0.024	<0.000005	0.0019	0.00033	0.00068	6.8	<0.0002	<0.02	0.29	<0.000002	<0.0002	<0.0005	---	0.0016	7.8	<0.0001	0.15	1.4	<0.0002	<0.001	0.0035	<0.0001	0.0051	<0.003				
IOR-KRL-06 (SS)	12-Jul-12	16053120712001	Total	4.7	<0.0006	0.0046	0.12	<0.001	0.032	0.00031	0.017	0.0089	0.0092	16	0.0079	<0.02	0.56	0.000016	0.0014	0.016	---	0.00027	17	<0.0001	0.23	4.4	<0.0002	<0.001	0.1	0.0008	0.019	0.04				
IOR-KRL-06 (SS)	12-Jul-12	16053120712002	Total	1.7	<0.0006	0.0026	0.1	<0.001	0.028	0.00025	0.0086	0.0032	0.0026	11	0.0053	<0.02	0.53	0.000018	0.00053	0.0063	---	<0.0002	10	<0.0001	0.22	1.2	<0.0002	<0.001	0.037	0.00049	0.013	0.024				
IOR-KRL-06 (SS)	21-Oct-12	16053121021003	Dissolved	0.056	<0.0006	0.0013	0.07	<0.001	0.022	0.000019	0.0015	0.00056	0.0025	5.9	0.00036	<0.02	0.24	0.0000038	0.0052	0.00064	---	0.0011	8	<0.0001	0.15	4.8	<0.0002	<0.001	0.003	<0.0001	0.0043	0.0049				
IOR-KRL-06 (SS)	21-Oct-12	16053121021003	Total	29	0.00061	0.035	0.47	0.0038	0.073	0.0029	0.11	0.076	0.087	110	0.074	0.068	2.3	0.00024	0.0069	0.14	---	0.0022	64	0.00059	0.68	56	0.0018	0.0021	0.4	0.0047	0.11	0.27				
IOR-KRL-07	27-Jan-09	16053090127001	Dissolved	0.004	<0.0002	0.0004	0.12	<0.001	0.16	<0.00001	<0.001	0.001	<0.0002	4.5	0.0006	0.02	0.82	<0.000001	0.0067	0.0012	<0.1	<0.0002	6.7	<0.0001	0.38	6.9	0.0002	<0.001	<0.001	0.0002	<0.001	<0.003				
IOR-KRL-07	27-Jan-09	16053090127002	Dissolved	0.005	<0.0002	0.0003	0.12	<0.001	0.14	<0.00001	<0.001	0.001	0.0018	4.4	0.0007	0.02	0.82	<0.000001	0.0065	0.0012	---	<0.0002	6.6	<0.0001	0.38	6.8	0.0003	<0.001	<0.001	0.0002	<0.001	0.01				
IOR-KRL-07	27-Jan-09	16053090127001	Total	0.23	0.0003	0.0005	0.12	<0.001	0.13	0.00002	0.001	0.0014	0.0071	4.4	0.001	0.02	0.88	<0.000001	0.0084	0.0016	<0.1	<0.0002	7.2	<0.0001	0.4	9	0.0002	<0.001	0.006	0.0003	<0.001	0.011				
IOR-KRL-07	27-Jan-09	16053090127002	Total	0.19	0.0003	0.0004	0.11	<0.001	0.13	0.00002	0.001	0.0013	0.0088	4.1	0.001	0.02	0.84	<0.000001	0.0075	0.0016	---	<0.0002	6.9	<0.0001	0.39	9.1	0.0002	<0.001	0.008	0.0003	<0.001	0.009				
IOR-KRL-07	21-Aug-10	16053100821003	Dissolved	0.013	<0.0002	<0.0002	0.08	<0.001	0.03	<0.00003	0.001	0.0004	<0.0002	9.9	<0.0002	<0.02	0.39	<0.000002	<0.0002	<0.0005	0.2	<0.0002	---	<0.0001	0.15	0.8	<0.0002	<0.001	0.001	<0.0001	<0.001	0.005				
IOR-KRL-07	21-Aug-10	16053100821003	Total	0.46	<0.0002	0.0004	0.09	<0.001	0.03	<0.00003	0.007	0.0009	0.0009	11	0.0004	<0.02	0.4	<0.000002	0.0015	0.0031	0.2	<0.0002	---	<0.0001	0.15	0.6	<0.0002	<0.001	0.013	0.0002	0.002	0.007				
IOR-KRL-07	12-Oct-10	16053101012002	Dissolved	0.008	<0.0002	0.0003	0.08	<0.001	<0.02	<0.00003	0.001	<0.0003	0.0009	8.3	<0.0002	<0.02	0.29	<0.000002	0.041	<0.0005	0.2	<0.0002	---	<0.0001	0.14	0.4	<0.0002	<0.001	0.001	0.0002	0.003	<0.003				
IOR-KRL-07	12-Oct-10	16053101012002	Total	1.5	0.0009	0.0015	0.08	<0.001	0.02	0.00006	0.015	0.0026	0.0037	8.6	0.0013	<0.02	0.29	0.000004	0.0041	0.0048	0.2	<0.0002	---	<0.0001	0.14	0.5	0.0003	0.001	0.049	0.0004	0.015	0.009				
IOR-KRL-07	24-Jul-11	16053110724002	Dissolved	0.012	<0.0006	<0.0002	0.06	<0.001	0.03	<0.00003	<0.001	<0.0003	<0.0002	5.6	<0.0002	<0.02	0.2	<0.000002	<0.0002	<0.0005	---	<0.0002	5.9	<0.0001	0.13	0.5	<0.0002	<0.001	0.002	0.0001	0.002	<0.003				
IOR-KRL-07	24-Jul-11	16053110724002	Total	1.7	<0.006	<0.002	0.07	<0.01	0.03	<0.00005	<0.01	<0.003	<0.002	6.4	<0.002	<0.02	0.21	0.000007	<0.002	<0.005	---	<0.002	6.9	<0.001	0.13	0.6	<0.002	<0.01	0.08	<0.001	<0.01	<0.03				
IOR-KRL-07	29-Sep-11	16053110929004	Dissolved	0.97	<0.0006	0.0051	0.06	<0.001	0.03	0.00019	0.011	0.0073	0.0012	5.8	0.0043	<0.02	0.19	<0.000002	0.0009	<0.0005	---	<0.0002	5.7	<0.0001	0.13	0.4	<0.0002	<0.001	0.016	0.0008	0.009	0.02				
IOR-KRL-07	29-Sep-11	16053110929004	Total	11	<0.01	0.009	0.11	<0.02	0.04	0.0002	0.04	0.014	0.022	16	0.009	0.02	0.35	0.000019	<0.004	0.03	---	<0.004	13	<0.002	0.16	3.7	<0.004	<0.02	0.4	<0.002	0.03	<0.06				
IOR-KRL-07	11-Jul-12	16053120711001	Dissolved	0.015	<0.0006	0.00055	0.067	<0.001	0.029	0.000007	<0.001	<0.0003	<0.0002	5.4	<0.0002	<0.02	0.32	<0.000002	0.00026	<0.0005	---	<0.0002	6.9	<0.0001	0.14	0.36	<0.0002	<0.001	0.0014	<0.0001	0.0023	<0.003				
IOR-KRL-07	11-Jul-12	16053120711001	Total	3.4	<0.0006	0.0061	0.11	<0.001	0.04	0.00021	0.021	0.0087	0.0065	11	0.0065	<0.02	0.3	<0.000002	0.003	0.017	---	0.00025	12	<0.0001	0.16	2.3	<0.0002	<0.001	0.065	0.0012	0.015	0.034				
IOR-KRL-07	21-Oct-12	16053121021004	Dissolved	0.015	<0.0006																															

TABLE 7.
GROUNDWATER QUALITY RESULTS - METALS
 Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Total or Dissolved	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	B mg/L	Cd mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mn mg/L	Hg mg/L	Mo mg/L	Ni mg/L	P mg/L	Se mg/L	Si mg/L	Ag mg/L	Sr mg/L	S mg/L	Tl mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L				
Surficial Sands																																				
IOR-KRL-09	13-Jul-12	16053120713001	Dissolved	0.0031	<0.0006	<0.0002	0.13	<0.001	<0.02	<0.000005	<0.001	<0.0003	<0.0002	0.28	<0.0002	<0.02	<u>0.16</u>	<0.000002	0.00024	<0.0005	---	<0.0002	5.1	<0.0001	0.096	1.3	<0.0002	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.003			
IOR-KRL-09	13-Jul-12	16053120713001	Total	<u>0.82</u>	<0.0006	0.00025	0.14	<0.001	<0.02	0.000021	<u>0.0023</u>	<0.0003	0.00077	<u>0.72</u>	0.00044	<0.02	<u>0.16</u>	0.0000021	0.00065	0.00077	---	<0.0002	5.6	<0.0001	0.096	1.3	<0.0002	<0.001	0.025	0.00013	0.0017	<0.003				
IOR-KRL-09	23-Oct-12	16053121023004	Dissolved	0.063	<0.0006	<0.0002	0.12	<0.001	<0.02	<0.000005	<0.001	<0.0003	0.0019	<u>0.24</u>	<0.0002	<0.02	<u>0.16</u>	<0.000002	0.00025	<0.0005	---	<0.0002	5.1	<0.0001	0.096	1.4	<0.0002	<0.001	<0.001	<0.001	<0.001	0.0031				
IOR-KRL-09	23-Oct-12	16053121023005	Dissolved	0.021	<0.0006	<0.0002	0.12	<0.001	0.022	0.0000069	<0.001	<0.0003	0.0019	<u>0.23</u>	<0.0002	<0.02	<u>0.16</u>	<0.000002	0.0002	<0.0005	---	<0.0002	4.9	<0.0001	0.093	1.3	<0.0002	<0.001	<0.001	<0.0001	<0.001	<0.003				
IOR-KRL-09	23-Oct-12	16053121023004	Total	0.099	0.0016	<0.0002	0.13	<0.001	0.022	0.000012	<0.001	<0.0003	0.00039	<u>0.39</u>	<0.0002	<0.02	<u>0.16</u>	<0.000002	0.00044	<0.0005	---	0.00022	5.1	<0.0001	0.095	1.3	<0.0002	<0.001	0.0031	<0.0001	<0.001	0.0031				
IOR-KRL-09	23-Oct-12	16053121023005	Total	<u>0.22</u>	<0.0006	<0.0002	0.12	<0.001	0.02	0.000019	<u>0.0025</u>	<0.0003	0.00058	<u>0.42</u>	0.0003	<0.02	<u>0.16</u>	<0.000002	0.00035	<0.0005	---	<0.0002	5	<0.0001	0.093	1.3	<0.0002	<0.001	0.0078	<0.0001	0.001	0.0052				
IOR-KRL-10	10-Feb-11	16053110210001	Dissolved	0.026	<0.0002	0.0006	0.12	<0.001	0.23	<0.000005	0.001	<0.0003	0.0005	<u>7.3</u>	<0.0002	0.03	<u>0.43</u>	<0.000002	0.0002	<0.0005	---	<0.0002	6.5	<0.0001	0.41	1	<0.0002	<0.001	0.002	0.0003	0.003	0.006				
IOR-KRL-10	10-Feb-11	16053110210001	Total	0.073	<0.001	0.0007	0.14	<0.001	0.25	0.000008	<u>0.004</u>	0.0003	0.0005	<u>9.2</u>	<0.0002	0.03	<u>0.48</u>	<0.000002	0.0007	0.0015	---	<0.0002	7.4	<0.0001	0.44	1	<0.0002	<0.001	0.005	0.0004	0.003	<0.003				
IOR-KRL-10	21-Jul-11	16053110721001	Dissolved	0.04	<0.006	<0.002	0.13	<0.01	0.26	<0.00005	<0.01	<0.003	<0.002	<u>7.1</u>	<0.002	0.03	<u>0.42</u>	0.000003	<0.002	<0.005	---	<0.002	6.5	<0.001	0.44	0.8	<0.002	<0.01	<0.01	<0.001	<0.01	<0.03				
IOR-KRL-10	21-Jul-11	16053110721002	Dissolved	0.04	<0.006	<0.002	0.13	<0.01	0.26	<0.00005	<0.01	<0.003	<0.002	<u>7.1</u>	<0.002	0.03	<u>0.42</u>	0.000002	<0.002	<0.005	---	<0.002	6.5	<0.001	0.45	0.8	<0.002	<0.01	<0.01	<0.001	<0.01	<0.03				
IOR-KRL-10	21-Jul-11	16053110721001	Total	<u>0.95</u>	<0.006	0.003	0.14	<0.01	0.26	0.000016	<0.01	<0.003	0.007	<u>19</u>	<0.002	0.03	<u>0.57</u>	0.000004	<0.002	<0.005	---	<0.002	8.1	<0.001	0.45	6.9	<0.002	<0.01	0.04	<0.001	<0.01	<0.03				
IOR-KRL-10	21-Jul-11	16053110721002	Total	<u>0.6</u>	<0.006	0.003	0.14	<0.01	0.26	0.000018	<0.01	<0.003	0.006	<u>19</u>	<0.002	0.03	<u>0.58</u>	<0.000002	<0.002	<0.005	---	<0.002	8.1	<0.001	0.45	6.6	<0.002	<0.01	0.03	<0.001	<0.01	<0.03				
IOR-KRL-10	28-Sep-11	16053110928001	Dissolved	0.028	<0.0006	<0.0002	0.13	<0.001	0.25	0.000008	0.001	<0.0003	0.0006	<u>7.6</u>	<0.0002	0.03	<u>0.44</u>	<0.000002	<0.0002	<0.0005	---	<0.0002	7.4	<0.0001	0.46	0.8	<0.0002	<0.001	0.002	0.0001	0.003	<0.003				
IOR-KRL-10	28-Sep-11	16053110928001	Total	<u>0.15</u>	<0.0006	0.0014	0.13	<0.001	0.26	0.000079	<u>0.002</u>	0.0004	0.0024	<u>9.8</u>	0.0004	0.03	<u>0.49</u>	<0.000003	<0.0002	0.0007	---	<0.0002	7.5	<0.0001	0.46	0.8	<0.0002	<0.001	0.007	0.0001	0.004	0.006				
IOR-KRL-10	17-Aug-12	16053120817003	Dissolved	0.021	<0.0006	0.00038	0.14	<0.001	0.29	0.0000097	<u>0.0012</u>	0.00045	0.00034	<u>10</u>	<0.0002	0.032	<u>0.51</u>	<0.000002	0.00034	<0.0005	---	0.00074	7	<0.0001	0.48	2.1	<0.0002	<0.001	0.0022	<0.0001	0.0023	<u>0.085</u>				
IOR-KRL-10	17-Aug-12	16053120817003	Total	<u>2</u>	0.00088	<u>0.0074</u>	0.19	<0.001	0.27	0.000012	<u>0.014</u>	0.005	<u>0.01</u>	<u>62</u>	0.0064	0.035	<u>1.2</u>	<0.000002	0.0018	0.013	---	<0.0002	9.6	<0.0001	0.51	25	<0.0002	0.0013	0.084	0.00098	0.018	<u>0.066</u>				
IOR-KRL-10	18-Oct-12	16053121018001	Dissolved	0.027	<0.0006	<0.0002	0.14	<0.001	0.31	0.000008	<u>0.0011</u>	<0.0003	0.00064	<u>7.7</u>	<0.0002	0.035	<u>0.45</u>	<0.000002	0.00084	<0.0005	---	<0.0002	7.6	<0.0001	0.48	0.83	<0.0002	<0.001	0.0022	<0.0001	0.0024	<0.003				
IOR-KRL-10	18-Oct-12	16053121018001	Total	<u>0.6</u>	<0.0006	0.0025	0.15	<0.001	0.3	0.000063	<u>0.0049</u>	0.0017	0.0054	<u>22</u>	0.002	0.038	<u>0.63</u>	<u>0.0000074</u>	0.00076	0.0049	---	<0.0002	8.7	<0.0001	0.49	7.9	<0.0002	<0.001	0.028	0.00027	0.0068	0.019				
IOR-KRL-11	11-Feb-11	16053110211001	Dissolved	0.004	<0.0002	<0.0002	0.06	<0.001	0.04	<0.000005	<0.001	<0.0003	<0.0002	<u>1.5</u>	<0.0002	<0.02	<u>0.12</u>	<0.000002	<0.0002	<0.0005	---	<0.0002	5.8	<0.0001	0.12	1.2	<0.0002	<0.001	<0.001	<0.0001	<0.001	<0.003				
IOR-KRL-11	11-Feb-11	16053110211001	Total	0.012	<0.0002	0.0002	0.07	<0.001	0.04	<0.000005	0.001	<0.0003	0.0002	<u>1.5</u>	<0.0002	<0.02	<u>0.12</u>	0.000003	<0.0002	<0.0005	---	<0.0002	5.6	<0.0001	0.13	1.2	<0.0002	<0.001	0.001	<0.0001	<0.001	<0.003				
IOR-KRL-11	18-Jul-11	16053110718002	Dissolved	0.003	<0.0006	<0.0002	0.07	<0.001	0.04	0.000044	<0.001	<0.0003	0.0008	<u>0.28</u>	<0.0002	<0.02	<u>0.13</u>	0.000002	<0.0002	0.0011	---	<0.0002	5.4	<0.0001	0.15	2.7	<0.0002	<0.001	<0.001	0.0003	<0.001	0.007				
IOR-KRL-11	18-Jul-11	16053110718002	Total	<u>8</u>	<0.0006	<u>0.0053</u>	0.27	0.002	0.06	0.000034	<u>0.018</u>	0.0059	<u>0.018</u>	<u>18</u>	<u>0.044</u>	0.03	<u>0.45</u>	<u>0.00016</u>	0.0008	0.012	---	0.0005	23	<u>0.0002</u>	0.2	2.4	<0.0002	0.001	0.32	0.0075	0.027	<u>0.068</u>				
IOR-KRL-11	23-Sep-11	16053110923002	Dissolved	0.002	<0.0006	<0.0002	0.07	<0.001	0.04	0.000014	<0.001	<0.0003	<0.0002	0.08	<0.0002	<0.02	<u>0.13</u>	<0.000002	<0.0002	0.0011	---	<0.0002	5.2	<0.0001	0.13	1.1	<0.0002	<0.001	<0.001	0.0002	<0.001	0.007				
IOR-KRL-11	23-Sep-11	16053110923002	Total	<u>16</u>	0.0011	<u>0.009</u>	0.39	0.003	0.07	<u>0.00047</u>	<u>0.026</u>	0.01	<u>0.032</u>	<u>35</u>	<u>0.056</u>	0.04	<u>0.81</u>	<u>0.000015</u>	0.0008	0.025	---	0.0008	34	<0.0001	0.25	3.1	0.0004	0.002	0.35	0.0095	0.052	<u>0.095</u>				
IOR-KRL-11	14-Jul-12	16053120714001	Dissolved	0.0036	<0.0006	<0.0002	0.068	<0.001	0.043	<0.000005	<0.001	<0.0003	0.00025	0.2	<0.0002	<0.02	<u>0.12</u>	<0.000002	<0.0002	<0.0005	---	<u>0.0017</u>	6.3	<0.0001	0.14	1.7	<0.0002	<0.001	<0.001	<0.0001	<0.001	<0.003				
IOR-KRL-11	14-Jul-12	16053120714001	Total	<u>3.6</u>	<0.0006	0.0019	0.14	0.001	0.049	0.000014	<u>0.0056</u>	0.0018	0.0066	<u>6.5</u>	<u>0.014</u>	<0.02	<u>0.21</u>	<u>0.000017</u>	0.00052	0.0041	---	<0.0002	15	<u>0.00015</u>	0.15	1.4	<0.0002	<0.001	0.17	0.0025	0.0081	0.029				
IOR-KRL-11	14-Oct-12	16053121014006	Dissolved	0.0042	<0.0006	<0.0002	0.061	<0.001	0.041	0.000009	<0.001	<0.0003	0.00026	<u>0.31</u>	<0.0002	<0.02	<u>0.11</u>	<0.000002	<0.0002	<0.0005	---	0.00083	5.6	<0.0001	0.12	0.69	<0.0002	<0.001	<0.001	<0.0001	<0.001	<0.003				
IOR-KRL-11	14-Oct-12	16053121014006	Total	<u>1.1</u>	<0.0006	0.00084	0.11	0.0013	0.047	0.000022	<u>0.0016</u>	0.00094	0.0026	<u>3.5</u>	<u>0.019</u>	<0.02	<u>0.36</u>	<u>0.00003</u>	<0.0002	0.0026	---	<0.0002	9.3	<0.0001	0.16	0.72	<0.0002	<0.001	0.04	0.002	0.0041	0.02				
TOT-EP-02 (SS)	15-Oct-10	16053101015002	Dissolved	<0.01	<0.0004	<0.0004	0.107	<0.001	0.079	0.000271	<0.005	<0.002	<0.001	<u>4.33</u>	<0.0001	0.0272	<u>0.273</u>	<0.0001	<0.005	<0.002	---	<0.0004														

TABLE 7.

GROUNDWATER QUALITY RESULTS - METALS

Alberta Environment and Sustainable Resource Development

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Total or Dissolved	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	B mg/L	Cd mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mn mg/L	Hg mg/L	Mo mg/L	Ni mg/L	P mg/L	Se mg/L	Si mg/L	Ag mg/L	Sr mg/L	S mg/L	Tl mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L					
Clearwater Formation																																					
AGS-02-108	09-Oct-96	16053961009001	Dissolved	0.698	<0.005	0.02	0.032	<0.0005	1.78	0.0005	0.0039	0.0018	0.062	0.46	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				
AGS-02-108	24-Oct-12	16053121024006	Dissolved	0.1	<0.0015	0.0073	0.078	<0.0025	1.8	0.000022	<0.0025	0.0029	0.0022	1.1	0.00063	0.16	0.058	<0.000005	0.0077	0.0025	1.5	0.00092	---	---	---	---	---	---	---	---	---	---	---				
AGS-02-108	23-Aug-13	16053130823014	Total	<0.02	<0.0005	0.00329	0.0619	<0.0025	2.02	<0.0002	<0.0008	<0.0005	<0.001	1.62	<0.00025	---	0.0833	<0.0001	0.00388	0.00068	---	<0.0005	4.78	<0.0004	0.545	---	<0.00025	<0.0005	<0.005	0.0067	0.0002	<0.0005	<0.015				
AGS-02-108	28-Nov-13	16053131128024	Dissolved	0.0086	<0.0005	0.0033	0.0865	<0.0025	2.22	<0.0001	<0.0005	<0.0005	0.00207	2.83	<0.00025	---	0.0768	<0.00002	0.00363	0.00073	---	<0.0005	4.67	<0.00005	0.403	---	<0.00025	<0.0005	<0.0015	0.000104	<0.0005	0.0193					
AGS-02-108	06-Aug-14	16053140806032	Dissolved	0.0121	0.00081	0.00378	0.195	---	3.13	<0.0001	<0.005	---	<0.001	0.091	<0.00025	---	0.0418	<0.000005	---	<0.002	---	<0.0005	3.88	<0.0001	---	---	---	---	---	0.00015	---	0.0072					
AGS-02-108	06-Aug-14	16053140806032	Total	139	0.00093	0.168	2.93	---	2.87	0.00686	0.235	---	0.419	337	0.313	---	6.36	0.00044	---	0.426	---	0.0093	---	0.00283	---	---	---	---	---	0.0298	---	1.52					
AGS-03-30	09-Oct-96	16053961009014	Dissolved	---	---	---	---	---	---	---	---	---	---	<0.04	---	---	0.194	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				
AGS-03-30	17-Sep-09	16053090917002	Dissolved	0.006	0.0015	0.0033	0.03	<0.001	2.1	0.000027	<0.001	<0.0003	0.0025	<0.06	<0.0002	0.16	0.12	---	0.0021	0.0015	0.2	0.0003	3.7	<0.0001	0.94	80	<0.0002	<0.001	<0.001	0.0001	0.001	0.008					
AGS-03-30	20-Nov-10	16053101120002	Dissolved	<0.01	<0.0004	<0.0004	0.0224	<0.001	1.61	<0.00005	<0.005	<0.002	0.0012	0.015	<0.0001	0.156	0.0815	<0.0001	<0.005	<0.002	---	<0.0004	---	<0.0001	---	---	<0.0001	<0.05	<0.001	<0.0001	<0.001	0.0047					
AGS-03-30	16-Feb-11	16053110216005	Dissolved	<0.01	<0.0004	0.00045	0.0282	<0.001	1.52	<0.00005	<0.005	<0.002	<0.001	0.385	<0.0001	0.138	0.11	<0.0001	<0.005	<0.002	---	<0.0004	---	<0.0001	---	---	<0.0001	<0.05	<0.001	<0.0001	<0.001	<0.002					
AGS-03-30	06-Aug-14	16053140806027	Dissolved	<0.005	0.00058	0.00094	0.031	---	1.86	<0.0001	<0.005	---	<0.001	0.083	<0.0001	---	0.115	<0.000005	---	0.0038	---	<0.0004	4.1	<0.0001	---	---	---	---	---	<0.0001	---	0.005					
AGS-03-30	06-Aug-14	16053140806027	Total	0.702	<0.0004	0.00209	0.0451	---	1.86	<0.0002	<0.005	---	0.0027	1.69	0.00121	---	0.151	0.0000076	---	0.0045	---	<0.0004	5.64	<0.0004	---	---	---	---	---	0.00019	---	0.0121					
AGS-03-30	30-Oct-14	16053141030009	Dissolved	<0.005	0.001	0.00205	0.036	---	2.11	<0.0001	<0.005	---	<0.001	0.102	<0.0001	---	0.154	0.0000106	---	0.0072	---	<0.0004	3.96	<0.0001	---	---	---	---	0.00027	---	<0.003						
AGS-03-30	30-Oct-14	16053141030009	Total	14.9	0.0008	0.0187	0.178	---	2.29	0.00076	0.0338	---	0.0554	26.4	0.0187	---	0.44	0.0000456	---	0.0544	---	0.00133	27.3	<0.0004	---	---	---	---	0.00248	---	0.003						
GWN-08-45	06-Mar-75	16053750306001	Total	---	---	<0.01	0.01	---	---	---	---	---	0.01	---	---	---	---	---	---	0.02	---	---	---	---	---	---	---	---	---	---	---	---	---				
GWN-08-45	17-Jul-76	16053760717001	Total	---	---	<0.038	<0.2	<0.001	---	<0.002	<0.006	<0.01	0.012	---	---	0.002	---	<0.006	<0.01	---	<0.06	---	---	0.16	---	---	---	---	---	---	---	0.022					
GWN-08-45	30-Sep-09	16053090930002	Dissolved	0.012	<0.001	<0.001	0.01	<0.005	0.72	0.00007	<0.005	<0.002	<0.001	0.19	<0.001	0.02	0.004	---	0.01	0.006	0.1	<0.001	0.5	<0.0005	0.04	<0.2	<0.001	<0.005	<0.005	<0.0005	<0.005	<0.02					
GWN-08-45	20-Oct-12	16053121020003	Dissolved	0.015	<0.0015	<0.0005	0.069	<0.0025	3.7	<0.000013	<0.0025	<0.00075	<0.0005	0.38	<0.0005	0.12	0.0061	<0.000002	0.00073	<0.0013	0.48	<0.0005	3.1	<0.00025	0.2	1.4	<0.0005	<0.0025	<0.0025	<0.00025	<0.0025	0.012					
GWN-08-45	17-Sep-13	16053130917029	Dissolved	<0.01	<0.0005	<0.0005	0.0496	<0.0025	---	<0.0001	0.00057	<0.0005	<0.00175	<0.05	<0.00025	---	0.0057	<0.0001	0.00338	0.00903	---	<0.0005	2.58	<0.0002	0.162	---	<0.00025	<0.0005	<0.0015	<0.0001	<0.0005	0.0139					
GWN-08-45	02-Aug-14	16053140802007	Dissolved	0.015	<0.001	0.0013	0.0461	<0.001	3.65	<0.0001	<0.001	<0.001	<0.001	<0.10	<0.0005	0.109	<0.005	<0.000005	0.0097	0.0112	---	<0.001	2.41	<0.0001	0.153	---	<0.0001	<0.001	<0.003	0.0001	0.0033	<0.010					
GWN-08-45	02-Aug-14	16053140802007	Total	16.9	0.00102	0.0208	0.333	---	1.9	0.00021	0.0475	---	0.1	65	0.0343	---	0.505	0.0000097	---	0.188	---	0.00094	32.9	<0.0004	---	---	---	---	---	0.00241	---	0.483					
GWN-08-45	02-Nov-14	16053141102024	Dissolved	0.0081	<0.0005	<0.0005	0.0559	---	3.5	<0.0001	<0.005	---	<0.001	0.089	<0.00025	---	0.0029	<0.000005	---	<0.002	---	<0.0005	2.72	<0.0001	---	---	---	---	---	<0.0001	---	<0.005					
GWN-08-45	02-Nov-14	16053141102024	Total	0.884	<0.0005	0.00153	0.101	---	3.47	<0.0002	0.0097	---	0.0229	6.81	0.0023	---	0.0484	<0.000005	---	0.013	---	<0.0005	4.84	<0.0004	---	---	---	---	---	0.00011	---	0.029					
GWN-14-33	15-Jul-76	16053760715002	Dissolved	<0.002	---	<0.038	<0.20	<0.001	4.05	<0.002	<0.006	<0.01	0.018	---	<0.088	---	---	---	<0.006	<0.01	<0.110	<0.060	3.25	<0.002	1.13	---	---	<0.045	<0.0009	<0.02	<0.0008	0.033					
GWN-14-33	15-Jul-76	16053760715008	Dissolved	---	---	---	---	---	---	---	---	---	0.044	---	---	0.023	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				
GWN-14-33	15-Jul-76	16053760715002	Total	---	---	<0.038	<0.2	<0.001	---	<0.002	<0.006	<0.01	0.018	---	---	0.023	---	<0.006	<0.01	---	<0.06	---	---	1.13	---	---	---	---	---	---	---	0.033					
GWN-14-33	07-Jul-78	16053780707002	Total	---	---	---	---	---	---	---	---	---	0.0019	---	---	0.01	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				
GWN-14-33	24-Aug-13	16053130824017	Dissolved	<0.01	<0.001	<0.001	0.51	<0.005	3.35	<0.0001	<0.001	<0.001	<0.001	<0.10	<0.0005	---	0.0146	<0.0001	0.00172	0.0012	---	<0.001	2.23	<0.0002	0.825	---	<0.0005	<0.001	<0.003	<0.0001	<0.001	0.019					
GWN-14-33	28-Nov-13	16053131128026	Dissolved	0.011	<0.001	<0.001	0.0171	<0.005	2.64	<0.0001	<0.001	<0.001	<0.001	<0.10	<0.0005	---	0.0054	<0.00002	0.00672	<0.001	---	<0.001	<0.5	<0.0001	0.0944	---	<0.0005	<0.001	<0.003	<0.0001	<0.001	0.018					
GWN-14-33	04-Aug-14	16053140804017	Dissolved	0.019	<0.001	<0.001	0.469	---	0.66	<0.0001	<0.005	---	<0.001	<0.10	<0.0005	---	0.0074	<0.000005	---	<0.002	---	<0.001	2.02	<0.0001	---	---	---	---	---	<0.0001	---	<0.010					
GWN-14-33	04-Aug-14	16053140804017	Total	0.075	<0.001	<0.001	0.542	---	3.37	<0.0002	<0.005	---	0.0102	3.09	0.0128	---	0.0553	<0.000005	---	<0.002	---	<0.001	2.35	<0.0004	---	---	---	---	---	<0.0001	---	0.063					
GWN-14-33	31-Oct-14	16053141031016	Dissolved	<0.01	<0.001	<0.001	0.831	---	4.04	<0.0001	<0.005	---	<0.001	<0.1	<0.0005	---	0.0063	<0.000005	---	<0.002	---	<0.001	3.16	<0.0001	---	---	---	---	0.00022	---	<0.01						
GWN-14-33	31-Oct-14	16053141031016	Total	0.113	<0.001	<0.001	0.827	---	3.81	<0.0002	<0.005	---	0.0119	3.66	0.0135	---	0.0667	<0.000005	---	<0.0031	---	<0.001	3.54	<0.0004	---	---	---	---	<0.0001	---	0.07						
Alberta Tier 1 - Natural Areas*				0.005 ^b -0.1 ^{b,A,SW}	0.006 ^{P(MAC)}	0.005 ^A	1 ^{P(MAC)}	NS	1.5 ^A	H ^{A,***}	0.001 ^{A,d,***}	NS	0.007 ^{A,c}	0.3<																							

TABLE 7.
GROUNDWATER QUALITY RESULTS - METALS
 Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Total or Dissolved	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	B mg/L	Cd mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mn mg/L	Hg mg/L	Mo mg/L	Ni mg/L	P mg/L	Se mg/L	Si mg/L	Ag mg/L	Sr mg/L	S mg/L	Tl mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L				
McMurray Formation Basal Aquifer - Aquifer Management Unit 2																																				
GWN-01-75	13-Jul-76	16053760713004	Dissolved	<0.002	---	<0.038	<0.20	<0.001	0.695	<0.002	<0.006	<0.01	1.3	---	<0.088	---	---	---	<0.006	<0.01	<0.110	<0.060	1.59	<0.002	0.481	---	---	<0.045	<0.0009	<0.02	<0.0008	0.044				
GWN-01-75	13-Jul-76	16053760713008	Dissolved	---	---	---	---	---	---	---	---	---	---	0.14	---	---	0.061	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			
GWN-01-75	13-Jul-76	16053760713004	Total	---	---	<0.038	<0.2	<0.001	---	<0.002	<0.006	<0.01	1.3	---	---	---	---	<0.006	<0.01	---	<0.06	---	---	0.481	---	---	---	---	---	---	---	---				
GWN-01-75	13-Dec-10	16053101213001	Dissolved	<0.01	<0.0004	<0.0004	0.527	<0.001	0.482	<0.00005	<0.005	<0.002	<0.001	20.1	<0.0001	0.145	0.34	<0.0001	<0.005	<0.002	---	<0.0004	---	<0.0001	---	<0.0001	<0.05	<0.001	<0.0001	<0.001	<0.001	0.0101				
GWN-01-75	01-Aug-14	16053140801005	Dissolved	<0.005	<0.0004	<0.0004	0.227	---	0.484	<0.0001	<0.005	---	0.0026	1.69	<0.0001	---	0.412	<0.000005	---	<0.002	---	<0.0004	2.69	<0.0001	---	---	---	---	<0.0001	---	0.0254					
GWN-01-75	01-Aug-14	16053140801005	Total	0.0767	0.0007	0.00119	0.426	---	0.309	<0.0002	<0.005	---	0.0076	40.2	<0.0001	---	0.542	<0.000005	---	<0.002	---	<0.0004	4.48	<0.0004	---	---	---	---	<0.0001	---	0.142					
GWN-01-75	04-Nov-14	16053141104034	Dissolved	<0.005	<0.0004	0.00045	0.365	---	0.494	<0.0001	<0.005	---	<0.001	10.9	<0.0001	---	0.409	0.0000255	---	0.0023	---	<0.0004	4.34	<0.0001	---	---	---	---	<0.0001	---	0.018					
GWN-01-75	04-Nov-14	16053141104034	Total	0.256	0.00275	0.00356	0.436	---	0.434	<0.0002	0.0074	---	0.0376	42.9	0.099	---	0.653	0.0000111	---	0.0064	---	<0.0004	5.26	<0.0004	---	---	---	---	<0.0001	---	0.211					
GWN-06-61	16-Jul-76	16053760716002	Dissolved	<0.002	---	<0.038	<0.20	<0.001	2.25	<0.002	<0.006	<0.01	0.018	---	<0.088	---	---	---	<0.006	<0.01	<0.110	<0.060	1.84	<0.002	0.578	---	---	<0.045	<0.0009	<0.02	<0.0008	0.022				
GWN-06-61	16-Jul-76	16053760716007	Dissolved	---	---	---	---	---	---	---	---	---	---	0.088	---	---	0.029	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				
GWN-06-61	16-Jul-76	16053760716002	Total	---	---	<0.038	<0.2	<0.001	---	<0.002	<0.006	<0.01	0.018	---	---	---	0.029	---	<0.006	<0.01	---	<0.06	---	0.578	---	---	---	---	---	---	---	0.022				
GWN-06-61	23-Nov-10	160531012123002	Dissolved	<0.040	<0.0016	<0.0016	0.056	<0.0040	2.16	<0.0002	<0.02	<0.008	<0.0040	0.041	<0.0004	0.299	0.0162	<0.0001	0.028	<0.008	---	<0.0016	---	<0.0004	---	<0.0004	<0.2	<0.0040	<0.0004	<0.0040	<0.008					
GWN-06-61	16-Oct-12	16053121016002	Dissolved	0.036	<0.006	<0.002	0.28	<0.01	2	<0.00005	<0.01	<0.003	<0.002	6.6	<0.002	0.24	0.039	<0.000002	0.0035	<0.005	0.3	<0.002	2	<0.001	1	4	<0.002	<0.01	<0.01	<0.01	<0.01	<0.03				
GWN-06-61	21-Aug-13	16053130821006	Dissolved	0.012	<0.001	<0.001	0.0471	<0.005	1.53	<0.0001	<0.001	<0.001	<0.001	0.21	<0.0005	---	0.0074	<0.00001	0.0413	<0.001	---	<0.0001	1.34	<0.0002	0.466	---	<0.0005	<0.001	<0.003	<0.0001	<0.001	0.028				
GWN-06-61	26-Nov-13	16053131126018	Dissolved	<0.01	<0.001	<0.001	0.359	<0.005	2.19	<0.0001	<0.001	<0.001	<0.001	4.99	<0.0005	---	0.0541	<0.00002	0.00193	<0.001	---	<0.001	2.57	<0.0001	1.11	---	<0.0005	<0.001	<0.003	<0.0001	<0.001	0.013				
GWN-06-61	31-Jul-14	16053140731002	Dissolved	0.001	<0.0001	0.00013	0.396	<0.0005	2.49	<0.0001	<0.0001	0.00015	<0.0001	3.3	<0.00005	0.327	0.0496	<0.000005	0.00125	0.00228	---	<0.0001	3.16	<0.0001	1.24	---	<0.0005	<0.0001	<0.00030	<0.0001	<0.0001	<0.005				
GWN-06-61	31-Jul-14	16053140731002	Total	0.123	0.0012	0.0017	0.416	<0.001	2.19	<0.0001	0.0079	0.006	0.0381	43.5	0.0136	0.283	0.223	<0.000005	0.00345	0.0429	---	<0.001	2.81	<0.0001	1.25	---	<0.0001	0.0017	0.0044	<0.0001	<0.001	0.099				
GWN-06-61	03-Nov-14	16053141103031	Dissolved	<0.01	<0.001	<0.001	0.321	---	2.25	<0.0001	<0.005	---	0.0019	5.4	<0.0005	---	0.0443	<0.000005	---	0.0023	---	<0.001	2.46	<0.0001	---	---	---	---	<0.0001	---	<0.01					
GWN-06-61	03-Nov-14	16053141103031	Total	0.03	<0.001	<0.001	0.36	---	2.5	<0.0002	0.005	---	0.0084	15.2	0.00453	---	0.0719	<0.000005	---	0.0148	---	<0.001	2.43	<0.0004	---	---	---	---	<0.0001	---	<0.030					
GWN-07-56	03-Aug-14	16053140803015	Dissolved	0.0074	<0.0004	<0.0004	<0.005	---	1.29	<0.0001	<0.005	---	0.0111	0.038	<0.0001	---	0.0039	<0.000005	---	<0.002	---	<0.0004	0.063	<0.0001	---	---	---	---	<0.0001	---	<0.003					
GWN-07-56	03-Aug-14	16053140803015	Total	0.0642	0.00062	0.00148	0.0054	---	1.07	<0.0002	0.0071	---	0.0773	14.6	0.00193	---	0.172	<0.000005	---	0.0199	---	<0.0004	0.159	<0.0004	---	---	---	---	<0.0001	---	0.0416					
GWN-07-56	01-Nov-14	16053141101021	Dissolved	<0.005	<0.0004	<0.0004	<0.005	---	1.71	<0.0001	<0.005	<0.0004	0.0015	0.033	0.00051	---	0.0022	<0.000005	---	0.0021	---	<0.0004	1.49	<0.0001	---	---	---	---	<0.0001	---	<0.003					
GWN-07-56	01-Nov-14	16053141101021	Total	0.325	0.00079	0.00138	0.294	---	1.58	<0.0002	<0.005	---	0.0692	17.9	0.00292	---	0.159	<0.000005	---	0.0201	---	<0.0004	2.25	<0.0004	---	---	---	---	<0.0001	---	0.214					
GWN-07-57	18-Jul-76	16053760718004	Dissolved	0.11	---	<0.038	<0.20	<0.001	1.32	<0.002	<0.006	<0.01	<0.0004	---	<0.088	---	---	---	<0.006	<0.01	0.66	<0.060	1.79	<0.002	0.611	---	---	<0.045	<0.0009	<0.02	<0.0008	0.022				
GWN-07-57	18-Jul-76	16053760718005	Dissolved	---	---	---	---	---	---	---	---	---	---	0.066	---	---	0.006	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				
GWN-07-57	18-Jul-76	16053760718004	Total	---	---	<0.038	<0.2	<0.001	---	<0.002	<0.006	<0.01	<0.0004	---	---	0.006	---	<0.006	<0.01	---	<0.06	---	---	0.611	---	---	---	---	---	---	---	0.022				
GWN-07-57	25-Sep-09	16053090925001	Dissolved	0.087	<0.001	<0.001	0.1	<0.005	1.2	0.00004	<0.005	<0.002	<0.001	0.12	<0.001	0.23	0.021	---	<0.001	<0.003	0.1	<0.001	---	<0.0005	1.2	1	<0.001	<0.005	<0.005	<0.0005	<0.005	<0.02				
GWN-07-57	13-Feb-11	16053110213003	Dissolved	0.025	<0.0016	<0.0016	0.128	<0.002	1.72	<0.0002	<0.005	<0.002	<0.0024	0.351	<0.0004	0.314	0.0181	<0.0001	<0.005	<0.002	---	<0.008	---	<0.0004	---	<0.0002	<0.05	<0.0012	<0.0004	<0.001	<0.0040					
GWN-07-57	21-Sep-13	16053130921040	Dissolved	0.0095	<0.0005	<0.0005	0.0735	<0.0025	1.48	<0.0001	<0.0005	<0.0005	0.00126	0.235	<0.00025	---	0.0107	<0.00002	0.0121	0.00767	---	<0.0005	2.52	<0.00005	1.12	---	<0.00025	<0.0005	<0.0015	<0.00005	<0.0005	0.0107				
GWN-07-57	05-Nov-13	16053131105033	Dissolved	0.0051	<0.0005	<0.0005	0.0827	<0.0025	1.21	<0.0001	<0.0005	<0.0005	0.0012	0.565	<0.00025	---	0.0129	<0.00002	0.00632	0.00384	---	<0.0005	---	<0.00005	1.09	---	<0.00025	<0.0005	<0.0015	<0.00005	<0.0005	<0.005				
GWN-07-57	03-Aug-14	16053140803010	Dissolved	<0.005	<0.0005	<0.0005	0.126	---	1.53	<0.0001	<0.005	---	<0.001	<0.05	<0.00025	---	0.0269	<0.000005	---	0.0066	---	<0.0005	2.65	<0.0001	---	---	---	---	<0.0001	---	0.0103					
GWN-07-57	03-Aug-14	16053140803010	Total	0.009	<0.0005	<0.0005	0.127	---	1.36	<0.0002	<0.005	---	0.002	0.763	0.00201	---	0.0311	<0.000005	---	0.0066	---	<0.0005	2.87	<0.0004	---	---	---	---	<0.0001	---	0.022					
GWN-07-57	01-Nov-14	16053141101020	Dissolved	<0.005	<0.0005	<0.0005	0.112	---	1.56	<0.0001	<0.005	---	<0.001	3.6	0.00038	---	0.0511	<0.000																		

TABLE 7.
GROUNDWATER QUALITY RESULTS - METALS
 Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Total or Dissolved	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	B mg/L	Cd mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mn mg/L	Hg mg/L	Mo mg/L	Ni mg/L	P mg/L	Se mg/L	Si mg/L	Ag mg/L	Sr mg/L	S mg/L	Tl mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L				
McMurray Formation Basal Aquifer - Aquifer Management Unit 2																																				
IOR-KRL-03 (BAS)	17-Aug-12	16053120817002	Dissolved	0.0024	<0.0006	0.00023	0.09	<0.001	0.87	0.000012	<0.001	<0.0003	0.00021	<0.06	<0.0002	0.082	0.023	<0.000002	0.00038	<0.0005	---	0.0013	2.3	<0.0001	1.1	720	<0.0002	<0.001	0.0012	<0.0001	<0.001	<0.003				
IOR-KRL-03 (BAS)	17-Aug-12	16053120817002	Total	0.32	<0.0006	0.0003	0.12	<0.001	0.92	0.000032	0.0024	0.0023	0.0022	0.67	0.00068	0.087	0.064	<0.000002	<0.0002	0.002	---	<0.0002	3	<0.0001	1.2	18	<0.0002	<0.001	0.0067	0.0002	0.002	0.029				
IOR-KRL-03 (BAS)	14-Oct-12	16053121014002	Dissolved	0.016	<0.0006	<0.0002	0.11	<0.001	1	0.0000083	<0.001	<0.0003	<0.0002	<0.06	<0.0002	0.088	0.03	0.000013	<0.0002	<0.0005	---	<0.0002	2.8	<0.0001	1.2	14	<0.0002	<0.001	0.0021	<0.0001	<0.001	<0.003				
IOR-KRL-03 (BAS)	14-Oct-12	16053121014003	Dissolved	0.015	<0.0006	<0.0002	0.1	<0.001	1	0.0000061	<0.001	<0.0003	<0.0002	<0.06	<0.0002	0.088	0.028	0.0000044	<0.0002	<0.0005	---	<0.0002	2.8	<0.0001	1.2	13	<0.0002	<0.001	0.0018	<0.0001	<0.001	<0.003				
IOR-KRL-03 (BAS)	14-Oct-12	16053121014002	Total	0.22	<0.0006	0.00022	0.11	<0.001	1.1	0.000018	<0.001	0.00039	0.00086	0.28	0.00034	0.095	0.042	0.0000024	<0.0002	<0.0005	---	<0.0002	3.1	<0.0001	1.3	11	<0.0002	<0.001	0.0063	<0.0001	0.013	0.007				
IOR-KRL-03 (BAS)	14-Oct-12	16053121014003	Total	0.26	<0.0006	0.00025	0.12	<0.001	1.1	0.000027	0.0014	0.00051	0.00053	0.54	0.00053	0.097	0.049	0.0000023	<0.0002	0.00062	---	<0.0002	3.2	<0.0001	1.3	10	<0.0002	<0.001	0.0063	<0.0001	0.019	<0.003				
IOR-KRL-04 (BAS)	26-Feb-98	16053980226001	Dissolved	0.19	<0.0002	<0.0002	0.06	0.005	0.69	<0.0002	<0.002	<0.0003	0.003	0.1	<0.0003	0.165	0.111	<0.00005	<0.003	0.003	---	<0.0002	---	<0.0001	0.983	---	<0.001	---	0.004	<0.0004	0.006	0.004				
IOR-KRL-04 (BAS)	26-Feb-98	16053980226002	Dissolved	<0.01	<0.0002	<0.0002	0.07	0.003	0.79	<0.0002	<0.002	<0.0003	0.004	<0.01	<0.0003	0.161	0.066	<0.00005	<0.003	0.0033	---	<0.0002	---	<0.0001	0.99	---	<0.001	---	<0.003	<0.0004	0.005	<0.001				
IOR-KRL-04 (BAS)	03-Mar-06	16053060303001	Dissolved	<0.005	<0.001	<0.005	0.665	<0.001	1.08	0.00003	<0.007	<0.005	<0.002	0.592	<0.001	0.26	0.167	<0.00005	<0.006	<0.008	0.2	0.006	2.86	<0.0001	2.02	13	<0.0008	<0.04	<0.006	<0.001	<0.05	<0.005				
IOR-KRL-04 (BAS)	21-Aug-10	16053100821001	Dissolved	0.002	<0.0002	0.0007	0.3	<0.001	1.1	0.000044	<0.001	<0.0003	0.0002	0.19	<0.0002	0.26	0.1	0.000006	<0.0002	0.0007	0.3	0.0005	---	<0.0001	1.9	8	<0.0002	<0.001	<0.001	<0.001	<0.001	0.003				
IOR-KRL-04 (BAS)	21-Aug-10	16053100821001	Total	32	<0.0002	0.012	0.85	0.003	1.3	0.00073	0.077	0.036	0.05	55	0.044	0.35	1.8	0.000028	0.0011	0.073	2.1	0.0008	---	0.001	2.3	17	0.0004	<0.001	0.15	0.0069	0.096	0.13				
IOR-KRL-04 (BAS)	10-Oct-10	16053101010001	Dissolved	0.009	<0.0002	0.0005	0.29	<0.001	1.2	0.00008	0.001	<0.0003	<0.0002	0.11	<0.0002	0.26	0.1	0.000007	0.016	0.0009	0.3	0.0026	---	<0.0001	2	11	<0.0002	<0.001	<0.001	0.0006	0.002	0.009				
IOR-KRL-04 (BAS)	10-Oct-10	16053101010001	Total	9.1	<0.0002	0.0033	0.48	<0.001	1.2	0.00033	0.025	0.011	0.015	17	0.014	0.29	0.57	0.000083	<0.0002	0.022	0.8	0.0005	---	0.0002	2.1	5.3	<0.0002	<0.001	0.052	0.0024	0.029	0.039				
IOR-KRL-04 (BAS)	16-Jul-11	16053110716001	Dissolved	0.009	<0.0006	0.0004	0.26	<0.001	1.1	<0.00003	<0.001	<0.0003	<0.0002	0.16	<0.0002	0.24	0.095	<0.000002	<0.0002	0.0008	---	<0.0002	2.3	<0.0001	1.8	9.8	<0.0002	<0.001	0.001	0.0001	0.002	<0.003				
IOR-KRL-04 (BAS)	16-Jul-11	16053110716001	Total	5.5	<0.006	0.004	0.35	<0.01	1.3	0.00012	0.01	0.007	0.01	8.4	0.01	0.27	0.32	0.000002	<0.002	0.015	---	<0.002	8	<0.001	2	3.9	<0.002	<0.01	0.13	0.001	0.02	<0.03				
IOR-KRL-04 (BAS)	29-Sep-11	16053110929001	Dissolved	<0.005	<0.003	<0.001	0.27	<0.005	1.2	0.00003	<0.005	<0.002	<0.001	0.19	<0.001	0.25	0.1	0.000002	<0.001	<0.003	---	0.005	2.4	<0.0005	2	15	<0.001	<0.005	<0.005	<0.0005	<0.005	<0.02				
IOR-KRL-04 (BAS)	29-Sep-11	16053110929001	Total	0.92	<0.002	0.0008	0.31	<0.003	1.2	0.00006	<0.003	<0.0008	<0.0005	3.2	0.001	0.26	0.24	0.00001	<0.0005	<0.001	---	<0.0005	4.7	<0.0003	2.1	1.4	<0.0005	<0.003	0.028	0.0006	0.005	<0.008				
IOR-KRL-04 (BAS)	17-Aug-12	16053120817001	Dissolved	<0.0025	<0.0015	<0.0005	0.24	<0.0025	1	0.00002	<0.0025	<0.00075	<0.0005	0.13	<0.0005	0.22	0.093	<0.000002	0.0015	<0.0013	---	0.013	2.1	<0.00025	1.7	23	<0.0005	<0.0025	<0.0025	<0.00025	<0.0025	<0.0075				
IOR-KRL-04 (BAS)	17-Aug-12	16053120817001	Total	2.2	<0.0015	0.0014	0.34	<0.0025	1.1	0.00012	0.0075	0.0059	0.0071	7.1	0.0058	0.25	0.34	<0.000002	<0.0005	0.01	---	<0.0005	5.4	<0.00025	1.9	2.6	<0.0005	<0.0025	0.023	0.0011	0.012	0.071				
IOR-KRL-04 (BAS)	14-Oct-12	16053121014001	Dissolved	0.0077	<0.003	<0.001	0.25	<0.005	1.1	0.000029	<0.005	<0.0015	<0.001	0.094	<0.001	0.25	0.09	0.0000033	<0.001	<0.0025	---	0.0023	2.2	<0.0005	2	20	<0.001	<0.005	<0.005	<0.0005	<0.005	<0.015				
IOR-KRL-04 (BAS)	14-Oct-12	16053121014001	Total	2.4	<0.0015	0.014	0.4	0.0033	1.3	0.00076	0.067	0.04	0.062	6	0.063	0.32	0.28	0.000031	0.0015	0.089	---	0.0033	6.3	<0.00025	2.3	3.3	<0.0005	<0.0025	0.23	0.0091	0.11	0.35				
IOR-KRL-05 (BAS)	26-Feb-98	16053980226003	Dissolved	0.06	<0.0002	<0.0002	0.19	<0.001	0.85	<0.0002	<0.002	<0.0003	0.018	0.05	<0.0003	0.141	0.076	<0.00005	<0.003	0.002	---	<0.0002	---	<0.0001	0.822	---	<0.001	---	<0.003	<0.0004	0.013	0.002				
IOR-KRL-05 (BAS)	26-Feb-98	16053980226004	Dissolved	<0.01	<0.0002	<0.0002	0.18	<0.001	0.88	0.0008	<0.002	0.0003	0.018	0.05	<0.0003	0.143	0.072	<0.00005	<0.003	<0.0005	---	<0.0002	---	<0.0001	0.918	---	<0.001	---	<0.003	<0.0004	<0.002	0.002				
IOR-KRL-05 (BAS)	03-Nov-98	16053981103001	Dissolved	0.22	0.0005	0.001	0.19	0.009	1.36	0.0003	<0.002	0.0014	0.003	0.16	<0.0003	0.197	0.285	<0.00005	<0.003	0.0015	---	<0.0002	---	<0.0001	1.49	---	---	---	<0.003	<0.0004	<0.002	0.001				
IOR-KRL-05 (BAS)	03-Nov-98	16053981103002	Dissolved	0.08	<0.0002	0.0009	0.2	0.01	1.41	<0.0002	<0.002	0.0004	0.006	0.13	<0.0003	0.2	0.277	<0.00005	<0.003	0.0012	---	<0.0002	---	<0.0001	1.54	---	---	---	<0.003	0.0004	0.009	<0.001				
IOR-KRL-05 (BAS)	17-Jul-09	16053090717001	Dissolved	0.095	<0.00005	0.0004	0.189	<0.0001	1.03	<0.000020	<0.0003	0.00012	0.0032	0.0415	0.000061	0.204	0.123	<0.00002	0.00013	0.00027	---	<0.0006	2.99	<0.00005	1.58	8.42	<0.00005	<0.0001	0.0018	0.00014	0.00023	<0.0005				
IOR-KRL-05 (BAS)	17-Jul-09	16053090717001	Total	---	---	---	---	---	---	---	---	---	44.2	---	---	1.18	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				
IOR-KRL-05 (BAS)	20-Oct-09	16053091020002	Dissolved	<0.001	<0.0002	<0.0002	0.19	<0.001	1.3	<0.000005	<0.001	<0.0003	<0.0002	<0.06	<0.0002	0.23	0.31	<0.000001	<0.0002	0.0018	<0.1	0.001	3.2	<0.0001	1.5	48	<0.0002	<0.001	0.001	<0.0001	<0.001	<0.003				
IOR-KRL-05 (BAS)	20-Oct-09	16053091020002	Total	26	<0.0002	0.0083	0.52	0.003	1.3	0.00083	0.022	0.0098	0.054	23	0.053	0.22	0.97	0.000002	0.0024	0.029	1.1	0.0008	59	0.0005	2.1	14	0.0003	0.001	0.11	0.011	0.02	0.11				
IOR-KRL-05 (BAS)	20-Aug-10	16053100820001	Dissolved	0.001	<0.0002	<0.0002	0.18	<0.001	1.2	<0.000005	<0.001	<0.0003	<0.0																							

TABLE 7.
GROUNDWATER QUALITY RESULTS - METALS
 Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Total or Dissolved	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	B mg/L	Cd mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mn mg/L	Hg mg/L	Mo mg/L	Ni mg/L	P mg/L	Se mg/L	Si mg/L	Ag mg/L	Sr mg/L	S mg/L	Tl mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L				
McMurray Formation Basal Aquifer - Aquifer Management Unit 2																																				
SHL-ALB-03	15-Feb-01	16053010215001	Dissolved	0.23	0.0005	0.0016	0.198	<0.001	3.27	<0.001	0.012	<0.002	<0.001	0.038	<0.005	---	0.008	<0.0002	<0.005	<0.002	<0.1	0.0063	---	<0.005	0.437	---	<0.05	<0.05	0.006	---	0.005	0.006				
SHL-ALB-03	02-Apr-02	16053020402001	Dissolved	0.06	---	0.0025	0.287	<0.001	3.19	<0.001	<0.005	<0.002	0.005	0.024	<0.005	---	0.03	<0.0002	0.005	<0.002	---	0.0058	---	<0.005	0.538	---	<0.05	<0.05	0.003	---	0.006	<0.001				
SHL-ALB-03	23-Mar-03	16053030323001	Dissolved	0.23	---	0.0042	0.231	<0.001	3.47	<0.001	0.022	<0.002	0.015	0.12	<0.005	---	0.04	<0.0002	<0.005	<0.002	---	0.0011	3.5	<0.005	0.59	---	<0.05	<0.05	0.006	---	0.009	0.013				
SHL-ALB-03	28-Jul-04	16053040728001	Dissolved	---	---	---	---	---	---	---	---	---	---	<0.06	---	---	<0.01	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				
SHL-ALB-03	16-Jun-05	16053050616001	Dissolved	---	---	---	---	---	---	---	---	---	---	<0.06	---	---	<0.01	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				
SHL-ALB-03	12-Dec-06	16053061212001	Dissolved	---	---	---	---	---	---	---	---	---	---	<0.005	---	---	<0.001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				
SHL-ALB-03	07-Dec-07	16053071207001	Dissolved	0.03	---	0.0006	0.212	<0.001	1.03	<0.001	0.033	<0.002	0.002	0.025	<0.005	---	<0.001	<0.0002	0.019	<0.002	---	0.0027	---	<0.005	0.276	---	<0.05	<0.05	0.001	---	0.009	0.085				
SHL-ALB-03	11-Jun-08	16053080611001	Dissolved	<0.1	---	---	0.13	<0.01	1.1	<0.01	<0.05	<0.02	<0.01	0.014	<0.05	---	<0.001	---	<0.05	<0.02	---	---	---	<0.05	0.55	---	<0.5	<0.5	<0.01	---	<0.01	0.14				
SHL-ALB-03	16-Jun-09	16053090616001	Dissolved	---	---	---	---	---	---	---	---	---	---	0.0757	---	---	0.0211	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				
SHL-JKP-01	27-Sep-01	16053010927001	Dissolved	0.33	---	0.0014	0.192	<0.001	1.52	<0.001	<0.005	<0.002	0.002	0.15	<0.005	---	0.09	<0.0002	<0.005	<0.002	0.2	0.01	---	<0.005	1.6	---	<0.05	<0.05	0.007	---	0.006	0.011				
SHL-JKP-01	21-Dec-07	16053071221001	Dissolved	---	---	---	---	---	---	---	---	---	---	<0.06	---	---	0.25	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				
SHL-JKP-01	20-Sep-08	16053080920001	Dissolved	0.71	<0.001	<0.001	0.18	<0.005	1.4	<0.00005	<0.005	<0.002	0.002	0.07	<0.001	0.2	0.056	0.000003	<0.001	<0.003	0.2	<0.001	2.2	<0.0005	1.5	4.6	<0.001	<0.005	<0.005	<0.0005	<0.005	<0.02				
SHL-JKP-01	15-May-09	16053090515001	Dissolved	0.006	<0.0002	<0.0002	0.17	<0.001	1.3	0.000015	<0.001	<0.0003	0.0003	<0.06	<0.0002	0.2	0.044	0.000004	<0.0002	<0.0005	0.6	0.0043	2.2	<0.0001	1.5	360	<0.0002	<0.001	<0.001	<0.0001	<0.001	<0.003				
SHL-JKP-01	25-Nov-09	16053091125001	Dissolved	0.015	<0.001	<0.001	0.18	<0.005	1.4	<0.00003	<0.005	<0.002	0.001	<0.06	<0.001	0.2	0.048	---	<0.001	<0.003	0.4	<0.001	2.4	<0.0005	1.6	150	<0.001	<0.005	<0.005	0.0008	<0.005	<0.02				
SHL-JKP-01	25-Nov-09	16053091125002	Dissolved	0.015	<0.001	<0.001	0.18	<0.005	1.4	<0.00003	<0.005	<0.002	0.001	<0.06	<0.001	0.2	0.048	---	<0.001	<0.003	0.4	<0.001	2.4	<0.0005	1.6	150	<0.001	<0.005	<0.005	0.0008	<0.005	<0.02				
SHL-JKP-01	23-Jun-10	16053100623001	Dissolved	<0.2	---	<0.0004	0.187	<0.02	1.54	<0.001	<0.10	<0.002	<0.02	<0.010	<0.005	---	0.0492	<0.000020	<0.005	<0.002	---	<0.0004	---	<0.005	1.78	---	<0.05	<0.05	<0.001	---	<0.02	<0.040				
SHL-JKP-01	23-Jun-10	16053100623005	Dissolved	---	---	---	---	---	---	---	---	---	---	0.01	---	---	0.0512	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				
SHL-JKP-01	26-Oct-10	16053101026001	Dissolved	---	---	---	---	---	---	---	---	---	---	<0.010	---	---	0.0496	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				
SHL-JKP-01	27-Oct-10	16053101027001	Dissolved	<0.01	---	<0.0004	0.2	<0.001	1.55	<0.001	<0.005	<0.002	<0.001	---	<0.005	---	<0.000020	<0.005	<0.002	---	<0.0004	---	<0.005	1.69	---	<0.05	<0.05	<0.001	---	<0.001	<0.002					
SHL-JKP-01	25-Jun-12	16053120625001	Total	---	---	---	---	---	---	---	---	---	---	<0.30	---	---	0.055	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				
SHL-JKP-01	06-Nov-12	16053121106001	Total	---	---	---	---	---	---	---	---	---	---	<0.30	---	---	<0.05	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				
GMF Interim Quality Triggers for NAOSA^^				NS	NS	0.003	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS				
Alberta Tier 1 - Natural Areas*				0.005 ^b -0.1 ^{b,A,SW}	0.006 ^{P(MAC)}	0.005 ^A	1 ^{P(MAC)}	NS	1.5 ^A	H ^{A,J,***}	0.001 ^{A,d,***}	NS	0.007 ^{A,c}	0.3 ^{P(AO),A}	H ^{A,***}	NS	0.05 ^{P(AO)}	0.000005 ^{A,c}	NS	H ^{A,***}	NS	0.001 ^A	NS	0.0001 ^{A,***}	NS	NS	NS	NS	NS	NS	NS	NS	0.02 ^{P(MAC)}	NS	0.03 ^A	
McMurray Formation Basal Aquifer - Aquifer Management Unit 3																																				
CNR-H02-002	11-Nov-10	16053101111001	Dissolved	<0.2	<0.008	<0.008	0.171	<0.02	1.2	<0.001	<0.1	<0.04	<0.02	0.516	<0.002	0.533	0.064	<0.0001	<0.1	<0.04	---	<0.008	<0.5	<0.002	2.78	3.2	<0.002	<1.0	<0.02	<0.002	<0.02	<0.04				
CNR-H02-002	17-Jun-11	16053110617001	Dissolved	<0.02	<0.0016	<0.0016	0.135	<0.002	1.08	<0.0004	<0.02	<0.002	<0.004	<0.2	<0.0004	0.536	<0.05	<0.00002	0.0135	<0.008	---	<0.0016	---	<0.0004	---	---	<0.0002	<0.05	<0.0012	<0.0004	<0.001	<0.008				
CNR-H02-002	07-Nov-11	16053111107001	Dissolved	<0.1	<0.008	<0.008	0.11	<0.01	<1.0	<0.002	<0.1	<0.002	<0.02	0.08	<0.002	0.36	0.0333	<0.00002	0.0115	<0.04	---	<0.008	---	<0.002	---	---	<0.002	<0.05	<0.006	<0.002	0.003	<0.06				
CNR-H02-002	06-May-12	16053120506001	Dissolved	<0.2	<0.008	<0.008	0.494	<0.02	1.7	<0.001	<0.1	<0.04	<0.02	0.81	<0.002	0.617	<0.04	<0.0001	<0.1	<0.04	---	<0.008	---	<0.002	---	---	<0.002	<1.0	<0.02	<0.002	<0.02	<0.04				
CNR-H02-002	24-Oct-12	16053121024001	Dissolved	<0.2	<0.008	<0.008	0.449	<0.02	1.2	<0.001	<0.1	<0.04	<0.02	0.149	<0.002	0.571	0.0162	<0.0001	<0.1	<0.04	---	<0.008	---	<0.002	---	---	<0.002	<1.0	<0.02	<0.002	<0.02	1.3				
CNR-H02-002	30-May-13	16053130530001	Dissolved	<0.1	<0.01	<0.01	0.516	<0.05	1.6	<0.001	<0.01	<0.01	<0.01	5.1	<0.005	0.61	0.0414	<0.0001	<0.005	<0.01	---	<0.01	---	<0.001	---	---	<0.005	<0.05	<0.030	<0.001	<0.01	0.2				
CNR-H02-002	19-Dec-13	16053131219001	Dissolved	<0.15	<0.030	<0.01	<1.0	<0.05	<2.0	<0.00025	<0.05	<0.015	<0.01	<6.0	<0.01	<2.0	<0.4	---	0.014	<0.025	---	<0.01	<10	<0.005	2.7	22	<0.01	<0.05	<0.05	<0.005	<0.05	<0.15				
GWN-16-24	18-Jul-76	16053760718007	Dissolved	<0.002	---	<0.038	<0.20	<0.001	3.29	<0.002	<0.006	<0.01	0.011	---	<0.088	---	---	---	<0.006	<0.01	<0.110	<0.060	0.81	<0.002	0.649	---	---	<0.045	<0.0009	<0.02	0.004	0.022				
GWN-16-24	18-Jul-76	16053760718012	Dissolved	---	---	---	---	---	---	---	---	---	---	0.022	---	---	0.006	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			
GWN-16-24	18-Jul-76	16053760718002	Total	---	---	<0.038	<0.2	<0.001	---	<0.002	<0.006	<0.01	0.011	---	---	0.006	---	<0.006	<0.01	---	<0.06	---	---	0.649	---	---	---	---	---	---	---	0.022				
GWN-16-24	19-Oct-12	16053121019003	Dissolved	0.017	<0.006	<0.002	0.011	<0.01	5.9	<0.00005	<0.01	<0.003	<0.002	0.29	0.0037	0.42	0.0093	0.0000025	0.0055	<0.005	<0.10	<0.002	0.98	<0.001	0.28	1.1	<0.002	<0.01	<0.01	<0.001	<0.01	<0.03				
GWN-16-24	19-Aug-13	16053130819002	Dissolved	<0.10	<0.01	<0.01	0.0087	<0.05	5.84	<0.001	<0.01	<0.01	<0.01	<1.0	<0.005	---	0.0246	<0.0001	<0.005	<0.01	---	<0.01	<5.0	<0.001	0.245	---	<0.005	<0.01	<0.03	<0.001	<0.01	<0				

TABLE 7.
GROUNDWATER QUALITY RESULTS - METALS
 Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Total or Dissolved	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	B mg/L	Cd mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mn mg/L	Hg mg/L	Mo mg/L	Ni mg/L	P mg/L	Se mg/L	Si mg/L	Ag mg/L	Sr mg/L	S mg/L	Tl mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L					
McMurray Formation Basal Aquifer - Aquifer Management Unit 4																																					
GWN-01-76	13-Mar-75	16053750313001	Total	---	---	<0.01	---	---	---	---	---	---	---	---	---	---	---	---	---	0.001	---	---	---	---	---	---	---	---	---	---	---	---	<0.005				
GWN-01-76	13-Jul-76	16053760713005	Dissolved	1.1	---	<0.038	<0.20	0.022	8.04	<0.002	<0.006	<0.01	0.11	---	<0.088	---	---	<0.006	<0.01	6.6	<0.060	4.84	<0.002	27.4	---	---	---	<0.045	0.033	<0.02	0.088	0.44					
GWN-01-76	13-Jul-76	16053760713009	Dissolved	---	---	---	---	---	---	---	---	---	---	46.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---					
GWN-01-76	13-Jul-76	16053760713005	Total	---	---	<0.038	<0.2	0.022	---	<0.002	<0.006	<0.01	0.11	---	---	---	---	<0.006	<0.01	---	<0.06	---	---	27.4	---	---	---	---	---	---	---	0.44					
GWN-01-76	27-Oct-12	16053121027003	Dissolved	0.68	<0.15	<0.05	0.032	<0.25	2.9	<0.0013	<0.25	<0.075	<0.05	170	<0.05	0.79	8.9	<0.00005	<0.05	<0.13	<0.10	<0.05	<0.10	<0.025	28	1200	<0.05	<0.25	<0.25	<0.025	<0.25	<0.75					
GWN-01-76	18-Sep-13	16053130918035	Dissolved	<1.0	<0.10	<0.10	0.088	<0.50	5.7	<0.01	<0.10	<0.10	<0.10	262	<0.05	---	16.6	<0.00001	<0.05	<0.10	<0.10	<0.10	<0.01	29.9	---	<0.05	<0.10	<0.30	<0.01	<0.10	5.3						
GWN-01-76	27-Nov-13	16053131127019	Dissolved	<1.0	<0.10	<0.10	0.079	<0.50	8.5	<0.01	<0.10	<0.10	<0.10	240	<0.05	---	16.9	<0.00002	<0.05	<0.10	---	<0.10	<0.01	26.7	---	<0.05	<0.10	<0.30	<0.01	<0.10	1.1						
GWN-01-76	04-Nov-14	16053141104033	Dissolved	<0.1	<0.01	<0.01	0.0579	---	3.8	<0.001	<0.01	---	<0.01	211	<0.005	---	17.7	<0.000005	---	<0.01	<0.01	<0.01	<0.001	---	---	---	---	---	<0.001	---	<0.1						
GWN-01-76	04-Nov-14	16053141104033	Total	<0.30	<0.01	<0.01	0.0631	---	4.2	<0.001	<0.01	---	0.014	243	---	---	19	<0.000005	---	<0.01	---	<0.01	<0.001	---	---	---	---	---	---	<0.001	---	<0.30					
Alberta Tier 1 - Natural Areas*				0.005^A-0.1^{b,A,SW}	0.006^{P(MAC)}	0.005^A	1^{P(MAC)}	NS	1.5^A	H^{A,J***}	0.001^{A,d***}	NS	0.007^{A,c}	0.3^{P(AO),A}	H^{A***}	NS	0.05^{P(AO)}	0.000005^{A,c}	NS	H^{A***}	NS	0.001^A	NS	0.0001^{A***}	NS	NS	NS	NS	NS	NS	NS	0.02^{P(MAC)}	NS	0.03^A			
Prairie Evaporite/Beaverhill Lake/Methy (Keg River) Formations																																					
CNR-H02-007	19-Jan-10	16053100119001	Dissolved	<0.10	<0.008	<0.008	1.22	---	3.48	<0.001	0.0168	---	<0.012	0.194	<0.002	---	0.128	<0.0001	---	0.0023	---	0.008	---	<0.002	---	---	---	---	---	<0.002	---	<0.02					
GWN-01-77	14-Feb-75	16053750214001	Total	---	---	<0.01	---	---	---	---	---	---	0.002	---	---	---	---	---	---	0.001	---	---	---	---	---	---	---	---	---	---	---	---	---				
GWN-01-77	29-Oct-12	16053121027002	Dissolved	0.64	<0.15	<0.05	0.063	<0.25	0.35	<0.0013	<0.25	<0.075	<0.05	0.37	<0.05	1.7	0.8	<0.000005	<0.05	<0.13	<0.10	<0.05	<0.10	<0.025	41	350	<0.05	<0.25	<0.25	<0.025	<0.25	<0.75					
GWN-01-77	18-Sep-13	16053130918034	Dissolved	<1.0	<0.10	<0.10	0.112	<0.50	15.8	<0.01	<0.10	<0.10	<0.10	22	<0.05	---	4.09	<0.0001	<0.05	<0.10	---	<0.10	<0.01	43.5	---	<0.05	<0.10	<0.30	<0.01	<0.10	<1.0						
GWN-01-77	27-Nov-13	16053131127020	Dissolved	<1.0	<0.10	<0.10	0.067	<0.50	2.9	<0.01	<0.10	<0.10	<0.10	<10	<0.05	---	0.153	<0.00002	<0.05	<0.10	---	<0.10	<0.01	36.8	---	<0.05	<0.10	<0.30	<0.01	<0.10	6.1						
GWN-01-78	27-Oct-12	16053121027001	Dissolved	0.19	<0.03	<0.01	0.051	<0.05	<0.02	<0.00025	<0.05	0.025	0.058	0.44	<0.01	0.37	<0.0040	<0.000005	0.17	0.1	<0.10	<0.01	0.34	<0.005	22	1600	<0.01	<0.05	<0.05	<0.005	<0.05	<0.15					
GWN-01-79	13-Jul-76	16053760713006	Dissolved	2.2	---	<0.038	<0.20	0.044	7.95	<0.002	<0.006	<0.01	0.187	---	<0.088	---	---	---	<0.006	<0.01	0.121	<0.060	1.87	<0.002	55.2	---	---	<0.045	0.066	<0.02	0.154	0.66					
GWN-01-79	13-Jul-76	16053760713010	Dissolved	---	---	---	---	---	---	---	---	---	0.22	---	---	---	0.154	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---					
GWN-01-79	13-Jul-76	16053760713006	Total	---	---	<0.038	<0.2	0.044	---	<0.002	<0.006	<0.01	0.187	---	---	---	0.154	---	<0.006	<0.01	---	<0.06	---	---	55.2	---	---	---	---	---	---	---	0.66				
GWN-06-62	16-Jul-76	16053760716003	Dissolved	0.55	---	<0.038	1.43	<0.001	3.61	<0.002	<0.006	<0.01	0.011	---	<0.088	---	---	<0.006	<0.01	0.99	<0.060	4.47	<0.002	6.5	---	---	---	<0.045	0.003	<0.02	0.016	0.014					
GWN-06-62	16-Jul-76	16053760716008	Dissolved	---	---	---	---	---	---	---	---	---	---	23.98	---	---	0.161	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				
GWN-06-62	16-Jul-76	16053760716003	Total	---	---	<0.038	1.43	<0.001	---	<0.002	<0.006	<0.01	0.011	---	---	---	0.161	---	<0.006	<0.01	---	<0.06	---	6.5	---	---	---	---	---	---	---	0.014					
GWN-06-62	17-Oct-12	16053121017001	Dissolved	<0.01	<0.006	<0.002	1.2	<0.01	3.6	<0.00005	<0.01	<0.003	0.0025	27	0.0027	1.5	0.093	<0.000002	0.025	0.018	<0.10	<0.002	4.4	<0.001	4.3	0.44	<0.002	<0.01	<0.01	<0.001	<0.01	<0.03					
GWN-06-62	21-Aug-13	16053130821004	Dissolved	<0.01	<0.0019	<0.001	0.00772	<0.005	1.11	<0.0001	<0.001	<0.001	<0.001	0.1	<0.0005	---	0.0041	0.0836	0.0022	---	<0.001	<0.50	<0.0002	0.0289	---	<0.0005	<0.001	<0.003	<0.001	<0.001	<0.01	<0.03					
GWN-06-62	26-Nov-13	16053131126016	Dissolved	0.015	0.0014	<0.001	0.0274	<0.005	1.71	<0.0001	<0.001	<0.001	<0.001	0.1	<0.0005	---	0.0099	<0.00002	0.078	0.0031	---	<0.001	0.89	<0.0001	0.208	---	<0.0005	<0.001	<0.003	<0.001	<0.001	<0.01	0.072				
GWN-07-58	21-Sep-13	16053130921041	Dissolved	0.15	<0.01	<0.01	0.11	<0.05	4.8	<0.001	<0.01	<0.01	0.012	<1.0	<0.005	---	0.198	<0.00002	0.0853	0.016	---	<0.01	<5.0	<0.001	2.4	---	<0.005	<0.01	<0.03	<0.001	<0.01	0.18					
GWN-07-58	03-Aug-14	16053140803013	Dissolved	<0.10	<0.010	<0.010	0.0395	---	4.5	<0.001	<0.010	---	<0.010	<1.0	<0.005	---	0.116	<0.000005	---	<0.010	---	<0.010	<5.0	<0.001	---	---	---	---	---	---	<0.10						
GWN-07-58	03-Aug-14	16053140803013	Total	<0.30	<0.01	<0.01	0.0903	---	4.4	<0.001	<0.01	---	0.037	11.4	0.0052	---	0.241	<0.000005	---	0.016	---	<0.01	<5.0	<0.001	---	---	---	---	---	---	<0.30						
GWN-07-59	11-Mar-75	16053750311001	Total	---	---	<0.01	0.005	---	---	---	---	---	0.005	---	---	---	0.002	---	---	0.03	---	---	---	---	---	---	---	---	---	---	---	---					
GWN-07-59	21-Sep-13	16053130921042	Dissolved	0.0388	<0.0005	0.00194	0.0419	<0.0025	0.141	<0.0002	<0.0005	<0.0005	0.00136	<0.05	0.00201	---	<0.002	<0.00002	0.767	0.0185	---	<0.0005	<0.25	<0.00005	6.28	---	<0.00025	0.0015	<0.0015	<0.00005	<0.0005	0.0196					
GWN-07-59	03-Aug-14	16053140803016	Dissolved	0.0163	<0.0005	0.00198	0.0494	---	0.229	0.0002	<0.005	---	0.0018	<0.05	0.00535	---	<0.002	<0.000005	---	0.0211	---	<0.0005	<0.25	<0.0001	---	---	---	---	---	---	---	0.0079					
GWN-07-59	03-Aug-14	16053140803016	Total	0.027	<0.0005	0.0024	0.0548	---	0.182	0.00023	<0.005	---	0.0103	5.02	0.00739	---	0.0479	<0.000005	---	0.0277	---	<0.0005	<0.25	<0.0004	---	---	---	---	---	---	---	0.03					
GWN-08-47	20-Oct-12	16053121020005	Dissolved	0.0064	<0.0015	0.0045	0.09	<0.0025	1.8	0.000019	<0.0025	0.0085	<0.0005	4.1	<0.0005	0.3	0.04	<0.000002	0.13	0.0017	<0.10	<0.0005	2.4	<0.00025	0.79	1	<0.0005	<0.0025	<0.0025	<0.00025	<0.0025	<0.0075					
GWN-08-47	20-Sep-13	16053130920036	Dissolved	<0.01	<0.0																																

TABLE 7.
GROUNDWATER QUALITY RESULTS - METALS
 Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Total or Dissolved	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	B mg/L	Cd mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mn mg/L	Hg mg/L	Mo mg/L	Ni mg/L	P mg/L	Se mg/L	Si mg/L	Ag mg/L	Sr mg/L	S mg/L	Tl mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L				
Prairie Evaporite/Beaverhill Lake/Methy (Keg River) Formations																																				
GWN-17-51	13-Jul-76	16053760713001	Dissolved	<u>0.44</u>	---	<0.038	<0.20	<0.001	<u>3.18</u>	<0.002	<0.006	<0.01	<u>0.019</u>	---	<0.088	---	---	---	<0.006	<0.01	<0.110	<0.060	4.32	<0.002	5.22	---	---	<0.045	0.003	<0.02	0.012	<u>0.077</u>				
GWN-17-51	13-Jul-76	16053760713015	Dissolved	---	---	---	---	---	---	---	---	---	---	0.11	---	---	0.021	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			
GWN-17-51	13-Jul-76	16053760713001	Total	---	---	---	---	---	---	---	---	---	<u>0.019</u>	---	---	---	0.021	---	<0.006	<0.01	---	<0.06	---	---	5.22	---	---	---	---	---	---	<u>0.077</u>				
GWN-17-51	23-Oct-12	16053121023003	Dissolved	<u>0.34</u>	<0.03	<0.01	<u>1.3</u>	<0.05	<u>4</u>	0.00031	<0.05	<0.015	<u>1</u>	<u>8.7</u>	<0.01	1.2	<u>0.063</u>	<0.000005	<0.01	<0.025	<0.10	<0.01	3.1	<0.005	9.8	0.84	<0.01	<0.05	<0.05	<0.005	<0.05	<0.15				
GWN-17-51	26-Aug-13	16053130826019	Dissolved	<0.10	<0.01	<0.01	<u>1.78</u>	<0.05	<u>4.99</u>	<0.001	<0.01	<0.01	<0.01	<u>3.7</u>	<0.005	---	<u>0.104</u>	<0.0001	<0.005	<0.01	---	<0.01	<5.0	<0.001	11.7	---	<0.005	<0.01	<0.03	<0.001	<0.01	<0.10				
GWN-17-51	26-Aug-13	16053130826021	Dissolved	<0.10	<0.01	<0.01	<u>1.75</u>	<0.05	<u>4.15</u>	<0.001	<0.01	<0.01	<0.01	<u>4.7</u>	<0.005	---	<u>0.0992</u>	<0.0001	<0.005	<0.01	---	<0.01	<5.0	<0.001	11.7	---	<0.005	<0.01	<0.03	<0.001	<0.01	<0.10				
GWN-17-51	19-Nov-13	16053131119001	Dissolved	<0.10	<0.01	<0.01	<u>1.7</u>	<0.05	<u>3.85</u>	<0.001	<0.01	<0.01	<0.01	<u>10.2</u>	<0.005	---	<u>0.0978</u>	<0.00002	<0.005	<0.01	---	<0.01	<5	<0.001	10.4	---	<0.005	<0.01	<0.03	<0.001	<0.01	<u>0.26</u>				
GWN-17-51	05-Aug-14	16053140805021	Dissolved	<0.10	<0.010	<0.010	<u>1.82</u>	---	<u>2.5</u>	<0.001	<0.010	---	<0.010	<u>3.1</u>	<0.005	---	<u>0.0947</u>	<0.000005	---	<0.010	---	<0.010	<5.0	<0.001	---	---	---	---	---	<0.01	---	<0.10				
GWN-17-51	05-Aug-14	16053140805021	Total	<0.30	<0.01	<0.01	<u>1.9</u>	---	<u>4.1</u>	<0.001	<0.01	---	<0.01	<u>18.5</u>	<0.005	---	<u>0.111</u>	<0.000005	---	<0.01	---	<0.01	<5.0	<0.001	---	---	---	---	---	<0.001	---	<0.30				
GWN-17-51	29-Oct-14	16053141029007	Dissolved	<0.1	<0.01	<0.01	<u>1.84</u>	---	<u>5.9</u>	<0.001	<0.01	---	<0.01	<u>12.4</u>	<0.005	---	<u>0.125</u>	<u>0.0000678</u>	---	<0.01	---	<0.01	<5.0	<0.001	---	---	---	---	---	<0.001	---	<0.1				
GWN-17-51	29-Oct-14	16053141029007	Total	0.034	<0.0005	<0.0005	<u>2.12</u>	---	<u>3.96</u>	<0.0002	<0.005	---	<0.001	<u>19.5</u>	0.00067	---	<u>0.135</u>	<u>0.0000127</u>	---	<0.002	---	<0.0005	3.84	<0.0004	---	---	---	---	---	<0.0001	---	<0.015				
Alberta Tier 1 - Natural Areas*				0.005^a-0.1^{b,A,SW}	0.006^{P(MAC)}	0.005^A	1^{P(MAC)}	NS	1.5^A	H^{A,J***}	0.001^{A,d***}	NS	0.007^{A,c}	0.3^{P(AO),A}	H^{A***}	NS	0.05^{P(AO)}	0.000005^{A,c}	NS	H^{A***}	NS	0.001^A	NS	0.0001^{A***}	NS	NS	NS	NS	NS	NS	NS	0.02^{P(MAC)}	NS	0.03^A		
McMurray Formation																																				
CVE-10-05-TW	31-Jan-11	16053110131001	Dissolved	0.009	<0.0002	<0.0002	0.1	<0.001	0.03	<0.000005	<0.001	<0.0003	0.0005	<0.06	<0.0002	<0.02	<u>0.094</u>	---	<0.0002	0.0009	0.2	<u>0.0017</u>	5.3	<0.0001	0.14	5.8	<0.0002	<0.001	<0.001	<0.0001	<0.001	<0.003				
CVE-10-05-TW	31-Jan-11	16053110131001	Total	<u>0.24</u>	0.0006	0.0006	0.1	<0.001	0.03	0.000019	<u>0.002</u>	0.0004	<u>0.17</u>	<u>0.32</u>	<u>0.053</u>	<0.02	<u>0.095</u>	---	<0.0002	0.0027	0.1	<0.0002	5.9	<0.0001	0.14	5.5	<0.0002	<0.001	0.014	<0.0001	0.001	0.023				
CVE-10-05-TW	07-Feb-11	16053110207001	Dissolved	0.007	0.0004	0.0003	0.1	<0.001	0.05	0.000018	<0.001	0.0005	0.0005	<0.06	<0.0002	<0.02	<u>0.083</u>	---	0.0018	0.002	0.2	0.0002	5.3	<0.0001	0.15	6.1	<0.0002	<0.001	0.001	0.0001	<0.001	0.02				
CVE-10-05-TW	07-Feb-11	16053110207001	Total	0.017	<0.0002	0.0006	0.1	<0.001	0.05	<0.000005	<0.001	0.0006	<u>0.023</u>	0.13	0.0043	<0.02	<u>0.078</u>	---	0.0018	0.0022	<0.1	<0.0002	5.2	<0.0001	0.14	5.6	<0.0002	<0.001	<0.001	<0.0001	<0.001	<u>0.058</u>				
Test 1	25-Oct-12	16053121025001	Dissolved	0.0021	<0.0006	0.0003	0.13	<0.001	0.052	0.000021	<0.001	<0.0003	0.0004	<0.060	<0.0002	<0.02	0.04	<0.000005	<0.0002	0.0014	0.38	0.00022	11	<0.0001	0.17	2.4	<0.0002	<0.001	<0.001	0.00051	<0.001	<0.003				
Test 2	30-Oct-12	16053121030005	Dissolved	<u>0.012</u>	<0.0006	<0.0002	<0.01	<0.001	<0.02	<0.000005	<0.001	<0.0003	0.0014	<0.060	<0.0002	<0.02	<0.0040	<0.000005	<0.0002	0.0017	<0.10	<u>0.0028</u>	<0.10	<0.0001	<0.02	<0.2	<0.0002	<0.001	<0.001	<0.0001	<0.001	0.0093				
Alberta Tier 1 - Natural Areas*				0.005^a-0.1^{b,A,SW}	0.006^{P(MAC)}	0.005^A	1^{P(MAC)}	NS	1.5^A	H^{A,J***}	0.001^{A,d***}	NS	0.007^{A,c}	0.3^{P(AO),A}	H^{A***}	NS	0.05^{P(AO)}	0.000005^{A,c}	NS	H^{A***}	NS	0.001^A	NS	0.0001^{A***}	NS	NS	NS	NS	NS	NS	NS	0.02^{P(MAC)}	NS	0.03^A		

- Notes:**
 --- - not analyzed
 NS - guideline not specified
 a - value if pH <6.5
 b - value if pH ≥6.5
 c - chronic aquatic life guideline from *Alberta Environment Surface Water Quality Guidelines for Use in Alberta* (AENV 1999)
 d - indicates guideline level for Cr(VI); guideline level for Cr(III) = 0.0089 mg/L
 j - indicates long-term exposure guideline; see CCME factsheet for short-term exposure guideline
 A - indicates guideline for Aquatic Life exposure pathway
 P - indicates guideline for Potable Groundwater exposure pathway
 H - dependent on hardness value
 AO - aesthetic objective
 MAC - maximum acceptable concentration
 * - *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* (AENV 2010)
 *** - *Water Quality Guidelines for the Protection of Aquatic Life* (CCME accessed on line March 2014)
 SW - *Alberta Environment Surface Water Quality Guidelines for Use in Alberta* (AENV 1999)
 AA - *Groundwater Management Framework Interim Quality Triggers for the North Athabasca Oil Sands Area*
 Underline - indicates values do not meet Alberta Tier 1 Natural Areas guideline
 Italics - indicates values do not meet GMF Interim Quality Triggers

TABLE 8.

GROUNDWATER QUALITY RESULTS - HYDROCARBONS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Total BTEX mg/L	F1 C ₆ -C ₁₀ - BTEX mg/L	F2 C ₇₋₁₀ -C ₁₆ mg/L	F3 C ₁₆ -C ₃₄ mg/L	F4 C ₃₄ -C ₅₀ mg/L	Naphthenic Acids mg/L
Suficial Sands												
AGS-01-WT	16-Sep-09	16053090916001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.2	---	---	<1.0
AGS-01-WT	25-Oct-12	16053121025003	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	<0.1	<0.1	<1.0
AGS-02-20	15-Sep-09	16053090915004	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1.0
AGS-02-20	19-Nov-10	16053101119004	<0.0005	<0.00075	<0.0005	<0.00071	ND	<0.1	<0.25	---	---	<1.0
AGS-02-20	15-Feb-11	16053110215004	<0.0005	<0.00075	<0.0005	<0.00071	ND	<0.1	<0.25	---	---	<1.0
AGS-02-20	15-Feb-11	16053110215006	---	---	---	---	---	---	---	---	---	<1.0
AGS-02-20	24-Oct-12	16053121024005	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	<0.1	<0.1	<1.0
AGS-02-20	23-Aug-13	16053130823011	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
AGS-02-20	22-Nov-13	16053131122006	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
AGS-02-20	06-Aug-14	16053140806030	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
AGS-02-20	30-Oct-14	16053141030014	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
AGS-02-50	15-Sep-09	16053090915003	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1.0
AGS-02-WT	15-Sep-09	16053090915001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1.0
AGS-02-WT	19-Nov-10	16053101119001	<0.0005	<0.00075	<0.0005	<0.00071	ND	<0.1	<0.25	---	---	<1.0
AGS-02-WT	24-Oct-12	16053121024004	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	<0.1	<0.1	<1.0
AGS-02-WT	23-Aug-13	16053130823012	<0.0005	<0.0005	<0.0005	<0.00071	ND	0.1	<0.25	<0.25	<0.25	<1.0
AGS-02-WT	22-Nov-13	16053131122007	<0.0005	<0.0005	<0.0005	<0.00071	ND	0.14	<0.25	<0.25	<0.25	<1.0
AGS-02-WT	06-Aug-14	16053140806028	<0.0005	<0.0005	<0.0005	<0.00071	ND	0.13	<0.25	<0.25	<0.25	<1.0
AGS-02-WT	30-Oct-14	16053141030015	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	0.29	<0.25	<1.0
AGS-03-WT	17-Sep-09	16053090917001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1.0
AGS-03-WT	20-Nov-10	16053101120001	<0.0005	<0.00075	<0.0005	<0.00071	ND	<0.1	<0.25	---	---	<1.0
AGS-03-WT	20-Nov-10	16053101120004	<0.0005	<0.00075	<0.0005	<0.00071	ND	<0.1	<0.25	---	---	<1.0
AGS-03-WT	16-Feb-11	16053110216004	<0.0005	<0.00075	<0.0005	<0.00071	ND	<0.1	<0.25	---	---	<1.0
AGS-03-WT	22-Aug-13	16053130822009	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
AGS-03-WT	28-Nov-13	16053131128022	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
AGS-03-WT	06-Aug-14	16053140806026	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	1
AGS-03-WT	30-Oct-14	16053141030010	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
CVE-BOR-01	24-Jan-08	16053080124001	---	---	---	---	---	---	---	---	---	<1.0
CVE-BOR-01	24-Jan-08	16053080124002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.15	---	---	---
CVE-BOR-01	24-Feb-10	16053100224001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1.0
CVE-BOR-01	19-Jun-10	16053100619001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1.0
CVE-BOR-01	19-Jun-10	16053100619002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1.0
CVE-BOR-01	07-Oct-10	16053101007001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1.0
GMF Interim Quality Triggers for NAOSA^^			NS	NS	NS	NS	NS	NS	NS	NS	NS	2
Alberta Tier 1 - Fine Grained Soils - Natural Areas*			0.005^{P(MAC)}	0.024^{P(AO)}	0.0024^{P(AO)}	0.3^{P(AO)}	NS	2.2^P	1.1^P	NS	NS	NS

TABLE 8.

GROUNDWATER QUALITY RESULTS - HYDROCARBONS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Total BTEX mg/L	F1 C ₆ -C ₁₀ - BTEX mg/L	F2 C ₇₋₁₀ -C ₁₆ mg/L	F3 C ₇₋₁₆ -C ₃₄ mg/L	F4 C ₇₋₃₄ -C ₅₀ mg/L	Naphthenic Acids mg/L
Suficial Sands												
CVE-BOR-02	23-Jan-08	16053080123001	<0.0004	0.0013	<0.0004	<0.0008	0.0013	<0.1	<0.15	---	---	<1.0
CVE-BOR-02	25-Feb-10	16053100225001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1.0
CVE-BOR-02	23-Jun-10	16053100623002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1.0
CVE-BOR-02	23-Jun-10	16053100623004	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1.0
CVE-BOR-02	08-Oct-10	16053101008001	<0.0004	---	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1.0
GWN-01-74	10-Sep-09	16053090910002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.4	---	---	<1.0
GWN-01-74	13-Dec-10	16053101213002	<0.0005	<0.00075	0.00089	0.0034	0.00429	0.2	3.93	---	---	<1.0
GWN-01-74	27-Oct-12	16053121027004	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	<0.1	<0.1	<1.0
GWN-01-74	18-Sep-13	16053130918033	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
GWN-01-74	01-Aug-14	16053140801004	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	0.36	<0.25	<0.25	<1.0
GWN-01-74	04-Nov-14	16053141104035	<0.0005	<0.0005	<0.0005	0.00222	0.00222	<0.1	5.24	2.22	0.52	<1.0
GWN-07-55	21-Sep-13	16053130921039	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	0.32	<0.25	<1.0
GWN-07-55	05-Nov-13	16053131105034	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	1.1
GWN-07-55	03-Aug-14	16053140803014	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	0.78	7.7	4.64	<1.0
GWN-07-55	01-Nov-14	16053141101022	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	0.34	4.05	2.82	1.3
GWN-08-43	30-Sep-09	16053090930003	<0.0004	0.0029	0.0061	0.061	0.07	0.57	17.3	---	---	<1.0
GWN-08-43	20-Oct-12	16053121020001	<0.0004	<0.0004	0.00094	0.0097	0.01064	<0.1	0.74	<0.1	<0.1	---
GWN-08-43	17-Sep-13	16053130917031	<0.0005	0.00234	0.00106	0.0127	0.0161	0.18	1.26	0.31	<0.25	1.1
GWN-08-43	02-Aug-14	16053140802006	<0.0005	0.00101	0.00661	0.0587	0.06632	2.54	484	173	24.4	1
GWN-08-43	02-Nov-14	16053141102025	<0.0005	<0.0005	<0.0005	0.0024	0.0024	0.11	3.1	0.88	<0.25	<1.0
GWN-13-26	08-Sep-09	16053090908002	<0.0004	0.0005	<0.0004	<0.0008	0.0005	<0.1	<0.1	---	---	<1.0
GWN-13-26	18-Nov-10	16053101118004	<0.0005	<0.00075	<0.0005	<0.00071	ND	<0.1	<0.25	---	---	<1.0
GWN-13-26	12-Feb-11	16053110212007	<0.0005	<0.00075	<0.0005	<0.00071	ND	<0.1	<0.25	---	---	<1.0
GWN-13-26	26-Aug-13	16053130826023	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
GWN-13-26	23-Nov-13	16053131123012	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
GWN-13-26	07-Aug-14	16053140807036	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	0.28	<0.25	<1.0
GWN-13-26	28-Oct-14	16053141028002	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	0.41	<0.25	<1.0
GWN-14-32	14-Sep-09	16053090914001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.5	---	---	<1.0
GWN-14-32	16-Feb-11	16053110216003	<0.0005	0.00135	<0.0005	<0.00071	0.00135	0.37	49.9	---	---	<1.0
GWN-14-32	24-Aug-13	16053130824016	<0.0005	0.00262	<0.0005	<0.00071	0.00262	<0.1	1.05	<0.25	<0.25	<1.0
GWN-14-32	28-Nov-13	16053131128025	<0.0005	0.00196	<0.0005	<0.00071	0.00196	0.26	3.58	<0.25	<0.25	<1.0
GWN-14-32	04-Aug-14	16053140804021	<0.0005	0.00081	0.00165	0.00919	0.01165	0.68	728	154	5.12	46.7
GWN-14-32	31-Oct-14	16053141031017	<0.0005	0.0005	0.00071	0.00412	0.00533	<0.1	13.2	<0.25	<0.25	<1.0
GMF Interim Quality Triggers for NAOSA^^			NS	NS	NS	NS	NS	NS	NS	NS	NS	2
Alberta Tier 1 - Fine Grained Soils - Natural Areas*			0.005^{P(MAC)}	0.024^{P(AO)}	0.0024^{P(AO)}	0.3^{P(AO)}	NS	2.2^P	1.1^P	NS	NS	NS

TABLE 8.

GROUNDWATER QUALITY RESULTS - HYDROCARBONS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Total BTEX mg/L	F1 C ₆ -C ₁₀ - BTEX mg/L	F2 C ₇₋₁₀ -C ₁₆ mg/L	F3 C ₇₋₁₆ -C ₃₄ mg/L	F4 C ₇₋₃₄ -C ₅₀ mg/L	Naphthenic Acids mg/L
Suficial Sands												
GWN-16-22	30-Sep-09	16053090930001	<0.0004	0.0064	<0.0004	0.0014	0.0078	<0.1	77.9	---	---	<1.0
GWN-16-22	18-Nov-10	16053101118003	<0.0005	0.0167	<0.0005	0.00097	0.01767	<0.1	102	---	---	5.9
GWN-16-22	12-Feb-11	16053110212003	<0.0005	0.00281	<0.0005	<0.00071	0.00281	<0.1	12.6	---	---	2.3
GWN-16-22	19-Oct-12	16053121019002	<0.0004	0.00072	<0.0004	<0.0008	0.00072	<0.1	0.41	0.13	<0.1	<1.0
GWN-16-22	19-Aug-13	16053130819001	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	0.38	0.38	<0.25	3.1
GWN-16-22	21-Nov-13	16053131121004	<0.0005	0.00826	<0.0005	0.00084	0.0091	0.34	11.1	6.68	2.75	<1.0
GWN-16-22	05-Aug-14	16053140805023	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	5.86	5.33	2	3.2
GWN-16-22	29-Oct-14	16053141029006	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	0.74	0.52	<0.25	2.3
IOR-KRL-01	03-Mar-05	16053050303001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	4.3
IOR-KRL-01	24-Jul-09	16053090724001	<0.001	<0.001	<0.001	<0.002	ND	---	<0.03	---	---	---
IOR-KRL-01	25-Jul-09	16053090725001	---	---	---	---	---	---	---	---	---	<1.0
IOR-KRL-01	17-Oct-09	16053091017001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1.0
IOR-KRL-01	19-Aug-10	16053100819001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.10	<0.1	---	---	<1.0
IOR-KRL-01	09-Oct-10	16053101009002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.10	<0.1	---	---	<1.0
IOR-KRL-01	23-Jul-11	16053110723001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-01	22-Sep-11	16053110922002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-01	03-Jul-12	16053120703001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	7.7
IOR-KRL-01	17-Oct-12	16053121017002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.12	---	---	<1
IOR-KRL-01	17-Oct-12	16053121017003	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-03 (SS)	13-Mar-04	16053040313002	<0.0005	<0.0005	<0.0005	0.0007	0.0007	<0.1	<0.1	---	---	---
IOR-KRL-03 (SS)	05-Feb-07	16053070205001	---	---	---	---	---	---	---	---	---	1.2
IOR-KRL-03 (SS)	16-Aug-10	16053100816001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.10	0.2	---	---	<1.0
IOR-KRL-03 (SS)	13-Oct-10	16053101013002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.10	<0.1	---	---	<1.0
IOR-KRL-03 (SS)	13-Oct-10	16053101013003	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.10	<0.1	---	---	<1.0
IOR-KRL-03 (SS)	22-Jul-11	16053110722004	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.1	---	---	<1
IOR-KRL-03 (SS)	24-Sep-11	16053110924001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.2	---	---	<1
IOR-KRL-03 (SS)	24-Sep-11	16053110924002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.1	---	---	<1
IOR-KRL-03 (SS)	06-Jul-12	16053120706001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-03 (SS)	19-Oct-12	16053121019007	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-04 (SS)	17-Mar-04	16053040317001	<0.0005	<0.0005	<0.0005	<0.0005	ND	<0.1	<0.1	---	---	---
IOR-KRL-04 (SS)	06-Feb-07	16053070206001	---	---	---	---	---	---	---	---	---	1.1
IOR-KRL-04 (SS)	27-Jul-09	16053090727001	<0.001	<0.001	<0.001	<0.002	ND	---	<0.03	---	---	<1.0
IOR-KRL-04 (SS)	18-Oct-09	16053091018001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1.0
IOR-KRL-04 (SS)	09-Oct-10	16053101009003	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.10	<0.1	---	---	<1.0
IOR-KRL-04 (SS)	09-Oct-10	16053101009004	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.10	<0.1	---	---	<1.0
GMF Interim Quality Triggers for NAOSA**			NS	NS	NS	NS	NS	NS	NS	NS	NS	2
Alberta Tier 1 - Fine Grained Soils - Natural Areas*			0.005^{P(MAC)}	0.024^{P(AO)}	0.0024^{P(AO)}	0.3^{P(AO)}	NS	2.2^P	1.1^P	NS	NS	NS

TABLE 8.

GROUNDWATER QUALITY RESULTS - HYDROCARBONS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Total BTEX mg/L	F1 C ₆ -C ₁₀ - BTEX mg/L	F2 C _{>10} -C ₁₆ mg/L	F3 C _{>16} -C ₃₄ mg/L	F4 C _{>34} -C ₅₀ mg/L	Naphthenic Acids mg/L
Suficial Sands												
IOR-KRL-04 (SS)	17-Jul-11	16053110717001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-04 (SS)	17-Jul-11	16053110717002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-04 (SS)	28-Sep-11	16053110928002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-04 (SS)	13-Jul-12	16053120713002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-04 (SS)	15-Oct-12	16053121015001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.14	---	---	<1
IOR-KRL-05 (SS)	10-Oct-10	16053101010301	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1.0
IOR-KRL-05 (SS)	16-Jul-11	16053110716002	<0.0004	0.0006	<0.0004	<0.0008	0.0006	<0.1	0.1	---	---	<1
IOR-KRL-05 (SS)	22-Sep-11	16053110922001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-05 (SS)	16-Aug-12	16053120816003	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-05 (SS)	14-Oct-12	16053121014005	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-06 (SS)	24-Jan-09	16053090124001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	---
IOR-KRL-06 (SS)	24-Jan-09	16053090124001	<0.0004	<0.0004	<0.0004	<0.0008	ND	---	<0.1	---	---	---
IOR-KRL-06 (SS)	24-Jan-09	16053090124002	---	---	---	---	---	---	---	---	---	<1.0
IOR-KRL-06 (SS)	21-Aug-10	16053100821002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.10	<0.1	---	---	<1.0
IOR-KRL-06 (SS)	12-Oct-10	16053101012001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.10	<0.1	---	---	<1.0
IOR-KRL-06 (SS)	24-Jul-11	16053110724001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-06 (SS)	29-Sep-11	16053110929003	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-06 (SS)	12-Jul-12	16053120712001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-06 (SS)	12-Jul-12	16053120712002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-06 (SS)	21-Oct-12	16053121021003	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.76	---	---	<1
IOR-KRL-07	27-Jan-09	16053090127001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-07	27-Jan-09	16053090127002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-07	21-Aug-10	16053100821003	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.10	<0.1	---	---	<1.0
IOR-KRL-07	12-Oct-10	16053101012002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.10	<0.1	---	---	<1.0
IOR-KRL-07	24-Jul-11	16053110724002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-07	29-Sep-11	16053110929004	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-07	11-Jul-12	16053120711001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.12	---	---	<1
IOR-KRL-07	21-Oct-12	16053121021004	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.2	---	---	<1
IOR-KRL-08	27-Jan-10	16053100127001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	1.8
IOR-KRL-08	22-Aug-10	16053100822001	<0.0004	0.0014	<0.0004	<0.0008	0.0014	<0.10	0.7	---	---	<1.0
IOR-KRL-08	17-Oct-10	16053101017002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.10	<0.1	---	---	<1.0
IOR-KRL-08	25-Jul-11	16053110725001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.4	---	---	<1
IOR-KRL-08	26-Sep-11	16053110926001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-08	05-Jul-12	16053120705001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	4.2	---	---	<1
IOR-KRL-08	19-Oct-12	16053121019005	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.35	---	---	1.1
GMF Interim Quality Triggers for NAOSA^{AA}			NS	NS	NS	NS	NS	NS	NS	NS	NS	2
Alberta Tier 1 - Fine Grained Soils - Natural Areas*			0.005^{P(MAC)}	0.024^{P(AO)}	0.0024^{P(AO)}	0.3^{P(AO)}	NS	2.2^P	1.1^P	NS	NS	NS

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Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Total BTEX mg/L	F1 C ₆ -C ₁₀ - BTEX mg/L	F2 C ₇₋₁₀ -C ₁₆ mg/L	F3 C ₇₋₁₆ -C ₃₄ mg/L	F4 C ₇₋₃₄ -C ₅₀ mg/L	Naphthenic Acids mg/L
Suficial Sands												
IOR-KRL-09	07-Feb-10	16053100207001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.1	---	---	<1.0
IOR-KRL-09	22-Aug-10	16053100822002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.10	0.1	---	---	<1.0
IOR-KRL-09	22-Aug-10	16053100822003	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.10	<0.1	---	---	<1.0
IOR-KRL-09	15-Oct-10	16053101015001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.10	0.4	---	---	<1.0
IOR-KRL-09	22-Jul-11	16053110722001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-09	22-Jul-11	16053110722002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-09	29-Sep-11	16053110929005	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-09	13-Jul-12	16053120713001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-09	23-Oct-12	16053121023004	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.1	---	---	<1
IOR-KRL-09	23-Oct-12	16053121023005	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-10	10-Feb-11	16053110210001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-10	21-Jul-11	16053110721001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.1	---	---	<1
IOR-KRL-10	21-Jul-11	16053110721002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.1	---	---	<1
IOR-KRL-10	28-Sep-11	16053110928001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.2	---	---	<1
IOR-KRL-10	17-Aug-12	16053120817003	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.11	---	---	<1
IOR-KRL-10	18-Oct-12	16053121018001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	1.3
IOR-KRL-11	11-Feb-11	16053110211001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-11	18-Jul-11	16053110718002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.2	---	---	<1
IOR-KRL-11	23-Sep-11	16053110923002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.2	---	---	<1
IOR-KRL-11	14-Jul-12	16053120714001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-11	14-Oct-12	16053121014006	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
TOT-EP-02 (SS)	15-Oct-10	16053101015002	---	---	---	---	---	---	---	---	---	1.1
GMF Interim Quality Triggers for NAOSA^^			NS	NS	NS	NS	NS	NS	NS	NS	NS	2
Alberta Tier 1 - Fine Grained Soils - Natural Areas*			0.005^{P(MAC)}	0.024^{P(AO)}	0.0024^{P(AO)}	0.3^{P(AO)}	NS	2.2^P	1.1^P	NS	NS	NS

TABLE 8.

GROUNDWATER QUALITY RESULTS - HYDROCARBONS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Total BTEX mg/L	F1 C ₆ -C ₁₀ - BTEX mg/L	F2 C _{>10} -C ₁₆ mg/L	F3 C _{>16} -C ₃₄ mg/L	F4 C _{>34} -C ₅₀ mg/L	Naphthenic Acids mg/L
Buried Channels and Valleys - Birch Channel												
AGS-02-97	15-Sep-09	16053090915002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1.0
AGS-02-97	19-Nov-10	16053101119002	<0.0005	0.00181	<0.0005	<0.00071	0.00181	<0.1	<0.25	---	---	<1.0
AGS-02-97	24-Oct-12	16053121024002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	<0.1	<0.1	<1.0
AGS-02-97	23-Aug-13	16053130823015	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	0.53	<0.25	<1.0
AGS-02-97	22-Nov-13	16053131122005	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
AGS-02-97	06-Aug-14	16053140806029	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
AGS-02-97	30-Oct-14	16053141030013	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	1.1
AGS-03-17	17-Sep-09	16053090917003	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1.0
AGS-03-17	20-Nov-10	16053101120003	<0.0005	<0.00075	<0.0005	<0.00071	ND	<0.1	<0.25	---	---	<1.0
AGS-03-17	16-Feb-11	16053110216006	<0.0005	<0.00075	<0.0005	<0.00071	ND	<0.1	<0.25	---	---	<1.0
AGS-03-17	22-Aug-13	16053130822008	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
AGS-03-17	28-Nov-13	16053131128021	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
AGS-03-17	06-Aug-14	16053140806024	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
AGS-03-17	30-Oct-14	16053141030012	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
GMF Interim Quality Triggers for NAOSA^^			NS	NS	NS	NS	NS	NS	NS	NS	NS	3
Alberta Tier 1 - Fine Grained Soils - Natural Areas*			0.005^{P(MAC)}	0.024^{P(AO)}	0.0024^{P(AO)}	0.3^{P(AO)}	NS	2.2^P	1.1^P	NS	NS	NS
Buried Channels and Valleys - Kearl Channel												
GWN-08-44	20-Oct-12	16053121020002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	<0.1	<0.1	---
GWN-08-44	17-Sep-13	16053130917030	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
GWN-08-44	02-Aug-14	16053140802008	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	1
GWN-08-44	02-Nov-14	16053141102026	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	1.3
GWN-Shell-PW2-63	05-Nov-09	16053091105001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	---
GWN-Shell-PW2-63	25-Nov-10	16053101125001	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	---	---	---
GWN-Shell-PW2-63	23-Oct-12	16053121023001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	0.36	<0.1	<1.0
GWN-Shell-PW2-63	21-Aug-13	16053130821005	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
GWN-Shell-PW2-63	25-Nov-13	16053131125014	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	0.5	<0.25	<1.0
GWN-Shell-PW2-63	31-Jul-14	16053140731001	<0.0005	<0.0005	<0.0005	0.00073	0.00073	<0.1	<0.25	<0.25	<0.25	<1.0
GWN-Shell-PW2-63	03-Nov-14	16053141103028	<0.0005	<0.0005	0.00084	0.00388	0.00472	<0.1	<0.25	<0.25	<0.25	1.7
IOR-KRL-02	13-Mar-04	16053040313001	<0.0005	<0.0005	<0.0005	<0.0005	ND	<0.1	<0.1	---	---	---
IOR-KRL-02	17-Aug-10	16053100817001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.10	<0.1	---	---	<1.0
IOR-KRL-02	13-Oct-10	16053101013001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.10	<0.1	---	---	<1.0
IOR-KRL-02	22-Jul-11	16053110722003	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-02	25-Sep-11	16053110925001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-02	08-Jul-12	16053120708001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
IOR-KRL-02	19-Oct-12	16053121019006	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1
GMF Interim Quality Triggers for NAOSA^^			NS	NS	NS	NS	NS	NS	NS	NS	NS	3
Alberta Tier 1 - Fine Grained Soils - Natural Areas*			0.005^{P(MAC)}	0.024^{P(AO)}	0.0024^{P(AO)}	0.3^{P(AO)}	NS	2.2^P	1.1^P	NS	NS	NS

TABLE 8.

GROUNDWATER QUALITY RESULTS - HYDROCARBONS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Total BTEX mg/L	F1 C ₆ -C ₁₀ - BTEX mg/L	F2 C _{>10} -C ₁₆ mg/L	F3 C _{>16} -C ₃₄ mg/L	F4 C _{>34} -C ₅₀ mg/L	Naphthenic Acids mg/L
Buried Channels and Valleys - Thickwood Channel												
GWN-13-27	08-Sep-09	16053090908001	<0.0004	0.0051	<0.0004	<0.0008	0.0051	<0.1	<0.1	---	---	<1.0
GWN-13-27	16-Nov-10	16053101116004	<0.0005	0.002	<0.0005	<0.00071	0.002	<0.1	<0.25	---	---	<1.0
GWN-13-27	12-Feb-11	16053110212006	<0.0005	0.00261	<0.0005	<0.00071	0.00261	<0.1	<0.25	---	---	<1.0
GWN-13-27	12-Feb-11	16053110212008	---	---	---	---	---	---	---	---	---	<1.0
GWN-13-27	26-Aug-13	16053130826022	<0.0005	0.00085	<0.0005	<0.00071	0.00085	<0.1	<0.25	<0.25	<0.25	<1.0
GWN-13-27	23-Nov-13	16053131123011	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	0.44	13.1	1.04	1.1
GWN-13-27	07-Aug-14	16053140807037	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
GWN-13-27	28-Oct-14	16053141028004	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	0.37	<0.25	<1.0
GMF Interim Quality Triggers for NAOSA^{AA}			NS	NS	NS	NS	NS	NS	NS	NS	NS	3
Alberta Tier 1 - Fine Grained Soils - Natural Areas*			0.005^{P(MAC)}	0.024^{P(AO)}	0.0024^{P(AO)}	0.3^{P(AO)}	NS	2.2^P	1.1^P	NS	NS	NS
Grand Rapids Formation												
CVE-BOR-03	31-Jan-08	16053080131001	<0.0004	0.0066	<0.0004	---	0.0066	<0.1	<0.15	---	---	<1.0
CVE-BOR-03	01-Mar-10	16053100301001	---	---	---	---	---	---	---	---	---	<1.0
CVE-BOR-03	23-Jun-10	16053100623003	---	---	---	---	---	---	---	---	---	<1.0
CVE-BOR-03	09-Oct-10	16053101009001	---	---	---	---	---	---	---	---	---	<1.0
GWN-13-28	27-Aug-13	16053130827026	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
GWN-13-28	23-Nov-13	16053131123008	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
GWN-13-28	07-Aug-14	16053140807035	<0.0005	0.00096	<0.0005	<0.00071	0.00096	<0.1	<0.25	<0.25	<0.25	<1.0
GWN-13-28	28-Oct-14	16053141028001	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	0.36	<0.25	1.1
Alberta Tier 1 - Fine Grained Soils - Natural Areas*			0.005^{P(MAC)}	0.024^{P(AO)}	0.0024^{P(AO)}	0.3^{P(AO)}	NS	2.2^P	1.1^P	NS	NS	NS
Clearwater Formation												
AGS-02-108	24-Oct-12	16053121024006	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	<0.1	<0.1	<1.0
AGS-02-108	23-Aug-13	16053130823014	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
AGS-02-108	28-Nov-13	16053131128024	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
AGS-02-108	06-Aug-14	16053140806032	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	0.39	<0.25	<1.0
AGS-03-30	17-Sep-09	16053090917002	<0.0004	0.0004	<0.0004	<0.0008	0.0004	<0.1	<0.1	---	---	<1.0
AGS-03-30	20-Nov-10	16053101120002	<0.0005	<0.00075	<0.0005	<0.00071	ND	<0.1	<0.25	---	---	<1.0
AGS-03-30	16-Feb-11	16053110216005	<0.0005	<0.00075	<0.0005	0.00163	0.00163	<0.1	<0.25	---	---	<1.0
AGS-03-30	06-Aug-14	16053140806027	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
AGS-03-30	30-Oct-14	16053141030009	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
GWN-08-45	30-Sep-09	16053090930002	<0.0004	0.0006	<0.0004	<0.0008	0.0006	<0.1	<0.1	---	---	<1.0
GWN-08-45	20-Oct-12	16053121020003	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	<0.1	<0.1	---
GWN-08-45	17-Sep-13	16053130917029	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
GWN-08-45	02-Aug-14	16053140802007	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	1
GWN-08-45	02-Nov-14	16053141102024	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	0.28	0.38	<1.0
Alberta Tier 1 - Fine Grained Soils - Natural Areas*			0.005^{P(MAC)}	0.024^{P(AO)}	0.0024^{P(AO)}	0.3^{P(AO)}	NS	2.2^P	1.1^P	NS	NS	NS

TABLE 8.

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Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Total BTEX mg/L	F1 C ₆ -C ₁₀ - BTEX mg/L	F2 C ₇₋₁₀ -C ₁₆ mg/L	F3 C ₇₋₁₆ -C ₃₄ mg/L	F4 C ₇₋₃₄ -C ₅₀ mg/L	Naphthenic Acids mg/L
Clearwater Formation												
GWN-14-33	24-Aug-13	16053130824017	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
GWN-14-33	28-Nov-13	16053131128026	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
GWN-14-33	04-Aug-14	16053140804017	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
GWN-14-33	31-Oct-14	16053141031016	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
Alberta Tier 1 - Fine Grained Soils - Natural Areas*			0.005^{P(MAC)}	0.024^{P(AO)}	0.0024^{P(AO)}	0.3^{P(AO)}	NS	2.2^P	1.1^P	NS	NS	NS
McMurray Formation Basal Aquifer - Aquifer Management Unit 1												
GWN-06-60	26-Sep-09	16053090926001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	<1.0
GWN-06-60	21-Nov-10	16053101121004	<0.0005	<0.00075	<0.0005	<0.00071	ND	<0.1	<0.25	---	---	<1.0
GWN-06-60	14-Feb-11	16053110214005	<0.0005	<0.00075	<0.0005	<0.00071	ND	<0.1	<0.25	---	---	1.1
GWN-06-60	16-Oct-12	16053121016001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	<0.1	<0.1	<1.0
GWN-06-60	21-Aug-13	16053130821007	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
GWN-06-60	26-Nov-13	16053131126015	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	0.69	0.3	<1.0
GWN-06-60	31-Jul-14	16053140731003	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	13.1	52.9	29.9	<1.0
GWN-06-60	03-Nov-14	16053141103029	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	1.3	5.8	3.09	1.8
GWN-17-50	10-Sep-09	16053090910001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.5	---	---	<1.0
GWN-17-50	10-Sep-09	16053090910003	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.8	---	---	---
GWN-17-50	23-Oct-12	16053121023002	<0.0004	0.0079	<0.0004	<0.0008	0.0079	<0.1	0.35	0.29	<0.1	2
GWN-17-50	26-Aug-13	16053130826020	<0.0005	0.004	<0.0005	<0.00071	0.004	<0.1	0.44	1.15	<0.25	2.7
GWN-17-50	19-Nov-13	16053131119002	<0.0005	<0.0005	0.00087	0.00494	0.00581	<0.1	1.3	1.52	<0.25	3.1
GWN-17-50	05-Aug-14	16053140805022	<0.0005	<0.0005	<0.0005	0.00072	0.00072	<0.1	0.28	1.15	<0.25	5.4
GWN-17-50	29-Oct-14	16053141029008	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	0.58	1.3	<0.25	3.4
GMF Interim Quality Triggers for NAOSA^^			NS	NS	NS	NS	NS	NS	NS	NS	NS	5
Alberta Tier 1 - Fine Grained Soils - Natural Areas*			0.005^{P(MAC)}	0.024^{P(AO)}	0.0024^{P(AO)}	0.3^{P(AO)}	NS	2.2^P	1.1^P	NS	NS	NS

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Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Total BTEX mg/L	F1 C ₆ -C ₁₀ - BTEX mg/L	F2 C _{>10} -C ₁₆ mg/L	F3 C _{>16} -C ₃₄ mg/L	F4 C _{>34} -C ₅₀ mg/L	Naphthenic Acids mg/L
McMurray Formation Basal Aquifer - Aquifer Management Unit 2												
GWN-01-75	13-Dec-10	16053101213001	<0.0005	<0.00075	<0.0005	<0.00071	ND	<0.1	0.88	---	---	5.9
GWN-01-75	01-Aug-14	16053140801005	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	0.74	2.26	<0.25	9.2
GWN-01-75	04-Nov-14	16053141104034	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	2.07	6.08	1.11	10.9
GWN-06-61	23-Nov-10	16053101123002	---	---	---	---	---	---	---	---	---	45.1
GWN-06-61	23-Nov-10	16053101123005	<0.0005	0.00084	<0.0005	0.00084	0.00168	<0.1	0.51	---	---	---
GWN-06-61	16-Oct-12	16053121016002	<0.0004	0.0018	<0.0004	<0.0008	0.0018	<0.1	0.12	0.45	0.13	25
GWN-06-61	21-Aug-13	16053130821006	<0.0005	0.00208	<0.0005	<0.00071	0.00208	<0.1	1.21	8.53	<0.25	52.1
GWN-06-61	26-Nov-13	16053131126018	<0.0005	0.00155	<0.0005	<0.00071	0.00155	<0.1	0.83	5.7	<0.25	40.1
GWN-06-61	31-Jul-14	16053140731002	<0.0005	<0.0005	0.00062	0.00323	0.00385	<0.1	0.61	4.94	<0.25	47.4
GWN-06-61	03-Nov-14	16053141103031	<0.0005	<0.0005	0.00094	0.00369	0.00463	<0.1	0.6	4.32	<0.25	56.2
GWN-07-56	03-Aug-14	16053140803015	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	1.32	6.58	<0.25	14
GWN-07-56	01-Nov-14	16053141101021	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	1.6	8.42	0.43	26
GWN-07-57	25-Sep-09	16053090925001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	6.2
GWN-07-57	25-Sep-09	16053090925002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.3	---	---	---
GWN-07-57	13-Feb-11	16053110213003	<0.0005	<0.00075	<0.0005	<0.00071	ND	<0.1	<0.25	---	---	13.7
GWN-07-57	21-Sep-13	16053130921040	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	0.65	3.5	<0.25	11.8
GWN-07-57	05-Nov-13	16053131105033	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	0.66	4.32	<0.25	12.7
GWN-07-57	03-Aug-14	16053140803010	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	0.67	3.2	<0.25	10.6
GWN-07-57	01-Nov-14	16053141101020	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	0.5	3.34	<0.25	17.4
GWN-08-46	20-Oct-12	16053121020004	<0.0004	0.0016	<0.0004	<0.0008	0.0016	<0.1	<0.1	<0.1	<0.1	---
GWN-08-46	17-Sep-13	16053130917032	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
GWN-08-46	04-Nov-13	16053131104031	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
GWN-08-46	02-Aug-14	16053140802009	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	---
GWN-08-46	02-Nov-14	16053141102023	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	1.1
IOR-KRL-03 (BAS)	01-Mar-98	16053980301001	<0.0004	0.0007	0.0005	0.0041	0.0053	---	---	---	---	---
IOR-KRL-03 (BAS)	04-Mar-98	16053980304002	---	---	---	---	---	---	---	---	---	3
IOR-KRL-03 (BAS)	07-Feb-07	16053070207001	---	---	---	---	---	---	---	---	---	10
IOR-KRL-03 (BAS)	07-Feb-07	16053070207002	---	---	---	---	---	---	---	---	---	10
IOR-KRL-03 (BAS)	21-Aug-10	16053100821004	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.7	---	---	8.4
IOR-KRL-03 (BAS)	11-Oct-10	16053101011001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.5	---	---	8.3
IOR-KRL-03 (BAS)	18-Jul-11	16053110718001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.7	---	---	13
IOR-KRL-03 (BAS)	23-Sep-11	16053110923001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.7	---	---	10
IOR-KRL-03 (BAS)	17-Aug-12	16053120817002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.16	---	---	12
IOR-KRL-03 (BAS)	14-Oct-12	16053121014002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	12
IOR-KRL-03 (BAS)	14-Oct-12	16053121014003	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	1.4
GMF Interim Quality Triggers for NAOSA^^			NS	NS	NS	NS	NS	NS	NS	NS	NS	20
Alberta Tier 1 - Fine Grained Soils - Natural Areas*			0.005^{P(MAC)}	0.024^{P(AO)}	0.0024^{P(AO)}	0.3^{P(AO)}	NS	2.2^P	1.1^P	NS	NS	NS

TABLE 8.

GROUNDWATER QUALITY RESULTS - HYDROCARBONS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Total BTEX mg/L	F1 C ₆ -C ₁₀ - BTEX mg/L	F2 C ₇₋₁₀ -C ₁₆ mg/L	F3 C ₁₆ -C ₃₄ mg/L	F4 C ₃₄ -C ₅₀ mg/L	Naphthenic Acids mg/L
McMurray Formation Basal Aquifer - Aquifer Management Unit 2												
IOR-KRL-04 (BAS)	26-Feb-98	16053980226001	<0.0004	<0.0004	<0.0004	<0.0008	ND	---	---	---	---	---
IOR-KRL-04 (BAS)	26-Feb-98	16053980226002	<0.0004	<0.0004	<0.0004	<0.0008	ND	---	---	---	---	---
IOR-KRL-04 (BAS)	21-Aug-10	16053100821001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.10	0.3	---	---	5.6
IOR-KRL-04 (BAS)	10-Oct-10	16053101010001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.10	0.2	---	---	4.6
IOR-KRL-04 (BAS)	16-Jul-11	16053110716001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	5.5
IOR-KRL-04 (BAS)	29-Sep-11	16053110929001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	5
IOR-KRL-04 (BAS)	17-Aug-12	16053120817001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	7.1
IOR-KRL-04 (BAS)	14-Oct-12	16053121014001	<0.0004	0.0027	<0.0004	<0.0008	0.0027	<0.1	<0.1	---	---	6.5
IOR-KRL-05 (BAS)	26-Feb-98	16053980226003	<0.0004	<0.0004	<0.0004	<0.0008	ND	---	---	---	---	---
IOR-KRL-05 (BAS)	26-Feb-98	16053980226004	<0.0004	<0.0004	<0.0004	<0.0008	ND	---	---	---	---	---
IOR-KRL-05 (BAS)	04-Mar-98	16053980304001	---	---	---	---	---	---	---	---	---	16
IOR-KRL-05 (BAS)	03-Nov-98	16053981103001	---	---	---	---	---	---	---	---	---	17
IOR-KRL-05 (BAS)	03-Nov-98	16053981103002	---	---	---	---	---	---	---	---	---	19
IOR-KRL-05 (BAS)	17-Jul-09	16053090717001	<0.001	<0.001	<0.001	<0.002	ND	---	3.04	---	---	---
IOR-KRL-05 (BAS)	17-Jul-09	16053090717002	---	---	---	---	---	---	---	---	---	9.3
IOR-KRL-05 (BAS)	20-Oct-09	16053091020002	<0.0004	0.0029	<0.0004	<0.0008	0.0029	<0.1	0.8	---	---	7.3
IOR-KRL-05 (BAS)	20-Aug-10	16053100820001	<0.0004	0.001	<0.0004	<0.0008	0.001	<0.10	0.9	---	---	7.3
IOR-KRL-05 (BAS)	10-Oct-10	16053101010002	<0.0004	0.0014	<0.0004	<0.0008	0.0014	<0.10	0.5	---	---	6
IOR-KRL-05 (BAS)	10-Oct-10	16053101010003	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.10	<0.1	---	---	6.3
IOR-KRL-05 (BAS)	10-Oct-10	16053101010004	<0.0004	0.0016	<0.0004	<0.0008	0.0016	<0.10	0.5	---	---	---
IOR-KRL-05 (BAS)	15-Jul-11	16053110715001	<0.0004	0.0005	<0.0004	<0.0008	0.0005	<0.1	0.3	---	---	6.9
IOR-KRL-05 (BAS)	29-Sep-11	16053110929002	0.015	0.019	0.001	0.0082	0.0432	<0.1	0.8	---	---	6.6
IOR-KRL-05 (BAS)	16-Aug-12	16053120816001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.15	---	---	7.7
IOR-KRL-05 (BAS)	16-Aug-12	16053120816002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.13	---	---	8.1
IOR-KRL-05 (BAS)	14-Oct-12	16053121014004	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.6	---	---	7.5
SHL-ALB-01	20-Oct-09	16053091020001	<0.0005	<0.0005	<0.0005	<0.0005	ND	---	---	---	---	19.3
SHL-ALB-01	03-Nov-09	16053091103001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	4.7	---	---	9.1
SHL-ALB-01	19-May-10	16053100519001	<0.0005	<0.0005	<0.0005	<0.0005	ND	---	---	---	---	17.4
SHL-ALB-01	30-May-11	16053110530001	---	---	---	---	---	---	---	---	---	20.3
SHL-ALB-01	26-Jun-12	16053120626001	---	---	---	---	---	---	---	---	---	19.8
SHL-ALB-01	26-Jun-12	16053120626002	---	---	---	---	---	---	---	---	---	18.2
SHL-ALB-02	02-Nov-09	16053091102001	<0.0005	<0.0005	<0.0005	<0.0005	ND	---	---	---	---	15.6
SHL-ALB-02	02-Nov-09	16053091102002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	5.5
SHL-ALB-02	27-May-10	16053100527001	<0.0005	<0.0005	<0.0005	<0.0005	ND	---	---	---	---	11.4
SHL-ALB-02	14-Oct-10	16053101014001	<0.0005	<0.0005	<0.0005	<0.0005	ND	---	---	---	---	13.7
GMF Interim Quality Triggers for NAOSA^^			NS	NS	NS	NS	NS	NS	NS	NS	NS	20
Alberta Tier 1 - Fine Grained Soils - Natural Areas*			0.005^{P(MAC)}	0.024^{P(AO)}	0.0024^{P(AO)}	0.3^{P(AO)}	NS	2.2^P	1.1^P	NS	NS	NS

TABLE 8.

GROUNDWATER QUALITY RESULTS - HYDROCARBONS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Total BTEX mg/L	F1 C ₆ -C ₁₀ - BTEX mg/L	F2 C _{>10} -C ₁₆ mg/L	F3 C _{>16} -C ₃₄ mg/L	F4 C _{>34} -C ₅₀ mg/L	Naphthenic Acids mg/L
McMurray Formation Basal Aquifer - Aquifer Management Unit 2												
SHL-ALB-03	15-Feb-01	16053010215001	<0.0005	<0.0005	<0.0005	<0.0005	ND	---	---	---	---	22
SHL-ALB-03	02-Apr-02	16053020402001	<0.0005	<0.0005	<0.0005	<0.0005	ND	---	---	---	---	20
SHL-ALB-03	23-Mar-03	16053030323001	<0.0005	<0.0005	<0.0005	<0.0005	ND	---	---	---	---	21
SHL-JKP-01	27-Sep-01	16053010927001	<0.0005	0	<0.0005	<0.0005	ND	---	---	---	---	---
SHL-JKP-01	21-Dec-07	16053071221001	---	---	---	---	---	---	---	---	---	<1.0
SHL-JKP-01	20-Sep-08	16053080920001	<0.0004	0.0029	<0.0004	<0.0008	0.0029	<0.1	<0.1	---	---	6.7
SHL-JKP-01	15-May-09	16053090515001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.7	---	---	7.3
SHL-JKP-01	25-Nov-09	16053091125001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	5.8
SHL-JKP-01	25-Nov-09	16053091125002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	---	---	5.8
SHL-JKP-01	23-Jun-10	16053100623001	<0.0005	<0.00075	<0.0005	<0.001	ND	<0.1	<0.25	---	---	10.2
SHL-JKP-01	23-Jun-10	16053100623005	---	---	---	---	---	---	---	---	---	<1.0
SHL-JKP-01	26-Oct-10	16053101026001	---	---	---	---	---	---	---	---	---	12.7
SHL-JKP-01	27-Oct-10	16053101027001	<0.0005	<0.0005	<0.0005	<0.001	ND	<0.1	0.45	---	---	---
SHL-JKP-01	10-Jun-11	16053110610001	---	---	---	---	---	---	---	---	---	11.1
SHL-JKP-01	10-Jun-11	16053110610002	---	---	---	---	---	---	---	---	---	11.7
SHL-JKP-01	23-Nov-11	16053111123001	---	---	---	---	---	---	---	---	---	8.8
SHL-JKP-01	25-Jun-12	16053120625001	---	---	---	---	---	---	---	---	---	0
SHL-JKP-01	06-Nov-12	16053121106001	---	---	---	---	---	---	---	---	---	11.4
GMF Interim Quality Triggers for NAOSA^{AA}			NS	NS	NS	NS	NS	NS	NS	NS	NS	20
Alberta Tier 1 - Fine Grained Soils - Natural Areas*			0.005^{P(MAC)}	0.024^{P(AO)}	0.0024^{P(AO)}	0.3^{P(AO)}	NS	2.2^P	1.1^P	NS	NS	NS
McMurray Formation Basal Aquifer - Aquifer Management Unit 3												
CNR-H02-002	11-Nov-10	16053101111001	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	---	---	3.7
CNR-H02-002	17-Jun-11	16053110617001	<0.0005	<0.00075	<0.0005	<0.00071	ND	<0.1	<0.25	---	---	1.4
CNR-H02-002	07-Nov-11	16053111107001	<0.0005	<0.00075	<0.0005	<0.001	ND	<0.1	<0.25	---	---	2.9
CNR-H02-002	06-May-12	16053120506001	<0.0005	0.00083	0.00056	0.00233	0.00372	<0.1	<0.25	---	---	3.7
CNR-H02-002	24-Oct-12	16053121024001	<0.0005	0.00078	0.00054	0.0027	0.00402	<0.1	0.3	---	---	5.1
CNR-H02-002	30-May-13	16053130530001	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	---	---	<1.0
CNR-H02-002	19-Dec-13	16053131219001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	0.13	---	---	<1.0
GWN-16-24	19-Oct-12	16053121019003	<0.0004	0.0015	<0.0004	<0.0008	0.0015	<0.1	0.17	0.11	<0.1	4.6
GWN-16-24	19-Aug-13	16053130819002	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	1.27	<0.25	16.1
GWN-16-24	21-Nov-13	16053131121003	<0.0005	0.00059	<0.0005	<0.00071	0.00059	<0.1	0.31	1.3	<0.25	13.4
GWN-16-24	08-Aug-14	16053140808039	<0.0005	0.00212	<0.0005	<0.00071	0.00212	<0.1	<0.25	1.58	<0.25	11.7
GWN-16-24	29-Oct-14	16053141029005	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	1.2	<0.25	10.5
Alberta Tier 1 - Fine Grained Soils - Natural Areas*			0.005^{P(MAC)}	0.024^{P(AO)}	0.0024^{P(AO)}	0.3^{P(AO)}	NS	2.2^P	1.1^P	NS	NS	NS

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Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Total BTEX mg/L	F1 C ₆ -C ₁₀ - BTEX mg/L	F2 C ₇₋₁₀ -C ₁₆ mg/L	F3 C ₇₋₁₆ -C ₃₄ mg/L	F4 C ₇₋₃₄ -C ₅₀ mg/L	Naphthenic Acids mg/L
McMurray Formation Basal Aquifer - Aquifer Management Unit 4												
CNR-HRZ-01	20-Jan-10	16053100120001	---	---	---	---	---	---	---	---	---	1.8
CNR-HRZ-01	08-Feb-10	16053100208001	<0.0005	<0.0005	<0.0005	<0.001	ND	<0.1	<0.25	---	---	1.1
CNR-HRZ-01	07-Nov-10	16053101107001	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	1.57	---	---	2.5
CNR-HRZ-01	08-Nov-10	16053101108001	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	1.39	---	---	1.6
CNR-HRZ-01	15-Jun-11	16053110615001	<0.0005	<0.00075	<0.0005	<0.00071	ND	<0.1	2.07	---	---	<1.0
CNR-HRZ-01	05-Nov-11	16053111105001	<0.0005	<0.00075	<0.0005	<0.001	ND	<0.1	<0.25	---	---	<1.0
CNR-HRZ-01	05-May-12	16053120505001	<0.0005	<0.00075	<0.0005	<0.00071	ND	<0.1	4.95	---	---	<1.0
CNR-HRZ-01	21-Oct-12	16053121021001	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	0.86	---	---	2.0
CNR-HRZ-01	21-Oct-12	16053121021002	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	0.77	---	---	1.9
CNR-HRZ-01	05-May-13	16053130505001	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	2.55	---	---	2.4
CNR-HRZ-01	21-Dec-13	16053131221001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	3.2	---	---	<1.0
CNR-HRZ-01	21-Dec-13	16053131221002	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	4.1	---	---	<1.0
GWN-01-76	27-Oct-12	16053121027003	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	<0.1	<0.1	<1.0
GWN-01-76	18-Sep-13	16053130918035	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	1.28	0.29	<1.0
GWN-01-76	27-Nov-13	16053131127019	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
GWN-01-76	04-Nov-14	16053141104033	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	<1.0
Alberta Tier 1 - Fine Grained Soils - Natural Areas*			0.005^{P(MAC)}	0.024^{P(AO)}	0.0024^{P(AO)}	0.3^{P(AO)}	NS	2.2^P	1.1^P	NS	NS	NS
Prairie Evaporite/Beaverhill Lake/Methy (Keg River) Formations												
CNR-H02-007	19-Jan-10	16053100119001	<0.0005	<0.0005	<0.0005	<0.0005	ND	<0.1	<0.25	---	---	7
GWN-01-77	29-Oct-12	16053121027002	0.00053	0.0017	0.00044	0.0025	0.00517	<0.1	<0.1	<0.1	<0.1	<1.0
GWN-01-77	18-Sep-13	16053130918034	<0.0005	0.00136	<0.0005	0.00152	0.00288	<0.1	<0.25	<0.25	<0.25	1.9
GWN-01-77	27-Nov-13	16053131127020	0.00178	0.00169	<0.0005	<0.00071	0.00347	<0.1	0.44	0.98	<0.25	2.5
GWN-01-78	27-Oct-12	16053121027001	0.013	0.0081	0.00078	0.0022	0.02408	<0.1	<0.1	<0.1	<0.1	<1.0
GWN-06-62	17-Oct-12	16053121017001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	<0.1	<0.1	2.2
GWN-06-62	21-Aug-13	16053130821004	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	1.41	7.79	<0.25	24.3
GWN-06-62	26-Nov-13	16053131126016	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	0.74	5.45	<0.25	26.4
GWN-07-58	21-Sep-13	16053130921041	0.00114	0.00188	0.00064	0.00235	0.00601	<0.1	<0.25	0.51	<0.25	2.2
GWN-07-58	03-Aug-14	16053140803013	0.00055	0.00105	<0.0005	0.00082	0.00242	<0.1	0.35	1.05	<0.25	3.5
GWN-07-59	21-Sep-13	16053130921042	0.0038	0.00596	0.00091	0.00463	0.0153	<0.1	0.6	1.26	<0.25	4
GWN-07-59	03-Aug-14	16053140803016	<0.0005	0.00089	<0.0005	<0.00071	0.00089	<0.1	0.63	1.63	<0.25	4.9
GWN-08-47	20-Oct-12	16053121020005	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	<0.1	<0.1	---
GWN-08-47	20-Sep-13	16053130920036	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	0.68	4.96	<0.25	18.3
Alberta Tier 1 - Fine Grained Soils - Natural Areas*			0.005^{P(MAC)}	0.024^{P(AO)}	0.0024^{P(AO)}	0.3^{P(AO)}	NS	2.2^P	1.1^P	NS	NS	NS

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North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Total BTEX mg/L	F1 C ₆ -C ₁₀ - BTEX mg/L	F2 C _{>10} -C ₁₆ mg/L	F3 C _{>16} -C ₃₄ mg/L	F4 C _{>34} -C ₅₀ mg/L	Naphthenic Acids mg/L
Prairie Evaporite/Beaverhill Lake/Methy (Keq River) Formations												
GWN-08-48	20-Oct-12	16053121020006	0.0004	0.00083	<0.0004	0.0019	0.00313	<0.1	<0.1	<0.1	<0.1	---
GWN-08-48	20-Sep-13	16053130920037	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	0.33	0.92	<0.25	4.3
GWN-14-35	25-Aug-13	16053130825018	<0.0005	<0.0005	<0.0005	0.0105	0.0105	5.22	225	37.3	<0.25	<1.0
GWN-14-35	04-Aug-14	16053140804020	<0.0005	0.00098	0.00443	0.154	0.15941	56.1	678	21	1.41	<1.0
GWN-14-36	04-Aug-14	16053140804018	<0.0005	0.00219	0.00096	0.01	0.01315	<0.1	0.31	1.84	<0.25	6.6
GWN-16-25	19-Oct-12	16053121019004	<0.0004	0.0036	<0.0004	<0.0008	0.0036	<0.1	<0.1	<0.1	<0.1	---
GWN-17-51	23-Oct-12	16053121023003	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	0.12	<0.1	<1.0
GWN-17-51	26-Aug-13	16053130826019	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	5.2
GWN-17-51	19-Nov-13	16053131119001	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	7.3
GWN-17-51	05-Aug-14	16053140805021	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	10.1
GWN-17-51	29-Oct-14	16053141029007	<0.0005	<0.0005	<0.0005	<0.00071	ND	<0.1	<0.25	<0.25	<0.25	7.3
Alberta Tier 1 - Fine Grained Soils - Natural Areas*			0.005^{P(MAC)}	0.024^{P(AO)}	0.0024^{P(AO)}	0.3^{P(AO)}	NS	2.2^P	1.1^P	NS	NS	NS
McMurray Formation												
CVE-10-05-TW	07-Feb-11	16053110207001	0.016	0.0068	0.0006	<0.0008	0.0234	---	---	---	---	1.2
Test 1	25-Oct-12	16053121025001	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	<0.1	<0.1	<1.0
Test 2	30-Oct-12	16053121030005	<0.0004	<0.0004	<0.0004	<0.0008	ND	<0.1	<0.1	<0.1	<0.1	<1.0
Alberta Tier 1 - Fine Grained Soils - Natural Areas*			0.005^{P(MAC)}	0.024^{P(AO)}	0.0024^{P(AO)}	0.3^{P(AO)}	NS	2.2^P	1.1^P	NS	NS	NS

Notes:

- - not analyzed
- NS - guideline not specified
- ^P - indicates guideline for Potable Groundwater exposure pathway
- ^{AO} - aesthetic objective
- ^{MAC} - maximum acceptable concentration
- * - Alberta Tier 1 Soil and Groundwater Remediation Guidelines (AENV 2010)
- ^{AA} - Groundwater Management Framework Interim Quality Triggers for the North Athabasca Oil Sands Area
- Underline** - indicates values do not meet Alberta Tier 1 Natural Areas guideline
- Italics** - indicates values do not meet GMF Interim Quality Triggers

TABLE 9.

GROUNDWATER QUALITY RESULTS - POLYCYCLIC AROMATIC HYDROCARBONS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Acenaphthene mg/L	Acenaphthylene mg/L	Anthracene mg/L	Benzo[a]anthracene** mg/L	Benzo[b+]/fluoranthene** mg/L	Benzo[k]fluoranthene** mg/L	Benzo[g,h,i]perylene** mg/L	Benzo[a]pyrene** mg/L	Chrysene** mg/L	Dibenz[a,h]anthracene** mg/L	Fluoranthene mg/L	Fluorene mg/L	Indeno[1,2,3-c,d]pyrene** mg/L	Naphthalene mg/L	Phenanthrene mg/L	Pyrene mg/L	Benzo[a]pyreneTPE+ mg/L
Surficial Sands																			
AGS-01-WT	16-Sep-09	16053090916001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	---	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
AGS-01-WT	25-Oct-12	16053121025003	<0.0001	<0.0001	<0.00001	<0.0000085	0.000011	<0.0000085	0.0000088	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	1.188E-06
AGS-02-20	15-Sep-09	16053090915004	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	---	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
AGS-02-20	19-Nov-10	16053101119004	<0.00002	---	<0.00001	<0.00001	<0.00001	<0.00001	0.000079	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000103	<0.00005	0.000026	0.00000079
AGS-02-20	15-Feb-11	16053110215004	<0.00002	---	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000068	<0.00005	<0.00002	ND
AGS-02-20	15-Feb-11	16053110215006	<0.00002	---	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000073	<0.00005	<0.00002	ND
AGS-02-20	24-Oct-12	16053121024005	<0.0001	<0.0001	<0.00001	<0.0000085	0.00001	<0.0000085	<0.0000085	0.000015	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	0.000016
AGS-02-20	23-Aug-13	16053130823011	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00002	ND
AGS-02-20	22-Nov-13	16053131122006	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00002	ND
AGS-02-20	06-Aug-14	16053140806030	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
AGS-02-20	30-Oct-14	16053141030014	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
AGS-02-50	15-Sep-09	16053090915003	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	---	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
AGS-02-WT	15-Sep-09	16053090915001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	---	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
AGS-02-WT	19-Nov-10	16053101119001	<0.00002	---	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.00006	<0.00005	0.000016	ND
AGS-02-WT	24-Oct-12	16053121024004	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	0.0000097	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	9.7E-08
AGS-02-WT	23-Aug-13	16053130823012	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00002	ND
AGS-02-WT	22-Nov-13	16053131122007	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.00005	<0.00005	<0.00002	ND
AGS-02-WT	06-Aug-14	16053140806028	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.0000060	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
AGS-02-WT	30-Oct-14	16053141030015	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000008	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000102	<0.00005	<0.00001	ND
AGS-03-WT	17-Sep-09	16053090917001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	---	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
AGS-03-WT	20-Nov-10	16053101120001	<0.00002	---	<0.00001	<0.00001	<0.00001	<0.00001	0.000049	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.000060	<0.00005	0.000011	0.00000049
AGS-03-WT	20-Nov-10	16053101120004	<0.00002	---	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.000060	<0.00005	0.00001	ND
AGS-03-WT	16-Feb-11	16053110216004	<0.00002	---	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00002	ND
AGS-03-WT	22-Aug-13	16053130822009	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00002	ND
AGS-03-WT	28-Nov-13	16053131128022	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
AGS-03-WT	06-Aug-14	16053140806026	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
AGS-03-WT	30-Oct-14	16053141030010	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
CVE-BOR-01	24-Jan-08	16053080124001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
CVE-BOR-01	24-Feb-10	16053100224001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
CVE-BOR-01	19-Jun-10	16053100619001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
CVE-BOR-01	19-Jun-10	16053100619002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
CVE-BOR-01	07-Oct-10	16053101007001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
CVE-BOR-02	23-Jan-08	16053080123001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
CVE-BOR-02	25-Feb-10	16053100225001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
CVE-BOR-02	23-Jun-10	16053100623002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
CVE-BOR-02	23-Jun-10	16053100623004	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
CVE-BOR-02	08-Oct-10	16053101008001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
AB Tier 1 - Fine Grained Soils - Natural Areas*			0.0058^A	0.046^A	0.000012^A	0.000018^A	0.000048^A	0.000048^A	0.00021^A	0.000017^A	0.0014^A	0.00028^A	0.00004^A	0.003^A	0.00023^A	0.0011^A	0.0004^A	0.000025^A	0.00001^P

TABLE 9.

GROUNDWATER QUALITY RESULTS - POLYCYCLIC AROMATIC HYDROCARBONS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Acenaphthene mg/L	Acenaphthylene mg/L	Anthracene mg/L	Benzo[a]anthracene** mg/L	Benzo[b+]/fluoranthene** mg/L	Benzo[k]fluoranthene** mg/L	Benzo[g,h,i]perylene** mg/L	Benzo[a]pyrene** mg/L	Chrysene** mg/L	Dibenz[a,h]anthracene** mg/L	Fluoranthene mg/L	Fluorene mg/L	Indeno[1,2,3-c,d]pyrene** mg/L	Naphthalene mg/L	Phenanthrene mg/L	Pyrene mg/L	Benzo[a]pyreneTPE+ mg/L
Surficial Sands																			
GWN-01-74	10-Sep-09	16053090910002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	---	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	0.00039	<0.00005	<u>0.000049</u>	ND
GWN-01-74	13-Dec-10	16053101213002	0.000065	---	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	0.000074	<0.00001	<u>0.00365</u>	0.000114	<0.00001	ND
GWN-01-74	27-Oct-12	16053121027004	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	0.00031	<0.00005	<0.00002	ND
GWN-01-74	18-Sep-13	16053130918033	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000126	<0.00005	<0.00002	ND
GWN-01-74	01-Aug-14	16053140801004	<0.00038	<0.0002	<0.00005	<0.00004	<0.00003	<0.00001	<0.00002	<0.000012	<0.00012	<0.000005	<0.000090	0.000354	<0.00001	<u>0.0275</u>	<u>0.00097</u>	<u>0.000218</u>	ND
GWN-01-74	04-Nov-14	16053141104035	<0.00020	<0.00010	<0.000015	<0.000015	0.000014	<0.00001	<0.00002	<0.00001	<0.00003	<0.000005	<0.00004	0.000133	<0.00001	<u>0.0124</u>	<u>0.000467</u>	<u>0.000098</u>	0.0000014
GWN-07-55	21-Sep-13	16053130921039	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00002	ND
GWN-07-55	05-Nov-13	16053131105034	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00002	ND
GWN-07-55	03-Aug-14	16053140803014	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	0.000028	<0.000005	<0.00002	<0.00002	<0.00001	0.000068	<0.00005	<0.00003	0.00000028
GWN-07-55	01-Nov-14	16053141101022	<0.00002	<0.00002	<0.00001	0.000016	<0.00004	<0.00001	0.000021	<0.000015	<0.00003	<0.000007	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<u>0.000075</u>	0.00000181
GWN-08-43	30-Sep-09	16053090930003	0.0012	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<u>0.000092</u>	0.0027	<0.0000085	<u>0.047</u>	<u>0.0041</u>	<u>0.00032</u>	ND
GWN-08-43	20-Oct-12	16053121020001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	0.00012	<0.0000085	<u>0.0047</u>	0.00011	<u>0.000049</u>	ND
GWN-08-43	17-Sep-13	16053130917031	0.000078	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	0.000121	<0.00001	<u>0.00585</u>	0.000083	<u>0.000027</u>	ND
GWN-08-43	02-Aug-14	16053140802006	<0.0018	---	<0.00030	<0.0001	<0.0001	<0.0001	<0.00020	<0.00005	0.00025	<0.00005	<0.00020	0.00227	<0.0001	<u>0.0346</u>	<u>0.00493</u>	<u>0.00063</u>	0.0000025
GWN-08-43	02-Nov-14	16053141102025	0.000098	<0.00004	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	0.00011	<0.00001	0.000863	<0.000070	<u>0.000063</u>	ND
GWN-13-26	08-Sep-09	16053090908002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	---	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
GWN-13-26	18-Nov-10	16053101118004	<0.00002	---	<0.00001	<0.00001	<0.00001	<0.00001	0.00005	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000112	0.000055	0.000018	0.0000005
GWN-13-26	12-Feb-11	16053110212007	<0.00002	---	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000062	0.000067	<0.00002	ND
GWN-13-26	26-Aug-13	16053130826023	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	0.000026	<0.00001	0.000073	<0.00005	<0.00002	ND
GWN-13-26	23-Nov-13	16053131123012	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
GWN-13-26	07-Aug-14	16053140807036	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
GWN-13-26	28-Oct-14	16053141028002	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000071	<0.00005	<0.00001	ND
GWN-14-32	14-Sep-09	16053090914001	0.00015	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	---	<0.0000085	<0.0000075	<0.00004	0.00017	<0.0000085	<u>0.0022</u>	<0.00005	<0.00002	ND
GWN-14-32	16-Feb-11	16053110216003	0.00228	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.0002	<0.00005	<0.0002	0.00185	<0.0001	<u>0.00524</u>	<0.0005	<0.0001	ND
GWN-14-32	24-Aug-13	16053130824016	0.000329	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	0.000249	<0.00001	<u>0.00322</u>	<0.00005	<0.00002	ND
GWN-14-32	28-Nov-13	16053131128025	<0.00045	<0.00008	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	0.000293	<0.00001	<u>0.00273</u>	0.000056	<0.00001	ND
GWN-14-32	04-Aug-14	16053140804021	<u>0.0652</u>	<0.017	<0.0030	<0.001	<0.001	<0.001	<0.002	<0.0005	<0.002	<0.00050	<0.002	<u>0.112</u>	<0.001	<u>0.127</u>	<u>0.106</u>	<0.001	ND
GWN-14-32	31-Oct-14	16053141031017	<0.00088	<0.00036	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	0.000558	<0.00001	<u>0.0178</u>	0.000114	<0.00001	ND
GWN-16-22	30-Sep-09	16053090930001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<u>0.000077</u>	0.0017	<0.0000085	<0.0001	0.00038	<u>0.00045</u>	ND
GWN-16-22	18-Nov-10	16053101118003	<0.0002	---	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	0.000028	0.0002	<0.00001	<u>0.00183</u>	0.000069	<u>0.000248</u>	ND
GWN-16-22	12-Feb-11	16053110212003	<0.00002	---	<0.00001	<0.00001	<0.00001	<0.00001	0.000028	<0.000005	<0.00002	<0.000005	0.000034	<0.00002	<0.00001	<u>0.00172</u>	0.000111	<u>0.000123</u>	0.0000028
GWN-16-22	19-Oct-12	16053121019002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	0.00023	<0.00005	0.000025	ND
GWN-16-22	19-Aug-13	16053130819001	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00002	ND
GWN-16-22	21-Nov-13	16053131121004	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.00005	<0.0002	<0.00005	<0.0002	<0.0002	<0.0001	<u>0.00162</u>	<0.0005	<0.0002	ND
GWN-16-22	05-Aug-14	16053140805023	<0.00007	<0.00004	<0.00001	<0.00001	<0.00002	<0.00001	<0.00002	<0.000008	<0.00002	<0.000005	<0.00002	0.00006	<0.00001	0.000623	<0.00007	<u>0.000033</u>	ND
GWN-16-22	29-Oct-14	16053141029006	0.000065	<0.00003	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	0.000049	<0.00001	<u>0.00127</u>	<0.00005	<0.00001	ND
AB Tier 1 - Fine Grained Soils - Natural Areas*			0.0058^A	0.046^A	0.000012^A	0.000018^A	0.00048^A	0.00048^A	0.00021^A	0.000017^A	0.0014^A	0.00028^A	0.00004^A	0.003^A	0.00023^A	0.0011^A	0.0004^A	0.000025^A	0.00001^P

TABLE 9.

GROUNDWATER QUALITY RESULTS - POLYCYCLIC AROMATIC HYDROCARBONS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Acenaphthene mg/L	Acenaphthylene mg/L	Anthracene mg/L	Benzo[a]anthracene** mg/L	Benzo[b+]/fluoranthene** mg/L	Benzo[k]fluoranthene** mg/L	Benzo[g,h,i]perylene** mg/L	Benzo[a]pyrene** mg/L	Chrysene** mg/L	Dibenz[a,h]anthracene** mg/L	Fluoranthene mg/L	Fluorene mg/L	Indeno[1,2,3-c,d]pyrene** mg/L	Naphthalene mg/L	Phenanthrene mg/L	Pyrene mg/L	Benzo[a]pyreneTPE+ mg/L
Surficial Sands																			
IOR-KRL-01	03-Mar-05	16053050303001	<0.0001	<0.0001	<0.00005	<0.00005	<0.0001	<0.0001	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.0001	<0.0001	<0.00005	<0.00005	ND
IOR-KRL-01	24-Jul-09	16053090724001	<0.00001	<0.00001	<0.000007	<0.000006	<0.00008	<0.00008	<0.00002	<0.000005	<0.00001	<0.00002	<0.00004	<0.00002	<0.00002	<0.00007	<0.00001	<0.00002	ND
IOR-KRL-01	25-Jul-09	16053090725001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
IOR-KRL-01	17-Oct-09	16053091017001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-01	19-Aug-10	16053100819001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-01	09-Oct-10	16053101009002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-01	23-Jul-11	16053110723001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-01	22-Sep-11	16053110922002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-01	03-Jul-12	16053120703001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-01	17-Oct-12	16053121017002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-01	17-Oct-12	16053121017003	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-03 (SS)	13-Mar-04	16053040313002	<0.0001	<0.0001	0.000025	<0.000018	<0.0001	<0.0001	<0.0001	<0.00001	<0.0001	<0.0001	<0.00004	<0.0001	<0.0001	<0.0010	0.00032	0.00004	ND
IOR-KRL-03 (SS)	14-Feb-06	16053060214001	<0.0001	<0.0001	<0.00001	<0.00001	<0.0001	<0.0001	<0.0001	<0.00001	<0.0001	<0.0001	<0.00004	<0.0001	<0.0001	<0.001	<0.0003	<0.00002	ND
IOR-KRL-03 (SS)	05-Feb-07	16053070205001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
IOR-KRL-03 (SS)	16-Aug-10	16053100816001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.000036	<0.0000085	0.00035	<0.0000075	0.00018	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	0.0000053
IOR-KRL-03 (SS)	13-Oct-10	16053101013002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	0.000073	<0.0000075	0.000033	<0.0000075	<0.00004	<0.00005	0.000015	<0.0001	<0.00005	<0.00002	0.00000256
IOR-KRL-03 (SS)	13-Oct-10	16053101013003	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	0.000056	<0.0000075	0.000034	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	0.0000009
IOR-KRL-03 (SS)	22-Jul-11	16053110722004	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	0.000012	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	0.0000012
IOR-KRL-03 (SS)	24-Sep-11	16053110924001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.000015	<0.0000085	0.000065	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	0.000053	0.00004	0.00000065
IOR-KRL-03 (SS)	24-Sep-11	16053110924002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.000011	<0.0000085	0.00006	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	0.000064	0.00005	0.0000006
IOR-KRL-03 (SS)	06-Jul-12	16053120706001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	0.000041	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	0.00000041
IOR-KRL-03 (SS)	19-Oct-12	16053121019007	<0.0001	<0.0001	<0.00001	<0.0000085	<0.000018	<0.0000085	0.000076	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	0.00000076
IOR-KRL-04 (SS)	17-Mar-04	16053040317001	<0.0001	<0.0001	0.00003	<0.000018	<0.0001	<0.0001	<0.0001	<0.00001	<0.0001	<0.0001	<0.00004	<0.0001	<0.0001	<0.0010	<0.00038	0.000035	ND
IOR-KRL-04 (SS)	01-Mar-06	16053060301001	<0.0001	<0.0001	<0.00001	<0.00001	<0.0001	<0.0001	<0.0001	<0.00001	<0.0001	<0.0001	<0.00004	<0.0001	<0.0001	<0.001	<0.0003	<0.00002	ND
IOR-KRL-04 (SS)	06-Feb-07	16053070206001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
IOR-KRL-04 (SS)	27-Jul-09	16053090727001	<0.00001	<0.00001	<0.000007	<0.000006	<0.00008	<0.00008	<0.00002	<0.000005	<0.00001	<0.00002	<0.00004	<0.00002	<0.00002	<0.00007	<0.00001	<0.00002	ND
IOR-KRL-04 (SS)	18-Oct-09	16053091018001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-04 (SS)	09-Oct-10	16053101009003	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-04 (SS)	09-Oct-10	16053101009004	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-04 (SS)	17-Jul-11	16053110717001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-04 (SS)	17-Jul-11	16053110717002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	0.0001	<0.00005	<0.00002	ND
IOR-KRL-04 (SS)	28-Sep-11	16053110928002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-04 (SS)	13-Jul-12	16053120713002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-04 (SS)	15-Oct-12	16053121015001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-05 (SS)	10-Oct-10	16053101010301	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	---	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-05 (SS)	16-Jul-11	16053110716002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	0.0000083	0.00002	<0.0000075	<0.00004	<0.00005	<0.0000085	0.00035	<0.00005	0.000027	0.0000085
IOR-KRL-05 (SS)	22-Sep-11	16053110922001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-05 (SS)	16-Aug-12	16053120816003	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	0.000015	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	0.000015
IOR-KRL-05 (SS)	14-Oct-12	16053121014005	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	0.0000097	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	0.0000097
AB Tier 1 - Fine Grained Soils - Natural Areas*			0.0058^A	0.046^A	0.000012^A	0.000018^A	0.00048^A	0.00048^A	0.00021^A	0.000017^A									

TABLE 9.**GROUNDWATER QUALITY RESULTS - POLYCYCLIC AROMATIC HYDROCARBONS**Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Acenaphthene mg/L	Acenaphthylene mg/L	Anthracene mg/L	Benz[a]anthracene ⁺⁺ mg/L	Benzo[b+J]fluoranthene ⁺⁺ mg/L	Benzo[k]fluoranthene ⁺⁺ mg/L	Benzo[g,h,i]perylene ⁺⁺ mg/L	Benzo[a]pyrene ⁺⁺ mg/L	Chrysene ⁺⁺ mg/L	Dibenz[a,h]anthracene ⁺⁺ mg/L	Fluoranthene mg/L	Fluorene mg/L	Indeno[1,2,3-c,d]pyrene ⁺⁺ mg/L	Naphthalene mg/L	Phenanthrene mg/L	Pyrene mg/L	Benzo[a]pyreneTPE ⁺ mg/L
Surficial Sands																			
IOR-KRL-06 (SS)	24-Jan-09	16053090124002	<0.0001	<0.0001	0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	0.000046	ND
IOR-KRL-06 (SS)	21-Aug-10	16053100821002	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	0.000016	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<0.00002	0.00000016
IOR-KRL-06 (SS)	12-Oct-10	16053101012001	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-06 (SS)	24-Jul-11	16053110724001	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-06 (SS)	29-Sep-11	16053110929003	<0.0001	<0.0001	<0.00001	<0.000085	0.000019	<0.000085	0.000011	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	0.000051	0.00000201
IOR-KRL-06 (SS)	12-Jul-12	16053120712001	<0.0001	<0.0001	<0.00001	<0.000085	<0.00002	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	0.000046	ND
IOR-KRL-06 (SS)	12-Jul-12	16053120712002	<0.0001	<0.0001	<0.00001	<0.000085	<0.00003	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	0.000048	ND
IOR-KRL-06 (SS)	21-Oct-12	16053121021003	<0.0001	<0.0001	<0.00001	<0.000085	<0.000093	<0.000085	0.000048	0.000093	<0.000085	<0.000075	<0.00004	<0.00005	0.000022	<0.0001	<0.00005	0.000018	0.00009568
IOR-KRL-07	27-Jan-09	16053090127001	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	0.000041	ND
IOR-KRL-07	27-Jan-09	16053090127002	<0.0001	<0.0001	0.000015	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	0.000035	ND
IOR-KRL-07	21-Aug-10	16053100821003	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-07	12-Oct-10	16053101012002	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-07	24-Jul-11	16053110724002	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	0.00002	ND
IOR-KRL-07	29-Sep-11	16053110929004	<0.0001	<0.0001	<0.00001	<0.000085	0.000012	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	0.00005	0.0000012
IOR-KRL-07	11-Jul-12	16053120711001	<0.0001	<0.0001	<0.00001	<0.000085	<0.000025	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	0.000064	ND
IOR-KRL-07	21-Oct-12	16053121021004	<0.0001	<0.0001	<0.00001	<0.000085	<0.000021	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	0.000058	0.000099	ND
IOR-KRL-08	27-Jan-10	16053100127001	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	0.00003	ND
IOR-KRL-08	22-Aug-10	16053100822001	<0.0001	<0.0001	<0.00001	<0.000085	0.00013	<0.00013	0.000073	0.000052	0.000052	0.000035	<0.00004	<0.00005	0.000037	<0.0001	<0.00005	0.000041	0.00010963
IOR-KRL-08	17-Oct-10	16053101017002	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-08	25-Jul-11	16053110725001	<0.0001	<0.0001	<0.00001	0.000032	<0.000037	<0.000085	0.000039	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	0.000025	<0.0001	<0.00005	0.000033	0.00003489
IOR-KRL-08	26-Sep-11	16053110926001	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<0.000029	ND
IOR-KRL-08	05-Jul-12	16053120705001	<0.0001	<0.0001	<0.00005	<0.000085	<0.000027	<0.000043	0.00011	<0.00012	<0.000083	<0.000046	<0.00004	<0.00005	0.000062	<0.0001	<0.000066	0.000092	0.0000073
IOR-KRL-08	19-Oct-12	16053121019005	<0.0001	<0.0001	<0.00001	<0.000085	<0.000046	<0.000085	0.000022	0.00004	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	0.000026	0.00004022
IOR-KRL-09	07-Feb-10	16053100207001	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-09	22-Aug-10	16053100822002	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	0.000017	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<0.00002	0.00000017
IOR-KRL-09	22-Aug-10	16053100822003	<0.0001	<0.0001	<0.00001	<0.000085	0.000019	<0.000085	0.000015	0.000014	0.000043	0.000016	<0.00004	<0.00005	0.000017	<0.0001	<0.00005	<0.00002	0.00003418
IOR-KRL-09	15-Oct-10	16053101015001	<0.0001	<0.0001	<0.00001	<0.000085	0.00002	<0.000085	0.000015	0.000091	0.000049	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	0.000023	0.00001174
IOR-KRL-09	22-Jul-11	16053110722001	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-09	22-Jul-11	16053110722002	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-09	29-Sep-11	16053110929005	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-09	13-Jul-12	16053120713001	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-09	23-Oct-12	16053121023004	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-09	23-Oct-12	16053121023005	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-10	10-Feb-11	16053110210001	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	0.000088	<0.0001	<0.00005	<0.00002	0.00000088
IOR-KRL-10	21-Jul-11	16053110721001	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	0.00001	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	0.00005	0.00001
IOR-KRL-10	21-Jul-11	16053110721002	<0.0001	<0.0001	<0.00001	<0.000085	0.000016	<0.000085	<0.000085	0.000098	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	0.000054	0.0000114
IOR-KRL-10	28-Sep-11	16053110928001	<0.0001	<0.0001	<0.00001	<0.000085	<0.00003	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	0.00006	ND
IOR-KRL-10	17-Aug-12	16053120817003	<0.0001	<0.0001	<0.00001	<0.000085	<0.000081	<0.000042	0.000032	0.000041	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	0.000038	0.00004132
IOR-KRL-10	18-Oct-12	16053121018001	<0.0001	<0.0001	<0.00001	<0.000085	<0.000012	<0.000085	<0.000085	0.000098	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	0.000047	0.0000098
AB Tier 1 - Fine Grained Soils - Natural Areas*			0.0058^A	0.046^A	0.000012^A	0.000018^A	0.000048^A	0.000048^A	0.00021^A	0.000017^A	0.0014^A	0.00028^A	0.00004^A	0.003^A	0.00023^A	0.0011^A	0.0004^A	0.000025^A	0.00001^P

TABLE 9.

GROUNDWATER QUALITY RESULTS - POLYCYCLIC AROMATIC HYDROCARBONS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Acenaphthene mg/L	Acenaphthylene mg/L	Anthracene mg/L	Benz[a]anthracene** mg/L	Benzo[b+]/fluoranthene** mg/L	Benzo[k]fluoranthene** mg/L	Benzo[g,h,i]perylene** mg/L	Benzo[a]pyrene** mg/L	Chrysene** mg/L	Dibenz[a,h]anthracene** mg/L	Fluoranthene mg/L	Fluorene mg/L	Indeno[1,2,3-c,d]pyrene** mg/L	Naphthalene mg/L	Phenanthrene mg/L	Pyrene mg/L	Benzo[a]pyreneTPE+ mg/L
Surficial Sands																			
IOR-KRL-11	11-Feb-11	16053110211001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-11	18-Jul-11	16053110718002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	0.000022	<0.0000075	0.000053	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	0.00000075
IOR-KRL-11	23-Sep-11	16053110923002	<0.0001	<0.0001	0.000013	<0.0000085	<0.000013	<0.0000085	0.000059	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	0.000027	0.00000059
IOR-KRL-11	14-Jul-12	16053120714001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	0.000016	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	0.00000016
IOR-KRL-11	14-Oct-12	16053121014006	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
TOT-EP-02 (SS)	15-Oct-10	16053101015002	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
AB Tier 1 - Fine Grained Soils - Natural Areas*			0.0058^A	0.046^A	0.000012^A	0.000018^A	0.00048^A	0.00048^A	0.00021^A	0.000017^A	0.0014^A	0.00028^A	0.00004^A	0.003^A	0.00023^A	0.0011^A	0.0004^A	0.000025^A	0.00001^P
Buried Channels and Valleys - Birch Channel																			
AGS-02-97	15-Sep-09	16053090915002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	---	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
AGS-02-97	19-Nov-10	16053101119002	<0.00002	---	<0.00001	<0.00001	<0.00001	<0.00001	0.000059	0.000015	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.00009	0.000054	<0.00001	0.00001559
AGS-02-97	24-Oct-12	16053121024002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
AGS-02-97	23-Aug-13	16053130823015	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000145	0.000057	<0.00002	ND
AGS-02-97	22-Nov-13	16053131122005	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00002	ND
AGS-02-97	06-Aug-14	16053140806029	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
AGS-02-97	30-Oct-14	16053141030013	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
AGS-03-17	17-Sep-09	16053090917003	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	---	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
AGS-03-17	20-Nov-10	16053101120003	<0.00002	---	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000104	<0.00005	0.00001	ND
AGS-03-17	16-Feb-11	16053110216006	<0.00002	---	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00002	ND
AGS-03-17	22-Aug-13	16053130822008	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00002	ND
AGS-03-17	28-Nov-13	16053131128021	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
AGS-03-17	06-Aug-14	16053140806024	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
AGS-03-17	30-Oct-14	16053141030012	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
AB Tier 1 - Fine Grained Soils - Natural Areas*			0.0058^A	0.046^A	0.000012^A	0.000018^A	0.00048^A	0.00048^A	0.00021^A	0.000017^A	0.0014^A	0.00028^A	0.00004^A	0.003^A	0.00023^A	0.0011^A	0.0004^A	0.000025^A	0.00001^P
Buried Channels and Valleys - Kearl Channel																			
GWN-08-44	20-Oct-12	16053121020002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	0.00016	<0.0000085	0.0022	0.00015	<0.00002	ND
GWN-08-44	17-Sep-13	16053130917030	0.000049	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	0.000121	<0.00001	0.00155	0.000116	<0.00002	ND
GWN-08-44	02-Aug-14	16053140802008	<0.00005	---	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	0.000091	<0.00001	0.000968	0.000089	<0.00001	ND
GWN-08-44	02-Nov-14	16053141102026	<0.00004	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	0.000069	<0.00001	0.00115	0.000063	<0.00001	ND
GWN-Shell-PW2-63	05-Nov-09	16053091105301	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
GWN-Shell-PW2-63	25-Nov-10	16053101125301	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000051	<0.00005	<0.00001	ND
GWN-Shell-PW2-63	23-Oct-12	16053121023001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	0.00014	<0.00005	<0.00002	ND
GWN-Shell-PW2-63	21-Aug-13	16053130821005	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00002	ND
GWN-Shell-PW2-63	25-Nov-13	16053131125014	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
GWN-Shell-PW2-63	31-Jul-14	16053140731001	<0.00002	---	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
GWN-Shell-PW2-63	03-Nov-14	16053141103028	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
IOR-KRL-02	13-Mar-04	16053040313001	<0.0001	<0.0001	0.000051	0.000018	<0.0001	<0.0001	<0.0001	<0.00001	<0.0001	<0.0001	0.000054	0.00012	<0.0001	<0.0010	0.00047	0.000061	0.0000018
IOR-KRL-02	17-Aug-10	16053100817001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	0.000019	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	0.00000019
IOR-KRL-02	13-Oct-10	16053101013001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	0.0000098	<0.0000075	0.000012	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	2.18E-07
IOR-KRL-02	22-Jul-11	16053110722003	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-02	25-Sep-11	16053110925001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	0.000021	ND
IOR-KRL-02	08-Jul-12	16053120708001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.00000											

TABLE 9.

GROUNDWATER QUALITY RESULTS - POLYCYCLIC AROMATIC HYDROCARBONS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Acenaphthene mg/L	Acenaphthylene mg/L	Anthracene mg/L	Benz[a]anthracene** mg/L	Benzo[b+]/fluoranthene** mg/L	Benzo[k]fluoranthene** mg/L	Benzo[g,h,i]perylene** mg/L	Benzo[a]pyrene** mg/L	Chrysene** mg/L	Dibenz[a,h]anthracene** mg/L	Fluoranthene mg/L	Fluorene mg/L	Indeno[1,2,3-c,d]pyrene** mg/L	Naphthalene mg/L	Phenanthrene mg/L	Pyrene mg/L	Benzo[a]pyreneTPE+ mg/L
Buried Channels and Valleys - Thickwood Channel																			
GWN-13-27	08-Sep-09	16053090908001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	---	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	0.00013	<0.00005	<0.00002	ND
GWN-13-27	16-Nov-10	16053101116004	<0.00002	---	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000198	<0.00005	0.000011	ND
GWN-13-27	12-Feb-11	16053110212006	<0.00002	---	<0.00001	<0.00001	0.00003	0.00002	0.000037	0.000016	0.000032	0.00001	<0.00002	0.000021	0.000023	0.00016	0.000111	<u>0.00003</u>	<u>0.00003399</u>
GWN-13-27	12-Feb-11	16053110212008	<0.00002	---	<0.00001	<0.00001	0.000022	0.000014	0.000043	<u>0.000019</u>	0.000032	<0.000005	<0.00002	0.000022	0.000023	0.000181	0.000108	<u>0.000032</u>	<u>0.00002565</u>
GWN-13-27	26-Aug-13	16053130826022	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000085	<0.00005	<0.00002	ND
GWN-13-27	23-Nov-13	16053131123011	0.000037	<0.00002	0.000012	<0.00002	0.00003	0.00001	<0.00002	<0.00002	<0.0001	<0.000005	<0.00004	0.000064	<0.00001	0.000139	<u>0.000464</u>	<0.0001	0.000004
GWN-13-27	07-Aug-14	16053140807037	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
GWN-13-27	28-Oct-14	16053141028004	0.000025	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000054	<0.00005	<0.00001	ND
AB Tier 1 - Fine Grained Soils - Natural Areas*			0.0058^A	0.046^A	0.000012^A	0.000018^A	0.00048^A	0.00048^A	0.00021^A	0.000017^A	0.0014^A	0.00028^A	0.00004^A	0.003^A	0.00023^A	0.0011^A	0.0004^A	0.000025^A	0.00001^P
Grand Rapids Formation																			
CVE-BOR-03	31-Jan-08	16053080131001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
CVE-BOR-03	01-Mar-10	16053100301001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
CVE-BOR-03	23-Jun-10	16053100623003	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	0.00019	<0.00005	<0.00002	ND
CVE-BOR-03	09-Oct-10	16053101009001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	0.00027	0.000057	<u>0.00004</u>	ND
GWN-13-28	27-Aug-13	16053130827026	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00002	ND
GWN-13-28	23-Nov-13	16053131123008	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000053	0.00007	0.000017	ND
GWN-13-28	07-Aug-14	16053140807035	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
GWN-13-28	28-Oct-14	16053141028001	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000061	<0.00005	<0.00001	ND
AB Tier 1 - Fine Grained Soils - Natural Areas*			0.0058^A	0.046^A	0.000012^A	0.000018^A	0.00048^A	0.00048^A	0.00021^A	0.000017^A	0.0014^A	0.00028^A	0.00004^A	0.003^A	0.00023^A	0.0011^A	0.0004^A	0.000025^A	0.00001^P
Clearwater Formation																			
AGS-02-108	24-Oct-12	16053121024006	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
AGS-02-108	23-Aug-13	16053130823014	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000142	<0.00005	<0.00002	ND
AGS-02-108	28-Nov-13	16053131128024	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
AGS-02-108	06-Aug-14	16053140806032	<0.00002	<0.00002	<0.00001	<0.00001	0.000047	<0.00001	0.000035	<u>0.000022</u>	<0.00002	<0.000005	0.000036	<0.00002	0.000018	0.000086	0.000058	<u>0.000059</u>	<u>0.00002885</u>
AGS-03-30	17-Sep-09	16053090917002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	---	<0.0000085	<0.0000075	0.00004	<0.00005	<0.0000085	<0.0001	0.000068	<u>0.000036</u>	ND
AGS-03-30	20-Nov-10	16053101120002	<0.00002	---	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	0.000038	<0.00002	<0.00001	0.000105	<0.00005	<u>0.000037</u>	ND
AGS-03-30	16-Feb-11	16053110216005	<0.00002	---	<0.00001	<u>0.000035</u>	0.00003	0.000018	<0.00002	<u>0.000028</u>	0.00004	<0.000005	<u>0.000041</u>	<0.00002	0.000018	0.000063	<0.00005	<u>0.000046</u>	<u>0.0000385</u>
AGS-03-30	06-Aug-14	16053140806027	<0.00002	<0.00002	<0.00001	<0.00001	0.000016	<0.00001	<0.00002	0.000007	<0.00002	<0.000005	0.000022	<0.00002	<0.00001	<0.00005	<0.00005	0.000022	0.0000086
AGS-03-30	30-Oct-14	16053141030009	<0.00002	<0.00002	<0.00001	<u>0.000029</u>	0.000046	0.000011	0.00002	<u>0.000028</u>	0.000029	0.000005	0.000036	<0.00002	0.000017	<0.00005	<0.00005	<u>0.000036</u>	<u>0.00004379</u>
GWN-08-45	30-Sep-09	16053090930002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
GWN-08-45	20-Oct-12	16053121020003	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
GWN-08-45	17-Sep-13	16053130917029	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000094	<0.00005	<0.00002	ND
GWN-08-45	02-Aug-14	16053140802007	<0.00002	---	<0.00001	<0.00001	0.000064	0.000023	0.000113	<u>0.00002</u>	<0.00002	0.000012	<0.00002	<0.00002	0.000067	0.000068	<0.00005	0.000016	<u>0.00004853</u>
GWN-08-45	02-Nov-14	16053141102024	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	0.00001	<0.00005	<0.00005	<0.00001	0.000001
GWN-14-33	24-Aug-13	16053130824017	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000051	<0.00005	<0.00002	ND
GWN-14-33	28-Nov-13	16053131128026	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.000015	ND
GWN-14-33	04-Aug-14	16053140804017	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
GWN-14-33	31-Oct-14	16053141031016	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
AB Tier 1 - Fine Grained Soils - Natural Areas*			0.0058^A	0.046^A	0.000012^A	0.000018^A	0.00048^A	0.00048^A	0.00021^A	0.000017^A	0.0014^A	0.00028^A	0.00004^A	0.003^A	0.00023^A	0.0011^A	0.0004^A	0.000025^A	0.00001^P

TABLE 9.

GROUNDWATER QUALITY RESULTS - POLYCYCLIC AROMATIC HYDROCARBONS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Acenaphthene mg/L	Acenaphthylene mg/L	Anthracene mg/L	Benzo[a]anthracene** mg/L	Benzo[b+]/fluoranthene** mg/L	Benzo[k]fluoranthene** mg/L	Benzo[g,h,i]perylene** mg/L	Benzo[a]pyrene** mg/L	Chrysene** mg/L	Dibenz[a,h]anthracene** mg/L	Fluoranthene mg/L	Fluorene mg/L	Indeno[1,2,3-c,d]pyrene** mg/L	Naphthalene mg/L	Phenanthrene mg/L	Pyrene mg/L	Benzo[a]pyreneTPE+ mg/L
McMurray Formation Basal Aquifer - Aquifer Management Unit 1																			
GWN-06-60	26-Sep-09	16053090926001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	0.000064	<0.00005	<0.0000085	<0.0001	0.000065	0.00027	ND
GWN-06-60	21-Nov-10	16053101121004	0.000035	---	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000069	0.000115	0.000459	ND
GWN-06-60	14-Feb-11	16053110214005	0.000032	---	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	0.00003	<0.000005	0.000024	<0.00002	<0.00001	<0.00005	0.000052	0.000098	0.0000003
GWN-06-60	16-Oct-12	16053121016001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	0.000048	ND
GWN-06-60	21-Aug-13	16053130821007	0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	0.00002	<0.00002	<0.00001	0.000064	<0.00005	0.000071	ND
GWN-06-60	26-Nov-13	16053131126015	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	0.000007	<0.000060	<0.000005	0.000038	<0.00002	<0.00001	<0.00005	<0.00005	0.000178	0.000007
GWN-06-60	31-Jul-14	16053140731003	0.000098	---	<0.00003	<0.00002	<0.00002	<0.00001	<0.00002	0.000005	0.00011	<0.000005	0.000074	0.00011	<0.00001	0.000509	0.000464	0.00028	0.0000061
GWN-06-60	03-Nov-14	16053141103029	0.000202	<0.00006	<0.000035	<0.00002	<0.00005	<0.00001	<0.00004	0.000086	<0.00001	<0.00010	0.000212	<0.00001	0.000567	0.00138	<0.00001	0.0000086	
GWN-17-50	10-Sep-09	16053090910001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	---	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	0.00031	<0.00005	<0.00002	ND
GWN-17-50	23-Oct-12	16053121023002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	0.00044	<0.00005	<0.00002	ND
GWN-17-50	26-Aug-13	16053130826020	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000255	<0.00005	<0.00002	ND
GWN-17-50	19-Nov-13	16053131119002	0.000092	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	0.000087	<0.00001	0.0034	0.000055	<0.00002	ND
GWN-17-50	05-Aug-14	16053140805022	0.000032	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	0.000023	<0.00001	0.000305	<0.00005	<0.00001	ND
GWN-17-50	29-Oct-14	16053141029008	0.000028	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	0.000024	<0.00001	0.000359	<0.00005	<0.00001	ND
AB Tier 1 - Fine Grained Soils - Natural Areas*			0.0058^A	0.046^A	0.000012^A	0.000018^A	0.00048^A	0.00048^A	0.00021^A	0.000017^A	0.0014^A	0.00028^A	0.00004^A	0.003^A	0.00023^A	0.0011^A	0.0004^A	0.000025^A	0.00001^P
McMurray Formation Basal Aquifer - Aquifer Management Unit 2																			
GWN-01-75	13-Dec-10	16053101213001	0.000328	---	<0.00001	0.000018	<0.00001	<0.00001	<0.00002	<0.000005	0.000036	<0.000005	0.000051	<0.00002	<0.00001	0.00101	0.000791	<0.00001	0.00000216
GWN-01-75	01-Aug-14	16053140801005	0.000097	<0.00002	<0.00001	<0.00002	<0.00002	<0.00001	<0.00002	<0.000018	<0.000060	<0.000005	<0.00003	<0.00002	<0.00001	0.00021	0.000147	0.000085	ND
GWN-01-75	04-Nov-14	16053141104034	0.000313	<0.000055	<0.000015	<0.000035	<0.000015	<0.00005	0.000089	<0.00010	0.000097	<0.00003	0.00009	<0.00010	<0.000055	0.000697	0.00102	0.000194	0.00000186
GWN-06-61	23-Nov-10	16053101123002	<0.00002	---	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000275	<0.00005	<0.00001	ND
GWN-06-61	16-Oct-12	16053121016002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.000013	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	0.00013	<0.00005	0.000064	ND
GWN-06-61	21-Aug-13	16053130821006	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000163	<0.00005	<0.00002	ND
GWN-06-61	26-Nov-13	16053131126018	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000077	<0.00005	<0.00001	ND
GWN-06-61	31-Jul-14	16053140731002	<0.00002	---	<0.00001	0.00002	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000077	<0.00005	0.000025	0.000002
GWN-06-61	03-Nov-14	16053141103031	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.00011	<0.00005	0.000012	ND
GWN-07-56	03-Aug-14	16053140803015	0.000118	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00004	<0.000005	<0.00002	<0.00002	<0.00001	0.00009	0.00016	0.000022	ND
GWN-07-56	01-Nov-14	16053141101021	0.000229	<0.00003	<0.00002	0.000032	<0.00006	<0.00001	0.00002	<0.000018	0.000102	<0.000011	<0.00005	<0.00002	<0.00001	0.000307	0.00085	0.000109	0.00000442
GWN-07-57	25-Sep-09	16053090925001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
GWN-07-57	13-Feb-11	16053110213003	<0.00002	---	<0.00001	<0.00001	<0.00001	<0.00001	0.000025	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000073	<0.00005	<0.00002	0.00000025
GWN-07-57	21-Sep-13	16053130921040	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00002	ND
GWN-07-57	05-Nov-13	16053131105033	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	0.000062	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00002	0.0000062
GWN-07-57	03-Aug-14	16053140803010	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
GWN-07-57	01-Nov-14	16053141101020	<0.00002	<0.00002	<0.00001	<0.00001	0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	0.000001
GWN-08-46	20-Oct-12	16053121020004	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
GWN-08-46	17-Sep-13	16053130917032	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	0.000025	<0.00001	<0.00005	<0.00005	<0.00002	ND
GWN-08-46	04-Nov-13	16053131104031	0.000023	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00002	ND
GWN-08-46	02-Aug-14	16053140802009	<0.00002	---	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
GWN-08-46	02-Nov-14	16053141102023	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
AB Tier 1 - Fine Grained Soils - Natural Areas*			0.0058^A	0.046^A	0.000012^A	0.000018^A	0.00048^A	0.00048^A	0.00021^A	0.000017^A	0.0014^A	0.00028^A	0.00004^A	0.003^A	0.00023^A	0.0011^A	0.0004^A	0.000025^A	0.00001^P

TABLE 9.

GROUNDWATER QUALITY RESULTS - POLYCYCLIC AROMATIC HYDROCARBONS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Acenaphthene mg/L	Acenaphthylene mg/L	Anthracene mg/L	Benzo[a]anthracene** mg/L	Benzo[b+]/fluoranthene** mg/L	Benzo[k]fluoranthene** mg/L	Benzo[g,h,i]perylene** mg/L	Benzo[a]pyrene** mg/L	Chrysene** mg/L	Dibenz[a,h]anthracene** mg/L	Fluoranthene mg/L	Fluorene mg/L	Indeno[1,2,3-c,d]pyrene** mg/L	Naphthalene mg/L	Phenanthrene mg/L	Pyrene mg/L	Benzo[a]pyreneTPE+ mg/L
McMurray Formation Basal Aquifer - Aquifer Management Unit 2																			
IOR-KRL-03 (BAS)	04-Mar-98	16053980304002	<0.0001	<0.0001	<0.0001	<0.0001	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	ND
IOR-KRL-03 (BAS)	04-Mar-06	16053060304001	<0.0001	<0.0001	<0.00001	<0.00001	<0.0001	<0.0001	<0.0001	<0.00001	<0.0001	<0.0001	<0.00004	<0.0001	<0.0001	<0.001	<0.0003	<0.00002	ND
IOR-KRL-03 (BAS)	07-Feb-07	16053070207001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
IOR-KRL-03 (BAS)	07-Feb-07	16053070207002	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
IOR-KRL-03 (BAS)	21-Aug-10	16053100821004	<0.0001	<0.0001	<0.00001	<0.000085	0.000016	<0.000085	<0.000085	<0.000075	0.000029	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<u>0.000026</u>	0.00000189
IOR-KRL-03 (BAS)	11-Oct-10	16053101011001	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-03 (BAS)	18-Jul-11	16053110718001	<0.0001	<0.0001	<u>0.0003</u>	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	0.000063	<0.000085	<0.0001	0.00014	<0.00002	ND
IOR-KRL-03 (BAS)	23-Sep-11	16053110923001	<0.0001	<0.0001	<0.00001	<0.000085	<0.000012	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	0.00013	<u>0.0001</u>	ND
IOR-KRL-03 (BAS)	17-Aug-12	16053120817002	<0.0001	<0.0001	<0.00001	<0.000085	<0.000043	<0.000085	0.000019	<u>0.000023</u>	<0.000085	0.000075	<0.00004	<0.00005	0.000087	<0.0001	<0.00005	<u>0.000064</u>	<u>0.00003156</u>
IOR-KRL-03 (BAS)	14-Oct-12	16053121014002	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<u>0.000026</u>	ND
IOR-KRL-03 (BAS)	14-Oct-12	16053121014003	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	0.0001	<0.00005	<0.00002	ND
IOR-KRL-04 (BAS)	03-Mar-06	16053060303001	<0.0001	<0.0001	<0.00001	<0.00001	<0.0001	<0.0001	<0.0001	<0.00001	<0.0001	<0.0001	<0.00004	<0.0001	<0.0001	<0.001	<0.0003	<0.00002	ND
IOR-KRL-04 (BAS)	21-Aug-10	16053100821001	<0.0001	<0.0001	<0.00001	<0.000085	0.000012	<0.000085	<0.000085	<0.000075	0.000021	<0.000075	<0.00004	<0.00005	<0.000085	0.00013	0.0001	<u>0.000036</u>	0.00000141
IOR-KRL-04 (BAS)	10-Oct-10	16053101010001	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-04 (BAS)	16-Jul-11	16053110716001	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	0.00013	<0.00005	0.0000023	ND
IOR-KRL-04 (BAS)	29-Sep-11	16053110929001	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<u>0.000059</u>	ND
IOR-KRL-04 (BAS)	17-Aug-12	16053120817001	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-04 (BAS)	14-Oct-12	16053121014001	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<0.00002	ND
IOR-KRL-05 (BAS)	04-Mar-98	16053980304001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	ND
IOR-KRL-05 (BAS)	03-Nov-98	16053981103001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
IOR-KRL-05 (BAS)	03-Nov-98	16053981103002	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
IOR-KRL-05 (BAS)	17-Jul-09	16053090717001	<0.00001	<0.00001	<0.000007	<0.000006	<0.00008	<0.00008	<0.00002	<0.000005	0.001	<0.00002	<0.00004	<0.00002	<0.00002	<0.00007	<0.00001	<u>0.0011</u>	0.00001
IOR-KRL-05 (BAS)	17-Jul-09	16053090717002	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
IOR-KRL-05 (BAS)	20-Oct-09	16053091020002	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	0.000023	<u>0.000035</u>	0.00029	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<u>0.00025</u>	<u>0.00003813</u>
IOR-KRL-05 (BAS)	20-Aug-10	16053100820001	<0.0001	<0.0001	<0.00001	<0.000085	0.000092	<0.000085	0.000044	<u>0.000036</u>	0.00038	0.000027	<0.00004	<0.00005	0.000022	<0.0001	<0.00005	<u>0.0003</u>	<u>0.00007864</u>
IOR-KRL-05 (BAS)	10-Oct-10	16053101010002	<0.0001	<0.0001	<0.00001	<0.000085	<0.00003	<0.000085	<0.000085	<0.000015	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	0.000062	<u>0.00011</u>	ND
IOR-KRL-05 (BAS)	10-Oct-10	16053101010003	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<0.000075	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<u>0.00005</u>	ND
IOR-KRL-05 (BAS)	15-Jul-11	16053110715001	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<u>0.000021</u>	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	0.00024	<0.00005	<u>0.00021</u>	<u>0.000021</u>
IOR-KRL-05 (BAS)	29-Sep-11	16053110929002	<0.0001	<0.0001	<0.00001	<0.000085	<0.00009	<0.000085	0.000041	<0.00003	<0.000085	<0.000075	<u>0.000041</u>	<0.00005	<0.000085	<0.0001	0.00017	<u>0.00033</u>	0.00000041
IOR-KRL-05 (BAS)	16-Aug-12	16053120816001	<0.0001	<0.0001	<0.00001	<0.000085	<0.000058	<0.000014	0.000023	<u>0.000035</u>	<0.000085	0.000099	<0.00004	<0.00005	0.000012	<0.0001	<0.00005	<u>0.00023</u>	<u>0.00004633</u>
IOR-KRL-05 (BAS)	16-Aug-12	16053120816002	<0.0001	<0.0001	<0.00001	<0.000085	<0.000057	<0.000018	0.000022	<u>0.000034</u>	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<u>0.00022</u>	<u>0.00003422</u>
IOR-KRL-05 (BAS)	14-Oct-12	16053121014004	<0.0001	<0.0001	<0.00001	<0.000085	<0.000041	<0.000085	0.000018	<u>0.000026</u>	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<u>0.00016</u>	<u>0.00002618</u>
SHL-ALB-01	20-Oct-09	16053091020001	0.000464	0.000061	<u>0.000183</u>	<u>0.000125</u>	0.000273	0.000073	<0.00005	<u>0.000128</u>	0.0011	<0.00005	<u>0.000062</u>	0.000195	<0.00005	0.000181	<u>0.00141</u>	<u>0.00053</u>	<u>0.0001861</u>
SHL-ALB-01	03-Nov-09	16053091103001	0.00045	<0.0001	<0.00001	<0.000085	<u>0.00053</u>	<0.000085	<u>0.00033</u>	<u>0.00059</u>	<0.000085	<0.000075	<0.00004	0.00034	<0.000085	<0.0001	<u>0.0031</u>	<u>0.0013</u>	<u>0.0006463</u>
SHL-ALB-01	19-May-10	16053100519001	<0.0005	<0.0005	<0.0001	<0.0001	<0.0010	<0.0005	<0.0005	<0.0001	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	ND
SHL-ALB-01	30-May-11	16053110530001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
SHL-ALB-01	26-Jun-12	16053120626002	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
SHL-ALB-01	26-Jun-12	16053120626001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
SHL-ALB-02	02-Nov-09	16053091102001	<0.00001	---	<0.00001	<0.00001	<0.00001	<0.00001	---	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.000028	<0.00001	ND
SHL-ALB-02	02-Nov-09	16053091102002	<0.0001	<0.0001	<0.00001	<0.000085	<0.000085	<0.000085	<0.000085	<u>0.000029</u>	<0.000085	<0.000075	<0.00004	<0.00005	<0.000085	<0.0001	<0.00005	<u>0.000034</u>	<u>0.000029</u>
SHL-ALB-02	27-May-10	16053100527001	<0.00001	---	<0.00001	<0.00001	<0.00001	<0.00001	---	<0.00001	0.000016	<0.00001	<0.00005	<0.00002	<0.00001	<0.00004	<0.000060	<0.00021	0.00000016
SHL-ALB-02	14-Oct-10	16053101014001	<0.00002	---	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
AB Tier 1 - Fine Grained Soils - Natural Areas*			0.0058^A	0.046^A	0.000012^A	0.000018^A	0.00048^A	0.00048^A	0.00021^A	0.000017^A	0.0014^A	0.0							

TABLE 9.

GROUNDWATER QUALITY RESULTS - POLYCYCLIC AROMATIC HYDROCARBONS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Acenaphthene mg/L	Acenaphthylene mg/L	Anthracene mg/L	Benz[a]anthracene** mg/L	Benzo[b+]/fluoranthene** mg/L	Benzo[k]fluoranthene** mg/L	Benzo[g,h,i]perylene** mg/L	Benzo[a]pyrene** mg/L	Chrysene** mg/L	Dibenz[a,h]anthracene** mg/L	Fluoranthene mg/L	Fluorene mg/L	Indeno[1,2,3-c,d]pyrene** mg/L	Naphthalene mg/L	Phenanthrene mg/L	Pyrene mg/L	Benzo[a]pyreneTPE+ mg/L
McMurray Formation Basal Aquifer - Aquifer Management Unit 2																			
SHL-ALB-03	15-Feb-01	16053010215001	0.00007	<0.00001	0.00003	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00002	0.00003	<0.00001	0.00001	0.00016	0.00001	ND
SHL-ALB-03	02-Apr-02	16053020402001	0.00009	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	0.00004	<0.00001	0.00003	0.00022	0.00003	ND
SHL-ALB-03	23-Mar-03	16053030323001	0.00011	0.00001	0.00012	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.0001	<0.00001	0.00002	0.00013	0.00001	0.000001
SHL-JKP-01	27-Sep-01	16053010927001	0.00005	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.00006	<0.00002	<0.00002	0.00007	<0.00002	ND
SHL-JKP-01	27-Sep-01	16053010927002	0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	---	<0.00001	<0.00001	<0.00001	<0.00001	0.00006	---	0.00001	0.00007	<0.00001	ND
SHL-JKP-01	21-Dec-07	16053071221001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
SHL-JKP-01	20-Sep-08	16053080920001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
SHL-JKP-01	15-May-09	16053090515001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
SHL-JKP-01	25-Nov-09	16053091125001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
SHL-JKP-01	25-Nov-09	16053091125002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
SHL-JKP-01	23-Jun-10	16053100623001	<0.00005	<0.00005	<0.00001	<0.00001	<0.00005	<0.00005	<0.00005	<0.00001	<0.00005	<0.00005	<0.00002	<0.00005	<0.00005	<0.00005	<0.00005	0.000084	ND
SHL-JKP-01	23-Jun-10	16053100623005	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
SHL-JKP-01	26-Oct-10	16053101026001	<0.00002	---	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.00005	<0.00002	<0.00005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
SHL-JKP-01	10-Jun-11	16053110610001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
SHL-JKP-01	10-Jun-11	16053110610002	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
SHL-JKP-01	23-Nov-11	16053111123001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
SHL-JKP-01	25-Jun-12	16053120625001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
SHL-JKP-01	06-Nov-12	16053121106001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
AB Tier 1 - Fine Grained Soils - Natural Areas*			0.0058^A	0.046^A	0.000012^A	0.000018^A	0.00048^A	0.00048^A	0.00021^A	0.000017^A	0.0014^A	0.00028^A	0.00004^A	0.003^A	0.00023^A	0.0011^A	0.0004^A	0.000025^A	0.00001^P
McMurray Formation Basal Aquifer - Aquifer Management Unit 3																			
GWN-16-24	19-Oct-12	16053121019003	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
GWN-16-24	19-Aug-13	16053130819002	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	0.000021	<0.00001	<0.00005	<0.00005	<0.00002	ND
GWN-16-24	21-Nov-13	16053131121003	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	0.000044	ND
GWN-16-24	08-Aug-14	16053140808039	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
GWN-16-24	29-Oct-14	16053141029005	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000066	<0.00005	<0.00001	ND
AB Tier 1 - Fine Grained Soils - Natural Areas*			0.0058^A	0.046^A	0.000012^A	0.000018^A	0.00048^A	0.00048^A	0.00021^A	0.000017^A	0.0014^A	0.00028^A	0.00004^A	0.003^A	0.00023^A	0.0011^A	0.0004^A	0.000025^A	0.00001^P
McMurray Formation Basal Aquifer - Aquifer Management Unit 4																			
CNR-HRZ-01	20-Jan-10	16053100120001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
CNR-HRZ-01	08-Feb-10	16053100208001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
GWN-01-76	27-Oct-12	16053121027003	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	0.00024	<0.00005	<0.00002	ND
GWN-01-76	18-Sep-13	16053130918035	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000173	<0.00005	<0.00002	ND
GWN-01-76	27-Nov-13	16053131127019	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000115	<0.00005	<0.00001	ND
GWN-01-76	04-Nov-14	16053141104033	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000203	<0.00005	<0.00001	ND
AB Tier 1 - Fine Grained Soils - Natural Areas*			0.0058^A	0.046^A	0.000012^A	0.000018^A	0.00048^A	0.00048^A	0.00021^A	0.000017^A	0.0014^A	0.00028^A	0.00004^A	0.003^A	0.00023^A	0.0011^A	0.0004^A	0.000025^A	0.00001^P

TABLE 9.

GROUNDWATER QUALITY RESULTS - POLYCYCLIC AROMATIC HYDROCARBONS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Acenaphthene mg/L	Acenaphthylene mg/L	Anthracene mg/L	Benzo[a]anthracene** mg/L	Benzo[b+]/fluoranthene** mg/L	Benzo[k]fluoranthene** mg/L	Benzo[g,h,i]perylene** mg/L	Benzo[a]pyrene** mg/L	Chrysene** mg/L	Dibenz[a,h]anthracene** mg/L	Fluoranthene mg/L	Fluorene mg/L	Indeno[1,2,3-c,d]pyrene** mg/L	Naphthalene mg/L	Phenanthrene mg/L	Pyrene mg/L	Benzo[a]pyreneTPE+ mg/L
Prairie Evaporite/Beaverhill Lake/Methy (Keg River) Formations																			
CNR-H02-007	19-Jan-10	16053100119001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
GWN-01-77	29-Oct-12	16053121027002	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	0.0016	0.00013	<0.00002	ND
GWN-01-77	18-Sep-13	16053130918034	0.000023	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	0.00002	<0.000005	<0.00002	<0.000005	0.000022	0.000043	<0.00001	0.000839	0.000105	0.000056	0.000002
GWN-01-77	27-Nov-13	16053131127020	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000138	<0.00005	<0.00001	ND
GWN-01-78	27-Oct-12	16053121027001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	0.000078	<0.0000085	0.0016	0.00012	0.000041	ND
GWN-06-62	17-Oct-12	16053121017001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	0.00055	0.000059	<0.00002	ND
GWN-06-62	21-Aug-13	16053130821004	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000132	<0.00005	<0.00002	ND
GWN-06-62	26-Nov-13	16053131126016	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000083	<0.00005	<0.00001	ND
GWN-07-58	21-Sep-13	16053130921041	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.00238	<0.00005	<0.00002	ND
GWN-07-58	03-Aug-14	16053140803013	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.00164	<0.00005	<0.00001	ND
GWN-07-59	21-Sep-13	16053130921042	0.000206	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	0.000164	<0.00001	0.00575	0.000124	<0.00002	ND
GWN-07-59	03-Aug-14	16053140803016	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000911	<0.00005	<0.00001	ND
GWN-08-47	20-Oct-12	16053121020005	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	0.000071	ND
GWN-08-47	20-Sep-13	16053130920036	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000081	<0.00005	<0.00002	ND
GWN-08-48	20-Oct-12	16053121020006	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	0.0012	<0.00005	<0.00002	ND
GWN-08-48	20-Sep-13	16053130920037	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000288	<0.00005	<0.00002	ND
GWN-14-35	25-Aug-13	16053130825018	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.02	<0.0050	<0.02	<0.0050	<0.02	<0.02	<0.01	<0.05	<0.2	<0.02	ND
GWN-14-35	04-Aug-14	16053140804020	<0.0037	<0.0016	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.00005	<0.0002	<0.00005	<0.0002	0.00334	<0.0001	0.0211	0.00112	<0.0002	ND
GWN-14-36	04-Aug-14	16053140804018	0.000194	<0.00003	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	0.000252	<0.00001	0.00231	0.000206	<0.00001	ND
GWN-16-25	19-Oct-12	16053121019004	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
GWN-17-51	23-Oct-12	16053121023003	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
GWN-17-51	26-Aug-13	16053130826019	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.00009	<0.00005	<0.00002	ND
GWN-17-51	19-Nov-13	16053131119001	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000052	<0.00005	<0.00002	ND
GWN-17-51	05-Aug-14	16053140805021	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
GWN-17-51	29-Oct-14	16053141029007	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001	ND
AB Tier 1 - Fine Grained Soils - Natural Areas*			0.0058^A	0.046^A	0.000012^A	0.000018^A	0.00048^A	0.00048^A	0.00021^A	0.000017^A	0.0014^A	0.00028^A	0.00004^A	0.003^A	0.00023^A	0.0011^A	0.0004^A	0.000025^A	0.00001^P

TABLE 9.

GROUNDWATER QUALITY RESULTS - POLYCYCLIC AROMATIC HYDROCARBONS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Acenaphthene mg/L	Acenaphthylene mg/L	Anthracene mg/L	Benzo[a]anthracene ⁺⁺ mg/L	Benzo[b+]/fluoranthene ⁺⁺ mg/L	Benzo[k]fluoranthene ⁺⁺ mg/L	Benzo[g,h,i]perylene ⁺⁺ mg/L	Benzo[a]pyrene ⁺⁺ mg/L	Chrysene ⁺⁺ mg/L	Dibenz[a,h]anthracene ⁺⁺ mg/L	Fluoranthene mg/L	Fluorene mg/L	Indeno[1,2,3-c,d]pyrene ⁺⁺ mg/L	Naphthalene mg/L	Phenanthrene mg/L	Pyrene mg/L	Benzo[a]pyreneTPE+ mg/L
McMurray Formation																			
CVE-10-05-TW	07-Feb-11	16053110207001	<0.0001	0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	0.0001	<0.0000085	<u>0.0032</u>	0.000093	<0.00002	ND
Test 1	25-Oct-12	16053121025001	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
Test 2	30-Oct-12	16053121030005	<0.0001	<0.0001	<0.00001	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.0000085	<0.0000075	<0.00004	<0.00005	<0.0000085	<0.0001	<0.00005	<0.00002	ND
AB Tier 1 - Fine Grained Soils - Natural Areas*			<u>0.0058^A</u>	<u>0.046^A</u>	<u>0.000012^A</u>	<u>0.000018^A</u>	<u>0.00048^A</u>	<u>0.00048^A</u>	<u>0.00021^A</u>	<u>0.000017^A</u>	<u>0.0014^A</u>	<u>0.00028^A</u>	<u>0.00004^A</u>	<u>0.003^A</u>	<u>0.00023^A</u>	<u>0.0011^A</u>	<u>0.0004^A</u>	<u>0.000025^A</u>	<u>0.00001^P</u>

Notes:

- - not analyzed
- NS - not specified
- ^A - indicates guideline for Aquatic Life exposure pathway
- ^P - indicates guideline for Potable Groundwater exposure pathway
- ^{MAC} - maximum acceptable concentration
- ⁺ - Equivalent Benzo[a]pyrene concentrations based on relative carcinogenic potency
- ⁺⁺ - Carcinogenic PAHs
- * - Alberta Tier 1 Soil and Groundwater Remediation Guidelines (AENV 2010)
- Underline - indicates values do not meet Alberta Tier 1 Natural Areas guideline

TABLE 10a.**WATER QUALITY CONTROL SAMPLE RESULTS - FIELD PARAMETERS**

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Temp °C	Field pH	Field EC µS/cm
AGS-03-17	28-Nov-13	16053131128021	6	7.2	810
AGS-03-17 dup	28-Nov-13	16053131128023	6.1	7.2	810
Detection Limit (DL)			0.1	0.1	10
Reliable Detection Limit (RDL)**			0.5	---	50
Absolute Difference*			0.1	0	0
Absolute Relative Percent Difference (RPD)*			2	---	0
Duplicate Sample Results Evaluation			Good	Good	Good
GWN-06-60	26-Nov-13	16053131126015	4.9	7.1	750
GWN-06-60 dup	26-Nov-13	16053131126017	4.9	7.1	750
Detection Limit (DL)			0.1	0.1	10
Reliable Detection Limit (RDL)**			0.5	---	50
Absolute Difference*			0	0	0
Absolute Relative Percent Difference (RPD)*			0	---	0
Duplicate Sample Results Evaluation			Good	Good	Good
GWN-08-45	02-Nov-13	16053131102027	3.9	8.7	2540
GWN-08-45 dup	02-Nov-13	16053131102029	---	---	---
Detection Limit (DL)			0.1	0.1	10
Reliable Detection Limit (RDL)**			---	---	---
Absolute Difference*			---	---	---
Absolute Relative Percent Difference (RPD)*			---	---	---
Duplicate Sample Results Evaluation			---	---	---
GWN-08-47	20-Sep-13	16053130920036	8.6	7.6	3340
GWN-08-47 dup	20-Sep-13	16053130920038	---	---	---
Detection Limit (DL)			0.1	0.1	10
Reliable Detection Limit (RDL)**			---	---	---
Absolute Difference*			---	---	---
Absolute Relative Percent Difference (RPD)*			---	---	---
Duplicate Sample Results Evaluation			---	---	---
GWN-13-28	23-Nov-13	16053131123008	3.3	9.5	1530
GWN-13-28 dup	23-Nov-13	16053131123010	3.4	9.4	1530
Detection Limit (DL)			0.1	0.1	10
Reliable Detection Limit (RDL)**			0.5	---	50
Absolute Difference*			0.1	0.1	0
Absolute Relative Percent Difference (RPD)*			3	---	0
Duplicate Sample Results Evaluation			Good	Good	Good

Notes:

- - not applicable
- * - non-detectable concentrations are assessed at 95% of the detection limit
- ** - the reliable (reporting) detection limit (RDL) or practical detection limit (PDL) is defined as 5 times the DL
- Good - evaluation indicates acceptable reproducibility
- Poor - evaluation indicates poor reproducibility

Evaluation of Duplicate Analyses:

- reproducibility is unacceptable if RPD is > 30% for inorganic waters and > 40% for soils and organics
- if RPD is not applicable (---), reproducibility is evaluated based on Absolute Difference (unacceptable if > 2 x RDL)
- if Absolute Difference is not applicable (---), reproducibility is evaluated based on the parameter concentration (unacceptable if > 2 x RDL)
- pH is evaluated based on Absolute Difference (unacceptable if > 0.5)

TABLE 10b.

WATER QUALITY CONTROL SAMPLE RESULTS - GENERAL PARAMETERS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC μ S/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO ₄ mg/L	NO ₂ -N mg/L	NO ₃ -N mg/L	NO ₂ +NO ₃ -N mg/L	NH ₃ -N mg/L	T-Alkalinity mg/L	HCO ₃ mg/L	Hardness mg/L	TDS mg/L	TOC mg/L	Phenol mg/L	Turbidity NTU
AGS-02-97	06-Aug-14	16053140806029	8.64	1830	47	27.8	350.0	5.47	50.5	277	<0.02	<0.05	<0.054	2.21	642	706	232	1140	9	<0.001	7.93
AGS-02-97	06-Aug-14	16053140806031	8.65	1840	49.1	28	355	5.51	50.9	278	<0.02	<0.05	<0.054	2.27	640	703	238	1150	8.8	<0.001	6.94
Detection Limit (DL)			0.1	0.2	0.5	0.1	1	0.1	0.5	0.5	0.02	0.05	0.054	0.05	2	5	1	10	0.1	0.001	0.1
Reliable Detection Limit (RDL)**			---	1	2.5	0.5	5	0.5	2.5	2.5	0.1	0.25	0.27	0.25	10	25	5	50	0.5	0.005	0.5
Absolute Difference*			0.01	10	2.1	0.2	5	0.04	0.4	1	---	---	---	0.06	2	3	6	10	0.2	---	0.99
Absolute Relative Percent Difference (RPD)*			---	1	4	1	1	1	1	0	---	---	---	3	0	0	3	1	2	---	13
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
GWN-07-57	03-Aug-14	16053140803010	8.08	2850	36.5	32.1	571	24.2	313	<0.5	<0.02	<0.05	<0.054	3.74	1120	1370	223	1650	16.9	<0.001	1.82
GWN-07-57	03-Aug-14	16053140803012	8.09	2850	35.8	32.3	560	23.8	310	<0.5	<0.02	<0.05	<0.054	3.5	1110	1360	222	1630	18.2	<0.001	2.07
Detection Limit (DL)			0.1	0.2	0.5	0.1	0.5	0.1	0.5	0.5	0.02	0.05	0.054	0.05	2	5	1	1	0.1	0.001	0.1
Reliable Detection Limit (RDL)**			---	1	2.5	0.5	2.5	0.5	2.5	2.5	0.1	0.25	0.27	0.25	10	25	5	5	0.5	0.005	0.5
Absolute Difference*			0.01	0	0.7	0.2	11	0.4	3	---	---	---	---	0.24	10	10	1	20	1.3	---	0.25
Absolute Relative Percent Difference (RPD)*			---	0	2	1	2	2	1	---	---	---	---	7	1	1	0	1	7	---	13
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
GWN-14-33	04-Aug-14	16053140804017	9.17	6280	5.21	5.53	1380	7.99	1190	<2.5	<0.1	<0.25	<0.27	6.06	1580	1410	35.8	3540	3.6	<0.001	17.7
GWN-14-33	04-Aug-14	16053140804019	8.92	6370	5.52	5.67	1390	7.99	1180	<2.5	<0.1	<0.25	<0.27	4.66	1650	1680	37.1	3580	3.4	<0.001	20.1
Detection Limit (DL)			0.1	0.2	0.5	0.1	0.5	0.1	0.5	2.5	0.1	0.25	0.27	0.05	2	5	1	1	0.1	0.001	0.1
Reliable Detection Limit (RDL)**			---	1	2.5	0.5	2.5	0.5	2.5	12.5	0.5	1.25	1.35	0.25	10	25	5	5	0.5	0.005	0.5
Absolute Difference*			0.25	90	0.31	0.14	10	0	10	---	---	---	---	1.4	70	270	1.3	40	0.2	---	2.4
Absolute Relative Percent Difference (RPD)*			---	1	6	2	1	0	1	---	---	---	---	26	4	17	4	1	6	---	13
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
GWN-Shell-PW2-63	03-Nov-14	16053141103028	8.33	556	102	15.1	5	1.6	<0.5	<0.5	<0.02	<0.05	<0.054	0.555	344	413	317	388	30	0.0023	229
GWN-Shell-PW2-63	03-Nov-14	16053141103030	8.33	558	99.5	14.7	4.9	1.56	<0.5	<0.5	<0.02	<0.05	<0.054	0.554	331	399	309	389	30.8	0.0031	237
Detection Limit (DL)			0.1	0.2	0.5	0.1	0.5	0.1	0.5	0.5	0.02	0.05	0.054	0.05	2	5	1	1	0.1	0.001	0.1
Reliable Detection Limit (RDL)**			---	1	2.5	0.5	2.5	0.5	2.5	2.5	0.1	0.25	0.27	0.25	10	25	5	5	0.5	0.005	0.5
Absolute Difference*			---	2	2.5	0.4	0.1	0.04	---	---	---	---	---	0.001	13	14	8	1	0.8	0.0008	8
Absolute Relative Percent Difference (RPD)*			---	0	2	3	2	3	---	---	---	---	---	0	4	3	3	0	3	---	3
Duplicate Sample Results Evaluation			---	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good

Notes:

- - not applicable
- * - non-detectable concentrations are assessed at 95% of the detection limit
- ** - the reliable (reporting) detection limit (RDL) or practical detection limit (PDL) is defined as 5 times the DL
- Good - evaluation indicates acceptable reproducibility
- Poor - evaluation indicates poor reproducibility

Evaluation of Duplicate Analyses:

- reproducibility is unacceptable if RPD is > 30% for inorganic waters and > 40% for soils and organics
- if RPD is not applicable (---), reproducibility is evaluated based on Absolute Difference (unacceptable if > 2 x RDL)
- if Absolute Difference is not applicable (---), reproducibility is evaluated based on the parameter concentration (unacceptable if > 2 x RDL)
- pH is evaluated based on Absolute Difference (unacceptable if > 0.5)

TABLE 10c.

WATER QUALITY CONTROL SAMPLE RESULTS - METALS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Total/Dissolved	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	B mg/L	Cd mg/L	Cr mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Mn mg/L	Hg mg/L	Ni mg/L	Se mg/L	Si mg/L	Ag mg/L	U mg/L	Zn mg/L
GWN-14-33	31-Oct-14	16053141031016	Dissolved	<0.01	<0.001	<0.001	0.831	4.04	<0.0001	<0.005	<0.001	<0.1	<0.0005	0.0063	<0.000005	<0.002	<0.001	3.16	<0.0001	0.00022	<0.01
GWN-14-33	31-Oct-14	16053141031018	Dissolved	<0.01	<0.001	<0.001	0.766	3.78	<0.0001	<0.005	<0.001	0.18	<0.0005	0.0085	<0.000005	<0.002	<0.001	2.99	<0.0001	<0.0001	<0.01
Detection Limit (DL)				0.01	0.001	0.001	0.005	0.1	0.0001	0.005	0.001	0.1	0.0005	0.002	0.000005	0.002	0.001	0.5	0.0001	0.0001	0.01
Reliable Detection Limit (RDL)**				0.05	0.005	0.005	0.025	0.5	0.0005	0.025	0.005	0.5	0.0025	0.01	0.000025	0.01	0.005	2.5	0.0005	0.0005	0.05
Absolute Difference*				---	---	---	0.065	0.26	---	---	---	---	---	0.0022	---	---	---	0.17	---	---	---
Absolute Relative Percent Difference (RPD)*				---	---	---	8	7	---	---	---	---	---	---	---	---	---	6	---	---	---
Duplicate Sample Results Evaluation				Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
GWN-14-33	31-Oct-14	16053141031016	Total	0.113	<0.001	<0.001	0.827	3.81	<0.0002	<0.005	0.0119	3.66	0.0135	0.0667	<0.000005	0.0031	<0.001	3.54	<0.0004	<0.0001	0.07
GWN-14-33	31-Oct-14	16053141031018	Total	0.123	<0.001	<0.001	0.825	3.64	<0.0002	<0.005	0.0105	3.39	0.0122	0.0553	0.0000066	0.0024	<0.001	3.46	<0.0004	<0.0001	0.051
Detection Limit (DL)				0.03	0.001	0.001	0.005	0.1	0.0002	0.005	0.001	0.1	0.0005	0.002	0.000005	0.002	0.001	0.5	0.0004	0.0001	0.03
Reliable Detection Limit (RDL)**				0.15	0.005	0.005	0.025	0.5	0.001	0.025	0.005	0.5	0.0025	0.01	0.000025	0.01	0.005	2.5	0.002	0.0005	0.15
Absolute Difference*				0.01	---	---	0.002	0.17	---	---	0.0014	0.27	0.0013	0.0114	---	0.0007	---	0.08	---	---	0.019
Absolute Relative Percent Difference (RPD)*				---	---	---	0	5	---	---	13	8	10	19	---	---	---	2	---	---	---
Duplicate Sample Results Evaluation				Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
GWN-Shell-PW2-63	03-Nov-14	16053141103028	Dissolved	<0.005	<0.0004	0.00082	0.472	0.092	<0.0001	<0.005	<0.001	29.5	<0.0001	0.543	<0.000005	0.0023	<0.0004	10.6	<0.0001	<0.0001	0.0038
GWN-Shell-PW2-63	03-Nov-14	16053141103030	Dissolved	<0.005	<0.0004	0.00077	0.471	0.071	<0.0001	<0.005	<0.001	29.6	<0.0001	0.539	<0.000005	0.0024	<0.0004	10.5	<0.0001	<0.0001	0.0047
Detection Limit (DL)				0.005	0.0004	0.0004	0.005	0.05	0.0001	0.005	0.001	0.01	0.0001	0.002	0.000005	0.002	0.0004	0.05	0.0001	0.0001	0.003
Reliable Detection Limit (RDL)**				0.025	0.002	0.002	0.025	0.25	0.0005	0.025	0.005	0.05	0.0005	0.01	0.000025	0.01	0.002	0.25	0.0005	0.0005	0.015
Absolute Difference*				---	---	0.00005	0.001	0.021	---	---	---	0.1	---	0.004	---	1E-04	---	0.1	---	---	0.0009
Absolute Relative Percent Difference (RPD)*				---	---	---	0	---	---	---	0	---	1	---	---	---	1	---	---	---	---
Duplicate Sample Results Evaluation				Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
GWN-Shell-PW2-63	03-Nov-14	16053141103028	Total	0.0169	<0.0004	0.00096	0.475	<0.050	<0.0002	<0.005	0.0014	31.2	0.00043	0.554	<0.000005	0.0038	<0.0004	10.2	<0.0004	<0.0001	0.0622
GWN-Shell-PW2-63	03-Nov-14	16053141103030	Total	0.0124	<0.0004	0.00094	0.478	<0.050	<0.0002	<0.005	0.001	31.4	0.00053	0.577	<0.000005	0.0038	<0.0004	10.5	<0.0004	<0.0001	0.0589
Detection Limit (DL)				0.003	0.0004	0.0004	0.005	0.05	0.0002	0.005	0.001	0.01	0.0001	0.002	0.000005	0.002	0.0004	0.05	0.0004	0.0001	0.004
Reliable Detection Limit (RDL)**				0.015	0.002	0.002	0.025	0.25	0.001	0.025	0.005	0.05	0.0005	0.01	0.000025	0.01	0.002	0.25	0.002	0.0005	0.02
Absolute Difference*				0.0045	---	2E-05	0.003	---	---	---	0.0004	0.2	0.0001	0.023	---	0	---	0.3	---	---	0.0033
Absolute Relative Percent Difference (RPD)*				---	---	---	1	---	---	---	---	1	---	4	---	---	---	3	---	---	5
Duplicate Sample Results Evaluation				Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good

Notes:

- - not applicable
- * - non-detectable concentrations are assessed at 95% of the detection limit
- ** - the reliable (reporting) detection limit (RDL) or practical detection limit (PDL) is defined as 5 times the DL
- Good - evaluation indicates acceptable reproducibility
- Poor - evaluation indicates poor reproducibility

Evaluation of Duplicate Analyses:

- reproducibility is unacceptable if RPD is > 30% for inorganic waters and > 40% for soils and organics
- if RPD is not applicable (---), reproducibility is evaluated based on Absolute Difference (unacceptable if > 2 x RDL)
- if Absolute Difference is not applicable (---), reproducibility is evaluated based on the parameter concentration (unacceptable if > 2 x RDL)

TABLE 10d.

WATER QUALITY CONTROL SAMPLE RESULTS - DISSOLVED HYDROCARBONS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Styrene mg/L	F1 C ₆ -C ₁₀ - BTEX mg/L	F2 C ₁₀ -C ₁₆ mg/L	F3 C ₁₆ -C ₃₄ mg/L	F4 C ₃₄ -C ₅₀ mg/L	Naphthenic Acids mg/L
AGS-02-97	06-Aug-14	16053140806029	<0.0005	<0.0005	<0.0005	<0.00071	<0.001	<0.1	<0.25	<0.25	<0.25	<1.0
AGS-02-97	06-Aug-14	16053140806031	<0.0005	<0.0005	<0.0005	<0.00071	<0.001	<0.1	<0.25	<0.25	<0.25	<1.0
Detection Limit (DL)			0.0005	0.0005	0.0005	0.00071	0.001	0.1	0.25	0.25	0.25	1
Reliable Detection Limit (RDL)**			0.0025	0.0025	0.0025	0.00355	0.005	0.5	1.25	1.25	1.25	5
Absolute Difference*			---	---	---	---	---	---	---	---	---	---
Absolute Relative Percent Difference (RPD)*			---	---	---	---	---	---	---	---	---	---
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
GWN-07-57	03-Aug-14	16053140803010	<0.0005	<0.0005	<0.0005	<0.00071	<0.001	<0.1	0.67	3.2	<0.25	10.6
GWN-07-57	03-Aug-14	16053140803012	<0.0005	<0.0005	<0.0005	<0.00071	<0.001	<0.1	0.68	3.29	<0.25	13.5
Detection Limit (DL)			0.0005	0.0005	0.0005	0.00071	0.001	0.1	0.25	0.25	0.25	1
Reliable Detection Limit (RDL)**			0.0025	0.0025	0.0025	0.00355	0.005	0.5	1.25	1.25	1.25	5
Absolute Difference*			---	---	---	---	---	---	0.01	0.09	---	2.9
Absolute Relative Percent Difference (RPD)*			---	---	---	---	---	---	---	3	---	24
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
GWN-14-33	04-Aug-14	16053140804017	<0.0005	<0.0005	<0.0005	<0.00071	<0.001	<0.1	<0.25	<0.25	<0.25	<1.0
GWN-14-33	04-Aug-14	16053140804019	<0.0005	<0.0005	<0.0005	<0.00071	<0.001	<0.1	<0.25	<0.25	<0.25	<1.0
Detection Limit (DL)			0.0005	0.0005	0.0005	0.00071	0.001	0.1	0.25	0.25	0.25	1
Reliable Detection Limit (RDL)**			0.0025	0.0025	0.0025	0.00355	0.005	0.5	1.25	1.25	1.25	5
Absolute Difference*			---	---	---	---	---	---	---	---	---	---
Absolute Relative Percent Difference (RPD)*			---	---	---	---	---	---	---	---	---	---
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
GWN-13-28	28-Oct-14	16053141028001	<0.0005	<0.0005	<0.0005	<0.00071	<0.001	<0.1	<0.25	0.36	<0.25	1.1
GWN-13-28	28-Oct-14	16053141028003	<0.0005	<0.0005	<0.0005	<0.00071	<0.001	<0.1	<0.25	0.43	<0.25	<1.0
Detection Limit (DL)			0.0005	0.0005	0.0005	0.00071	0.001	0.1	0.25	0.25	0.25	1
Reliable Detection Limit (RDL)**			0.0025	0.0025	0.0025	0.00355	0.005	0.5	1.25	1.25	1.25	5
Absolute Difference*			---	---	---	---	---	---	---	0.07	---	---
Absolute Relative Percent Difference (RPD)*			---	---	---	---	---	---	---	---	---	---
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
GWN-14-33	31-Oct-14	16053141031016	<0.0005	<0.0005	<0.0005	<0.00071	<0.001	<0.1	<0.25	<0.25	<0.25	<1.0
GWN-14-33	31-Oct-14	16053141031018	<0.0005	<0.0005	<0.0005	<0.00071	<0.001	<0.1	<0.25	<0.25	<0.25	<1.0
Detection Limit (DL)			0.0005	0.0005	0.0005	0.00071	0.001	0.1	0.25	0.25	0.25	1
Reliable Detection Limit (RDL)**			0.0025	0.0025	0.0025	0.00355	0.005	0.5	1.25	1.25	1.25	5
Absolute Difference*			---	---	---	---	---	---	---	---	---	---
Absolute Relative Percent Difference (RPD)*			---	---	---	---	---	---	---	---	---	---
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
GWN-Shell-PW2-63	03-Nov-14	16053141103028	<0.0005	<0.0005	0.00084	0.00388	<0.001	<0.1	<0.25	<0.25	<0.25	1.7
GWN-Shell-PW2-63	03-Nov-14	16053141103030	<0.0005	<0.0005	0.00096	0.00406	<0.001	<0.1	<0.25	<0.25	<0.25	2
Detection Limit (DL)			0.0005	0.0005	0.0005	0.00071	0.001	0.1	0.25	0.25	0.25	1
Reliable Detection Limit (RDL)**			0.0025	0.0025	0.0025	0.00355	0.005	0.5	1.25	1.25	1.25	5
Absolute Difference*			---	---	0.00012	0.00018	---	---	---	---	---	0.3
Absolute Relative Percent Difference (RPD)*			---	---	---	5	---	---	---	---	---	---
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good

Notes:

- - not applicable
- * - non-detectable concentrations are assessed at 95% of the detection limit
- ** - the reliable (reporting) detection limit (RDL) or practical detection limit (PDL) is defined as 5 times the DL
- Good - evaluation indicates acceptable reproducibility
- Poor - evaluation indicates poor reproducibility

Evaluation of Duplicate Analyses:

- reproducibility is unacceptable if RPD is > 30% for inorganic waters and > 40% for soils and organics
- if RPD is not applicable (---), reproducibility is evaluated based on Absolute Difference (unacceptable if > 2 x RDL)
- if Absolute Difference is not applicable (---), reproducibility is evaluated based on the parameter concentration (unacceptable if > 2 x RDL)

TABLE 10e.

WATER QUALITY CONTROL SAMPLE RESULTS - POLYCYCLIC AROMATIC HYDROCARBONS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Acenaphthene mg/L	Acenaphthylene mg/L	Anthracene mg/L	Benz[a]anthracene** mg/L	Benzo[b+g,h,i]fluoranthene** mg/L	Benzo[k]fluoranthene** mg/L	Benzo[a]pyrene** mg/L	Chrysene** mg/L	Dibenz[a,h]anthracene** mg/L	Fluoranthene mg/L	Fluorene mg/L	Indeno[1,2,3-c,d]pyrene** mg/L	Naphthalene mg/L	Phenanthrene mg/L	Pyrene mg/L	
AGS-02-97	06-Aug-14	16053140806029	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001
AGS-02-97	06-Aug-14	16053140806031	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001
Detection Limit (DL)			0.00002	0.00002	0.00001	0.00001	0.00001	0.00001	0.00002	0.000005	0.00002	0.000005	0.00002	0.00002	0.00001	0.00005	0.00005	0.00002
Reliable Detection Limit (RDL)**			0.0001	0.0001	0.00005	0.00005	0.00005	0.00005	0.0001	0.000025	0.0001	0.000025	0.0001	0.0001	0.00005	0.00025	0.00025	0.0001
Absolute Difference*			---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Absolute Relative Percent Difference (RPD)*			---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
GWN-07-57	03-Aug-14	16053140803010	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001
GWN-07-57	03-Aug-14	16053140803012	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001
Detection Limit (DL)			0.00002	0.00002	0.00001	0.00001	0.00001	0.00001	0.00002	0.000005	0.00002	0.000005	0.00002	0.00002	0.00001	0.00005	0.00005	0.00002
Reliable Detection Limit (RDL)**			0.0001	0.0001	0.00005	0.00005	0.00005	0.00005	0.0001	0.000025	0.0001	0.000025	0.0001	0.0001	0.00005	0.00025	0.00025	0.0001
Absolute Difference*			---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Absolute Relative Percent Difference (RPD)*			---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
GWN-14-33	04-Aug-14	16053140804017	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001
GWN-14-33	04-Aug-14	16053140804019	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001
Detection Limit (DL)			0.00002	0.00002	0.00001	0.00001	0.00001	0.00001	0.00002	0.000005	0.00002	0.000005	0.00002	0.00002	0.00001	0.00005	0.00005	0.00002
Reliable Detection Limit (RDL)**			0.0001	0.0001	0.00005	0.00005	0.00005	0.00005	0.0001	0.000025	0.0001	0.000025	0.0001	0.0001	0.00005	0.00025	0.00025	0.0001
Absolute Difference*			---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Absolute Relative Percent Difference (RPD)*			---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
AGS-03-17	28-Nov-13	16053131128021	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001
AGS-03-17 dup	28-Nov-13	16053131128023	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001
Detection Limit (DL)			0.00002	0.00002	0.00001	0.00001	0.00001	0.00001	0.00002	0.000005	0.00002	0.000005	0.00002	0.00002	0.00001	0.00005	0.00005	0.00001
Reliable Detection Limit (RDL)**			0.0001	0.0001	0.00005	0.00005	0.00005	0.00005	0.0001	0.000025	0.0001	0.000025	0.0001	0.0001	0.00005	0.00025	0.00025	0.00005
Absolute Difference*			---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Absolute Relative Percent Difference (RPD)*			---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
GWN-08-47	20-Sep-13	16053130920036	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000081	<0.00005	<0.00002
GWN-08-47 dup	20-Sep-13	16053130920038	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00002
Detection Limit (DL)			0.00002	0.00002	0.00001	0.00001	0.00001	0.00001	0.00002	0.000005	0.00002	0.000005	0.00002	0.00002	0.00001	0.00005	0.00005	0.00002
Reliable Detection Limit (RDL)**			0.0001	0.0001	0.00005	0.00005	0.00005	0.00005	0.0001	0.000025	0.0001	0.000025	0.0001	0.0001	0.00005	0.00025	0.00025	0.0001
Absolute Difference*			---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Absolute Relative Percent Difference (RPD)*			---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
GWN-13-28	28-Oct-14	16053141028001	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	0.000061	<0.00005	<0.00001
GWN-13-28	28-Oct-14	16053141028003	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001
Detection Limit (DL)			0.00002	0.00002	0.00001	0.00001	0.00001	0.00001	0.00002	0.000005	0.00002	0.000005	0.00002	0.00002	0.00001	0.00005	0.00005	0.00002
Reliable Detection Limit (RDL)**			0.0001	0.0001	0.00005	0.00005	0.00005	0.00005	0.0001	0.000025	0.0001	0.000025	0.0001	0.0001	0.00005	0.00025	0.00025	0.0001
Absolute Difference*			---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Absolute Relative Percent Difference (RPD)*			---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good

TABLE 10e.

WATER QUALITY CONTROL SAMPLE RESULTS - POLYCYCLIC AROMATIC HYDROCARBONS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Acenaphthene mg/L	Acenaphthylene mg/L	Anthracene mg/L	Benz[a]anthracene ⁺⁺ mg/L	Benzo[b+g]fluoranthene ⁺⁺ mg/L	Benzo[k]fluoranthene ⁺⁺ mg/L	Benzo[g,h,i]perylene ⁺⁺ mg/L	Benzo[a]pyrene ⁺⁺ mg/L	Chrysene ⁺⁺ mg/L	Dibenz[a,h]anthracene ⁺⁺ mg/L	Fluoranthene mg/L	Fluorene mg/L	Indeno[1,2,3-c,d]pyrene ⁺⁺ mg/L	Naphthalene mg/L	Phenanthrene mg/L	Pyrene mg/L
GWN-14-33	31-Oct-14	16053141031016	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001
GWN-14-33	31-Oct-14	16053141031018	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001
Detection Limit (DL)			0.00002	0.00002	0.00001	0.00001	0.00001	0.00001	0.00002	0.000005	0.00002	0.000005	0.00002	0.00002	0.00001	0.00005	0.00005	0.00002
Reliable Detection Limit (RDL)**			0.0001	0.0001	0.00005	0.00005	0.00005	0.00005	0.0001	0.000025	0.0001	0.000025	0.0001	0.0001	0.00005	0.00025	0.00025	0.0001
Absolute Difference*			---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Absolute Relative Percent Difference (RPD)*			---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
GWN-Shell-PW2-63	03-Nov-14	16053141103028	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001
GWN-Shell-PW2-63	03-Nov-14	16053141103030	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00002	<0.00001	<0.00005	<0.00005	<0.00001
Detection Limit (DL)			0.00002	0.00002	0.00001	0.00001	0.00001	0.00001	0.00002	0.000005	0.00002	0.000005	0.00002	0.00002	0.00001	0.00005	0.00005	0.00002
Reliable Detection Limit (RDL)**			0.0001	0.0001	0.00005	0.00005	0.00005	0.00005	0.0001	0.000025	0.0001	0.000025	0.0001	0.0001	0.00005	0.00025	0.00025	0.0001
Absolute Difference*			---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Absolute Relative Percent Difference (RPD)*			---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good

Notes:

- - not applicable
- * - non-detectable concentrations are assessed at 95% of the detection limit
- ** - the reliable (reporting) detection limit (RDL) or practical detection limit (PDL) is defined as 5 times the DL
- Good - evaluation indicates acceptable reproducibility
- Poor - evaluation indicates poor reproducibility

Evaluation of Duplicate Analyses:

- reproducibility is unacceptable if RPD is > 30% for inorganic waters and > 40% for soils and organics
- if RPD is not applicable (---), reproducibility is evaluated based on Absolute Difference (unacceptable if > 2 x RDL)
- if Absolute Difference is not applicable (---), reproducibility is evaluated based on the parameter concentration (unacceptable if > 2 x RDL)

TABLE 11a.**WATER QUALITY CONTROL SAMPLE RESULTS - GENERAL PARAMETERS - BLANKS**

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC μ S/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO ₄ mg/L	NO ₂ -N mg/L	NO ₃ -N mg/L	NO ₂ /NO ₃ -N mg/L	NH ₃ -N mg/L	T-Alkalinity mg/L	HCO ₃ mg/L	Phenol mg/L
Field Blank	07-Aug-14	16053140807033	5.49	0.73	<0.5	<0.1	<1.0	<0.1	<0.5	<0.5	<0.02	<0.05	<0.054	<0.05	<2.0	<5.0	<0.001
Field Blank	08-Aug-14	16053140808040	5.43	0.77	<i>4.74</i>	<i>1.29</i>	<1.0	<0.1	<0.5	<0.5	<0.02	<0.05	<0.054	<0.05	<2.0	<5.0	<0.001
Detection Limit (DL)			-	0.2	0.5	0.1	1	0.5	0.5	0.5	0.5	0.5	0.071	0.05	2	5	0.001

TABLE 11b.**WATER QUALITY CONTROL SAMPLE RESULTS - METALS - BLANKS**

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Total/Dissolved	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	B mg/L	Cd mg/L	Cr mg/L	Cu mg/L	Fe mg/L
Field Blank	07-Aug-14	16053140807033	Dissolved	<0.005	<0.0004	<0.0004	<0.005	<0.05	<0.0001	<0.005	<0.001	<0.01
Field Blank	08-Aug-14	16053140808040	Dissolved	<0.005	<0.0004	<0.0004	<0.005	<0.05	<0.0001	<0.005	<0.001	<0.01
Field Blank	07-Aug-14	16053140807033	Total	<0.003	<0.0004	<0.0004	<0.005	<0.05	<0.0001	<0.005	<0.001	<0.01
Field Blank	08-Aug-14	16053140808040	Total	<0.003	<0.0004	<0.0004	<0.005	<0.05	<0.0002	<0.005	<0.001	<0.01
Detection Limit (DL)				0.001	0.0004	0.0004	0.0001	0.002	0.0001	0.0004	0.0006	0.01

Monitoring Well	Sample Date	MSI Sample Number	Total/Dissolved	Pb mg/L	Mn mg/L	Hg mg/L	Ni mg/L	Se mg/L	Ag mg/L	U mg/L	Zn mg/L
Field Blank	07-Aug-14	16053140807033	Dissolved	<0.0001	<0.002	<0.000005	<0.002	<0.0004	<0.0001	<0.0001	<0.003
Field Blank	08-Aug-14	16053140808040	Dissolved	<0.0001	<0.002	<0.000005	<0.002	<0.0004	<0.0001	<0.0001	<0.003
Field Blank	07-Aug-14	16053140807033	Total	<0.0001	<0.002	<0.000005	<0.002	<0.0004	<0.0004	<0.0001	<0.004
Field Blank	08-Aug-14	16053140808040	Total	<0.0001	<0.002	<0.000005	<0.002	<0.0004	<0.0004	<0.0001	<0.004
Detection Limit (DL)				0.0001	0.002	0.00002	0.0001	0.0004	0.00001	0.00001	0.001

Notes:

--- - not analyzed

Italics - value exceeds 2 x detection limit and indicates the results for this parameter may be suspect: further investigation warranted

TABLE 11c.**WATER QUALITY CONTROL SAMPLE RESULTS - DISSOLVED HYDROCARBONS - BLANKS**

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	F1 C ₆ -C ₁₀ mg/L	F2 C ₁₀ -C ₁₆ mg/L
Field Blank	07-Aug-14	16053140807033	<0.0005	<0.0005	<0.0005	<0.00071	<0.1	<0.25
Field Blank	08-Aug-14	16053140808040	<0.0005	<0.0005	<0.0005	<0.00071	<0.1	<0.25
Field Blank	30-Oct-14	16053141030011	<0.0005	<0.0005	<0.0005	<0.00071	<0.1	<0.25
Field Blank	31-Oct-14	16053141031019	<0.0005	<0.0005	<0.0005	<0.00071	<0.1	<0.25
Trip Blank	03-Aug-14	16053140803011	<0.0005	<0.0005	<0.0005	<0.00071	<0.1	---
Trip Blank	07-Aug-14	16053140807034	<0.0005	<0.0005	<0.0005	<0.00071	<0.1	---
Trip Blank	08-Aug-14	16053140808041	<0.0005	<0.0005	<0.0005	<0.00071	<0.1	---
Trip Blank	02-Nov-14	16053141102027	<0.0005	<0.0005	<0.0005	<0.00071	<0.1	---
Trip Blank	03-Nov-14	16053141103032	<0.0005	<0.0005	<0.0005	<0.00071	<0.1	---
Trip Blank	04-Nov-14	16053141104036	<0.0005	<0.0005	<0.0005	<0.00071	<0.1	---
Detection Limit (DL)			0.0005	0.0005	0.0005	0.00071	0.1	0.25

TABLE 11d.**WATER QUALITY CONTROL SAMPLE RESULTS - POLYCYCLIC AROMATIC HYDROCARBONS - BLANKS**

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Monitoring Well	Sample Date	MSI Sample Number	Acenaphthene mg/L	Acenaphthylene mg/L	Anthracene mg/L	Benz[a]anthracene ⁺⁺ mg/L	Benzo[b,]fluoranthene ⁺⁺ mg/L	Benzo[k]fluoranthene ⁺⁺ mg/L	Benzo[g,h,i]perylene ⁺⁺ mg/L	Benzo[a]pyrene ⁺⁺ mg/L	Chrysene ⁺⁺ mg/L	Dibenz[a,h]anthracene ⁺⁺ mg/L	Fluoranthene mg/L	Phenanthrene mg/L	Fluorene mg/L	Indeno[1,2,3-c,d]pyrene ⁺⁺ mg/L	Naphthalene mg/L	Pyrene mg/L
Field Blank	07-Aug-14	16053140807033	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00005	<0.00002	<0.00001	<0.00005	0.00001
Field Blank	08-Aug-14	16053140808040	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.000005	<0.00002	<0.000005	<0.00002	<0.00005	<0.00002	<0.00001	<0.00005	<0.00001
Minimal Detection Limit			0.00002	0.00002	0.00001	0.00001	0.00001	0.00001	0.00002	0.000005	0.00002	0.000005	0.00002	0.00005	0.00002	0.00001	0.00005	0.00001

Notes:

--- - not analyzed

Italics - value exceeds 2 x detection limit and indicates the results for this parameter may be suspect: further investigation warranted

TABLE 12.

NETWORK EVALUATION RESULTS (GWN-AGS WELLS)

Alberta Environment and Sustainable Resource Development

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Site No./Operator	Legal Location	NAOS Well ID	GOWN ID/Operator Well Name	Geologic Period	Interpreted Aquifer (or AMU)/Group	Drift Thickness (m)	Current Groundwater Monitoring Category ¹	Proposed Groundwater Monitoring Category	Regulatory Framework and Conceptual Model							Total Score (%)	Comments	
									Spatial Distribution	Proximity to Current Operations Footprints / Communities		Proximity to Major Rivers/Lakes	Proximity to Bedrock Incisions	Proximity to Current Operations Footprints (Cumulative Effects)	Aquifer Parameters			
										Quality	Quantity				Groundwater Mineralization			Well Completion
1	06-13-009-10 W4M	GWN-16-22	16-55	Quaternary	Surficial Sands	8	Strategic	Strategic	2	1	1	2	1	1	2	2	75	
		GWN-16-24	16-325	Cretaceous	Basal McMurray	8	Strategic	Strategic	2	1	1	2	1	1	0	2	63	AMU 3
		GWN-16-25	16-550	Devonian	Beaverhill Lake	8	NC	Strategic	2	1	1	2	1	1	0	1	56	
2	08-11- 090-12 W4M	GWN-13-26	13-70	Quaternary	Surficial Sands	62	Strategic	Strategic	2	2	2	1	2	2	2	2	94	
		GWN-13-27	13-230	Quaternary	Buried Channels - Thickwood Valley	62	Strategic	Strategic	2	2	2	1	2	2	2	2	94	
		GWN-13-28	13-460	Cretaceous	Grand Rapids	62	Strategic	Strategic	2	2	2	1	2	2	2	2	94	
		GWN-13-30	13-872	Cretaceous	Basal McMurray	62	NC	Strategic	2	2	2	1	2	2	2	0	81	AMU 2; well may be completed in undifferentiated McMurray aquitard; for further review
		GWN-13-31	13-1230	Devonian	Beaverhill Lake	62	NC	Surveillance	2	2	2	1	2	2	---	1	75	
3	04-15-092-12 W4M	GWN-14-32	14-31	Quaternary	Surficial Sands	0	Surveillance	Surveillance	1	1	1	2	1	1	2	2	69	
		GWN-14-33	14-119	Cretaceous	Clearwater	0	Surveillance	Surveillance	2	1	1	2	1	1	2	2	75	
		GWN-14-34	14-247	Cretaceous	Basal McMurray	0	NC	NC	2	1	1	2	1	1	---	0	50	Well appears to be completed in unsaturated Wabiskaw sand unit or Upper McMurray aquitard (historically dry); reclassify or discontinue from network
		GWN-14-35	14-699	Devonian	Beaverhill Lake	0	Surveillance	Surveillance	2	1	1	2	1	1	0	1	56	Well impacted by hydrocarbon; discontinue from network
		GWN-14-36	14-1590	Devonian	Methy (Keg River)	0	Strategic	Strategic	2	1	1	2	1	1	0	1	56	
5	13-06-093-12 W4M	AGS-02-WT	Unknown	Quaternary	Surficial Sands	67	Surveillance	Surveillance	1	0	0	1	2	0	2	2	50	
		AGS-02-20	Unknown	Quaternary	Surficial Sands	67	Surveillance	Surveillance/ Investigative	1	0	0	1	2	0	2	2	50	
		AGS-02-97	Unknown	Quaternary	Buried Channels - Birch	67	Surveillance	Surveillance/ Investigative	1	0	0	1	2	0	2	1	44	
		AGS-02-108	Unknown	Cretaceous	Clearwater	67	Strategic	Surveillance	0	0	0	1	2	0	2	1	38	
6	15-09-093-12 W4M	AGS-03-WT	Unknown	Quaternary	Surficial Sands	17	Surveillance	Surveillance	2	1	1	2	2	1	2	2	81	
		AGS-03-17	Unknown	Quaternary	Buried Channels - Birch	17	Surveillance	Surveillance/ Investigative	2	1	1	2	2	1	2	1	75	
		AGS-03-30	Unknown	Cretaceous	Clearwater	17	NC	Surveillance	1	1	1	2	2	1	2	1	69	
7	13-12-094-11 W4M	GWN-17-50	17-45	Cretaceous	Basal McMurray	0	Strategic	Surveillance	2	1	1	2	1	1	2	2	75	AMU 1
		GWN-17-51	17-200	Devonian	Beaverhill Lake	0	Strategic	Surveillance	1	1	1	2	1	1	0	1	50	
8	08-15-096-11 W4M	GWN-01-74	1-32	Quaternary	Surficial Sands	0	Surveillance	Surveillance	2	1	1	2	1	1	2	2	75	
		GWN-01-75	1-123	Cretaceous	Basal McMurray	0	---	Surveillance	1	1	1	2	1	1	2	2	69	AMU 2; well impacted by hydrocarbon; discontinue from network
		GWN-01-76	1-432	Cretaceous	Basal McMurray	0	Surveillance	NC	0	1	1	2	1	1	0	2	50	AMU 4
		GWN-01-77	1-507	Devonian	Beaverhill Lake	0	Surveillance	Surveillance	1	1	1	2	1	1	0	1	50	
		GWN-01-78	1-726	Devonian	Prairie Evaporite/Methy (Keg River) Formations	0	Strategic	Strategic	2	1	1	2	1	1	0	1	56	
GWN-01-79	1-1040	Devonian	Granite Wash	0	NC	Strategic	2	1	1	2	1	1	0	1	56			

TABLE 12.

NETWORK EVALUATION RESULTS (GWN-AGS WELLS)

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Site No./Operator	Legal Location	NAOS Well ID	GOWN ID/Operator Well Name	Geologic Period	Interpreted Aquifer (or AMU)/Group	Drift Thickness (m)	Current Groundwater Monitoring Category ¹	Proposed Groundwater Monitoring Category	Regulatory Framework and Conceptual Model							Aquifer Parameters		Total Score (%)	Comments
									Spatial Distribution	Proximity to Current Operations Footprints / Communities		Proximity to Major Rivers/Lakes	Proximity to Bedrock Incisions	Proximity to Current Operations Footprints (Cumulative Effects)	Groundwater Mineralization	Well Completion			
										Quality	Quantity								
9	02-18-095-09 W4M	GWN-06-60	6-21	Cretaceous	Basal McMurray	4	Surveillance	NC	0	1	1	1	2	1	2	0	50	Well appears to be completed in McMurray oil sands; reclassify or discontinue from network	
		GWN-06-61	6-220	Cretaceous	Basal McMurray	4	Surveillance	Surveillance	2	1	1	1	2	1	2	2	75	AMU 2	
		GWN-06-62	6-310	Devonian	Beaverhill Lake	4	Surveillance	Surveillance	2	1	1	1	2	1	2	1	69		
10	13-20-095-08 W4M	GWN-07-55	7-32	Quaternary	Surficial Sands	2	Surveillance	Surveillance/ Investigative	1	1	1	2	2	1	2	2	75		
		GWN-07-56	7-135	Cretaceous	Basal McMurray	2	NC	NC	0	1	1	2	2	1	---	0	44	Well appears to be completed in McMurray aquitard (bitumen in well); reclassify or	
		GWN-07-57	7-337	Cretaceous	Basal McMurray	2	Surveillance	Surveillance	2	1	1	2	2	1	2	2	81	AMU 2	
		GWN-07-58	7-594	Devonian	Beaverhill Lake	2	Surveillance	Surveillance	1	1	1	2	2	1	0	1	56		
		GWN-07-59	7-933	Devonian	Granite Wash	2	Strategic	Strategic	2	1	1	2	2	1	2	2	81		
11	10-24-095-09 W4M	GWN-Shell-PW2-63	N/A	Quaternary	Buried Channels - Kearn	14	Surveillance	Surveillance/ Investigative	2	0	0	2	2	0	2	2	63		
12	05-30-094-07 W4M	GWN-08-43	8-34	Quaternary	Surficial Sands	41	Strategic	Strategic	2	2	2	0	2	2	2	2	88		
		GWN-08-44	8-114	Quaternary	Buried Channels	41	Strategic	Strategic/ Investigative	2	2	2	0	2	2	2	2	88		
		GWN-08-45	8-220	Cretaceous	Clearwater	41	Strategic	Strategic	2	2	2	0	2	2	2	2	88		
		GWN-08-46	8-370	Cretaceous	Basal McMurray	41	Strategic	NC	1	2	2	0	2	2	2	0	69	Well appears to be completed in Clearwater Aquitard; reclassify or discontinue from network	
		GWN-08-47	8-532	Devonian	Prairie Evaporite/Beaverhill Lake/Methy (Keg River) Formations	41	Strategic	Strategic	2	2	2	0	2	2	2	2	88		
		GWN-08-48	8-716	Devonian	Beaverhill Lake	41	Strategic	Strategic	1	2	2	0	2	2	2	1	75		
Total Score (%)									77	57	57	72	81	57	70	71			

Notes:

- - No chemistry data available
- NC - Not classified
- ¹ - Integrated Sustainability (2013)
- Total Score (%) = (sum of row or column scores/maximum possible score) x 100
- Most Effective (> 65%) = 24 wells
- Moderately Effective (51 - 65) = 7 wells
- Least Effective (< or = 50) = 8 wells
- Reclassify or discontinue from network = 4 wells

TABLE 13.

NETWORK EVALUATION RESULTS (OPERATOR WELLS)

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Site No./Operator	EastingNAD83	NorthingNAD83	NAOS Well ID	GOWN ID/Operator Well Name	Geologic Period	Interpreted Aquifer (or AMU)/Group	Drift Thickness (m)	Proposed Groundwater Monitoring Category	Regulatory Framework and Conceptual Model							Aquifer Parameters		Total Score	Comments
									Spatial Distribution	Proximity to Current Operations / Footprints / Communities		Proximity to Major Rivers/Lakes	Proximity to Bedrock Incisions	Proximity to Current Operations Footprints (Cumulative Effects)	Groundwater Mineralization	Well Completion			
										Quality	Quantity								
CNRL	458152	6358590	CNR-HRZ-01(BAS)	H01-002	Cretaceous	Basal McMurray	4	NC	2	0	0	2	1	0	0	1	38	AMU 4	
	458422	6353808	CNR-H02-007(PBM)	H02-007	Devonian	Prairie Evaporite/Beaverhill Lake/Methy (Keg River) Formations	0	NC	0	1	1	2	1	1	0	1	44		
	439254	6353850	CNR-H02-001(BAS)	H02-001	Cretaceous	Basal McMurray	4	NC	1	2	1	0	0	1	---	1	38		
	439255	6353851	CNR-H02-002(BAS)	H02-002	Cretaceous	Basal McMurray	4	NC	1	2	1	0	0	1	0	1	38	AMU 3	
Cenovus	533800	6326685	CVE-BOR-03(GR)	WW07-11	Cretaceous	Grand Rapids	138	Strategic	1	2	2	0	0	0	2	1	50		
	541530	6326917	CVE-BOR-04(GR)	WW07-13	Cretaceous	Grand Rapids	20	Strategic	1	2	2	0	0	0	2	1	50		
	539018	6341946	CVE-BOR-01(SS)	WW07-06	Quaternary	Surficial Sands	0	Strategic	2	2	2	2	0	0	2	1	69		
	535997	6338668	CVE-BOR-02(SS)	WW07-08	Quaternary	Surficial Sands	15	Strategic	0	2	2	1	0	0	2	1	50		
	536830	6335489	CVE-WW10-13(GR)	WW10-13-GR	Cretaceous	Grand Rapids	13	Strategic	2	2	2	1	0	0	2	1	63		
	543509	6331828	CVE-10-05-TW(MM)	10-05-94-2-TW	Cretaceous	Middle McMurray	0	NC	2	2	2	1	0	0	2	1	63		
	535227	6331019	CVE-02-04-LM(LM)	02-04-94-3-LM	Cretaceous	Lower McMurray	40	Strategic	2	2	2	0	0	0	2	1	56	AMU 1	
Imperial	487166	6355093	IOR-KRL-03(BAS)	3-22-96-8(B)	Cretaceous	Basal McMurray	26	Surveillance/ Investigative	1	1	0	0	2	1	2	1	50	AMU 2	
	480119	6351189	IOR-KRL-04(BAS)	12-1-96-9B	Cretaceous	Basal McMurray	6	Surveillance	1	1	1	2	2	1	2	1	69	AMU 2	
	483761	6350291	IOR-KRL-05(BAS)	03-5-96-8(B)	Cretaceous	Basal McMurray	18	Surveillance/ Investigative	0	2	0	2	2	1	2	1	63	AMU 2	
	498066	6359190	IOR-KRL-02(BCH)	P12359607Q1	Quaternary	Buried Channels - Kearl	27	Surveillance/ Investigative	2	0	0	1	2	0	2	1	50		
	500504	6367332	IOR-KRL-01(SS)	P05-038Q	Quaternary	Surficial Sands	1	Surveillance	1	1	1	2	1	1	2	1	63		
	500094	6357991	IOR-KRL-03(SS)	P14259607Q	Quaternary	Surficial Sands	0	Surveillance/ Investigative	1	2	1	1	2	1	2	1	69		
	495225	6351481	IOR-KRL-04(SS)	P14049607Q1	Quaternary	Surficial Sands	10	Surveillance/ Investigative	1	1	1	1	2	1	2	1	63		
	483761	6350291	IOR-KRL-05(SS)	03-5-96-8(Q)	Quaternary	Surficial Sands	18	Surveillance/ Investigative	1	2	0	2	2	1	2	1	69		
	486567	6366130	IOR-KRL-06(SS)	KH09-095	Quaternary	Surficial Sands	15	Surveillance/ Investigative	1	2	1	2	2	1	2	1	75		
	488308	6365522	IOR-KRL-07(SS)	KH09-098	Quaternary	Surficial Sands	7	Surveillance/ Investigative	0	1	1	1	2	1	2	1	56		
	495240	6367377	IOR-KRL-08(SS)	KH10-022	Quaternary	Surficial Sands	23	Surveillance/ Investigative	2	1	1	2	2	1	2	1	75		
	492172	6372856	IOR-KRL-09(SS)	KH10-069	Quaternary	Surficial Sands	20	Surveillance/ Investigative	1	2	2	2	2	2	2	1	88		
	487167	6362005	IOR-KRL-10(SS)	KH11-180	Quaternary	Surficial Sands	15	Surveillance	0	1	1	1	2	1	2	1	56		
487209	6355044	IOR-KRL-11(SS)	KH11-181	Quaternary	Surficial Sands	26	Surveillance/ Investigative	1	1	0	0	2	1	2	1	50			
488300	6365521	IOR-KRL-06(BAS)	KH12-136	Cretaceous	Basal McMurray	7	Surveillance/ Investigative	2	1	1	1	2	1	---	1	56			

TABLE 13.

NETWORK EVALUATION RESULTS (OPERATOR WELLS)

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Site No./Operator	EastingNAD83	NorthingNAD83	NAOS Well ID	GOWN ID/Operator Well Name	Geologic Period	Interpreted Aquifer (or AMU)/Group	Drift Thickness (m)	Proposed Groundwater Monitoring Category	Regulatory Framework and Conceptual Model							Aquifer Parameters		Total Score	Comments
									Spatial Distribution	Proximity to Current Operations / Footprints / Communities		Proximity to Major Rivers/Lakes	Proximity to Bedrock Incisions	Proximity to Current Operations Footprints (Cumulative Effects)	Groundwater Mineralization	Well Completion			
										Quality	Quantity								
Shell	463448	6350164	SHL-ALB-01(BAS)	ASE09-5043	Cretaceous	Basal McMurray	0	NC	1	0	0	2	1	0	2	1	44	AMU 2	
	473146	6349884	SHL-ALB-02(BAS)	ASE08-107	Cretaceous	Basal McMurray	0	NC	1	0	0	0	2	0	2	1	38	AMU 2	
	6344361	464085	SHL-ALB-03(BAS)	ASE97-042	Cretaceous	Basal McMurray	7	Surveillance	1	0	0	2	0	0	2	1	38	AMU 2	
	475458	6341860	SHL-JKP-01(BAS)	P01-902D	Cretaceous	Basal McMurray	11	Surveillance/ Investigative	0	0	0	0	2	0	2	1	31	AMU 2	
Suncor	460178	6355322	SUN-MW-07-110(BAS)	MW-07-110	Cretaceous	Basal McMurray	5	NC	0	0	0	2	1	0	0	1	25	AMU 4	
	460894	6356745	SUN-MW-07-111(BAS)	MW-07-111	Cretaceous	Basal McMurray	20	NC	0	0	0	2	2	0	0	1	31	AMU 4	
	460978	6357368	SUN-MW-07-112(BAS)	MW-07-112	Cretaceous	Basal McMurray	16	NC	0	0	0	2	2	0	0	1	31	AMU 4	
Total	443140	6344715	TOT-EP-02(BAS)	SP_04-078	Cretaceous	Basal McMurray	0	NC	2	2	2	2	1	2	0	1	75	Formerly F-078, AMU 3	
	453690	6347068	TOT-EP-01(SS)	SP_04-021	Quaternary	Surficial Sands	14	Strategic	1	1	1	2	1	1	---	1	50	Formerly F-021	
	453741	6340666	TOT-EP-02(SS)	SP_04-010	Quaternary	Surficial Sands	3	Strategic	2	2	2	2	2	2	2	1	94	Formerly F-010	
	454905	6348598	TOT-EP-03(SS)	SP_03-009	Quaternary	Surficial Sands	0	NC	1	1	1	2	1	1	---	1	50		
Total Score									51	59	46	64	62	32	70	50			

Notes:

--- - No chemistry data available

NC - Not classified

- Total Score (%) = (sum of row or column scores/maximum possible score) x 100

- Most Effective (> 65%) = 9 wells

- Moderately Effective (51 - 65) = 9 wells

- Least Effective (< or = 50) = 19 wells

TABLE 14.

PROPOSED SUB-NETWORKS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Site No./Operator	Legal Location	NAOS Well ID	GOWN ID/Operator Well Name	Geologic Period	Interpreted Aquifer (or AMU)/Group	Drift Thickness (m)	Proposed Groundwater Monitoring Category	Regulatory Framework and Conceptual Model							Aquifer Parameters		Total Score (%)	Comments
								Spatial Distribution	Proximity to Current Operations / Footprints / Communities		Proximity to Major Rivers/Lakes	Proximity to Bedrock Incisions	Proximity to Current Operations Footprints (Cumulative Effects)	Groundwater Mineralization	Well Completion			
									Quality	Quantity								
Sub-Network A																		
1	06-13-009-10 W4M	GWN-16-22	16-55	Quaternary	Surficial Sands	8	Strategic	2	1	1	2	1	1	2	2	75	AMU 3	
		GWN-16-24	16-325	Cretaceous	Basal McMurray	8	Strategic	2	1	1	2	1	1	0	2	63		
		GWN-16-25	16-550	Devonian	Beaverhill Lake	8	Strategic	2	1	1	2	1	1	0	1	56		
2	08-11-090-12 W4M	GWN-13-26	13-70	Quaternary	Surficial Sands	62	Strategic	2	2	2	1	2	2	2	2	94	AMU 2; well may be completed in undifferentiated McMurray aquitard; for further review	
		GWN-13-27	13-230	Quaternary	Buried Channels - Thickwood Valley	62	Strategic	2	2	2	1	2	2	2	2	94		
		GWN-13-28	13-460	Cretaceous	Grand Rapids	62	Strategic	2	2	2	1	2	2	2	2	94		
		GWN-13-30	13-872	Cretaceous	Basal McMurray	62	Strategic	2	2	2	1	2	2	2	0	81		
3	04-15-092-12 W4M	GWN-14-36	14-1590	Devonian	Methy (Keg River)	0	Strategic	2	1	1	2	1	1	0	1	56		
8	08-15-096-11 W4M	GWN-01-78	1-726	Devonian	Prairie Evaporite/Methy (Keg River) Formations	0	Strategic	2	1	1	2	1	1	0	1	56		
		GWN-01-79	1-1040	Devonian	Granite Wash	0	Strategic	2	1	1	2	1	1	0	1	56		
12	05-30-094-07 W4M	GWN-08-43	8-34	Quaternary	Surficial Sands	41	Strategic	2	2	2	0	2	2	2	2	88		
		GWN-08-44	8-114	Quaternary	Buried Channels - Kearl	41	Strategic/ Investigative	2	2	2	0	2	2	2	2	88		
		GWN-08-45	8-220	Cretaceous	Clearwater	41	Strategic	2	2	2	0	2	2	2	2	88		
		GWN-08-47	8-532	Devonian	Prairie Evaporite/Beaverhill Lake/Methy (Keg River) Formations	41	Strategic	2	2	2	0	2	2	2	2	88		
		GWN-08-48	8-716	Devonian	Beaverhill Lake	41	Strategic	1	2	2	0	2	2	2	1	75		
Sub-Network B																		
2	08-11-090-12 W4M	GWN-13-31	13-1230	Devonian	Beaverhill Lake	62	Surveillance	2	2	2	1	2	2	---	1	75		
3	04-15-092-12 W4M	GWN-14-32	14-31	Quaternary	Surficial Sands	0	Surveillance	1	1	1	2	1	1	2	2	69		
		GWN-14-33	14-119	Cretaceous	Clearwater	0	Surveillance	2	1	1	2	1	1	2	2	75		
		GWN-14-34	14-247	Cretaceous	Basal McMurray	0	NC	2	1	1	2	1	1	---	0	50	Well appears to be completed in unsaturated Wabiskaw sand unit or Upper McMurray aquitard (historically dry); reclassify or discontinue from network	
		GWN-14-35	14-699	Devonian	Beaverhill Lake	0	Surveillance	2	1	1	2	1	1	0	1	56	Well impacted by hydrocarbon; discontinue from network	
5	13-06-093-12 W4M	AGS-02-WT	Unknown	Quaternary	Surficial Sands	67	Surveillance	1	0	0	1	2	0	2	2	50		
		AGS-02-20	Unknown	Quaternary	Surficial Sands	67	Surveillance/ Investigative	1	0	0	1	2	0	2	2	50		
		AGS-02-97	Unknown	Quaternary	Buried Channels - Birch	67	Surveillance/ Investigative	1	0	0	1	2	0	2	1	44		
		AGS-02-108	Unknown	Cretaceous	Clearwater	67	Surveillance	0	0	0	1	2	0	2	1	38		

TABLE 14.

PROPOSED SUB-NETWORKS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Site No./Operator	Legal Location	NAOS Well ID	GOWN ID/Operator Well Name	Geologic Period	Interpreted Aquifer (or AMU)/Group	Drift Thickness (m)	Proposed Groundwater Monitoring Category	Regulatory Framework and Conceptual Model						Aquifer Parameters		Total Score (%)	Comments
								Spatial Distribution	Proximity to Current Operations / Footprints / Communities		Proximity to Major Rivers/Lakes	Proximity to Bedrock Incisions	Proximity to Current Operations Footprints (Cumulative Effects)	Groundwater Mineralization	Well Completion		
									Quality	Quantity							
6	15-09-093-12 W4M	AGS-03-WT	Unknown	Quaternary	Surficial Sands	17	Surveillance	2	1	1	2	2	1	2	2	81	
		AGS-03-17	Unknown	Quaternary	Buried Channels - Birch	17	Surveillance/ Investigative	2	1	1	2	2	1	2	1	75	
		AGS-03-30	Unknown	Cretaceous	Clearwater	17	Surveillance	1	1	1	2	2	1	2	1	69	
7	13-12-094-11 W4M	GWN-17-50	17-45	Cretaceous	Basal McMurray	0	Surveillance	2	1	1	2	1	1	2	2	75	AMU 1
		GWN-17-51	17-200	Devonian	Beaverhill Lake	0	Surveillance	1	1	1	2	1	1	0	1	50	
8	08-15-096-11 W4M	GWN-01-74	1-32	Quaternary	Surficial Sands	0	Surveillance	2	1	1	2	1	1	2	2	75	
		GWN-01-75	1-123	Cretaceous	Basal McMurray	0	Surveillance	1	1	1	2	1	1	2	2	69	AMU 2; well impacted by hydrocarbon; discontinue from network
		GWN-01-76	1-432	Cretaceous	Basal McMurray	0	Surveillance	0	1	1	2	1	1	0	2	50	AMU 4
		GWN-01-77	1-507	Devonian	Beaverhill Lake	0	Surveillance	1	1	1	2	1	1	0	1	50	
9	02-18-095-09 W4M	GWN-06-60	6-21	Cretaceous	Basal McMurray	4	NC	0	1	1	1	2	1	2	0	50	Well appears to be completed in McMurray oil sands; reclassify or discontinue from network
		GWN-06-61	6-220	Cretaceous	Basal McMurray	4	Surveillance	2	1	1	1	2	1	2	2	75	AMU 2
		GWN-06-62	6-310	Devonian	Beaverhill Lake	4	Surveillance	2	1	1	1	2	1	2	1	69	
10	13-20-095-08 W4M	GWN-07-55	7-32	Quaternary	Surficial Sands	2	Surveillance/ Investigative	1	1	1	2	2	1	2	2	75	
		GWN-07-56	7-135	Cretaceous	Basal McMurray	2	NC	0	1	1	2	2	1	---	0	44	Well appears to be completed in McMurray aquitard (bitumen in well); reclassify or discontinue from network
		GWN-07-57	7-337	Cretaceous	Basal McMurray	2	Surveillance	2	1	1	2	2	1	2	2	81	AMU 2
		GWN-07-58	7-594	Devonian	Beaverhill Lake	2	Surveillance	1	1	1	2	2	1	0	1	56	
		GWN-07-59	7-933	Devonian	Granite Wash	2	Surveillance	2	1	1	2	2	1	2	2	81	
11	10-24-095-09 W4M	GWN-Shell-PW2-63	N/A	Quaternary	Buried Channels - Kearn	14	Surveillance/ Investigative	2	0	0	2	2	0	2	2	63	
12	05-30-094-07 W4M	GWN-08-46	8-370	Cretaceous	Basal McMurray	41	NC	1	2	2	0	2	2	2	0	69	Well appears to be completed in Clearwater Aquitard; reclassify or discontinue from network

TABLE 14.

PROPOSED SUB-NETWORKS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Site No./Operator	Legal Location	NAOS Well ID	GOWN ID/Operator Well Name	Geologic Period	Interpreted Aquifer (or AMU)/Group	Drift Thickness (m)	Proposed Groundwater Monitoring Category	Regulatory Framework and Conceptual Model						Aquifer Parameters		Total Score (%)	Comments
								Spatial Distribution	Proximity to Current Operations / Footprints / Communities		Proximity to Major Rivers/Lakes	Proximity to Bedrock Incisions	Proximity to Current Operations Footprints (Cumulative Effects)	Groundwater Mineralization	Well Completion		
									Quality	Quantity							
Sub-Network C																	
5	13-06-093-12 W4M	AGS-02-20	Unknown	Quaternary	Surficial Sands	67	Surveillance/ Investigative	1	0	0	1	2	0	2	2	50	
		AGS-02-97	Unknown	Quaternary	Buried Channels - Birch	67	Surveillance/ Investigative	1	0	0	1	2	0	2	1	44	
6	15-09-093-12 W4M	AGS-03-17	Unknown	Quaternary	Buried Channels - Birch	17	Surveillance/ Investigative	2	1	1	2	2	1	2	1	75	
10	13-20-095-08 W4M	GWN-07-55	7-32	Quaternary	Surficial Sands	2	Surveillance/ Investigative	1	1	1	2	2	1	2	2	75	
11	10-24-095-09 W4M	GWN-Shell-PW2-63	N/A	Quaternary	Buried Channels - Kearn	14	Surveillance/ Investigative	2	0	0	2	2	0	2	2	63	
12	05-30-094-07 W4M	GWN-08-44	8-114	Quaternary	Buried Channels	41	Strategic/ Investigative	2	2	2	0	2	2	2	2	88	

Notes:

- - No chemistry data available
- NC - Not classified
- Total Score (%) = (sum of row or column scores/maximum possible score) x 100
- Most Effective (> 65%)
- Moderately Effective (51 - 65)
- Least Effective (< or = 50)
- Reclassify or discontinue from network

APPENDIX A
Groundwater Sampling Methods and Quality
Assurance/Quality Control Protocols

APPENDIX A

GROUNDWATER SAMPLING AND QUALITY ASSURANCE/QUALITY CONTROL PROTOCOLS

The following sections describe the groundwater monitoring and sampling, and the data quality assurance/quality control (QA/QC) protocol used during the 2014 North Athabasca Oil Sands (NAOS) Area regional groundwater monitoring program.

1 GROUNDWATER MONITORING AND SAMPLING

1.1 Low-flow Sampling

Low-flow sampling is an acceptable method for both shallow wells and regional wells (production wells not already equipped with submersible pumps). This sampling method requires the use of a pump capable of operating at low speeds (less than or equal to the natural flow rates through the screen). The pumping rate during purging must be equal to or less than the natural recovery rate of the well. This sampling method was used to collect groundwater samples from the majority of monitoring wells as part of the 2014 NAOS groundwater monitoring program (all except shallow completions).

Low-flow sampling involves removing water directly from the screened interval without physically or hydraulically disturbing the stagnant water column above the screen (Nielsen and Nielsen 2007). It can be achieved by either installing a dedicated pump in a well or by lowering a portable pump so that its intake is within the screened interval (typically near the middle of the screen). In low-flow sampling, the well is pumped at a low flow rate to maintain a stable water level in the well. Typical flow rates are in the order of 0.1 to 0.5 mL per minute but may be as fast as 1 L per minute in high-yield (coarse) formations.

To avoid excessive drawdown in the well, water levels have to be monitored continuously until stabilization has been achieved. Keeping drawdown at a minimum will isolate the stagnant water column from the sampling point. Puls and Barcelona (1996) proposed that drawdown in a well should not exceed 0.1 m. However, the most important factor is to obtain stable water levels to eliminate the potential for stagnant water to enter the pump intake. Drawdown should not exceed the distance between the top of the well screen and the pump intake (Nielsen and Nielsen 2007).

With this method, the well is purged until indicator parameters, measured in an attached flow-through cell, have stabilized according to the criteria listed in Table 1. Parameters typically monitored include pH, temperature, electrical conductivity, oxidation-reduction potential (ORP) and dissolved oxygen (DO). The amount of water purged will vary based on the well diameter but typically ranges between less than one half of a well volume to one well volume (Barcelona et al. 1994).

Table 1 Stabilization Criteria for Groundwater Quality Indicator Parameters

Parameter	Stabilization Criteria
pH	+/- 0.1 Standard Unit
Specific Electrical Conductance (SC)	± 5% for SC ≤ 100 µS/cm ± 3% for SC > 100 µS/cm
Temperature	+/- 0.2°C for thermistor thermometers +/- 0.5°C for liquid in glass thermometers
DO	+/- 0.3 mg/L
ORP	+/- 10 mV

Source: Wilde et al. 1998

1.1.1 Method Advantages

The advantages of low-flow purging and sampling include:

- Minimizes turbulent flow through the well screen which eliminates the entrainment of artifactual turbidity in the samples collected. This negates the need for field filtration.
- Produces small volumes of purge water.
- Improves sample accuracy and precision (reproducibility).
- Reduces sampling time.
- No limits on sampling volumes other than the formation.
- Can be used in wells where the water table is above or within the screen and in bedrock wells.
- Low-flow sampling produces a weighted average concentration over the screened length (Martin-Hayden and Robbins 1997; Puls and Paul 1997). The effects of heterogeneity at the screened interval may change the contribution of various zones but do not change the effect of concentration averaging. Site-specific sampling objectives must be reviewed to determine if this sampling method is suitable.

1.1.2 Method Disadvantages

The disadvantages of low-flow purging and sampling include:

- Pumps need to be decontaminated between wells (if using portable pump).
- Produces large volumes of disposable tubing (if using portable pump).
- Requires source of power (generator or battery).
- May have mechanical problems in the field (less user friendly than other methods).
- Requires more training on use of different types of pumps.

- Initial cost can be expensive but should be considered for long-term monitoring programs.
- Certain pumps have limitations (lift capability, physical dimensions, analytical limitations, heating samples, etc.).

1.2 Fixed Volume Purging

Fixed-volume purging and sampling involves the evacuation (purging) of a predetermined volume of water from a well prior to collecting a groundwater sample. For the 2014 NAOS groundwater monitoring program, fixed volume purging was done prior to sampling shallow well completions; three well volumes were removed prior to sample collection. The purging was done using inertial lift pumps (Waterra™). This method typically requires the use of devices that mix, agitate and aerate the water in the well during purging that can result in possible chemical and physical sample alterations (Matrix 2012).

Fixed-volume purging and sampling is suitable for both shallow and regional wells provided the right purging device is used. However, this method may not be suitable for:

- Wells screened in low-yield formations because of the risks associated with dewatering a well.
- Deeper wells (regional or shallow wells) because of the prohibitive volume of purge water generated.

2 CHEMICAL ANALYSIS

All field equipment involved in monitoring and sampling was decontaminated following each event. Groundwater samples were collected using appropriate handling protocols and were placed in sample containers provided by the laboratory. Sample filtration and preservation were conducted in the field as required. All samples were labelled with a distinctive sample identifier. Chain-of-custody forms were completed and the samples were stored in chilled coolers following collection and during shipment to the analytical laboratory. Care was taken to ensure that sample holding times were not exceeded.

Groundwater samples were submitted to ALS Environmental laboratory in Fort McMurray, Alberta. ALS is accredited with the Canadian Association for Laboratory Accreditation. All samples were kept cool by refrigeration or the use of ice packs. The requested analytical parameters were outlined in the main text of this report and the analytical reports are included in the appendices.

2.1 Data Management

For this program, two standard field forms were completed. One form, the groundwater sampling form, captures all water level, purging, sampling and field parameter information; the second form, a triplicate chain-of-custody form, assigns sample control numbers, analyte requirements, shipping and reporting details for each sample submitted to the laboratory.

3 QUALITY ASSURANCE/QUALITY CONTROL PROTOCOL

Matrix standard QA/QC protocol provided a formal system for evaluating the technical adequacy of sample collection and handling, equipment decontamination procedures, and analysis. The QA/QC

protocol describes procedures, auditing techniques and documentation for controlled data collection. The ultimate purpose of this protocol is to obtain representative data and to reduce uncertainty. The QA/QC program is designed to confirm that potential sources of bias (such as inconsistent sampling procedures, potential cross-contamination from sampling equipment, shipping conditions and laboratory practices) were not contributing an unacceptable variation in data quality. The QA/QC protocol for the groundwater sampling program consisted of two programs: the field and data management QA/QC programs.

3.1 Field Quality Assurance/Quality Control Program

Duplicate samples were collected at each site and used to assess precision of field sampling procedures. A duplicate sample is one where the QA/QC sample is collected successively to the original sample (i.e., two groundwater samples taken immediately after one another under comparable conditions). Both samples are submitted for laboratory analysis. Relative percent difference (RPD) is then calculated to compare the values from this pair of samples. Theoretically, these samples should have similar chemical concentrations. Due to factors such as sample matrix heterogeneity, natural variability, or variations in sample collection, handling or analysis, a minor variation in chemical concentration may occur. The maximum acceptable RPD selected to meet the data quality objectives of this project is set at 20% for inorganic parameters and 30% for organic parameters. The quantity target for QA/QC duplicate samples for water is set at 10% of total water samples submitted for analysis. The RPD was calculated as follows:

$$RPD = \frac{\text{Absolute difference between the two duplicate results}}{\text{Mean of the two duplicate results}} \times 100$$

Where: RPD = relative percent difference

Theoretically, the samples should have identical chemical concentrations (i.e., RPD = 0). The reproducibility of duplicate analyses at concentrations near the reported detection limit can be difficult, and can often result in RPD values of greater than 20% and 30%. Therefore, RPD values of greater than the project objective are acceptable if the differences in concentrations of the duplicate analyses are less than approximately ten times the method detection limit. The QA/QC duplicate samples are used to assess the reliability of field sampling procedures, with analysis of these samples used to evaluate the reproducibility or precision of the sampling methodology. Reproducibility was evaluated based on the RPD calculated for each parameter. Rinsate samples are used to assess the adequacy of the decontamination process and detect any contamination associated with sampling equipment. The rinsate samples were collected by using laboratory-supplied de-ionized water to rinse off the water level tape to confirm de-contamination of the probe.

Field blanks are used to assess contamination from field conditions during sampling. Field blank samples were collected using laboratory-supplied de-ionized water that was transferred to a sample container at a sampling location, which exposes it to the sampling environment. Trip blanks are used to assess contamination introduced during the transport of sample bottles to the site and back to the Laboratory. The laboratory supplied the trip blank samples, which were kept with the sample bottles and samples and were returned, unopened, to the laboratory.

3.2 Data Management Quality Assurance/Quality Control Program

Project chemistry data was managed using EQuIS software, a database application developed specifically for management of environmental data. Electronic data (e.g., laboratory results) were uploaded to the database directly, and other data (e.g., data from field notes) were manually entered. The following data quality controls were established for the project database:

- A check was completed on the manually entered data to confirm that it has been transcribed correctly from the field forms into the database.
- Electronic data was checked by the data manager to confirm that data for the requested analyses have been provided by ALS.
- Database functions were used to check the data had been supplied in the correct units and were within the expected ranges.
- The project coordinator confirmed the data meets the program technical objectives.
- Database maintenance was performed on an ongoing basis and included an initial QA/QC check of data prior to entry into the database.

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APPENDIX B

Client Data Portal Overview

Matrix Client Data Portal - Getting Started

Contents

What is the Client Data Portal?	1
The Client Data Portal is New	2
Getting Started	2
Login	2
Main Page	2
Home Tab	2
Map View	3
Data View	4
Graph View Tabs.....	6
Documents View Tabs	8

What is the Client Data Portal?

The client data portal (CDP) is primarily a tool that enables rapid read-only accessibility to your physical hydrogeological data that is already stored in a database system at Matrix.

CDP functionality is delivered via a secure web application that should not interfere with corporate IT requirements. Specifically, because the CDP works through a web browser, it does not require any software to be installed and it is not blocked by corporate firewalls.

Authorized individuals can view and download their physical hydrogeological time series data which is already stored in Matrix’s Physical Hydrogeological Database (PHD), including heads, water flow rates, and temperatures.

Well locations are shown on an interactive map and are color coded depending on well type.

Wells contain screened or perforated intervals of hydraulic communication between the well and the formation, or the well may contain one or more temperature measurement points. These downhole intervals or measurement points are called “well segments” in the CDP. Details regarding well segments can be grouped, sorted and selected for data plotting in an interactive data grid view. Well segment data can be copied and pasted to other apps such as Excel.

Data plots can show data from multiple well segments and can be interactively re-scaled with the mouse for zooming in on data over small time scales. Plotted data can be exported to Excel.

The CDP is intended to provide time-efficient access to groundwater data and to support a data QA/QC process. Ultimately, it should be expected that the CDP will lower the costs of data management for several aspects of

groundwater resource stewardship such as data review, modeling, reporting, operations decision making, and permit applications.

The Client Data Portal is New

Matrix has recognized a requirement by clients for better access to their groundwater data and in response has invested in development of the CDP. This tool is new, and therefore will undoubtedly have some “rough edges”. That’s where you, as an engaged user, can help out. We want your thoughts. What works well, what needs improvement, what functionality is it missing, does it do the job at hand? We’d like to know.

We won’t promise to implement every change or suggestion we receive, but if you and others find this tool useful and worthy of its objectives, then evolutionary improvements based on your feedback will likely proceed.

Getting Started

The CDP is intended to be a fairly simple application to use, much like an iPhone or iPad application, and is probably best learned by experimenting with it. The sections below provide details on what functionality is available.

Login

- Open a web browser (e.g. Internet Explorer) and enter ‘**cdp.matrix-solutions.com**’.
- A login page should appear.
- Enter your CDP user ID and password.
- Current Limitation: Current Limitation: A second login box may appear (sorry, it’s a Microsoft technical issue yet to be resolved). Remember to always **suffix** your CDP user ID with ‘**@matrix-solutions.com**’ (e.g. ‘yourUserName@matrix-solutions.com’) and use the same CDP password as before.
- **NOTE: If you enter an incorrect password more than 3 times, you will be locked out** and will not be able to login. In that case, contact Matrix to reinstate the password. This is a security measure.
- Once you’re logged in, you should see the CDP Home Tab page in the web browser.

Main Page

- The Home tab is displayed at the top left of the Main Page and is described in the next section.
- Help, in the form of this document, is available using the Help link at the top right of the Main Page.
- Use the Send Feedback link to email question, comments, bug reports or feature requests.
- The Logout button will end your session and present the login page.

Home Tab

- Top half is the Map View, bottom half is the Data View.
- The Map View and Data View sizes can be changed by dragging the view separator bar.
- Logout button is at top right.

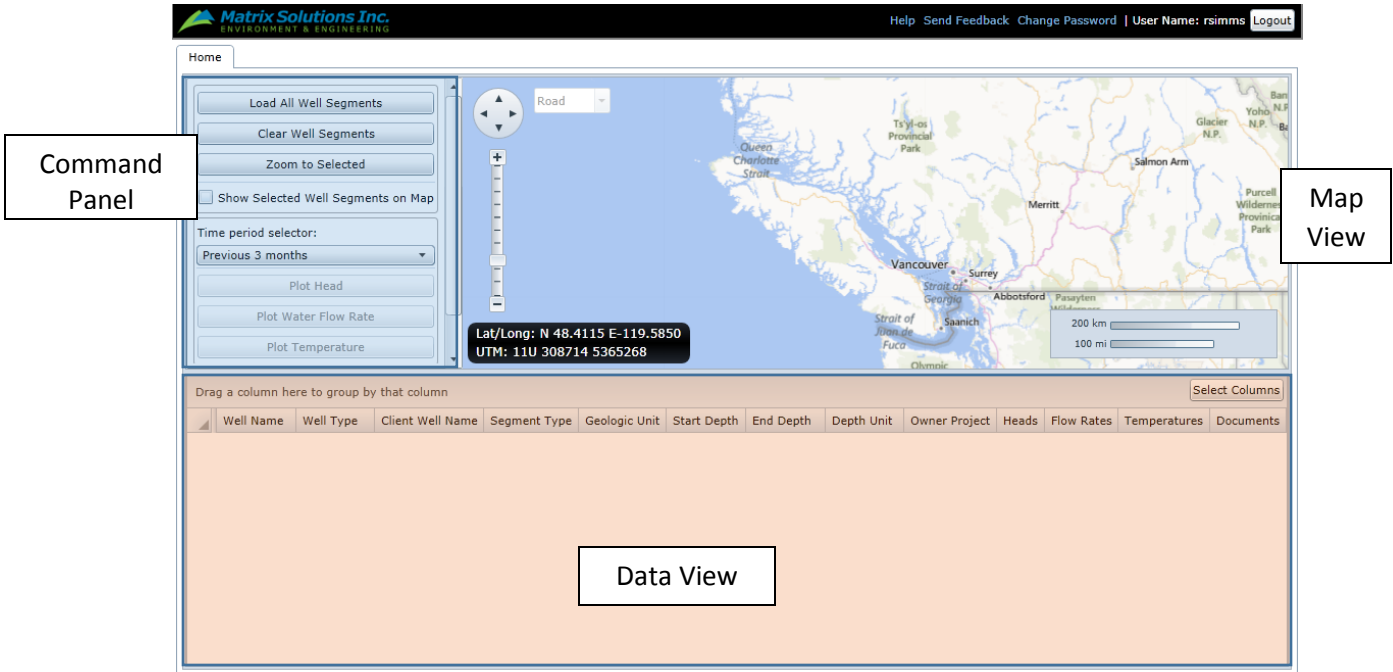


Figure 1: Home Tab layout

Map View

- The Map View is used to view the spatial locations of wells and to select wells for review.
- Well locations are shown on map and are color coded based on well type.
- Well labels are shown if they don't overlap another well point.
- Additional well information shows as a tool tip when the mouse is pointed at a well point.
- Map Zooming
 - Use the mouse scroll wheel or the zoom control at top left of map.
 - Current scale is indicated on lower right of map.
- Map Panning
 - Click and drag mouse, or use pan control at top left of map.
- Base Map Selection
 - Selectable using drop down at top left of map view.

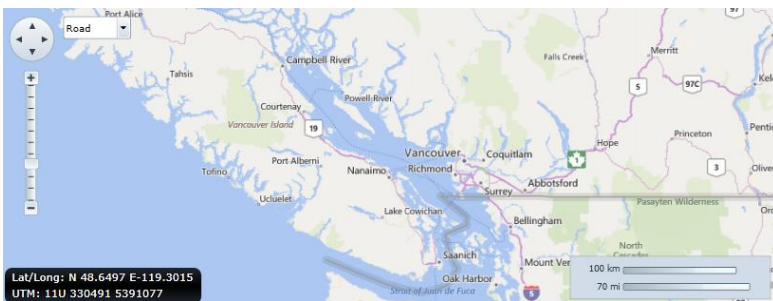


Figure 2: Map View

- Well Selection
 - Clicking on a well point will display the well’s segments in the Data View.
 - The Load All Well Segments button will load well segments from all wells into the Data View.
 - If a well has no segments, or if the well segment data is already shown in the Data View, a message box will appear to indicate either of these situations.
 - Selected wells (i.e. wells with well segments shown in the Data View) are highlighted in the Map View.
 - Well segments from multiple wells can be selected at once by clicking and dragging with the right mouse button to create a rectangular selection area.
 - In the command panel:
 - “Zoom to Selected” will focus the map so that the selected well segments are visible
- Current Limitations
 - It is not possible to see how many well segments a well has before clicking it with the mouse.

Data View

- The primary purpose of the Data View is to select individual well segments.
- Each row in the Data View corresponds to one well segment.
- Well segments from wells selected in the Map View will be shown in the Data View.
- Well segments selected in the Data View will be highlighted in the Map View.
- Columns in the data view can be shown and hidden by clicking on the “Select Columns” button and checking or unchecking the columns.
- In the command panel:
 - The Clear Well Segments button removes all well segments from the Data View.
 - The Load All Well Segment button loads all available well segments into the Data View.

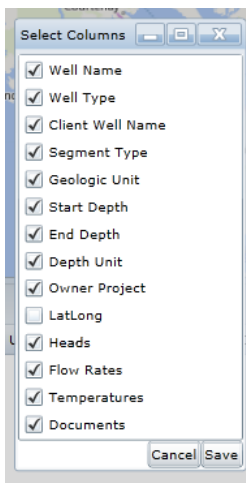


Figure 3: Column selection panel

Working with Well Segment Data

- Well segment data can be interactively grouped, sorted, filtered, selected and copied easily in the Data View. This facilitates finding well segments of particular interest.
- Grouping Data
 - Drag and drop a column label in the grey area directly above the column labels.
 - Subgrouping is possible by dragging and dropping multiple column labels individually.

- Reordering Data Columns
 - Drag a column label horizontally to a new position and drop it in place.
 - Reordering data columns is very useful to when data has been grouped or sorted.
- Sorting Data
 - Click a column label once to sort in ascending order. Further clicks will toggle to sort by descending or ascending order.
 - Multiple sorting levels are also possible by first sorting one column as just described, and then Ctrl-clicking additional columns. For example, sort by Well Type, and then sort by Geologic Unit.
- Filtering Data
 - Hold the mouse pointer near the right side of a column label to display a drop down arrow. Clicking the drop down arrow will display a filter settings box.
 - Filter settings for the column can then be set.
 - Filters can be set using multiple criteria by selecting the AND or OR radio buttons.
- Selecting Well Segments
 - Select a single well segment by clicking on the row for a well segment.
 - Select multiple well segments by first selecting a single well segment, then press the Ctrl or Shift key and click on another well segment. Ctrl-click selection will only select the well segments clicked, whereas Shift-click selection will select all well segments between the first and last well segments selected.
 - Select all well segments by first clicking on a well segment row or a group row, then press Ctrl-A.
- Copying Well Segment Data
 - First select one or more well segments then press Ctrl-C to copy data from the selected well segment rows to the clipboard.
 - The data from the clipboard can then be pasted to another application such as Excel by pressing Ctrl-P.

Plotting Well Segment Time-Series Data

- Different types of measurements, such as head, water flow rate, and temperature, may be associated with each well segment.
- The corresponding columns in the Data View show the total number of measurements available for that parameter.
- Plotting Time-Series Data
 - Select one or more well segments in the Data View.
 - In the command panel:
 - Select a timeperiod over which to search for data. The default time period will plot data collected within the last three months.
 - Press one of the available plot buttons. If the selected well segment does not have data available for a certain parameter, the corresponding plot button will be disabled.
 - Data for the selected well segment, time period, and specified measurement type is retrieved from the database for plotting.
 - A new tab is created for each plot, or Graph View, is created beside the Home Tab at the top right of the display.
 - To close a Graph View tab, click the 'X' located to the right of each tab.

Graph View Tabs



Figure 4: Graph view layout

- The purpose of the Graph View is to graphically browse and export time-series data.
- Data Zoom
 - By default, the Axis XY radio button at the bottom right of the Graph View should be selected. If not, select it.
 - Mouse-click and drag a rectangle over the plot area of interest.
 - The plot will be re-drawn to show only the area selected.
 - Click the Zoom Out button to redraw the plot at the original scale.
 - The Axis X and Axis Y radio buttons can be used to select zoom ranges along the x- and y-axes, respectively.
- Symbol Toggle
 - There may be tens of thousands of data points in each time-series.
 - Symbols can slow display time and therefore can be toggled using the Show Symbols checkbox at the bottom of the Graph View.
 - The number of symbols shown depends on the amount of zoom and the amount of data points shown on the plot. At some point when zooming in, there will be a 1:1 symbols to data point ratio.
- Export Data
 - Click the Export button, and select a folder location and file name to save an Excel file.
 - If a large data set is exported, the user interface may become unresponsive during the latter portion of the data export process.
- Time period selector
 - Same as the time period selector in the command panel. Applies only to the shown graph.

- Show Legend
 - Enable/disable the legend
- Plot as relative difference
 - Toggles between plotting the values of a parameter over time to plotting the change in the parameter values over time
 - The selected date from is treated as the 'zero change' point and values are plotted relative to this zero change
- Current Limitations
 - The interface will be slow when plotting long time series collected at a high frequency. To improve performance, we recommend using a small time period whenever possible.
 - The chart doesn't render every data point. You will need to zoom in to see all the data.

Documents View Tabs

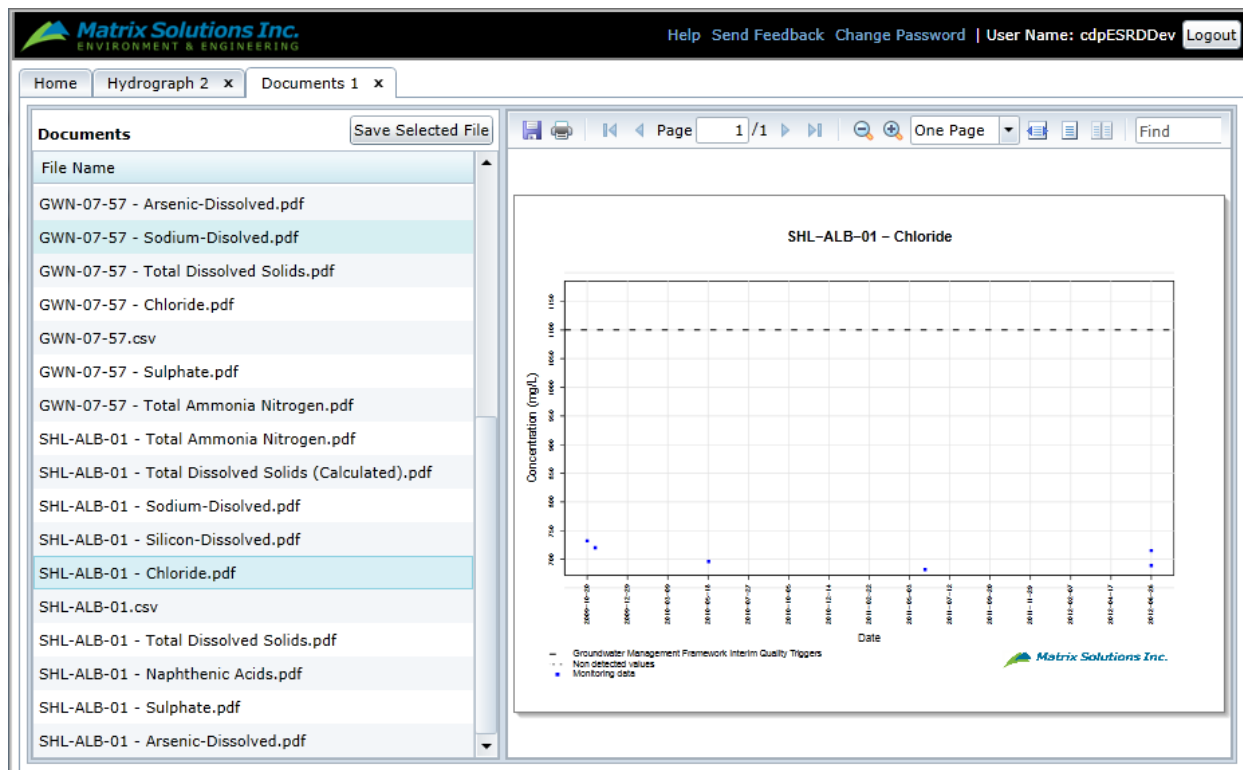


Figure 5: Documents view layout

- The Documents View is where you can access files related to the selected well segments.
- Documents can be downloaded by pressing the “Save Selected File” button.
- Documents can be filtered and sorted in the same way that well segments are filtered and sorted.
- The CDP has support for a few file formats through its online interface:
 - PDF – Portable Document Format files
 - CSV – Comma Separated Value files
 - Cells can be copy and pasted directly in to Excel
 - Other – files in other formats cannot be viewed online but they may be downloaded with the “Save Select File” button

APPENDIX C

Statistical Analysis Charts and Tables

APPENDIX C1

SUMMARY STATISTICS FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Count	Minimum	Maximum	Average	Median	Notes	
Total Dissolved Solids (TDS) - Measured								
Surficial Sands								
AGS-01-WT	TDS - Measured	1	340	340	340	340	1255.3 mg/L (09-OCT-1996) removed as outlier	
AGS-02-20	TDS - Measured	5	723	804	756	750		
AGS-02-50	TDS - Measured	2	950	1470.2	1210.1	1210.1		
AGS-02-WT	TDS - Measured	5	570	915.57	673.914	613		
AGS-03-WT	TDS - Measured	5	541	610	563.8	561		
CVE-BOR-01	TDS - Measured	6	148	190	169	172.5		
CVE-BOR-02	TDS - Measured	6	214	260	235.33	235.5		
GWN-01-74	TDS - Measured	11	1760	2490	2223.09	2300		
GWN-07-55	TDS - Measured	2	268	306	287	287		
GWN-08-43	TDS - Measured	19	390	1030	557.95	514		
GWN-13-26	TDS - Measured	12	138	308	224	239		
GWN-14-32	TDS - Measured	9	839	1500	1197.78	1218		2260 mg/L (04-AUG-2014) removed as outlier
GWN-16-22	TDS - Measured	9	372	574	467.89	472		1056 mg/L (18-JUL-1976) removed as outlier
IOR-KRL-01	TDS - Measured	6	170	220	210	220		0 mg/L (01-MAR-2008) removed as outlier
IOR-KRL-03 (SS)	TDS - Measured	6	100	160	133.33	135		
IOR-KRL-04 (SS)	TDS - Measured	5	1400	1500	1440	1400		
IOR-KRL-05 (SS)	TDS - Measured	5	270	350	308	300		
IOR-KRL-06 (SS)	TDS - Measured	6	360	450	396.67	395		
IOR-KRL-07	TDS - Measured	7	280	360	324.57	330		
IOR-KRL-08	TDS - Measured	7	400	500	431.43	420		
IOR-KRL-09	TDS - Measured	7	160	200	188.57	200		
IOR-KRL-10	TDS - Measured	5	460	490	474	480		
IOR-KRL-11	TDS - Measured	5	270	360	330	340		
TOT-EP-02 (SS)	TDS - Measured	0	-	-	-	-		
Buried Channels and Valleys - Birch Channel								
AGS-02-97	TDS - Measured	5	1100	1678.98	1249.8	1150		
AGS-03-17	TDS - Measured	5	440	523	480.4	478		
Buried Channels and Valleys - Thickwood Channel								
GWN-13-27	TDS - Measured	12	508	5334	1797.25	811		
Buried Channels and Valleys - Kearsy Channel								
GWN-08-44	TDS - Measured	10	516	876	653.8	626		
GWN-Shell-PW2-63	TDS - Measured	3	340	430	386	388		
IOR-KRL-02	TDS - Measured	6	290	330	310	310		
Grand Rapids Formations								
CVE-BOR-03	TDS - Measured	5	734	1210	943.2	887		
CVE-BOR-04	TDS - Measured	1	228	228	228	228		
CVE-WW10-13	TDS - Measured	1	740	740	740	740		
GWN-13-28	TDS - Measured	11	919	1130	973.27	948		
Clearwater Formations								
AGS-02-108	TDS - Measured	2	2056.75	2620	2338.375	2338.375		
AGS-03-30	TDS - Measured	5	902	1140	1014.8	980		
GWN-08-45	TDS - Measured	7	1236	1614	1530	1570	3058 mg/L, 1000 mg/L (06-MAR-1975, 17-JUL-1975) removed as outliers	
GWN-14-33	TDS - Measured	7	1844	4005	3107.88	3511		
McMurray Formation Basal Aquifer - Aquifer Management Unit 1								
CVE-02-04-LM	TDS - Measured	1	340	340	340	340		
GWN-06-60	TDS - Measured	62	196	1138	489.15	465		
GWN-17-50	TDS - Measured	9	370	688	514.11	514		

APPENDIX C1

SUMMARY STATISTICS FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Count	Minimum	Maximum	Average	Median	Notes
McMurray Formation Basal Aquifer - Aquifer Management Unit 2							
GWN-01-75	TDS - Measured	10	496	1974	855.6	609.5	
GWN-06-61	TDS - Measured	12	2807	3988	3740.58	3832	
GWN-07-56	TDS - Measured	2	718	879	798.5	798.5	
GWN-07-57	TDS - Measured	14	1556	1730	1619	1612	
GWN-08-46	TDS - Measured	7	582	9766	3493.86	1560	
GWN-13-29	TDS - Measured	5	596	984	782.4	776	2100 mg/L (19-JUL-1976) removed as outlier
GWN-13-30	TDS - Measured	4	2120	6900	4036.5	3563	
IOR-KRL-03 (BAS)	TDS - Measured	9	332	800	619.33	680	
IOR-KRL-04 (BAS)	TDS - Measured	6	2100	2300	2216.67	2200	
IOR-KRL-05 (BAS)	TDS - Measured	6	1100	1700	1566.67	1700	
SHL-ALB-01	TDS - Measured	1	2500	2500	2500	2500	
SHL-ALB-02	TDS - Measured	1	2400	2400	2400	2400	
SHL-ALB-03	TDS - Measured	0	-	-	-	-	
SHL-JKP-01	TDS - Measured	10	2300	2530	2396	2405	606 mg/L (21-DEC-2007) removed as outlier
McMurray Formation Basal Aquifer - Aquifer Management Unit 3							
CNR-H02-002	TDS - Measured	4	13300	17000	15200	15250	
GWN-16-24	TDS - Measured	9	5290	11079	6372.33	5596	
TOT-EP-02 (BAS)	TDS - Measured	2	17700	18300	18000	18000	
McMurray Formation Basal Aquifer - Aquifer Management Unit 4							
CNR-HRZ-01	TDS - Measured	4	198000	204000	201750	202500	
GWN-01-76	TDS - Measured	10	220440	278340	265232	272670	394mg/L (13-JAN-1975) removed as outlier
SUN-MW-07-110	TDS - Measured	1	280000	280000	280000	280000	
SUN-MW-07-111	TDS - Measured	2	44000	44000	44000	44000	
SUN-MW-07-112	TDS - Measured	1	190000	190000	190000	190000	
Prairie Evaporite/Beverhill Lake/Methy (Keg River) Formations							
CNR-H02-007	TDS - Measured	0	-	-	-	-	
GWN-01-77	TDS - Measured	9	156080	274280	217354.44	217700	73300 mg/L (13-JAN-1975) removed as outlier
GWN-01-78	TDS - Measured	9	3970	9528	6282.22	6692	
GWN-01-79	TDS - Measured	7	24700	246559	185022.71	241840	
GWN-06-62	TDS - Measured	10	2947	11773	8735.8	10732	
GWN-07-58	TDS - Measured	10	1418	10150	6576.2	7712	
GWN-07-59	TDS - Measured	7	671	3388	1866.71	1610	16100 mg/L, 34430 mg/L (10-SEP-1975, 10-JUL-1977) removed as outliers
GWN-08-47	TDS - Measured	0	-	-	-	-	
GWN-08-48	TDS - Measured	7	654	20410	8824.86	6020	
GWN-14-35	TDS - Measured	1	13200	13200	13200	13200	
GWN-14-36	TDS - Measured	8	22600	405587	300013.4	339850	5000 mg/L (15-FEB-2976) removed as outlier
GWN-16-25	TDS - Measured	7	3520	16974	11704.57143	12444	
GWN-17-51	TDS - Measured	8	19680	24924	23238	23735	
McMurray Formations							
CVE-10-05-TW	TDS - Measured	2	260	270	265	265	

APPENDIX C1

SUMMARY STATISTICS FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Count	Minimum	Maximum	Average	Median	Notes
Sodium - Dissolved							
Surficial Sands							
AGS-01-WT	Sodium - Dissolved	1	6.1	6.1	6.1	6.1	
AGS-02-20	Sodium - Dissolved	9	61	145	80.12	74	
AGS-02-50	Sodium - Dissolved	2	53	111	82	82	
AGS-02-WT	Sodium - Dissolved	8	9.3	45.4	20.44	16.45	
AGS-03-WT	Sodium - Dissolved	7	37.9	53	46.13	47.6	
CVE-BOR-01	Sodium - Dissolved	6	9.3	17	12.17	10	
CVE-BOR-02	Sodium - Dissolved	6	6.7	11.3	8.47	7.95	
GWN-01-74	Sodium - Dissolved	13	744	1013	909.77	917	
GWN-07-55	Sodium - Dissolved	4	9.2	50.1	20.35	11.05	
GWN-08-43	Sodium - Dissolved	25	125	162	144.95	145	
GWN-13-26	Sodium - Dissolved	12	1.9	43.8	17.46	15.45	490 mg/L (19-JUL-1976) removed as outlier
GWN-14-32	Sodium - Dissolved	12	104	244	182.5	200.5	
GWN-16-22	Sodium - Dissolved	13	25	60.3	47.47	52.3	
IOR-KRL-01	Sodium - Dissolved	9	2.1	5.2	2.89	2.6	33.7 mg/L (03-MAR-2005) removed as outlier
IOR-KRL-03 (SS)	Sodium - Dissolved	9	0.09	3.3	1.36	1.1	
IOR-KRL-04 (SS)	Sodium - Dissolved	10	180	226	196	196.5	
IOR-KRL-05 (SS)	Sodium - Dissolved	5	5.6	8.6	7.06	7.5	
IOR-KRL-06 (SS)	Sodium - Dissolved	6	3.9	5.7	4.73	4.7	27 mg/L (24-JAN-2009) removed as outlier
IOR-KRL-07	Sodium - Dissolved	6	3.7	4.6	4.03	4	25 mg/L (27-JAN-2009) removed as outlier
IOR-KRL-08	Sodium - Dissolved	7	8.4	25	13.09	11	
IOR-KRL-09	Sodium - Dissolved	7	1.9	4.3	2.6	2.3	
IOR-KRL-10	Sodium - Dissolved	5	29	46	35.8	33	
IOR-KRL-11	Sodium - Dissolved	5	7.6	11	9.08	8.6	
TOT-EP-02 (SS)	Sodium - Dissolved	1	29.1	29.1	29.1	29.1	
Buried Channels and Valleys - Birch Channel							
AGS-02-97	Sodium - Dissolved	8	300	394	344.38	349	
AGS-03-17	Sodium - Dissolved	7	40.3	48.9	46.19	47	
Buried Channels and Valleys - Thickwood Channel							
GWN-13-27	Sodium - Dissolved	14	192	446	259	212.5	
Buried Channels and Valleys - Kearn Channel							
GWN-08-44	Sodium - Dissolved	13	141	380	220.08	204	
GWN-Shell-PW2-63	Sodium - Dissolved	7	3.8	6.2	4.81	4.8	
IOR-KRL-02	Sodium - Dissolved	7	1.6	3.25	2.01	1.8	
Grand Rapids Formations							
CVE-BOR-03	Sodium - Dissolved	5	280	480	372	360	
CVE-BOR-04	Sodium - Dissolved	1	43.2	43.2	43.2	43.2	
CVE-WW10-13	Sodium - Dissolved	1	290	290	290	290	
GWN-13-28	Sodium - Dissolved	13	353	442	387.38	386	
Clearwater Formations							
AGS-02-108	Sodium - Dissolved	5	450	1000	654.4	621	
AGS-03-30	Sodium - Dissolved	5	273	320	298	293	
GWN-08-45	Sodium - Dissolved	12	403	700	605.5	604.5	
GWN-14-33	Sodium - Dissolved	10	737	1859	1331.1	1405	
McMurray Formation Basal Aquifer - Aquifer Management Unit 1							
CVE-02-04-LM	Sodium - Dissolved	1	46	46	46	46	
GWN-06-60	Sodium - Dissolved	65	2.8	63.8	23.46	22.5	150 mg/L (26-AUG-1981) removed as outlier
GWN-17-50	Sodium - Dissolved	12	72.3	183	144.59	91.9	

APPENDIX C1

SUMMARY STATISTICS FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Count	Minimum	Maximum	Average	Median	Notes
McMurray Formation Basal Aquifer - Aquifer Management Unit 2							
GWN-01-75	Sodium - Dissolved	9	68.6	228	132.47	139	575 mg/L (10-SEP-1975) removed as outlier 725 mg/L (19-JUL-1976) removed as outlier 4.57 mg/L, 588 mg/L (28-FEB-1998, 01-MAR-1998) removed as outliers 95 mg/L (21-DEC-2007) removed as outlier
GWN-06-61	Sodium - Dissolved	15	1005	1625	1390.47	1406	
GWN-07-56	Sodium - Dissolved	2	256	311	283.5	283.5	
GWN-07-57	Sodium - Dissolved	16	556	630	586.06	584	
GWN-08-46	Sodium - Dissolved	10	152	1100	436.7	294.5	
GWN-13-29	Sodium - Dissolved	5	150	305	228.8	216	
GWN-13-30	Sodium - Dissolved	4	713	2675	1447	1200	
IOR-KRL-03 (BAS)	Sodium - Dissolved	10	71	200	164.62	188	
IOR-KRL-04 (BAS)	Sodium - Dissolved	8	660	852	764.5	750	
IOR-KRL-05 (BAS)	Sodium - Dissolved	10	440	640	549.2	554.5	
SHL-ALB-01	Sodium - Dissolved	5	948	1040	983.6	970	
SHL-ALB-02	Sodium - Dissolved	3	872	914	888	878	
SHL-ALB-03	Sodium - Dissolved	12	792	2220	1151.17	1029.5	
SHL-JKP-01	Sodium - Dissolved	10	789	906	842.8	841	
McMurray Formation Basal Aquifer - Aquifer Management Unit 3							
CNR-H02-002	Sodium - Dissolved	7	4380	6350	5555.86	5971	4232 mg/L (25-SEP-1984) removed as outlier
GWN-16-24	Sodium - Dissolved	11	2025	3170	2484.64	2541	
TOT-EP-02 (BAS)	Sodium - Dissolved	4	6940	6960	6950	6950	
McMurray Formation Basal Aquifer - Aquifer Management Unit 4							
CNR-HRZ-01	Sodium - Dissolved	10	61000	81900	72240	71850	32.5 mg/L (13-JAN-1975) excluded as outlier
GWN-01-76	Sodium - Dissolved	9	99330	111250	103238.11	103000	
SUN-MW-07-110	Sodium - Dissolved	0	-	-	-	-	
SUN-MW-07-111	Sodium - Dissolved	0	-	-	-	-	
SUN-MW-07-112	Sodium - Dissolved	0	-	-	-	-	
Prairie Evaporite/Beverhill Lake/Methy (Keg River) Formations							
CNR-H02-007	Sodium - Dissolved	1	2420	2420	2420	2420	361 mg/L, 534 mg/L (18-MAR-1975, 13-JAN-1975) excluded as outliers 7500 mg/L (26-FEB-1976) excluded as outlier 8875 mg/L (10-JUL-1977) excluded as outlier
GWN-01-77	Sodium - Dissolved	7	45600	70000	57082.14	59000	
GWN-01-78	Sodium - Dissolved	8	1112	10000	2591	1487	
GWN-01-79	Sodium - Dissolved	4	77550	101250	88637.5	87875	
GWN-06-62	Sodium - Dissolved	13	875	4813	2857.15	3600	
GWN-07-58	Sodium - Dissolved	11	309	2125	1460	1710	
GWN-07-59	Sodium - Dissolved	9	129	4050	758	306	
GWN-08-47	Sodium - Dissolved	2	620	787	703.5	703.5	
GWN-08-48	Sodium - Dissolved	10	69	3025	1539.3	1650	
GWN-14-35	Sodium - Dissolved	2	5120	5550	5335	5335	
GWN-14-36	Sodium - Dissolved	7	1512	102500	55030.71	68530	
GWN-16-25	Sodium - Dissolved	9	1450	8370	5220.67	5025	
GWN-17-51	Sodium - Dissolved	11	7750	9300	8684.45	8700	
McMurray Formations							
CVE-10-05-TW	Sodium - Dissolved	2	6.4	6.6	6.5	6.5	

APPENDIX C1

SUMMARY STATISTICS FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Count	Minimum	Maximum	Average	Median	Notes
Chloride							
Surficial Sands							
AGS-01-WT	Chloride	1	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (1/1)
AGS-02-20	Chloride	8	0.5*	2.26	0.99	0.75	16.1 mg/L (09-OCT-1996) removed as outlier
AGS-02-50	Chloride	2	1	35.3	18.15	18.15	
AGS-02-WT	Chloride	7	2.03	5	3.11	3.25	14.1 mg/L (09-OCT-1996) removed as outlier
AGS-03-WT	Chloride	7	1.73	5.82	2.97	2.61	
CVE-BOR-01	Chloride	6	0.3	1.7	-	-	Unable to calculate average/median due to high number of non detect values (4/6)
CVE-BOR-02	Chloride	6	0.6	1.2	0.84	0.84	
GWN-01-74	Chloride	13	149	320.45	196.04	169	
GWN-07-55	Chloride	4	4.3	36.9	15	9.4	
GWN-08-43	Chloride	25	1.07	67.6	29.15	28.04	
GWN-13-26	Chloride	13	0.5*	22.03	7.39	2.57	46 mg/L (10-JUL-1979) removed as outlier
GWN-14-32	Chloride	12	14	580	282.27	275	
GWN-16-22	Chloride	13	4	62	23.19	13.6	
IOR-KRL-01	Chloride	9	0.4	1*	-	-	139 mg/L (03-MAR-2005) removed as outlier; Unable to calculate average/median due to high number of non detect values (7/9)
IOR-KRL-03 (SS)	Chloride	9	0.5*	2.4	-	-	Unable to calculate average/median due to high number of non detect values (6/9)
IOR-KRL-04 (SS)	Chloride	10	1*	2	1.17	1.05	
IOR-KRL-05 (SS)	Chloride	5	1*	2	1.39	1.3	
IOR-KRL-06 (SS)	Chloride	7	1*	3	1.7	1.9	
IOR-KRL-07	Chloride	7	1*	4	2.23	2.3	
IOR-KRL-08	Chloride	7	1*	4	2.36	2	
IOR-KRL-09	Chloride	7	1*	1	-	-	Unable to calculate average/median due to high number of non detect values (7/7)
IOR-KRL-10	Chloride	5	8	12	9.8	10	
IOR-KRL-11	Chloride	5	2	3.1	2.34	2	
TOT-EP-02 (SS)	Chloride	1	2.95	2.95	2.95	2.95	
Buried Channels and Valleys - Birch Channel							
AGS-02-97	Chloride	8	44	85.7	55.25	51.95	
AGS-03-17	Chloride	7	1.59	2.2	1.86	1.83	
Buried Channels and Valleys - Thickwood Channel							
GWN-13-27	Chloride	14	1.08	380.54	95.36	69	
Buried Channels and Valleys - Kearn Channel							
GWN-08-44	Chloride	12	1.34	94.13	24.92	8.96	
GWN-Shell-PW2-63	Chloride	7	0.5*	3.4	-	-	Unable to calculate average/median due to high number of non detect values (4/7)
IOR-KRL-02	Chloride	7	1*	1.1	-	-	Unable to calculate average/median due to high number of non detect values (4/7)
Grand Rapids Formations							
CVE-BOR-03	Chloride	5	32.1	89	60.42	57	
CVE-BOR-04	Chloride	1	1.9	1.9	1.9	1.9	
CVE-WW10-13	Chloride	1	24	24	24	24	
GWN-13-28	Chloride	13	3.09	32	12.32	11	
Clearwater Formations							
AGS-02-108	Chloride	4	244	261	248	245.5	847 mg/L (06-AUG-2014) removed as outlier
AGS-03-30	Chloride	5	10.9	13	11.72	11.9	
GWN-08-45	Chloride	10	158.22	200	182.9	182.5	4 mg/L, 87.12 mg/L (06-MAR-1975, 23-FEB-1975) removed as outliers
GWN-14-33	Chloride	9	594	1241.75	1063.53	1190	2000 mg/L (05-JUL-1980) removed as outlier
McMurray Formation Basal Aquifer - Aquifer Management Unit 1							
CVE-02-04-LM	Chloride	1	34	34	34	34	
GWN-06-60	Chloride	66	0.5*	158.22	28.14	18	
GWN-17-50	Chloride	12	42.5	148	84.64	68.3	

APPENDIX C1

SUMMARY STATISTICS FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Count	Minimum	Maximum	Average	Median	Notes
McMurray Formation Basal Aquifer - Aquifer Management Unit 2							
GWN-01-75	Chloride	10	1.43	652.92	158.89	48.067	
GWN-06-61	Chloride	15	658.93	1321.86	1115.3	1130	
GWN-07-56	Chloride	2	44.9	75.9	60.4	60.4	
GWN-07-57	Chloride	16	218.31	398.56	310.95	312	
GWN-08-46	Chloride	8	8.27	500.71	76.48	9.52	1241.75 mg/L (09-JUL-1977) removed as outlier
GWN-13-29	Chloride	5	224.32	420	318.14	296	1118 mg/L (19-JUL-1976) removed as outlier
GWN-13-30	Chloride	4	1009.42	3520	2118.04	1971.37	
IOR-KRL-03 (BAS)	Chloride	12	1.5	56	38.14	50	
IOR-KRL-04 (BAS)	Chloride	8	605	976	697.63	665	
IOR-KRL-05 (BAS)	Chloride	10	270	347	308	305	
SHL-ALB-01	Chloride	5	682	732	709	715	
SHL-ALB-02	Chloride	3	793	806	799	798	
SHL-ALB-03	Chloride	11	595	937	706.45	714	2300 mg/L (25-AUG-2009) removed as outlier
SHL-JKP-01	Chloride	10	730	785	755.3	755	80 mg/L (21-DEC-2007) removed as outlier
McMurray Formation Basal Aquifer - Aquifer Management Unit 3							
CNR-H02-002	Chloride	7	6790	10300	8247.14	7360	
GWN-16-24	Chloride	12	2600	5502.75	3100.43	2865	
TOT-EP-02 (BAS)	Chloride	4	8520	9110	8815	8815	
McMurray Formation Basal Aquifer - Aquifer Management Unit 4							
CNR-HRZ-01	Chloride	10	97800	13600	116280	118000	
GWN-01-76	Chloride	9	30362.76	172000	141109.4	163000	18.03 mg/L (13-JAN-1975) removed as outlier
SUN-MW-07-110	Chloride	1	170000	170000	170000	170000	
SUN-MW-07-111	Chloride	2	23000	24000	23500	23500	
SUN-MW-07-112	Chloride	1	110000	110000	110000	110000	
Prairie Evaporite/Beverhill Lake/Methy (Keg River) Formations							
CNR-H02-007	Chloride	1	1430	1430	1430	1430	
GWN-01-77	Chloride	8	48067.7	106200	86008.46	88950	
GWN-01-78	Chloride	9	851.2	2813.96	1798.26	1922.71	17000 mg/L (27-OCT-2012) removed as outlier
GWN-01-79	Chloride	5	12417.49	155000	94407.67	139800	
GWN-06-62	Chloride	13	741.04	6243	3797.04	5467.7	
GWN-07-58	Chloride	11	364.51	3454.87	2236.5	3060	
GWN-07-59	Chloride	8	202	4284.03	958.97	398.34	16423.13 mg/L, 84 mg/L (10-JAN-1977, 07-JUL-1980) removed as outliers
GWN-08-47	Chloride	2	430	472	451	451	
GWN-08-48	Chloride	10	27.04	4185.9	1992.08	2106.83	
GWN-14-35	Chloride	2	6620	7880	7250	7250	
GWN-14-36	Chloride	6	3404.79	200000	123484.13	167200	
GWN-16-25	Chloride	8	3785.33	13900	8637.37	8241.33	1920 mg/L (18-JUL-1976) removed as outlier
GWN-17-51	Chloride	10	12000	14500	13130	13150	113619.2 mg/L (04-JUL-1978) removed as outlier
McMurray Formations							
CVE-10-05-TW	Chloride	2	2	2	2	2	

APPENDIX C1

SUMMARY STATISTICS FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Count	Minimum	Maximum	Average	Median	Notes
Sulphate							
Surficial Sands							
AGS-01-WT	Sulphate	2	10	16.9	13.45	13.45	
AGS-02-20	Sulphate	8	103	140	118.75	120	206 mg/L (09-OCT-1996) removed as outlier
AGS-02-50	Sulphate	2	290	376	333	333	
AGS-02-WT	Sulphate	8	29.3	133	93.25	96.15	
AGS-03-WT	Sulphate	8	74.3	150	108.35	108.05	
CVE-BOR-01	Sulphate	6	0.6	1*	-	-	Unable to calculate average/median due to high number of non detect values (4/6)
CVE-BOR-02	Sulphate	6	0.5*	3.1	-	-	Unable to calculate average/median due to high number of non detect values (5/6)
GWN-01-74	Sulphate	13	159.9	278	218.91	225.86	
GWN-07-55	Sulphate	4	1.1	5.54	3.5325	3.745	
GWN-08-43	Sulphate	23	0.5*	25.98	8.18	5	439.72 mg/L (27-AUG-1980) removed as outlier
GWN-13-26	Sulphate	14	1.3	21	9.79	9.08	
GWN-14-32	Sulphate	9	167	562	396.19	413.74	12 mg/L, 5 mg/L, 0.5 mg/L (16-FEB-2011, 24-AUG-2013, 28-NOV-2013) removed as outliers
GWN-16-22	Sulphate	13	0.05*	157	35.33	5.13	
IOR-KRL-01	Sulphate	9	7.1	12	9.86	10	36.4 mg/L (03-MAR-2005) removed as outlier
IOR-KRL-03 (SS)	Sulphate	9	8	12	9.21	9	
IOR-KRL-04 (SS)	Sulphate	10	522	660	608	615	
IOR-KRL-05 (SS)	Sulphate	5	6	15	9.4	8	
IOR-KRL-06 (SS)	Sulphate	6	1*	2	-	-	33 mg/L (24-JAN-2009) removed as outlier; Unable to calculate average/median due to high number of non detect values (5/6)
IOR-KRL-07	Sulphate	6	1*	1*	-	-	24 mg/L (27-JAN-2009) removed as outlier; Unable to calculate average/median due to high number of non detect values (6/6)
IOR-KRL-08	Sulphate	7	1*	16	7.07	6	
IOR-KRL-09	Sulphate	7	3	6	4.17	4	
IOR-KRL-10	Sulphate	5	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (5/5)
IOR-KRL-11	Sulphate	5	1*	1.7	-	-	Unable to calculate average/median due to high number of non detect values (4/5)
TOT-EP-02 (SS)	Sulphate	1	37.7	37.7	37.7	37.7	
Buried Channels and Valleys - Birch Channel							
AGS-02-97	Sulphate	8	250	338	284	277.5	
AGS-03-17	Sulphate	8	69	107	92	94.8	
Buried Channels and Valleys - Thickwood Channel							
GWN-13-27	Sulphate	13	5.15	72.96	40.05	42.97	150 mg/L (08-SEP-2009) removed as outlier
Buried Channels and Valleys - Kearl Channel							
GWN-08-44	Sulphate	12	0.5*	9.6	3.66	3.65	96.94 mg/L (22-FEB-1975) removed as outlier
GWN-Shell-PW2-63	Sulphate	7	0.5*	3	-	-	Unable to calculate average/median due to high number of non detect values (6/7)
IOR-KRL-02	Sulphate	7	8	9.7	8.9	9	
Grand Rapids Formations							
CVE-BOR-03	Sulphate	5	0	65.1	25.02	28	
CVE-BOR-04	Sulphate	1	1.4	1.4	1.4	1.4	
CVE-WW10-13	Sulphate	1	43	43	43	43	
GWN-13-28	Sulphate	12	31.48	134.91	96.86	98.5	2.37 mg/L (27-AUG-2013) removed as outlier
Clearwater Formations							
AGS-02-108	Sulphate	5	41.6	260	205.32	253	
AGS-03-30	Sulphate	6	215	261	241.67	243	
GWN-08-45	Sulphate	11	0.5*	33.78	7.64	5.2	102.94 mg/L (23-FEB-1975) removed as outlier
GWN-14-33	Sulphate	10	0.55	27.8	8.85	3.8	
McMurray Formation Basal Aquifer - Aquifer Management Unit 1							
CVE-02-04-LM	Sulphate	1	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (1/1)
GWN-06-60	Sulphate	62	0.5	38	15.65	12.5	0 mg/L (03-AUG-1977, 15-MAR-1978) removed as outliers
GWN-17-50	Sulphate	12	0.5*	20.19	5.48	2.65	

APPENDIX C1

SUMMARY STATISTICS FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Count	Minimum	Maximum	Average	Median	Notes
McMurray Formation Basal Aquifer - Aquifer Management Unit 2							
GWN-01-75	Sulphate	10	0.5*	81.45	20.36	10.09	
GWN-06-61	Sulphate	15	1*	73.45	10.98	4.2	
GWN-07-56	Sulphate	2	0.5*	0.8	-	-	Unable to calculate average/median due to high number of non detect values (1/2)
GWN-07-57	Sulphate	16	0.5*	12.69	4.43	2.35	
GWN-08-46	Sulphate	9	2.35	15.69	6.59	4.8	116.93 mg/L (23-FEB-1975) removed as outlier
GWN-13-29	Sulphate	6	33.38	91	60.06	56.5	
GWN-13-30	Sulphate	4	52	111	69.48	57.46	
IOR-KRL-03 (BAS)	Sulphate	12	1*	43.5	9.84	4.35	
IOR-KRL-04 (BAS)	Sulphate	8	1*	6	2.46	1.72	
IOR-KRL-05 (BAS)	Sulphate	10	1*	27	15.63	16.95	
SHL-ALB-01	Sulphate	5	0.5*	9.9	-	-	Unable to calculate average/median due to high number of non detect values (4/5)
SHL-ALB-02	Sulphate	3	1.45	2.14	1.71	1.55	
SHL-ALB-03	Sulphate	12	0.99	152	36.41	16.1	
SHL-JKP-01	Sulphate	11	0.5*	89.7	16.9	1.69	
McMurray Formation Basal Aquifer - Aquifer Management Unit 3							
CNR-H02-002	Sulphate	7	5*	78	-	-	Unable to calculate average/median due to high number of non detect values (4/7)
GWN-16-24	Sulphate	12	1*	45.8	19.91	11.41	
TOT-EP-02 (BAS)	Sulphate	4	4	10.2	7.1	7.1	
McMurray Formation Basal Aquifer - Aquifer Management Unit 4							
CNR-HRZ-01	Sulphate	10	2240	3080	2632	2600	
GWN-01-76	Sulphate	11	2688.32	3897.57	3421.33	3600	153.9 mg/L, 343.72 mg/L (13-JAN-1975, 10-SEP-1975) removed as outliers
SUN-MW-07-110	Sulphate	1	3500	3500	3500	3500	
SUN-MW-07-111	Sulphate	2	3900	4400	4150	4150	
SUN-MW-07-112	Sulphate	1	4000	4000	4000	4000	
Prairie Evaporite/Beverhill Lake/Methy (Keg River) Formations							
CNR-H02-007	Sulphate	1	5*	5*	-	-	Unable to calculate average/median due to high number of non detect values (1/1)
GWN-01-77	Sulphate	13	1200	4147.41	2276.24	1800	
GWN-01-78	Sulphate	10	600	2300	1389.81	1309.18	
GWN-01-79	Sulphate	7	1698.94	3637.73	2552.19	2448.47	
GWN-06-62	Sulphate	13	1*	122.92	30.06	17.39	
GWN-07-58	Sulphate	11	104.93	2498.44	1180.61	1390	
GWN-07-59	Sulphate	10	133.92	1848.85	772.31	631.77	
GWN-08-47	Sulphate	2	1*	1.23	-	-	Unable to calculate average/median due to high number of non detect values (1/2)
GWN-08-48	Sulphate	10	11.8	330.79	137.72	118.43	
GWN-14-35	Sulphate	2	1160	2180	1670	1670	
GWN-14-36	Sulphate	8	162.9	3890	1043.07	279.41	10 mg/L* (04-AUG-2014) removed as outlier
GWN-16-25	Sulphate	9	130	1150	693.27	815.49	
GWN-17-51	Sulphate	11	1*	87	45.24	58	
McMurray Formations							
CVE-10-05-TW	Sulphate	2	17	19	18	18	

APPENDIX C1

SUMMARY STATISTICS FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Count	Minimum	Maximum	Average	Median	Notes
Ammonium-N							
Surficial Sands							
AGS-01-WT	Ammonium-N	1	0.13	0.13	0.13	0.13	
AGS-02-20	Ammonium-N	8	3.09	3.78	3.48	3.5	
AGS-02-50	Ammonium-N	1	3.3	3.3	3.3	3.3	
AGS-02-WT	Ammonium-N	7	0.05*	0.48	0.15	0.09	
AGS-03-WT	Ammonium-N	7	0.05*	0.53	0.099	0.0084	
CVE-BOR-01	Ammonium-N	1	1.8	1.8	1.8	1.8	
CVE-BOR-02	Ammonium-N	1	1.2	1.2	1.2	1.2	
GWN-01-74	Ammonium-N	6	2.54	3.52	2.86	2.31	
GWN-07-55	Ammonium-N	4	0.065	0.243	0.16325	0.1725	
GWN-08-43	Ammonium-N	5	0.646	1.13	0.8528	0.886	4.4 mg/L (02-AUG-2014) removed as outlier
GWN-13-26	Ammonium-N	7	0.05*	0.16	0.081219273	0.075	
GWN-14-32	Ammonium-N	5	0.217	0.86	0.426	0.293	7.24 (04-AUG-2014) removed as outlier
GWN-16-22	Ammonium-N	8	0.39	2.5	1	0.91	
IOR-KRL-01	Ammonium-N	6	0.05*	0.25	0.084	0.055	
IOR-KRL-03 (SS)	Ammonium-N	4	0.05*	0.081	-	-	Unable to calculate average/median due to high number of non detect values (3/4)
IOR-KRL-04 (SS)	Ammonium-N	5	2	3.3	2.51	2.36	
IOR-KRL-05 (SS)	Ammonium-N	4	0.44	1.4	0.74	0.56	
IOR-KRL-06 (SS)	Ammonium-N	4	2.8	4.5	3.725	3.8	
IOR-KRL-07	Ammonium-N	5	0.3	0.45	0.37	0.35	
IOR-KRL-08	Ammonium-N	4	0.23	0.52	0.38	0.385	
IOR-KRL-09	Ammonium-N	4	0.05*	0.05	-	-	Unable to calculate average/median due to high number of non detect values (2/4)
IOR-KRL-10	Ammonium-N	6	4.3	5.6	5.08	5.15	
IOR-KRL-11	Ammonium-N	5	0.23	0.28	0.258	0.27	
TOT-EP-02 (SS)	Ammonium-N	0	-	-	-	-	
Buried Channels and Valleys - Birch Channel							
AGS-02-97	Ammonium-N	7	1.92	2.31	2.14	2.2	
AGS-03-17	Ammonium-N	6	0.54	0.68	0.61	0.62	0.05 mg/L* (22-AUG-2013) removed as outlier
Buried Channels and Valleys - Thickwood Channel							
GWN-13-27	Ammonium-N	7	1.24	3	1.84	1.56	
Buried Channels and Valleys - Kearn Channel							
GWN-08-44	Ammonium-N	5	0.61	0.76	0.69	0.68	
GWN-Shell-PW2-63	Ammonium-N	6	0.13	0.62	0.45	0.54	
IOR-KRL-02	Ammonium-N	4	0.5*	1.1	-	-	Unable to calculate average/median due to high number of non detect values (3/4)
Grand Rapids Formations							
CVE-BOR-03	Ammonium-N	0	-	-	-	-	
CVE-BOR-04	Ammonium-N	0	-	-	-	-	
CVE-WW10-13	Ammonium-N	0	-	-	-	-	
GWN-13-28	Ammonium-N	4	1.02	1.19	1.08	1.06	
Clearwater Formations							
AGS-02-108	Ammonium-N	4	1.53	3.69	2.22	1.84	
AGS-03-30	Ammonium-N	5	2.21	2.6	2.36	2.34	
GWN-08-45	Ammonium-N	6	1.42	1.7	1.61	1.64	
GWN-14-33	Ammonium-N	4	3.33	13.7	6.94	5.37	
McMurray Formation Basal Aquifer - Aquifer Management Unit 1							
CVE-02-04-LM	Ammonium-N	0	-	-	-	-	
GWN-06-60	Ammonium-N	7	0.053	0.2	0.11	0.096	
GWN-17-50	Ammonium-N	6	0.63	0.85	0.71	0.69	

APPENDIX C1

SUMMARY STATISTICS FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Count	Minimum	Maximum	Average	Median	Notes
McMurray Formation Basal Aquifer - Aquifer Management Unit 2							
GWN-01-75	Ammonium-N	3	1.14	1.29	1.2	1.17	
GWN-06-61	Ammonium-N	5	1.89	2.72	2.372	2.4	
GWN-07-56	Ammonium-N	2	3.59	3.93	3.76	3.76	
GWN-07-57	Ammonium-N	6	3.36	4.15	3.885	3.97	
GWN-08-46	Ammonium-N	4	3.09	4.3	3.57	3.445	
GWN-13-29	Ammonium-N	0	-	-	-	-	
GWN-13-30	Ammonium-N	0	-	-	-	-	
IOR-KRL-03 (BAS)	Ammonium-N	7	1.1	1.9	1.38	1.3	
IOR-KRL-04 (BAS)	Ammonium-N	4	2.3	2.9	2.68	2.75	
IOR-KRL-05 (BAS)	Ammonium-N	5	2.5	3.73	3.03	3	
SHL-ALB-01	Ammonium-N	1	2.8	2.8	2.8	2.8	
SHL-ALB-02	Ammonium-N	1	2.1	2.1	2.1	2.1	
SHL-ALB-03	Ammonium-N	0	-	-	-	-	
SHL-JKP-01	Ammonium-N	1	2.6	2.6	2.6	2.6	
McMurray Formation Basal Aquifer - Aquifer Management Unit 3							
CNR-H02-002	Ammonium-N	7	9.29	13.4	11.54	11.5	
GWN-16-24	Ammonium-N	6	3.15*	6.3	4.55	4.08	
TOT-EP-02 (BAS)	Ammonium-N	0	-	-	-	-	
McMurray Formation Basal Aquifer - Aquifer Management Unit 4							
CNR-HRZ-01	Ammonium-N	8	6.6	8.1	7.41	7.43	
GWN-01-76	Ammonium-N	4	10.7	14.5	12.15	11.7	
SUN-MW-07-110	Ammonium-N	1	4.3	4.3	4.3	4.3	
SUN-MW-07-111	Ammonium-N	1	3.3	3.3	3.3	3.3	
SUN-MW-07-112	Ammonium-N	1	2.6	2.6	2.6	2.6	
Prairie Evaporite/Beverhill Lake/Methy (Keg River) Formations							
CNR-H02-007	Ammonium-N	0	-	-	-	-	
GWN-01-77	Ammonium-N	3	20.3	26.9	23.73	24	
GWN-01-78	Ammonium-N	1	130	130	130	130	
GWN-01-79	Ammonium-N	0	-	-	-	-	
GWN-06-62	Ammonium-N	3	8.9	27.4	18	17.7	
GWN-07-58	Ammonium-N	2	14.5	16.2	15.35	15.35	
GWN-07-59	Ammonium-N	2	3.12	3.89	3.51	3.51	
GWN-08-47	Ammonium-N	2	3.91	5.4	4.66	4.66	
GWN-08-48	Ammonium-N	3	15.5	20.9	18.47	19	
GWN-14-35	Ammonium-N	2	0.75	7.39	4.07	4.07	
GWN-14-36	Ammonium-N	1	10.3	10.3	10.3	10.3	
GWN-16-25	Ammonium-N	3	9.79	11	10.2	9.79	
GWN-17-51	Ammonium-N	5	10.5	13	11.68	11.6	
McMurray Formations							
CVE-10-05-TW	Ammonium-N	0	-	-	-	-	

APPENDIX C1

SUMMARY STATISTICS FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Count	Minimum	Maximum	Average	Median	Notes
Arsenic - Dissolved							
Surficial Sands							
AGS-01-WT	Arsenic - Dissolved	1	0.0005	0.0005	0.0005	0.0005	
AGS-02-20	Arsenic - Dissolved	7	0.0004*	0.0019	0.00087	0.00074	
AGS-02-50	Arsenic - Dissolved	1	0.0018	0.0018	0.0018	0.0018	
AGS-02-WT	Arsenic - Dissolved	6	0.00025	0.0016	0.00089	0.00089	
AGS-03-WT	Arsenic - Dissolved	7	0.0004	0.00046	0.00041	0.00041	
CVE-BOR-01	Arsenic - Dissolved	5	0.0002*	0.0009	0.00058	0.00065	
CVE-BOR-02	Arsenic - Dissolved	5	0.0002*	0.0022	0.0021	0.002	
GWN-01-74	Arsenic - Dissolved	7	0.0005*	0.038*	-	-	Unable to calculate average/median due to high number of non detect values (4/7)
GWN-07-55	Arsenic - Dissolved	4	0.0004*	0.00089	0.000566266	0.000545	
GWN-08-43	Arsenic - Dissolved	6	0.00045	0.0016	0.00092	0.00087	
GWN-13-26	Arsenic - Dissolved	7	0.00048	0.0013	0.00095	0.00094	0.038 mg/L* (19-JUL-1976) removed due to high detection limit
GWN-14-32	Arsenic - Dissolved	7	0.0002*	0.038*	-	-	Unable to calculate average/median due to high number of non detect values (5/7)
GWN-16-22	Arsenic - Dissolved	8	0.0004*	0.0019	0.00094	0.00079	0.038 mg/L* (18-JUL-1976) removed due to high detection limit
IOR-KRL-01	Arsenic - Dissolved	10	0.0001*	0.005*	-	-	Unable to calculate average/median due to high number of non detect values (9/10)
IOR-KRL-03 (SS)	Arsenic - Dissolved	9	0.0002*	0.005*	-	-	Unable to calculate average/median due to high number of non detect values (8/9)
IOR-KRL-04 (SS)	Arsenic - Dissolved	8	0.0002*	0.0013	0.0005	0.00035	0.005 mg/L* (17-MAR-2004, 01-MAR-2006) removed due to high detection limit
IOR-KRL-05 (SS)	Arsenic - Dissolved	5	0.0012	0.0021	0.0016	0.0014	
IOR-KRL-06 (SS)	Arsenic - Dissolved	7	0.0002*	0.0043	0.001	0.00046	
IOR-KRL-07	Arsenic - Dissolved	7	0.0002*	0.0051	0.0011	0.0003	
IOR-KRL-08	Arsenic - Dissolved	7	0.0003	0.0051	0.0019	0.0015	
IOR-KRL-09	Arsenic - Dissolved	7	0.0002*	0.0007	-	-	Unable to calculate average/median due to high number of non detect values (6/7)
IOR-KRL-10	Arsenic - Dissolved	5	0.0002*	0.0006	-	-	Unable to calculate average/median due to high number of non detect values (3/5)
IOR-KRL-11	Arsenic - Dissolved	5	0.0002*	0.0002*	-	-	Unable to calculate average/median due to high number of non detect values (5/5)
TOT-EP-02 (SS)	Arsenic - Dissolved	1	0.0004*	0.0004*	-	-	Unable to calculate average/median due to high number of non detect values (1/1)
Buried Channels and Valleys - Birch Channel							
AGS-02-97	Arsenic - Dissolved	7	0.0004*	0.00034	-	-	Unable to calculate average/median due to high number of non detect values (5/7)
AGS-03-17	Arsenic - Dissolved	7	0.0004*	0.0002*	-	-	Unable to calculate average/median due to high number of non detect values (7/7)
Buried Channels and Valleys - Thickwood Channel							
GWN-13-27	Arsenic - Dissolved	7	0.0006	0.0031	0.0021	0.0026	
Buried Channels and Valleys - Kearsy Channel							
GWN-08-44	Arsenic - Dissolved	5	0.0002*	0.0023	-	-	Unable to calculate average/median due to high number of non detect values (3/5)
GWN-Shell-PW2-63	Arsenic - Dissolved	7	0.0002*	0.001	0.00065	0.0007	
IOR-KRL-02	Arsenic - Dissolved	7	0.0002*	0.005*	-	-	Unable to calculate average/median due to high number of non detect values (5/5)
Grand Rapids Formations							
CVE-BOR-03	Arsenic - Dissolved	5	0.0013	0.0038	0.0021	0.0016	
CVE-BOR-04	Arsenic - Dissolved	0	-	-	-	-	
CVE-WW10-13	Arsenic - Dissolved	1	0.039	0.039	0.039	0.039	
GWN-13-28	Arsenic - Dissolved	4	0.0012	0.0066	0.0031	0.0023	0.038 mg/L* (11-NOV-1976) removed due to high detection limit
Clearwater Formations							
AGS-02-108	Arsenic - Dissolved	4	0.0033	0.02	0.0086	0.0055	
AGS-03-30	Arsenic - Dissolved	5	0.0004*	0.0033	0.0014	0.00094	
GWN-08-45	Arsenic - Dissolved	6	0.0005*	0.0013	-	-	Unable to calculate average/median due to high number of non detect values (5/6)
GWN-14-33	Arsenic - Dissolved	5	0.001*	0.038*	-	-	Unable to calculate average/median due to high number of non detect values (5/5)
McMurray Formation Basal Aquifer - Aquifer Management Unit 1							
CVE-02-04-LM	Arsenic - Dissolved	1	0.0002*	0.0002*	-	-	Unable to calculate average/median due to high number of non detect values (1/1)
GWN-06-60	Arsenic - Dissolved	8	0.00027	0.0025	0.0012	0.0011	0.038 mg/L* (16-JUL-1976) removed due to high detection limit
GWN-17-50	Arsenic - Dissolved	6	0.0004	0.0021	0.00086	0.00072	0.038 mg/L* (13-JUL-1976) removed due to high detection limit

APPENDIX C1

SUMMARY STATISTICS FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Count	Minimum	Maximum	Average	Median	Notes
McMurray Formation Basal Aquifer - Aquifer Management Unit 2							
GWN-01-75	Arsenic - Dissolved	3	0.0004*	0.00045	-	-	0.038 mg/L* (13-JUL-1976) removed due to high detection limit
GWN-06-61	Arsenic - Dissolved	7	0.00013	0.038*	-	-	Unable to calculate average/median due to high number of non detect values (6/7)
GWN-07-56	Arsenic - Dissolved	2	0.0004*	0.0004*	-	-	Unable to calculate average/median due to high number of non detect values (2/2)
GWN-07-57	Arsenic - Dissolved	7	0.0004*	0.038*	-	-	Unable to calculate average/median due to high number of non detect values (7/7)
GWN-08-46	Arsenic - Dissolved	5	0.00046	0.00053	0.0005	0.0005	
GWN-13-29	Arsenic - Dissolved	0	-	-	-	-	
GWN-13-30	Arsenic - Dissolved	0	-	-	-	-	
IOR-KRL-03 (BAS)	Arsenic - Dissolved	9	0.0002*	0.0011	0.00023	0.0002	
IOR-KRL-04 (BAS)	Arsenic - Dissolved	8	0.0002*	0.005*	-	-	Unable to calculate average/median due to high number of non detect values (5/8)
IOR-KRL-05 (BAS)	Arsenic - Dissolved	10	0.0002*	0.001	0.00026	0.00035	
SHL-ALB-01	Arsenic - Dissolved	3	0.0004*	0.001*	-	-	Unable to calculate average/median due to high number of non detect values (2/3)
SHL-ALB-02	Arsenic - Dissolved	3	0.0004*	0.0004*	-	-	Unable to calculate average/median due to high number of non detect values (3/3)
SHL-ALB-03	Arsenic - Dissolved	4	0.0006	0.0042	0.0022	0.0021	
SHL-JKP-01	Arsenic - Dissolved	6	0.0002*	0.0014	-	-	Unable to calculate average/median due to high number of non detect values (5/6)
McMurray Formation Basal Aquifer - Aquifer Management Unit 3							
CNR-H02-002	Arsenic - Dissolved	7	0.0016*	0.01*	-	-	Unable to calculate average/median due to high number of non detect values (7/7)
GWN-16-24	Arsenic - Dissolved	6	0.002*	0.038*	-	-	Unable to calculate average/median due to high number of non detect values (6/6)
TOT-EP-02 (BAS)	Arsenic - Dissolved	0	-	-	-	-	
McMurray Formation Basal Aquifer - Aquifer Management Unit 4							
CNR-HRZ-01	Arsenic - Dissolved	9	0.0016*	0.243	-	-	Unable to calculate average/median due to high number of non detect values (8/9)
GWN-01-76	Arsenic - Dissolved	5	0.01*	0.1*	-	-	Unable to calculate average/median due to high number of non detect values (5/5)
SUN-MW-07-110	Arsenic - Dissolved	0	-	-	-	-	
SUN-MW-07-111	Arsenic - Dissolved	0	-	-	-	-	
SUN-MW-07-112	Arsenic - Dissolved	0	-	-	-	-	
Prairie Evaporite/Beverhill Lake/Methy (Keg River) Formations							
CNR-H02-007	Arsenic - Dissolved	1	0.008*	0.008*	-	-	Unable to calculate average/median due to high number of non detect values (1/1)
GWN-01-77	Arsenic - Dissolved	3	0.05*	0.1*	-	-	Unable to calculate average/median due to high number of non detect values (3/3)
GWN-01-78	Arsenic - Dissolved	1	0.01*	0.01*	-	-	Unable to calculate average/median due to high number of non detect values (1/1)
GWN-01-79	Arsenic - Dissolved	1	0.038*	0.038*	-	-	Unable to calculate average/median due to high number of non detect values (1/1)
GWN-06-62	Arsenic - Dissolved	4	0.001*	0.038*	-	-	Unable to calculate average/median due to high number of non detect values (4/4)
GWN-07-58	Arsenic - Dissolved	2	0.01*	0.01*	-	-	Unable to calculate average/median due to high number of non detect values (2/2)
GWN-07-59	Arsenic - Dissolved	2	0.0019	0.002	0.002	0.002	
GWN-08-47	Arsenic - Dissolved	2	3.91	5.4	4.66	4.66	
GWN-08-48	Arsenic - Dissolved	3	0.00084	0.0013	-	-	Unable to calculate average/median due to high number of non detect values (1/3)
GWN-14-35	Arsenic - Dissolved	2	0.0021	0.13	0.064	0.064	
GWN-14-36	Arsenic - Dissolved	2	0.01*	0.038*	-	-	Unable to calculate average/median due to high number of non detect values (2/2)
GWN-16-25	Arsenic - Dissolved	3	0.005*	0.038*	-	-	Unable to calculate average/median due to high number of non detect values (3/3)
GWN-17-51	Arsenic - Dissolved	6	0.01*	0.038*	-	-	Unable to calculate average/median due to high number of non detect values (6/6)
McMurray Formations							
CVE-10-05-TW	Arsenic - Dissolved	2	0.0002*	0.0003	-	-	Unable to calculate average/median due to high number of non detect values (1/2)

APPENDIX C1

SUMMARY STATISTICS FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Count	Minimum	Maximum	Average	Median	Notes
Arsenic - Total							
Surficial Sands							
AGS-01-WT	Arsenic - Total	0	-	-	-	-	
AGS-02-20	Arsenic - Total	3	0.00076	0.0071	0.005	0.0071	
AGS-02-50	Arsenic - Total	0	-	-	-	-	
AGS-02-WT	Arsenic - Total	3	0.0027	0.0054	0.0037	0.003	
AGS-03-WT	Arsenic - Total	2	0.00125	0.00128	0.00127	0.00127	
CVE-BOR-01	Arsenic - Total	1	0.053	0.053	0.053	0.053	
CVE-BOR-02	Arsenic - Total	1	0.0021	0.0021	0.0021	0.0021	
GWN-01-74	Arsenic - Total	2	0.019	0.03	0.025	0.025	0.038 mg/L* (13-JUL-1976) removed due to high detection limit
GWN-07-55	Arsenic - Total	2	0.0063	0.023	0.014	0.014	
GWN-08-43	Arsenic - Total	3	0.0045	0.1	0.036	0.0045	
GWN-13-26	Arsenic - Total	2	0.0023	0.0047	0.0035	0.0035	0.038 mg/L* (19-JUL-1976) removed due to high detection limit
GWN-14-32	Arsenic - Total	2	0.0055	0.026	0.016	0.016	0.038 mg/L* (15-JUL-1976) removed due to high detection limit
GWN-16-22	Arsenic - Total	2	0.0025	0.008	0.0052	0.0052	0.038 mg/L* (18-JUL-1976) removed due to high detection limit
IOR-KRL-01	Arsenic - Total	7	0.0002*	0.0029	0.0014	0.0011	
IOR-KRL-03 (SS)	Arsenic - Total	6	0.00065	0.0044	0.0017	0.0013	
IOR-KRL-04 (SS)	Arsenic - Total	6	0.0011	0.0085	0.00394	0.003	0.088 mg/L (13-JUL-2012) removed as outlier
IOR-KRL-05 (SS)	Arsenic - Total	5	0.004	0.007	0.0058	0.0057	
IOR-KRL-06 (SS)	Arsenic - Total	7	0.0009	0.035	0.0092	0.0049	
IOR-KRL-07	Arsenic - Total	7	0.0004	0.022	0.0057	0.0015	
IOR-KRL-08	Arsenic - Total	6	0.0009	0.0097	0.0041	0.0034	0.026 mg/L (05-JUL-2012) removed as outlier
IOR-KRL-09	Arsenic - Total	6	0.0002*	0.0008	0.00037	0.00028	
IOR-KRL-10	Arsenic - Total	4	0.0007	0.003	0.0019	0.002	0.0074 mg/L (17-AUG-2012) removed as outlier
IOR-KRL-11	Arsenic - Total	5	0.0002	0.009	0.0034	0.0019	
TOT-EP-02 (SS)	Arsenic - Total	1	0.00064	0.00064	0.00064	0.00064	
Buried Channels and Valleys - Birch Channel							
AGS-02-97	Arsenic - Total	3	0.0004*	0.0004*	-	-	Unable to calculate average/median due to high number of non detect values (3/3)
AGS-03-17	Arsenic - Total	2	0.0004*	0.0058	-	-	Unable to calculate average/median due to high number of non detect values (1/2)
Buried Channels and Valleys - Thickwood Channel							
GWN-13-27	Arsenic - Total	2	0.0084	0.014	0.011	0.011	
Buried Channels and Valleys - Kearsy Channel							
GWN-08-44	Arsenic - Total	2	0.0004*	0.0041	-	-	Unable to calculate average/median due to high number of non detect values (1/2)
GWN-Shell-PW2-63	Arsenic - Total	2	0.00084	0.00096	0.0009	0.0009	
IOR-KRL-02	Arsenic - Total	6	0.0012	0.0054	0.0026	0.0023	
Grand Rapids Formations							
CVE-BOR-03	Arsenic - Total	1	0.003	0.003	0.003	0.003	
CVE-BOR-04	Arsenic - Total	0	-	-	-	-	
CVE-WW10-13	Arsenic - Total	1	0.038	0.038	0.038	0.038	
GWN-13-28	Arsenic - Total	2	0.0077	0.012	0.0096	0.0096	0.038 mg/L* (11-NOV-1976) removed due to high detection limit
Clearwater Formations							
AGS-02-108	Arsenic - Total	2	0.0033	0.168	0.086	0.086	
AGS-03-30	Arsenic - Total	2	0.0021	0.019	0.011	0.011	
GWN-08-45	Arsenic - Total	4	0.00153	0.038*	-	-	Unable to calculate average/median due to high number of non detect values (2/4)
GWN-14-33	Arsenic - Total	3	0.001*	0.038*	-	-	Unable to calculate average/median due to high number of non detect values (3/3)
McMurray Formation Basal Aquifer - Aquifer Management Unit 1							
CVE-02-04-LM	Arsenic - Total	1	0.0002*	0.0002*	-	-	Unable to calculate average/median due to high number of non detect values (1/1)
GWN-06-60	Arsenic - Total	3	0.001*	0.018	-	-	0.038 mg/L* (16-JUL-1976) removed due to high detection limit; Unable to calculate average/median due to high number of non detect values (1/3)
GWN-17-50	Arsenic - Total	2	0.00063	0.0033	0.002	0.002	0.038 mg/L* (13-JUL-1976) removed due to high detection limit

APPENDIX C1

SUMMARY STATISTICS FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Count	Minimum	Maximum	Average	Median	Notes
McMurray Formation Basal Aquifer - Aquifer Management Unit 2							
GWN-01-75	Arsenic - Total	2	0.0012	0.0036	0.0024	0.0024	0.038 mg/L* (13-JUL-1976) removed due to high detection limit
GWN-06-61	Arsenic - Total	2	0.001*	0.0017	-	-	0.038 mg/L* (16-JUL-1976) removed due to high detection limit; Unable to calculate average/median due to high number of non detect values (1/2)
GWN-07-56	Arsenic - Total	2	0.0014	0.0015	0.0014	0.0014	
GWN-07-57	Arsenic - Total	2	0.0005*	0.0028	-	-	0.038 mg/L* (18-JUL-1976) removed due to high detection limit; Unable to calculate average/median due to high number of non detect values (1/2)
GWN-08-46	Arsenic - Total	2	0.00064	0.00091	0.000078	0.00078	0.01 mg/L*, 0.038 mg/L* (23-FEB-1975, 16-JUL-1976) removed due to high detection limits
GWN-13-29	Arsenic - Total	0	-	-	-	-	
GWN-13-30	Arsenic - Total	0	-	-	-	-	
IOR-KRL-03 (BAS)	Arsenic - Total	6	0.0002*	0.001	0.00048	0.00026	
IOR-KRL-04 (BAS)	Arsenic - Total	6	0.0008	0.014	0.0059	0.0037	
IOR-KRL-05 (BAS)	Arsenic - Total	6	0.0013	0.0083	0.0036	0.0033	0.045 mg/L (14-OCT-2012) removed as outlier
SHL-ALB-01	Arsenic - Total	0	-	-	-	-	
SHL-ALB-02	Arsenic - Total	0	-	-	-	-	
SHL-ALB-03	Arsenic - Total	0	-	-	-	-	
SHL-JKP-01	Arsenic - Total	0	-	-	-	-	
McMurray Formation Basal Aquifer - Aquifer Management Unit 3							
CNR-H02-002	Arsenic - Total	0	-	-	-	-	
GWN-16-24	Arsenic - Total	3	0.0005*	0.038*	-	-	Unable to calculate average/median due to high number of non detect values (3/3)
TOT-EP-02 (BAS)	Arsenic - Total	0	-	-	-	-	
McMurray Formation Basal Aquifer - Aquifer Management Unit 4							
CNR-HRZ-01	Arsenic - Total	0	-	-	-	-	
GWN-01-76	Arsenic - Total	3	0.01*	0.038*	-	-	Unable to calculate average/median due to high number of non detect values (3/3)
SUN-MW-07-110	Arsenic - Total	0	-	-	-	-	
SUN-MW-07-111	Arsenic - Total	0	-	-	-	-	
SUN-MW-07-112	Arsenic - Total	0	-	-	-	-	
Prairie Evaporite/Beverhill Lake/Methy (Keg River) Formations							
CNR-H02-007	Arsenic - Total	0	-	-	-	-	
GWN-01-77	Arsenic - Total	1	0.01*	0.01*	-	-	Unable to calculate average/median due to high number of non detect values (1/1)
GWN-01-78	Arsenic - Total	0	-	-	-	-	
GWN-01-79	Arsenic - Total	1	0.038*	0.038*	-	-	Unable to calculate average/median due to high number of non detect values (1/1)
GWN-06-62	Arsenic - Total	1	0.038*	0.038*	-	-	Unable to calculate average/median due to high number of non detect values (1/1)
GWN-07-58	Arsenic - Total	1	0.01*	0.01*	-	-	Unable to calculate average/median due to high number of non detect values (1/1)
GWN-07-59	Arsenic - Total	2	0.01*	0.0024	-	-	Unable to calculate average/median due to high number of non detect values (1/2)
GWN-08-47	Arsenic - Total	0	-	-	-	-	
GWN-08-48	Arsenic - Total	1	0.038*	0.038*	-	-	Unable to calculate average/median due to high number of non detect values (1/1)
GWN-14-35	Arsenic - Total	1	0.0022	0.0022	0.0022	0.0022	
GWN-14-36	Arsenic - Total	1	0.01*	0.01*	-	-	Unable to calculate average/median due to high number of non detect values (1/1)
GWN-16-25	Arsenic - Total	1	0.038*	0.038*	-	-	Unable to calculate average/median due to high number of non detect values (1/1)
GWN-17-51	Arsenic - Total	3	0.0005*	0.038*	-	-	Unable to calculate average/median due to high number of non detect values (3/3)
McMurray Formations							
CVE-10-05-TW	Arsenic - Total	2	0.0006	0.0006	0.0006	0.0006	

APPENDIX C1

SUMMARY STATISTICS FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Count	Minimum	Maximum	Average	Median	Notes
Silica - Dissolved							
Surficial Sands							
AGS-01-WT	Silica - Dissolved	1	19.70	19.70	19.70	19.70	
AGS-02-20	Silica - Dissolved	5	13.49	16.70	15.67	16.28	
AGS-02-50	Silica - Dissolved	1	17.56	17.56	17.56	17.56	
AGS-02-WT	Silica - Dissolved	5	14.56	19.40	16.41	15.80	
AGS-03-WT	Silica - Dissolved	5	14.35	16.08	15.11	14.80	
CVE-BOR-01	Silica - Dissolved	5	9.64	13.28	12.21	12.64	
CVE-BOR-02	Silica - Dissolved	4	9.42	15.85	11.78	10.93	1.29 mg/L (23-JAN-2008) removed as outlier
GWN-01-74	Silica - Dissolved	6	5.78	6.58	6.01	5.84	
GWN-07-55	Silica - Dissolved	3	6.15	8.23	7.00	6.62	
GWN-08-43	Silica - Dissolved	5	1.07	4.58	2.32	2.01	
GWN-13-26	Silica - Dissolved	6	4.74	9.85	6.73	6.06	
GWN-14-32	Silica - Dissolved	5	0.43	8.35	3.78	3.55	11 mg/L* (04-AUG-2014) removed due to high detection limit
GWN-16-22	Silica - Dissolved	7	2.05	16.13	9.81	11.00	
IOR-KRL-01	Silica - Dissolved	8	10.28	13.02	11.33	11.46	
IOR-KRL-03 (SS)	Silica - Dissolved	6	6.85	8.14	7.40	7.31	
IOR-KRL-04 (SS)	Silica - Dissolved	8	17.99	23.56	20.73	20.56	
IOR-KRL-05 (SS)	Silica - Dissolved	4	12.64	13.28	13.01	13.06	
IOR-KRL-06 (SS)	Silica - Dissolved	5	14.35	17.13	15.46	14.78	
IOR-KRL-07	Silica - Dissolved	5	12.21	14.78	13.62	14.14	
IOR-KRL-08	Silica - Dissolved	5	18.85	25.70	22.62	23.56	
IOR-KRL-09	Silica - Dissolved	5	9.64	10.92	10.32	10.07	
IOR-KRL-10	Silica - Dissolved	5	13.92	16.28	14.99	14.99	
IOR-KRL-11	Silica - Dissolved	5	11.14	13.49	12.12	11.99	
TOT-EP-02 (SS)	Silica - Dissolved	0	-	-	-	-	
Buried Channels and Valleys - Birch Channel							
AGS-02-97	Silica - Dissolved	5	11.78	13.71	12.96	13.20	
AGS-03-17	Silica - Dissolved	5	17.99	20.50	18.97	19.00	
Buried Channels and Valleys - Thickwood Channel							
GWN-13-27	Silica - Dissolved	5	1.05	13.71	5.63	2.27	
Buried Channels and Valleys - Kearn Channel							
GWN-08-44	Silica - Dissolved	4	4.12	13.88	10.71	12.43	
GWN-Shell-PW2-63	Silica - Dissolved	6	1.43	22.60	15.61	21.25	
IOR-KRL-02	Silica - Dissolved	4	14.99	16.28	15.64	15.64	
Grand Rapids Formations							
CVE-BOR-03	Silica - Dissolved	5	0.43	5.35	1.80	0.64	
CVE-BOR-04	Silica - Dissolved	0	-	-	-	-	
CVE-WW10-13	Silica - Dissolved	1	2.78	2.78	2.78	2.78	
GWN-13-28	Silica - Dissolved	5	0.52	5.12	3.33	4.58	
Clearwater Formations							
AGS-02-108	Silica - Dissolved	3	8.30	10.71	9.67	10.00	
AGS-03-30	Silica - Dissolved	3	7.92	8.76	8.39	8.48	
GWN-08-45	Silica - Dissolved	4	5.10	6.64	5.77	5.68	1.07 mg/L (30-SEP-2013) removed as outlier
GWN-14-33	Silica - Dissolved	5	1.1*	6.96	4.68	4.78	
McMurray Formation Basal Aquifer - Aquifer Management Unit 1							
CVE-02-04-LM	Silica - Dissolved	1	6.43	6.43	6.43	6.43	
GWN-06-60	Silica - Dissolved	7	8.78	11.70	10.12	10.11	
GWN-17-50	Silica - Dissolved	7	5.91	11.70	9.10	9.51	

APPENDIX C1

SUMMARY STATISTICS FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Count	Minimum	Maximum	Average	Median	Notes
McMurray Formation Basal Aquifer - Aquifer Management Unit 2							
GWN-01-75	Silica - Dissolved	3	3.41	9.28	6.15	5.76	
GWN-06-61	Silica - Dissolved	6	2.87	6.75	4.77	4.79	
GWN-07-56	Silica - Dissolved	2	0.13	3.19	1.66	1.66	
GWN-07-57	Silica - Dissolved	4	3.83	6.18	5.27	5.54	
GWN-08-46	Silica - Dissolved	4	0.11*	0.21*	-	-	Unable to calculate average/median due to high number of non detect values (4/4)
GWN-13-29	Silica - Dissolved	0	-	-	-	-	
GWN-13-30	Silica - Dissolved	0	-	-	-	-	
IOR-KRL-03 (BAS)	Silica - Dissolved	4	4.93	6.00	5.25	5.04	39.19 mg/L (15-MAR-2008) removed as outlier
IOR-KRL-04 (BAS)	Silica - Dissolved	5	4.50	6.13	5.08	4.93	
IOR-KRL-05 (BAS)	Silica - Dissolved	6	4.93	6.85	5.81	5.68	
SHL-ALB-01	Silica - Dissolved	1	4.93	4.93	4.93	4.93	
SHL-ALB-02	Silica - Dissolved	1	4.71	4.71	4.71	4.71	
SHL-ALB-03	Silica - Dissolved	1	7.50	7.50	7.50	7.50	
SHL-JKP-01	Silica - Dissolved	3	4.71	5.14	4.85	4.71	
McMurray Formation Basal Aquifer - Aquifer Management Unit 3							
CNR-H02-002	Silica - Dissolved	2	1.1*	21*	-	-	Unable to calculate average/median due to high number of non detect values (2/2)
GWN-16-24	Silica - Dissolved	6	1.73	11*	-	-	Unable to calculate average/median due to high number of non detect values (4/6)
TOT-EP-02 (BAS)	Silica - Dissolved	0	-	-	-	-	
McMurray Formation Basal Aquifer - Aquifer Management Unit 4							
CNR-HRZ-01	Silica - Dissolved	3	1.1*	21*	-	-	Unable to calculate average/median due to high number of non detect values (3/3)
GWN-01-76	Silica - Dissolved	4	10.37	110*	-	-	0.21 mg/L* (27-OCT-2012) removed as outlier; Unable to calculate average/median due to high number of non detect values (3/4)
SUN-MW-07-110	Silica - Dissolved	0	-	-	-	-	
SUN-MW-07-111	Silica - Dissolved	0	-	-	-	-	
SUN-MW-07-112	Silica - Dissolved	0	-	-	-	-	
Prairie Evaporite/Beverhill Lake/Methy (Keg River) Formations							
CNR-H02-007	Silica - Dissolved	0	-	-	-	-	
GWN-01-77	Silica - Dissolved	3	0.21*	110*	-	-	Unable to calculate average/median due to high number of non detect values (3/3)
GWN-01-78	Silica - Dissolved	1	0.73	0.73	0.73	0.73	
GWN-01-79	Silica - Dissolved	1	4.01	4.01	4.01	4.01	
GWN-06-62	Silica - Dissolved	4	1.1*	9.57	5.37	5.66	
GWN-07-58	Silica - Dissolved	2	11*	11*	-	-	Unable to calculate average/median due to high number of non detect values (2/2)
GWN-07-59	Silica - Dissolved	2	0.53*	0.53*	-	-	Unable to calculate average/median due to high number of non detect values (2/2)
GWN-08-47	Silica - Dissolved	2	5.14	6.32	5.73	5.73	
GWN-08-48	Silica - Dissolved	2	0.66	0.92	0.79	0.79	
GWN-14-35	Silica - Dissolved	2	0.53*	11*	-	-	Unable to calculate average/median due to high number of non detect values (2/2)
GWN-14-36	Silica - Dissolved	2	11*	11.31	-	-	Unable to calculate average/median due to high number of non detect values (1/2)
GWN-16-25	Silica - Dissolved	2	0.26	16.11	8.19	8.19	
GWN-17-51	Silica - Dissolved	6	6.64	11*	-	-	Unable to calculate average/median due to high number of non detect values (4/6)
McMurray Formations							
CVE-10-05-TW	Silica - Dissolved	2	11.35	11.35	11.35	11.35	

APPENDIX C1

SUMMARY STATISTICS FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Count	Minimum	Maximum	Average	Median	Notes
Naphthenic Acids							
Surficial Sands							
AGS-01-WT	Naphthenic Acids	1	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (1/1)
AGS-02-20	Naphthenic Acids	8	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (8/8)
AGS-02-50	Naphthenic Acids	1	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (1/1)
AGS-02-WT	Naphthenic Acids	7	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (7/7)
AGS-03-WT	Naphthenic Acids	7	1*	1	-	-	Unable to calculate average/median due to high number of non detect values (6/7)
CVE-BOR-01	Naphthenic Acids	4	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (4/4)
CVE-BOR-02	Naphthenic Acids	4	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (4/4)
GWN-01-74	Naphthenic Acids	6	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (6/6)
GWN-07-55	Naphthenic Acids	4	1*	1.3	-	-	Unable to calculate average/median due to high number of non detect values (2/4)
GWN-08-43	Naphthenic Acids	5	1*	1.6	0.97	1	
GWN-13-26	Naphthenic Acids	7	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (7/7)
GWN-14-32	Naphthenic Acids	5	1*	1*	-	-	46.7 mg/L (04-AUG-2014) removed as outlier
GWN-16-22	Naphthenic Acids	8	1*	5.9	2.53	2.3	
IOR-KRL-01	Naphthenic Acids	9	1*	7.7	-	-	Unable to calculate average/median due to high number of non detect values (7/9)
IOR-KRL-03 (SS)	Naphthenic Acids	7	1*	1.2	-	-	Unable to calculate average/median due to high number of non detect values (6/7)
IOR-KRL-04 (SS)	Naphthenic Acids	8	1*	1.1	-	-	Unable to calculate average/median due to high number of non detect values (7/8)
IOR-KRL-05 (SS)	Naphthenic Acids	5	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (5/5)
IOR-KRL-06 (SS)	Naphthenic Acids	7	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (7/7)
IOR-KRL-07	Naphthenic Acids	7	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (7/7)
IOR-KRL-08	Naphthenic Acids	7	1*	1.8	-	-	Unable to calculate average/median due to high number of non detect values (5/7)
IOR-KRL-09	Naphthenic Acids	7	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (7/7)
IOR-KRL-10	Naphthenic Acids	5	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (5/5)
IOR-KRL-11	Naphthenic Acids	5	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (5/5)
TOT-EP-02 (SS)	Naphthenic Acids	1	1.1	1.1	1.1	1.1	
Buried Channels and Valleys - Birch Channel							
AGS-02-97	Naphthenic Acids	7	1*	1.1	-	-	Unable to calculate average/median due to high number of non detect values (6/7)
AGS-03-17	Naphthenic Acids	7	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (7/7)
Buried Channels and Valleys - Thickwood Channel							
GWN-13-27	Naphthenic Acids	7	1*	1.1	-	-	Unable to calculate average/median due to high number of non detect values (6/7)
Buried Channels and Valleys - Kearn Channel							
GWN-08-44	Naphthenic Acids	4	1*	1.3	1.01	1	
GWN-Shell-PW2-63	Naphthenic Acids	5	1*	1.7	-	-	Unable to calculate average/median due to high number of non detect values (4/5)
IOR-KRL-02	Naphthenic Acids	6	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (6/6)
Grand Rapids Formations							
CVE-BOR-03	Naphthenic Acids	4	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (4/4)
CVE-BOR-04	Naphthenic Acids	0	-	-	-	-	
CVE-WW10-13	Naphthenic Acids	0	-	-	-	-	
GWN-13-28	Naphthenic Acids	4	1*	1.1	-	-	Unable to calculate average/median due to high number of non detect values (3/4)
Clearwater Formations							
AGS-02-108	Naphthenic Acids	4	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (4/4)
AGS-03-30	Naphthenic Acids	5	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (5/5)
GWN-08-45	Naphthenic Acids	5	1*	1	-	-	Unable to calculate average/median due to high number of non detect values (3/5)
GWN-14-33	Naphthenic Acids	4	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (4/4)
McMurray Formation Basal Aquifer - Aquifer Management Unit 1							
CVE-02-04-LM	Naphthenic Acids	0	-	-	-	-	
GWN-06-60	Naphthenic Acids	8	1*	1.8	-	-	Unable to calculate average/median due to high number of non detect values (6/8)
GWN-17-50	Naphthenic Acids	6	1*	5.4	2.97	2.9	

APPENDIX C1

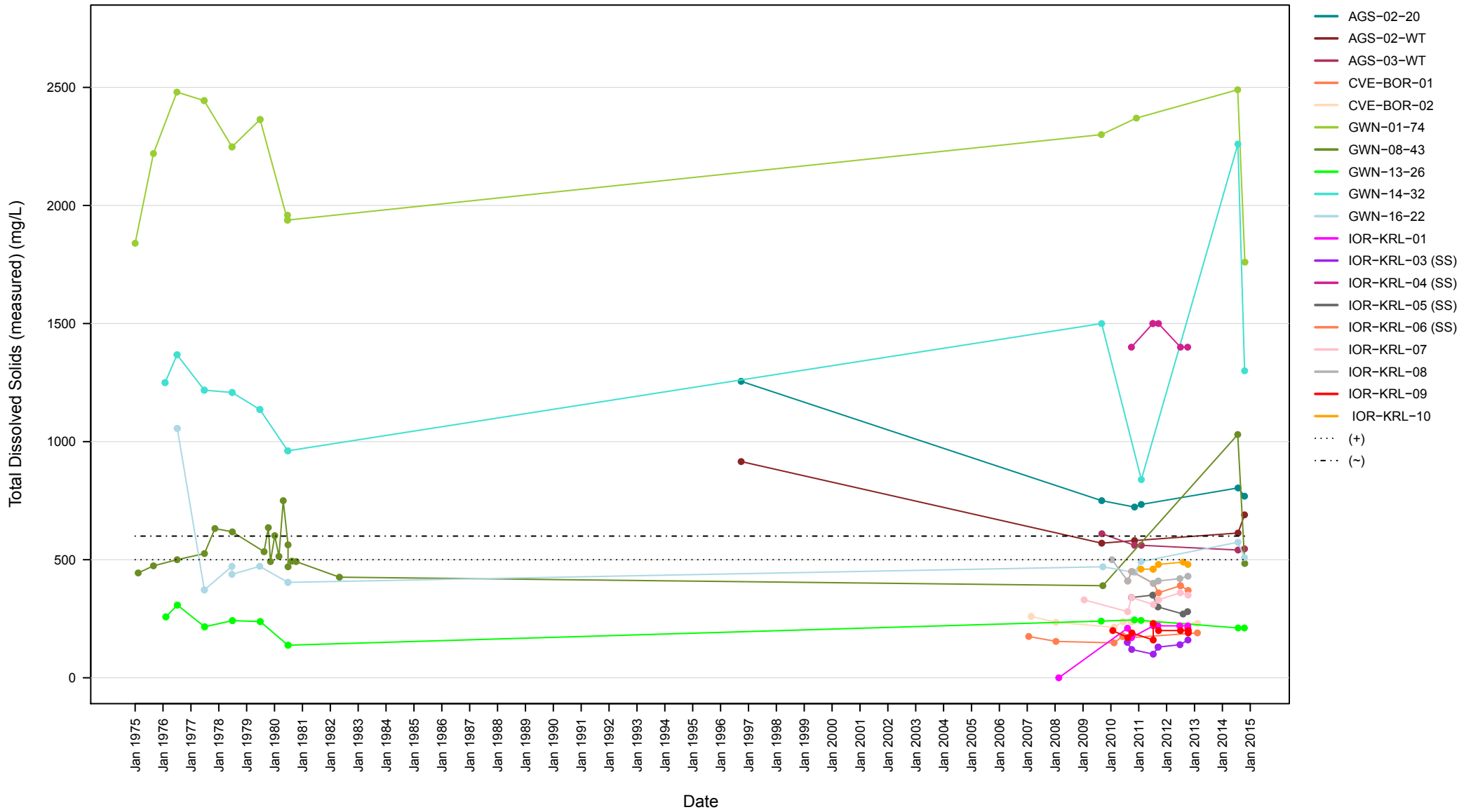
SUMMARY STATISTICS FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Count	Minimum	Maximum	Average	Median	Notes	
McMurray Formation Basal Aquifer - Aquifer Management Unit 2								
GWN-01-75	Naphthenic Acids	3	5.9	10.9	8.67	9.2	Unable to calculate average/median due to high number of non detect values (2/3)	
GWN-06-61	Naphthenic Acids	6	25	56.2	44.32	46.25		
GWN-07-56	Naphthenic Acids	2	14	26	20	20		
GWN-07-57	Naphthenic Acids	6	6.2	17.4	12.1	12.3		
GWN-08-46	Naphthenic Acids	3	1*	1.1	-	-		
GWN-13-29	Naphthenic Acids	0	-	-	-	-		
GWN-13-30	Naphthenic Acids	0	-	-	-	-		
IOR-KRL-03 (BAS)	Naphthenic Acids	8	3	13	9.59	10		
IOR-KRL-04 (BAS)	Naphthenic Acids	6	4.6	7.1	5.72	5.55		
IOR-KRL-05 (BAS)	Naphthenic Acids	10	6	17	9.16	7.4		
SHL-ALB-01	Naphthenic Acids	5	9.1	20.3	16.86	18.2		
SHL-ALB-02	Naphthenic Acids	3	11.4	15.6	13.57	13.7		
SHL-ALB-03	Naphthenic Acids	3	20	22	21	21		
SHL-JKP-01	Naphthenic Acids	10	0*	12.7	7.51	8.05		
McMurray Formation Basal Aquifer - Aquifer Management Unit 3								
CNR-H02-002	Naphthenic Acids	7	1*	5.1	2.67	2.9		
GWN-16-24	Naphthenic Acids	5	4.6	16.1	11.26	11.7		
TOT-EP-02 (BAS)	Naphthenic Acids	0	-	-	-	-		
McMurray Formation Basal Aquifer - Aquifer Management Unit 4								
CNR-HRZ-01	Naphthenic Acids	10	1*	2.5	1.47	1.35	Unable to calculate average/median due to high number of non detect values (4/4)	
GWN-01-76	Naphthenic Acids	4	1*	1*	-	-		
SUN-MW-07-110	Naphthenic Acids	0	-	-	-	-		
SUN-MW-07-111	Naphthenic Acids	0	-	-	-	-		
SUN-MW-07-112	Naphthenic Acids	0	-	-	-	-		
Prairie Evaporite/Beverhill Lake/Methy (Keg River) Formations								
CNR-H02-007	Naphthenic Acids	1	7	7	7	7	Unable to calculate average/median due to high number of non detect values (1/3)	
GWN-01-77	Naphthenic Acids	3	1*	2.5	-	-		
GWN-01-78	Naphthenic Acids	1	1*	1*	-	-	Unable to calculate average/median due to high number of non detect values (1/1)	
GWN-01-79	Naphthenic Acids	0	-	-	-	-	Unable to calculate average/median due to high number of non detect values (2/2)	
GWN-06-62	Naphthenic Acids	3	2.2	26.4	17.63	24.3		
GWN-07-58	Naphthenic Acids	2	2.2	3.5	2.85	2.85		
GWN-07-59	Naphthenic Acids	2	4	4.9	4.45	4.45		
GWN-08-47	Naphthenic Acids	1	18.3	18.3	18.3	18.3		
GWN-08-48	Naphthenic Acids	2	2.4	4.3	3.35	3.35		
GWN-14-35	Naphthenic Acids	2	1*	1*	-	-		
GWN-14-36	Naphthenic Acids	1	6.6	6.6	6.6	6.6		
GWN-16-25	Naphthenic Acids	0	-	-	-	-		
GWN-17-51	Naphthenic Acids	5	1*	10.1	6.11	7.3		
McMurray Formations								
CVE-10-05-TW	Naphthenic Acids	1	1.2	1.2	1.2	1.2		

* Value below detection limit

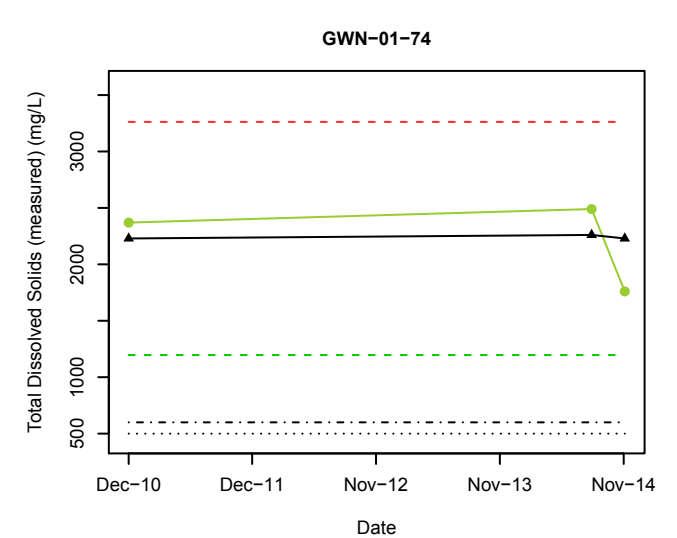
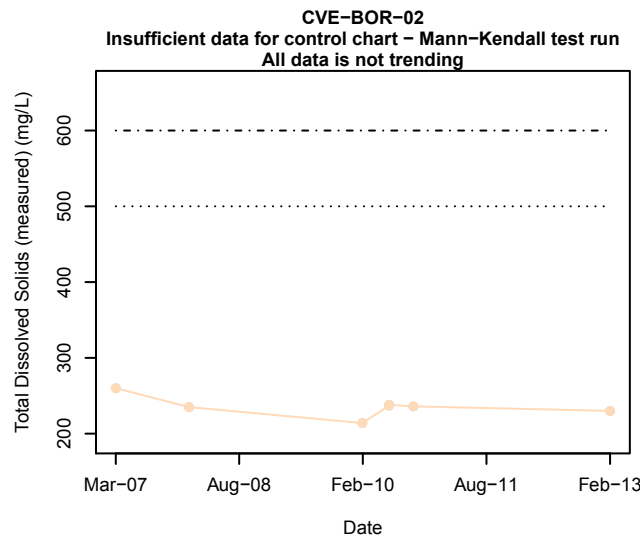
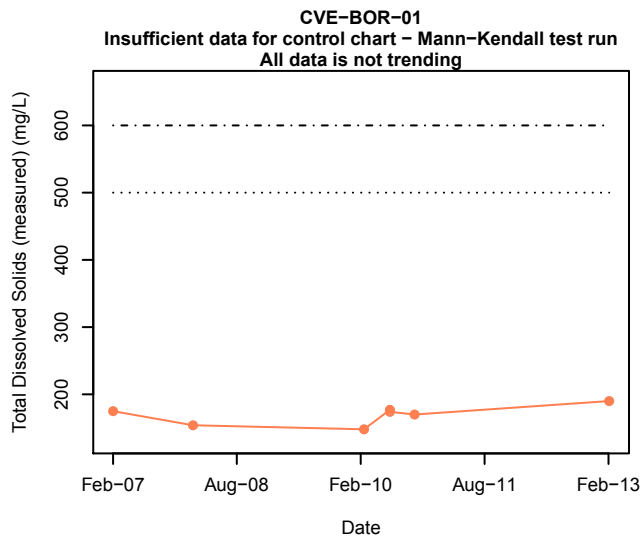
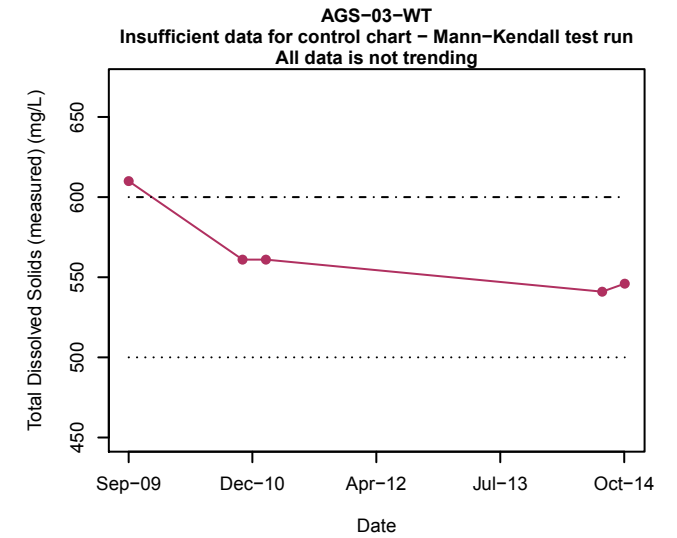
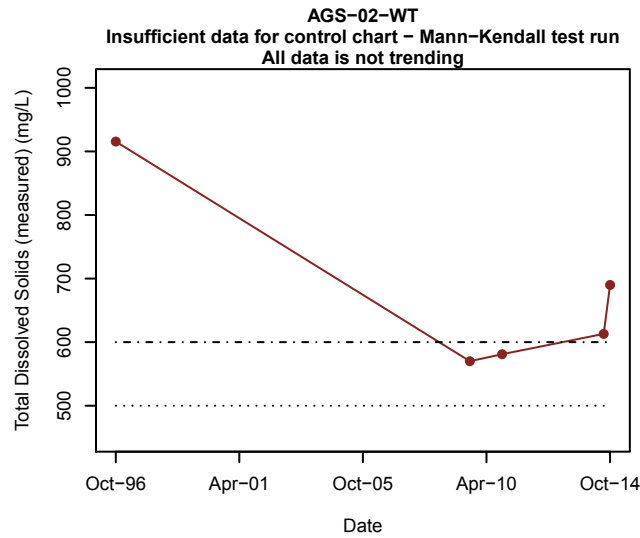
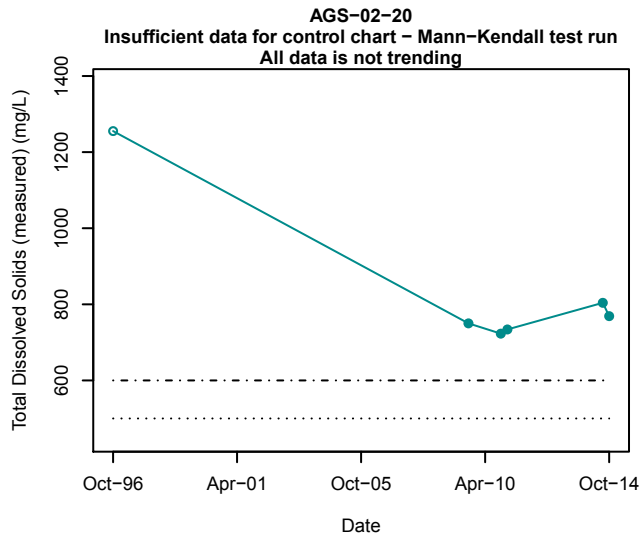
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Historical Total Dissolved Solid Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 500 mg/L
 (-) Interim Quality Triggers for NAOS- Surficial Deposits = 600 mg/L

Appendix C2a

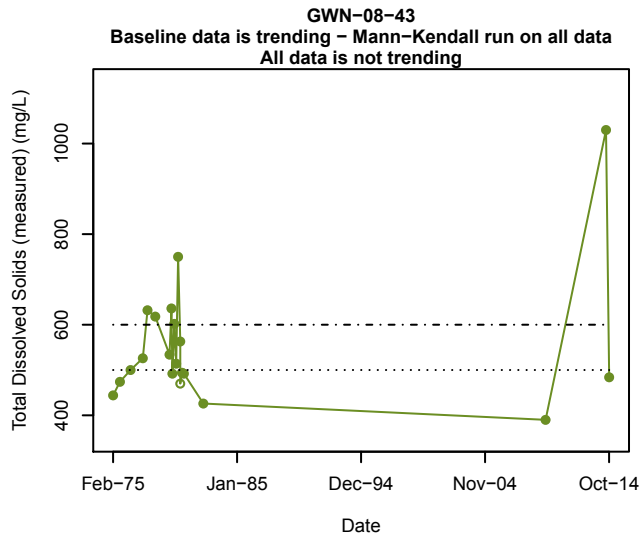
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Total Dissolved Solids



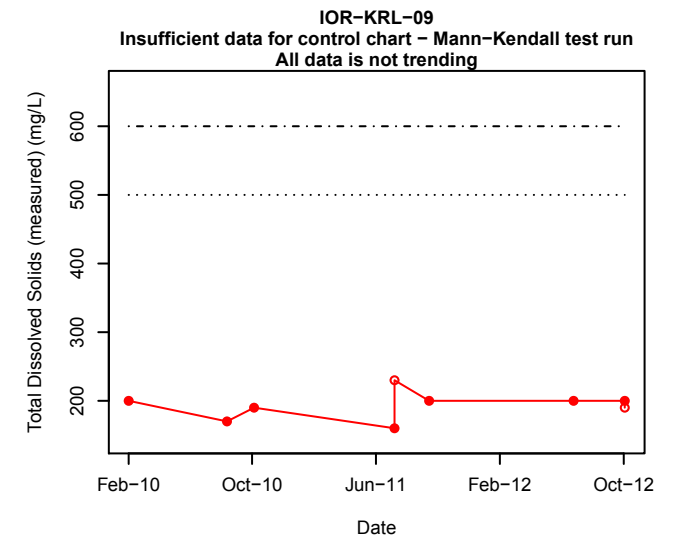
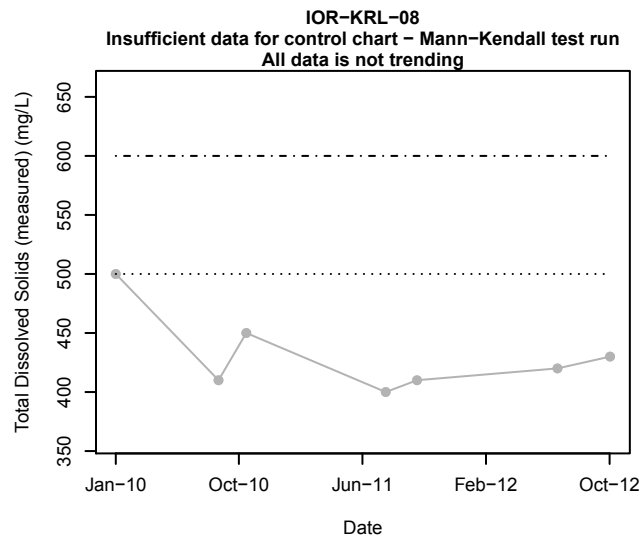
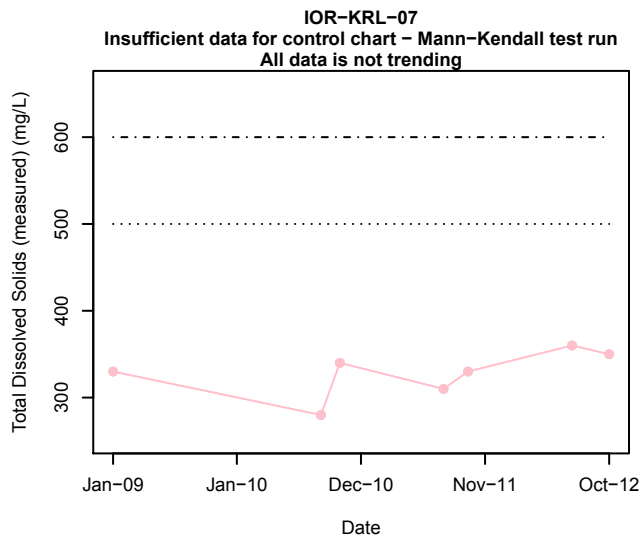
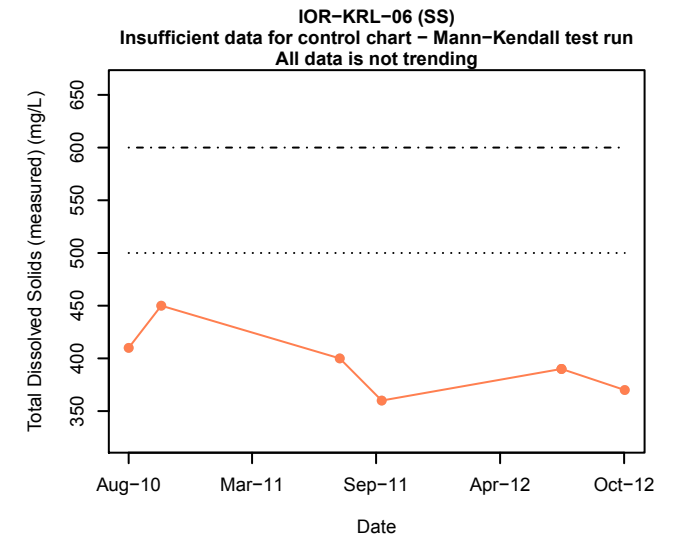
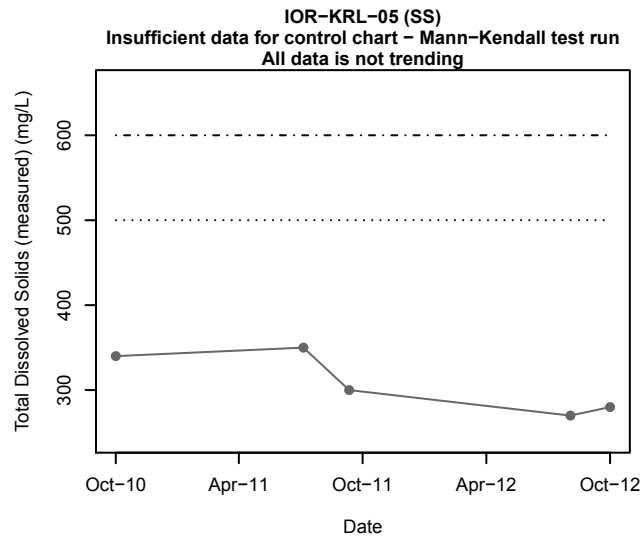
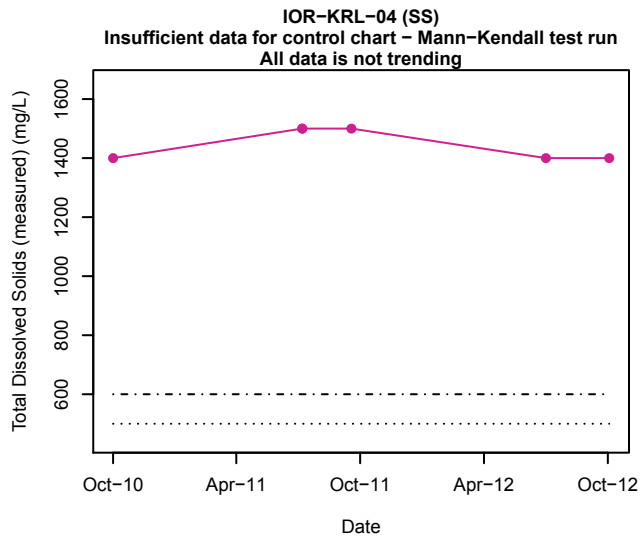
- Total Dissolved Solids (measured)
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 500 mg/L
- ⋯ Interim Quality Triggers for NAOS- Surficial Deposits = 600 mg/L
- ▲ CUSUM
- Well upper control limit
- Well lower control limit

Appendix C2b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Total Dissolved Solids



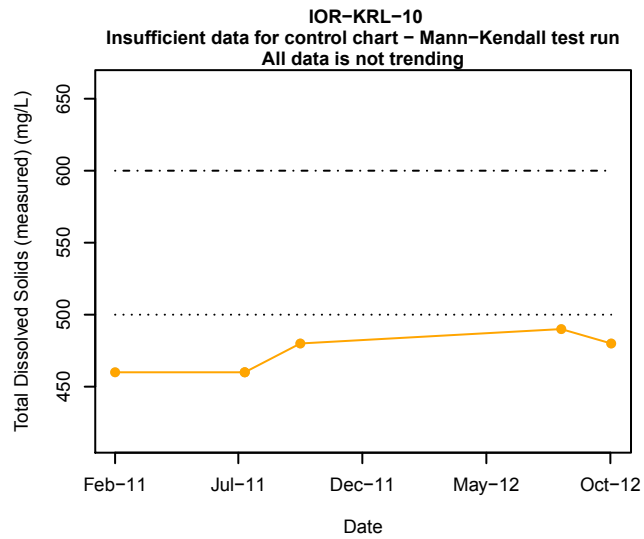
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Total Dissolved Solids



- Total Dissolved Solids (measured)
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 500 mg/L
- ⋯ Interim Quality Triggers for NAOS- Surficial Deposits = 600 mg/L
- ▲ CUSUM
- Well upper control limit
- Well lower control limit

Appendix C2b

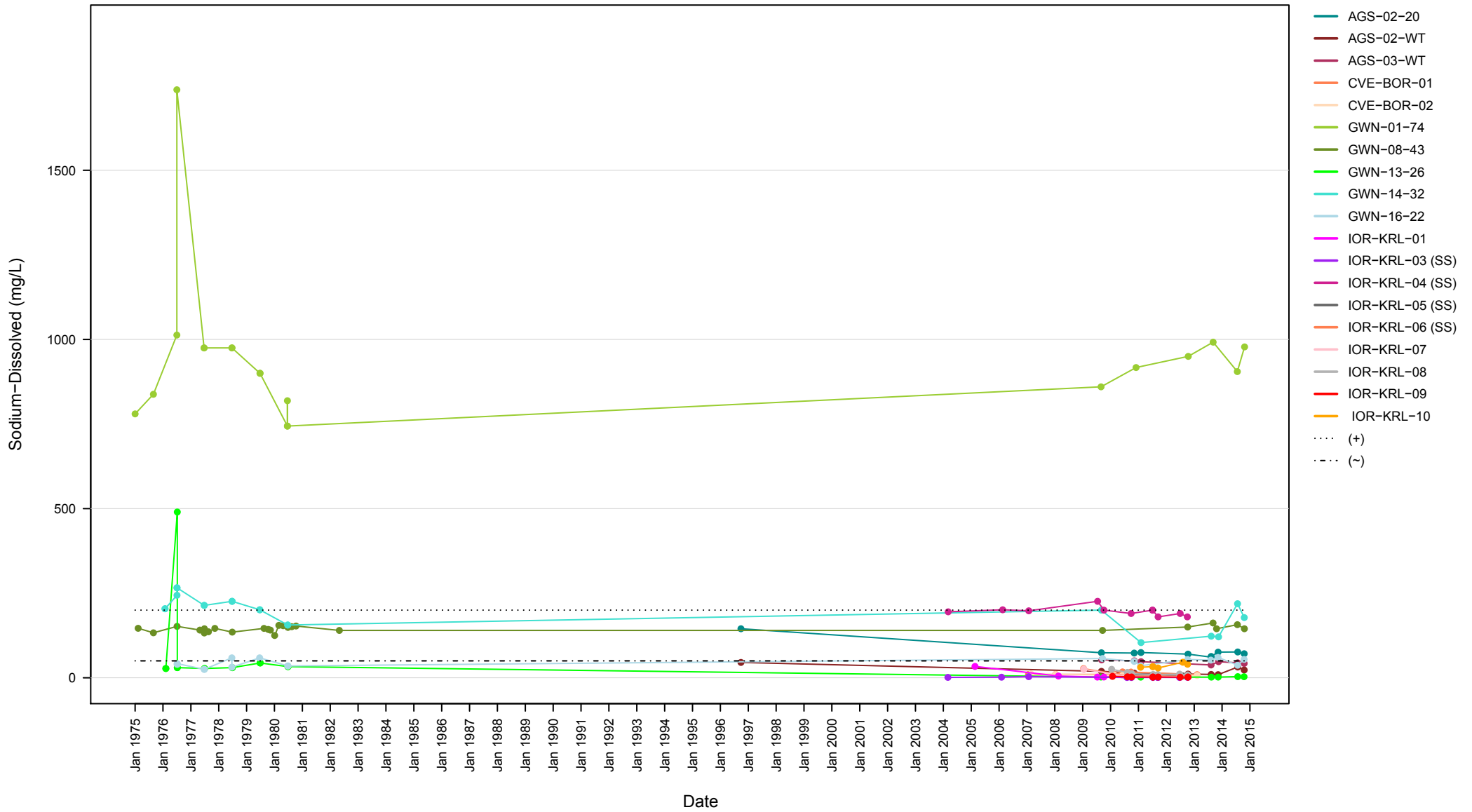
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Total Dissolved Solids



- Total Dissolved Solids (measured)
- Data point not used in analysis
- Alberta Tier 1-Natural Areas -2010 = 500 mg/L
- Interim Quality Triggers for NAOS- Surficial Deposits = 600 mg/L
- ▲ CUSUM
- - - Well upper control limit
- - - Well lower control limit

Appendix C2b

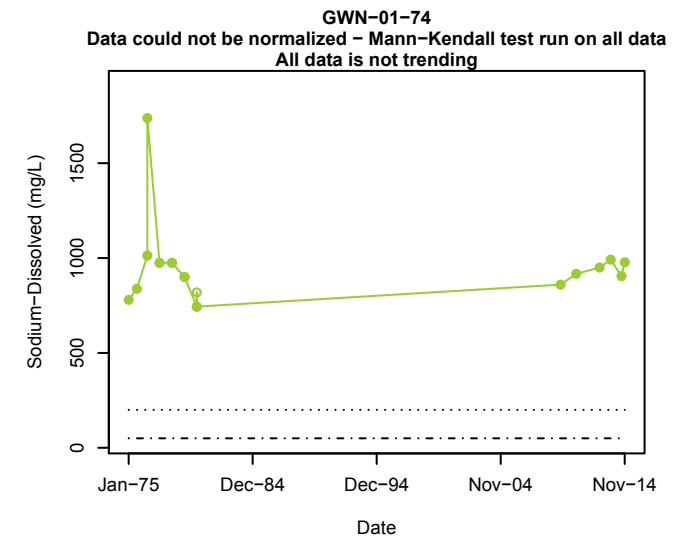
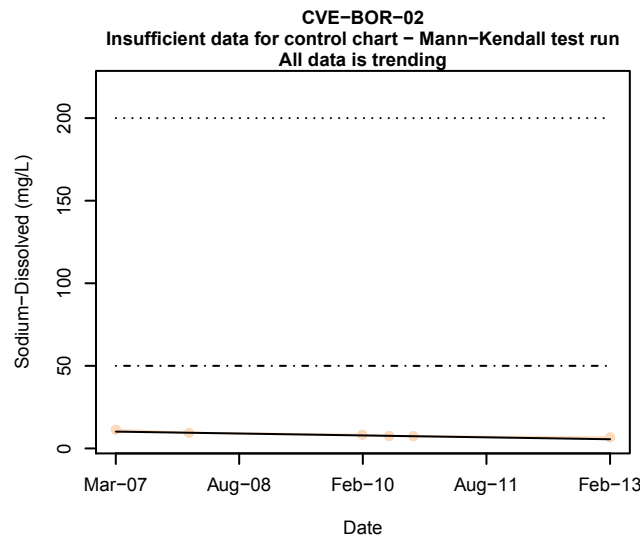
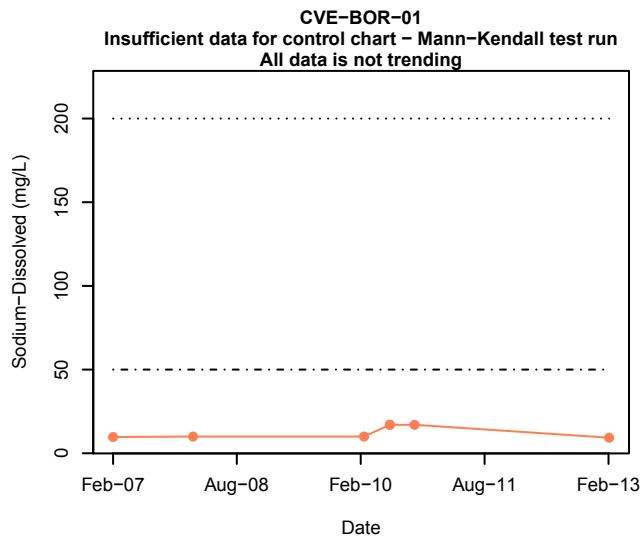
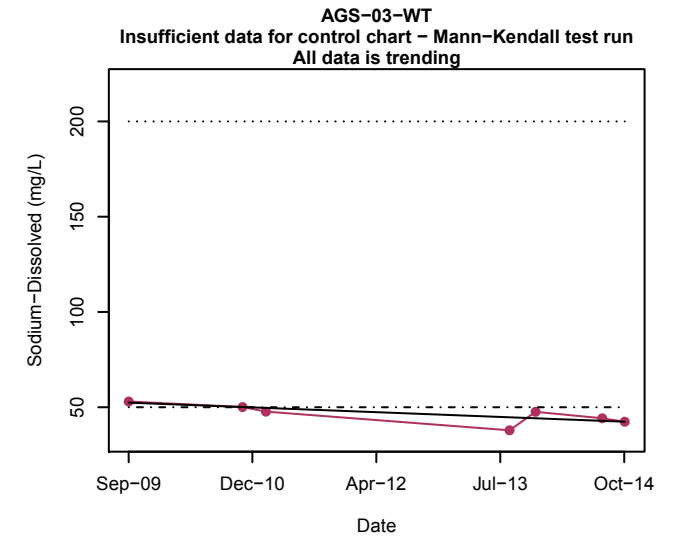
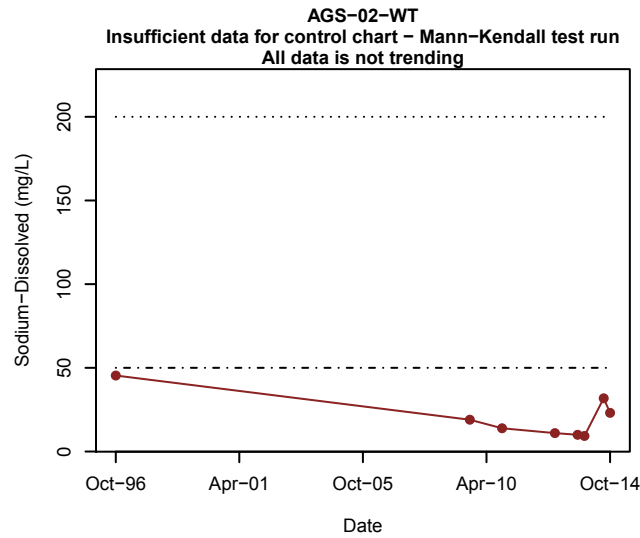
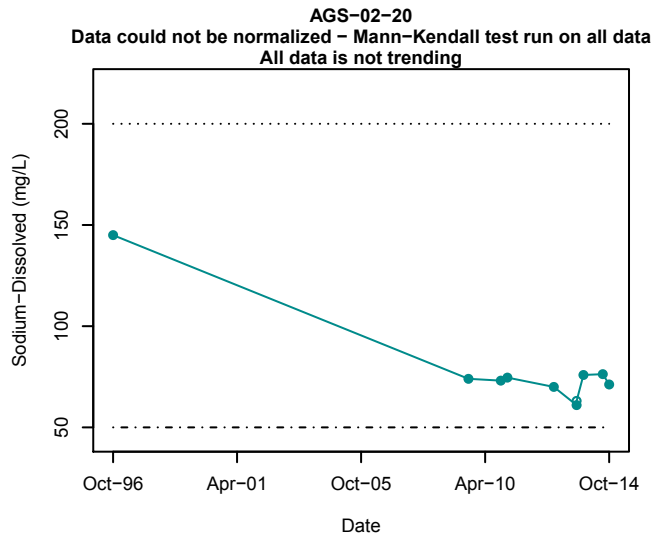
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Historical Dissolved Sodium Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 200 mg/L
 (-) Interim Quality Triggers for NAOS- Surficial Deposits = 50 mg/L

Appendix C3a

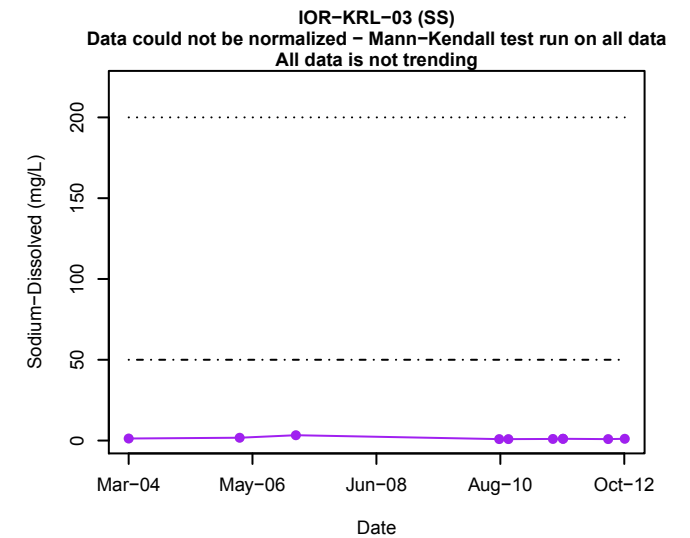
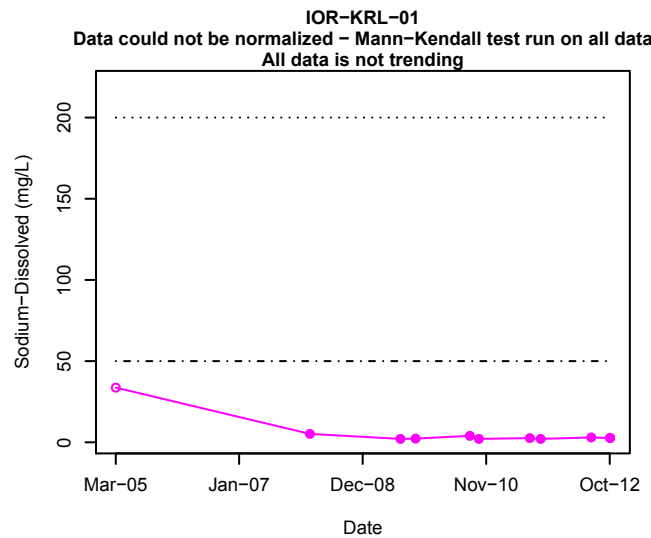
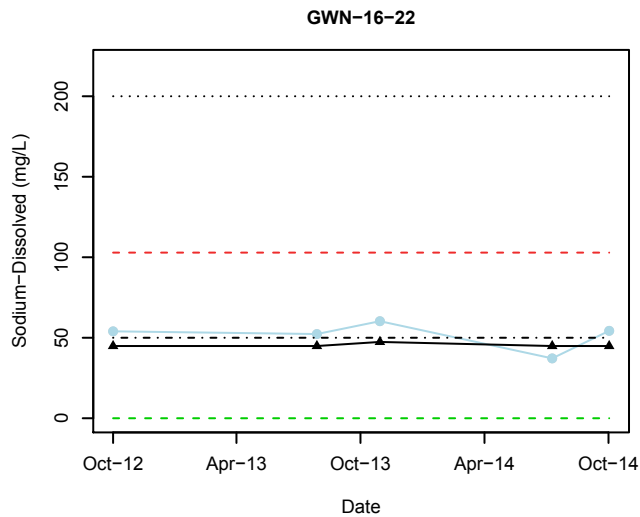
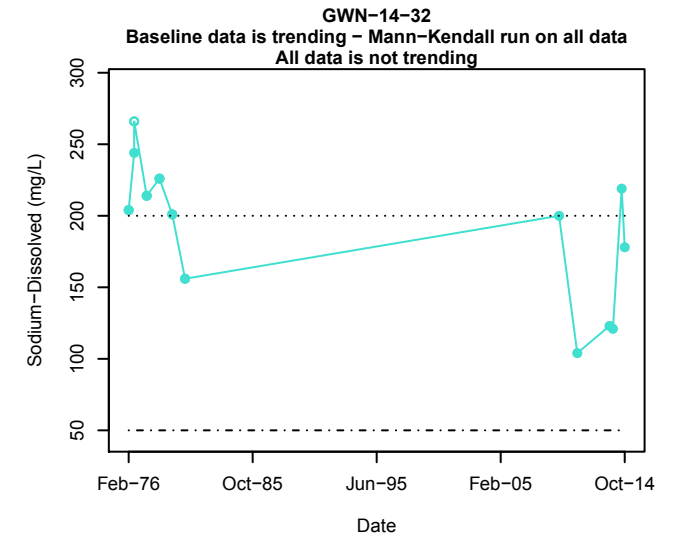
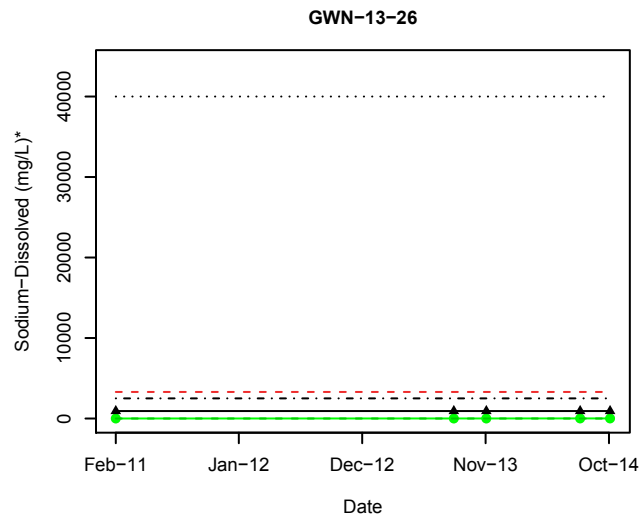
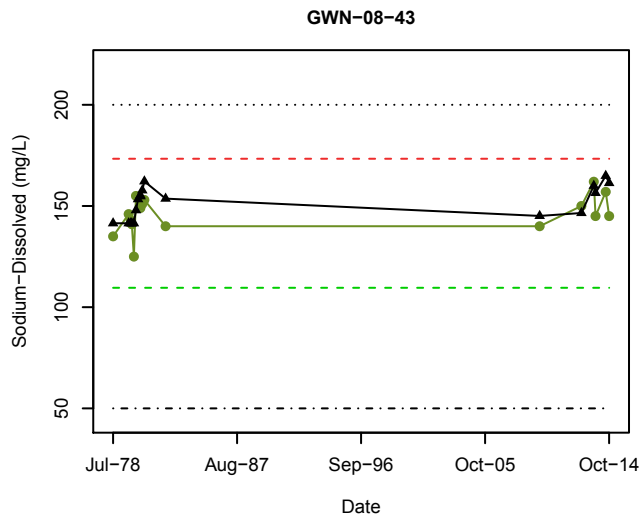
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Dissolved Sodium



- Sodium-Dissolved
- Sen slope
- Data point not used in analysis
- Alberta Tier 1-Natural Areas -2010 = 200 mg/L
- Interim Quality Triggers for NAOS- Surficial Deposits = 50 mg/L

Appendix C3b

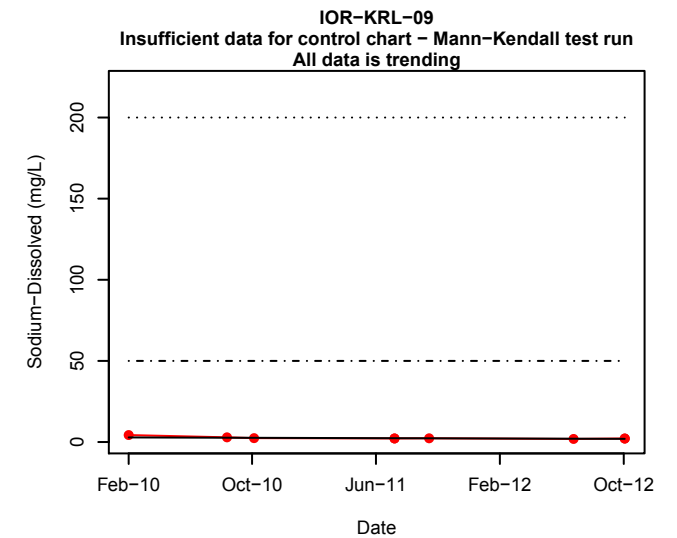
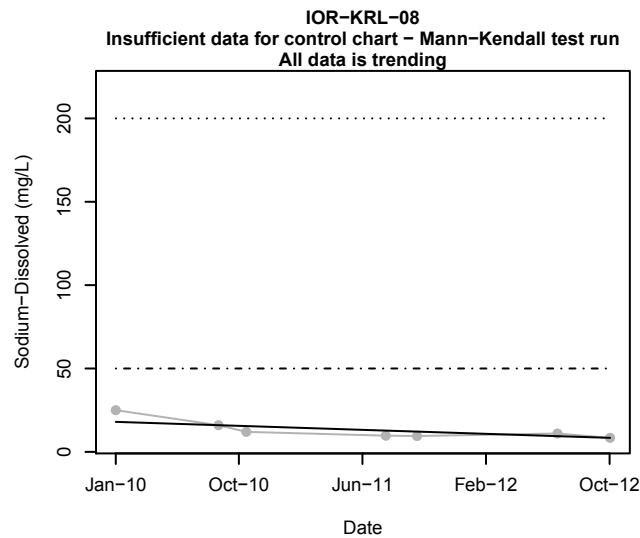
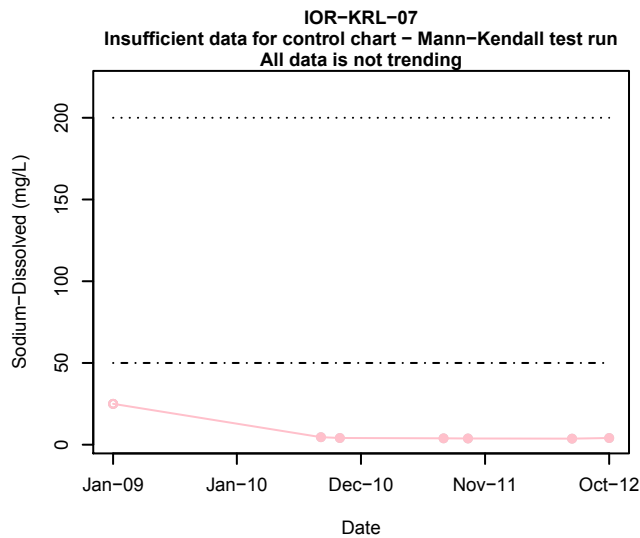
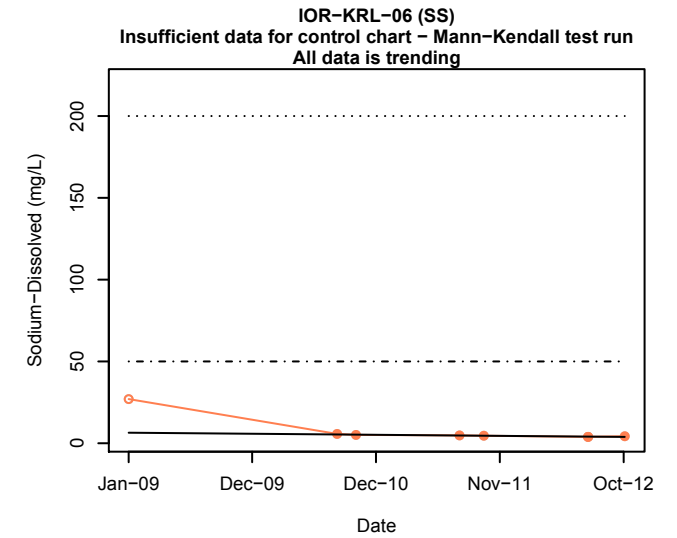
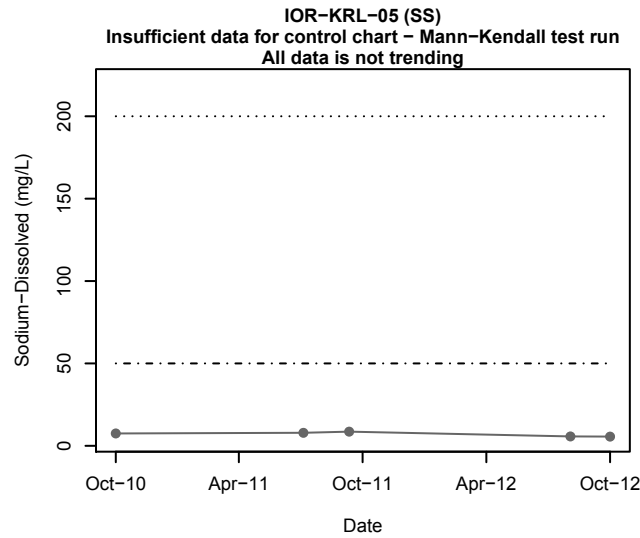
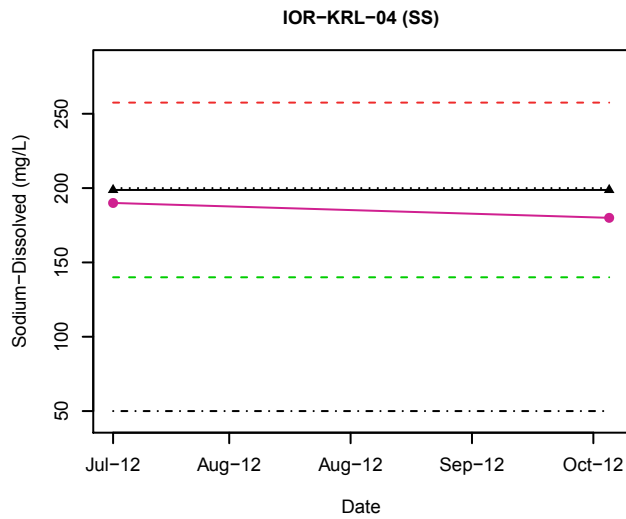
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Dissolved Sodium



- Sodium-Dissolved
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 200 mg/L
- ⋯ Interim Quality Triggers for NAOS- Surficial Deposits = 50 mg/L
- ▲ CUSUM
- * Data transformed for normality
- - - Well upper control limit
- - - Well lower control limit

Appendix C3b

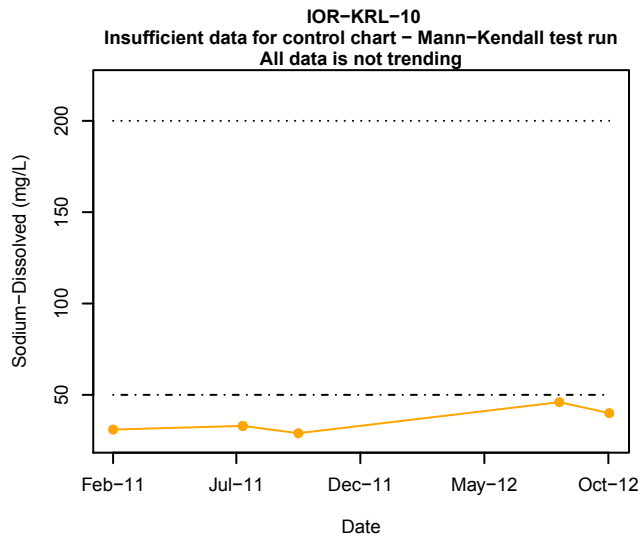
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Dissolved Sodium



- Sodium-Dissolved
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 200 mg/L
- ⋯ Interim Quality Triggers for NAOS- Surficial Deposits = 50 mg/L
- ▲ CUSUM
- * Data transformed for normality
- - - Well upper control limit
- - - Well lower control limit

Appendix C3b

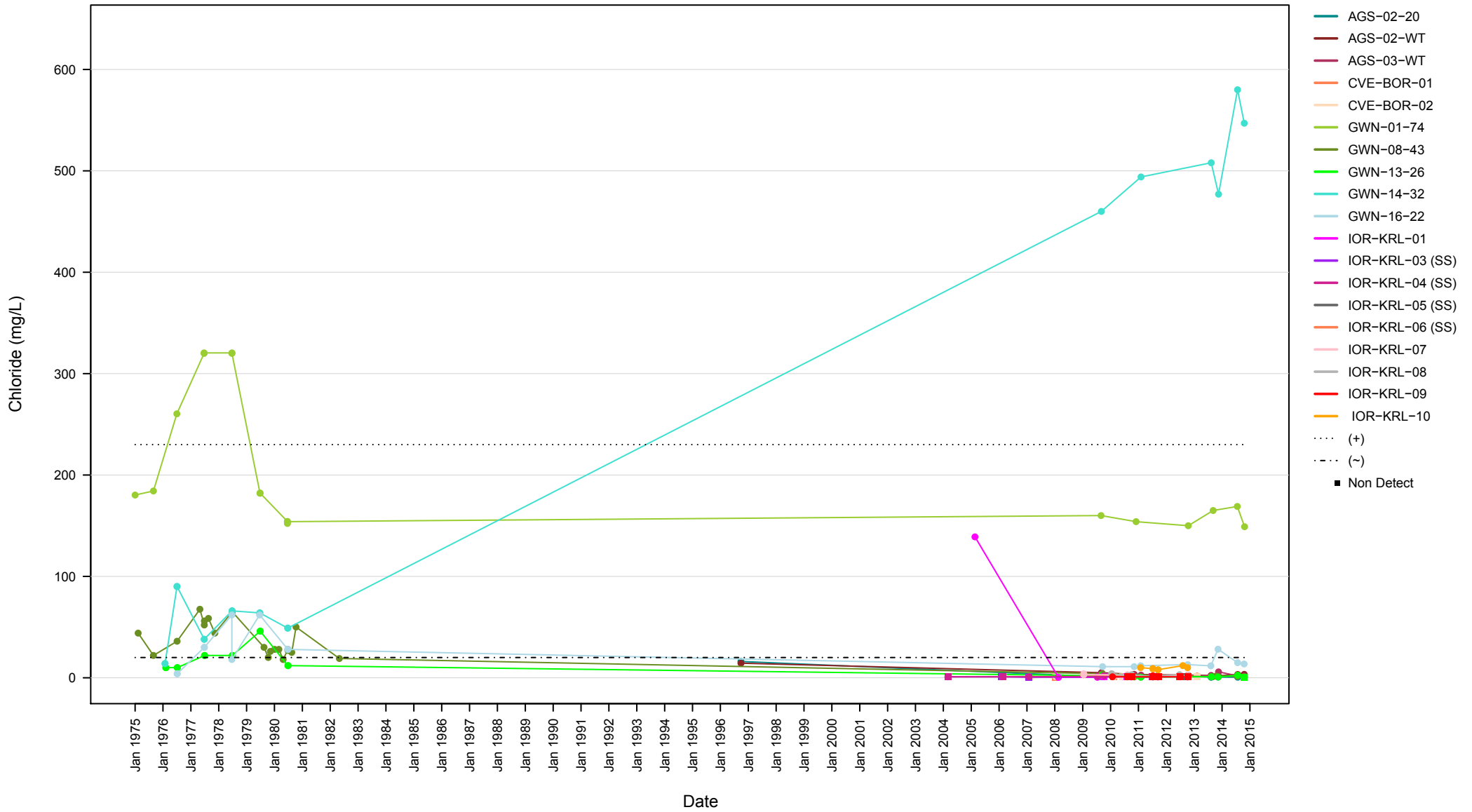
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Dissolved Sodium



- Sodium-Dissolved
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 200 mg/L
- ⋯ Interim Quality Triggers for NAOS- Surficial Deposits = 50 mg/L
- ▲ CUSUM
- * Data transformed for normality
- - - Well upper control limit
- - - Well lower control limit

Appendix C3b

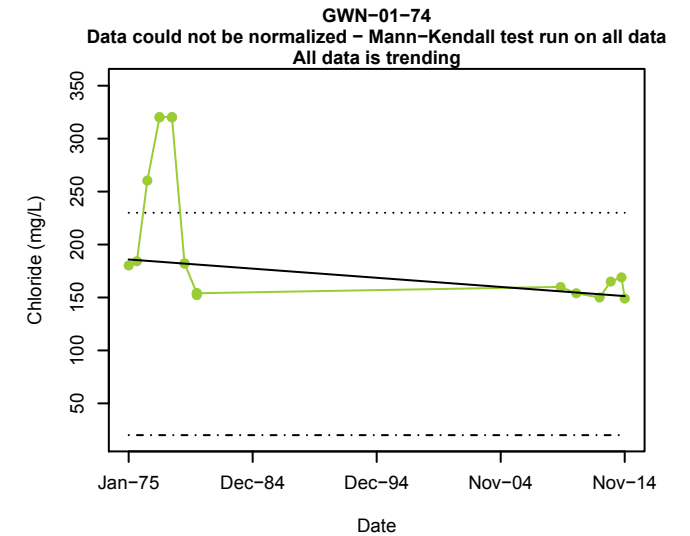
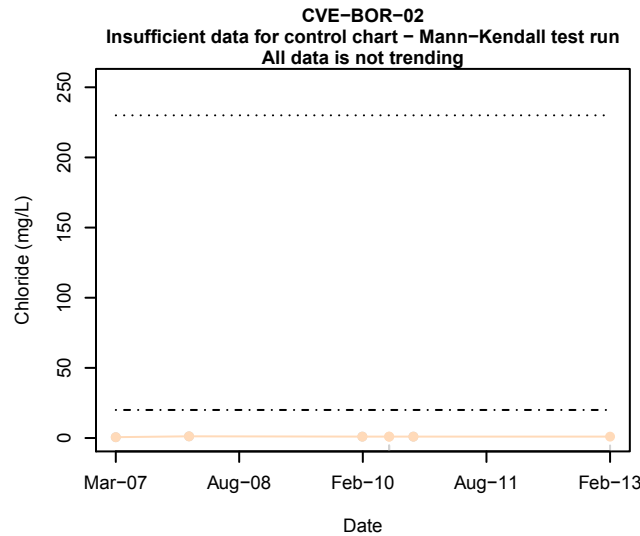
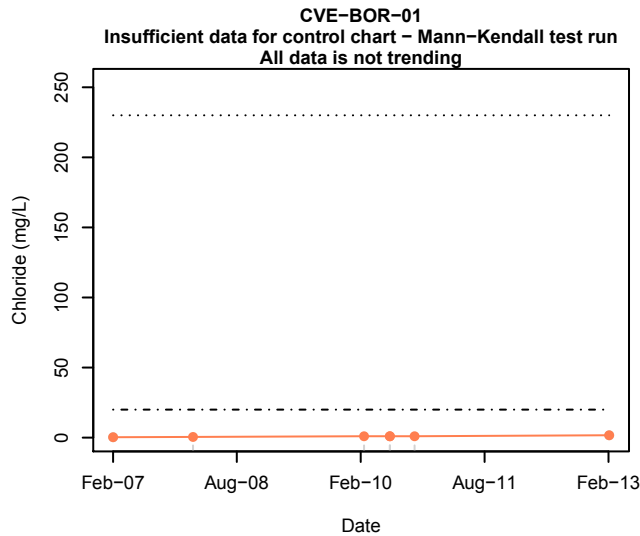
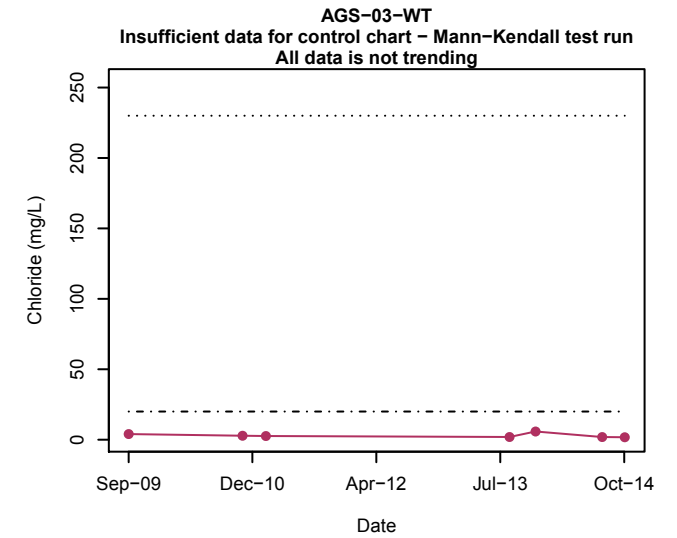
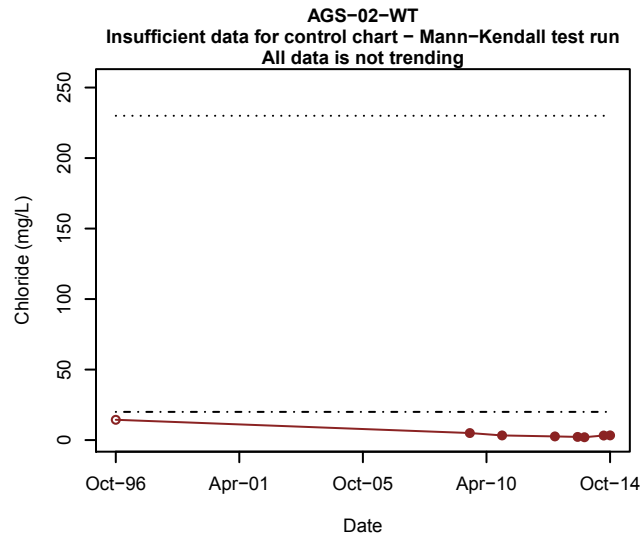
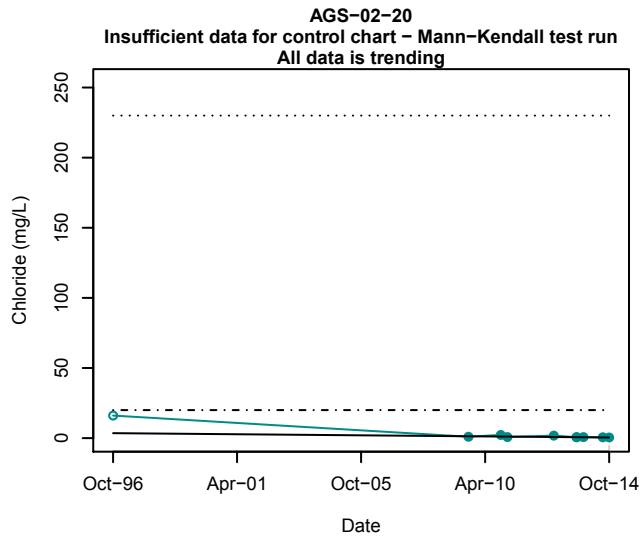
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Historical Dissolved Chloride Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 230 mg/L
 (-) Interim Quality Triggers for NAOS- Surficial Deposits = 20 mg/L

Appendix C4a

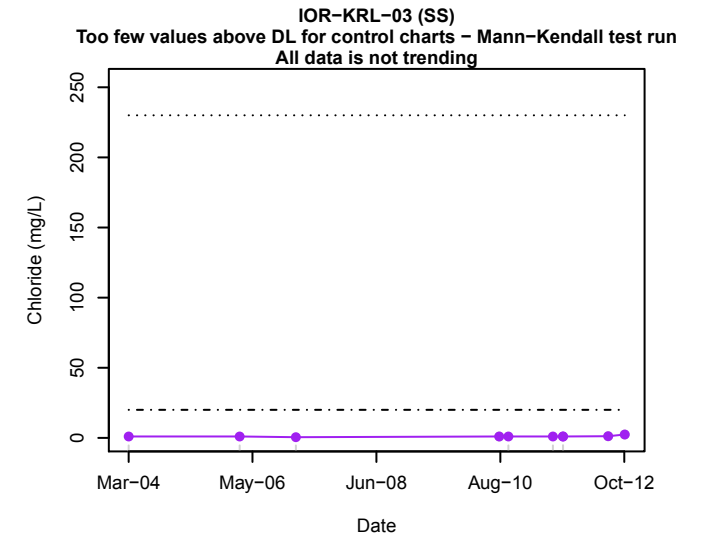
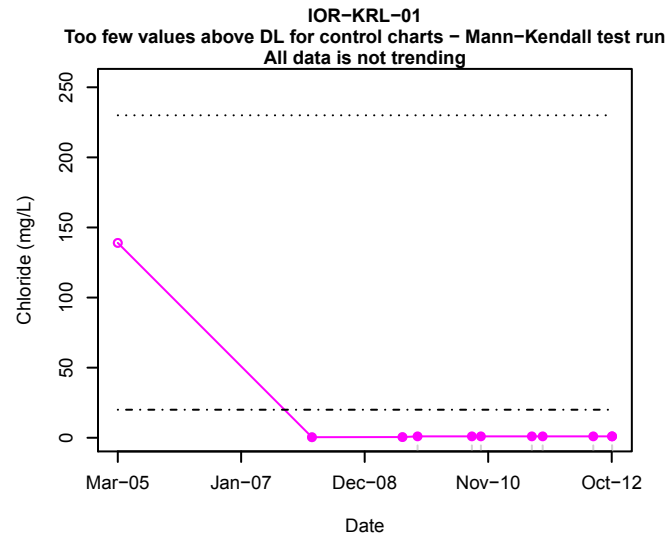
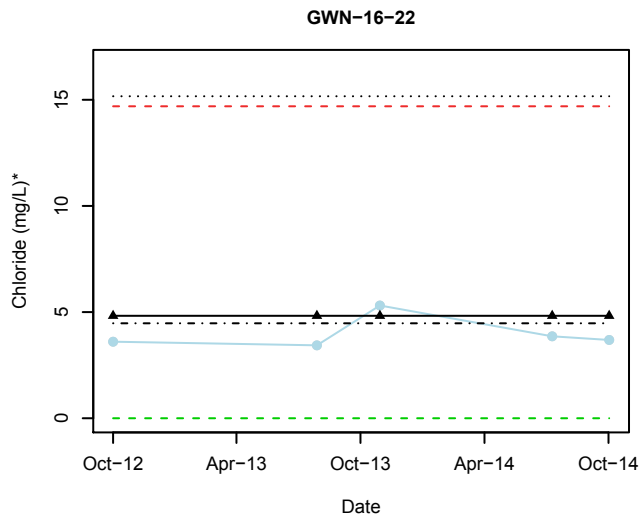
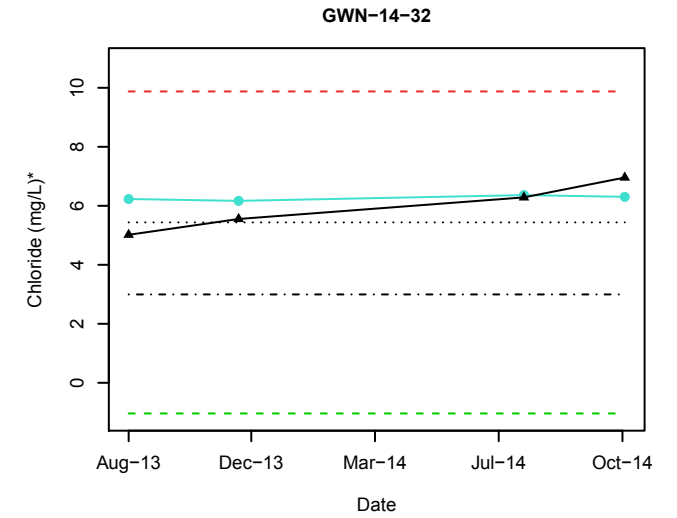
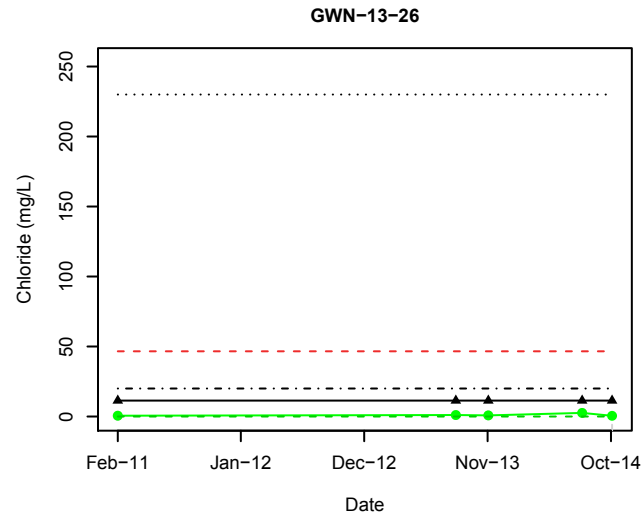
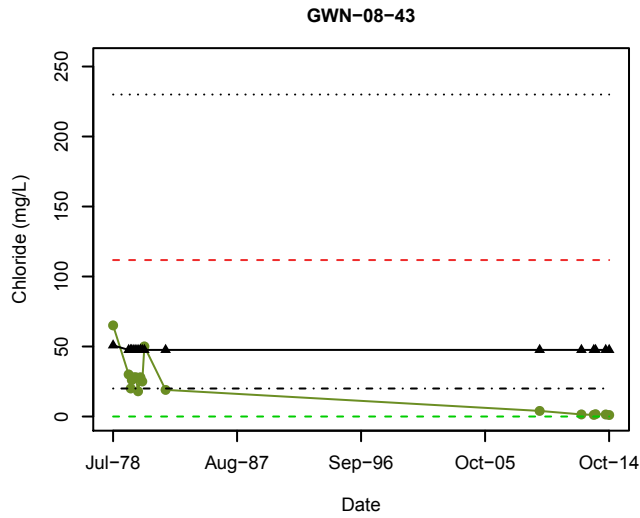
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Dissolved Chloride



- Chloride
- Data point not used in analysis
- Values below detection limit
- Alberta Tier 1-Natural Areas -2010 = 230 mg/L
- Interim Quality Triggers for NAOS- Surficial Deposits = 20 mg/L
- Sen slope

Appendix C4b

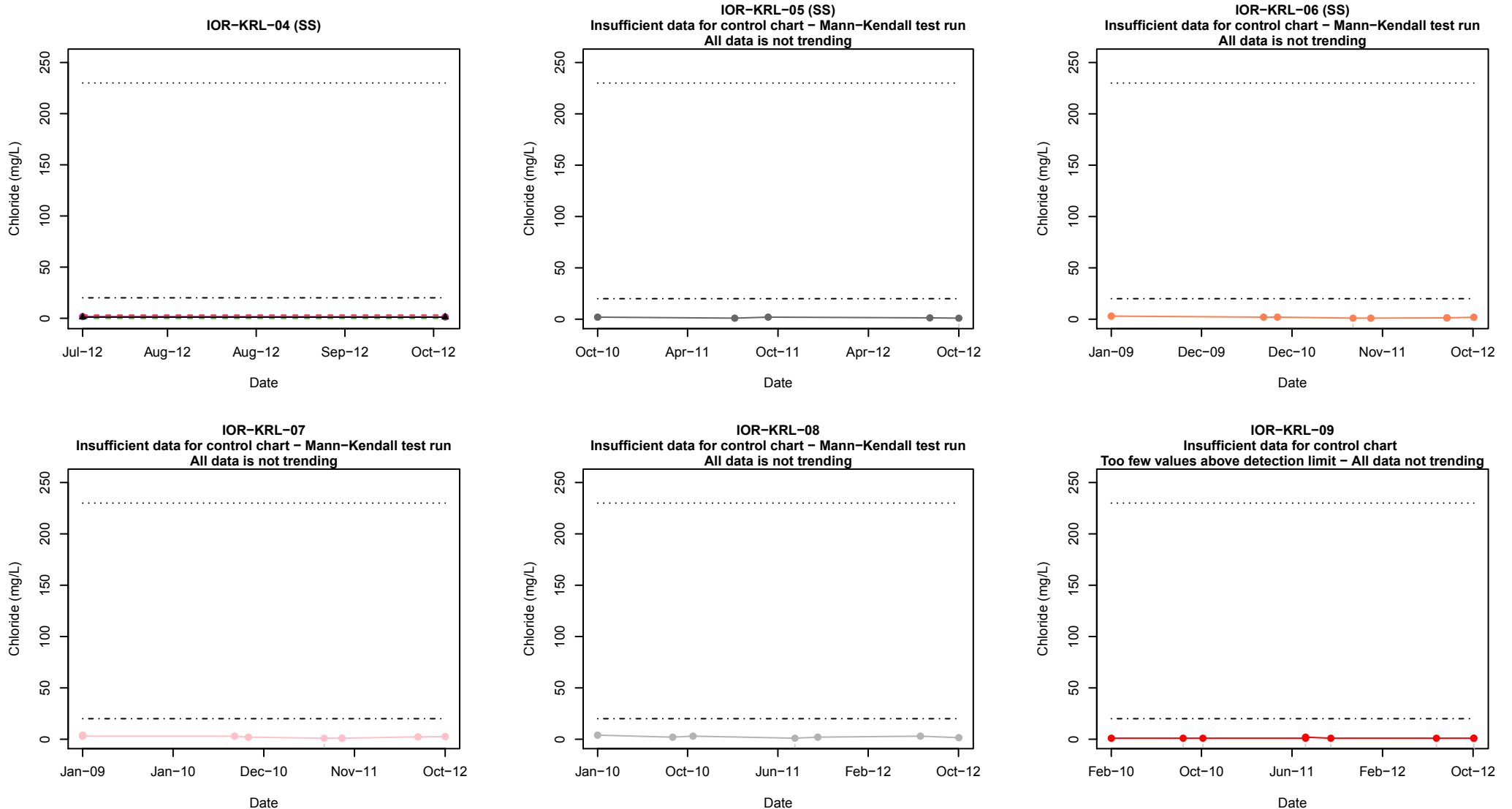
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Dissolved Chloride



- Chloride
- Values below detection limit
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 230 mg/L
- ⋯ Interim Quality Triggers for NAOS- Surficial Deposits = 20 mg/L
- ▲ CUSUM
- * Data transformed for normality
- - - Well upper control limit
- - - Well lower control limit

Appendix C4b

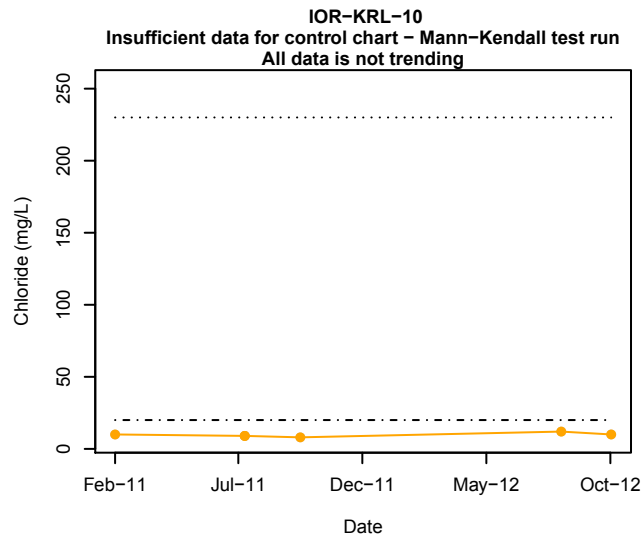
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Dissolved Chloride



- Chloride
- Values below detection limit
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 230 mg/L
- ⋯ Interim Quality Triggers for NAOS- Surficial Deposits = 20 mg/L
- ▲ CUSUM
- * Data transformed for normality
- - Well upper control limit
- - Well lower control limit

Appendix C4b

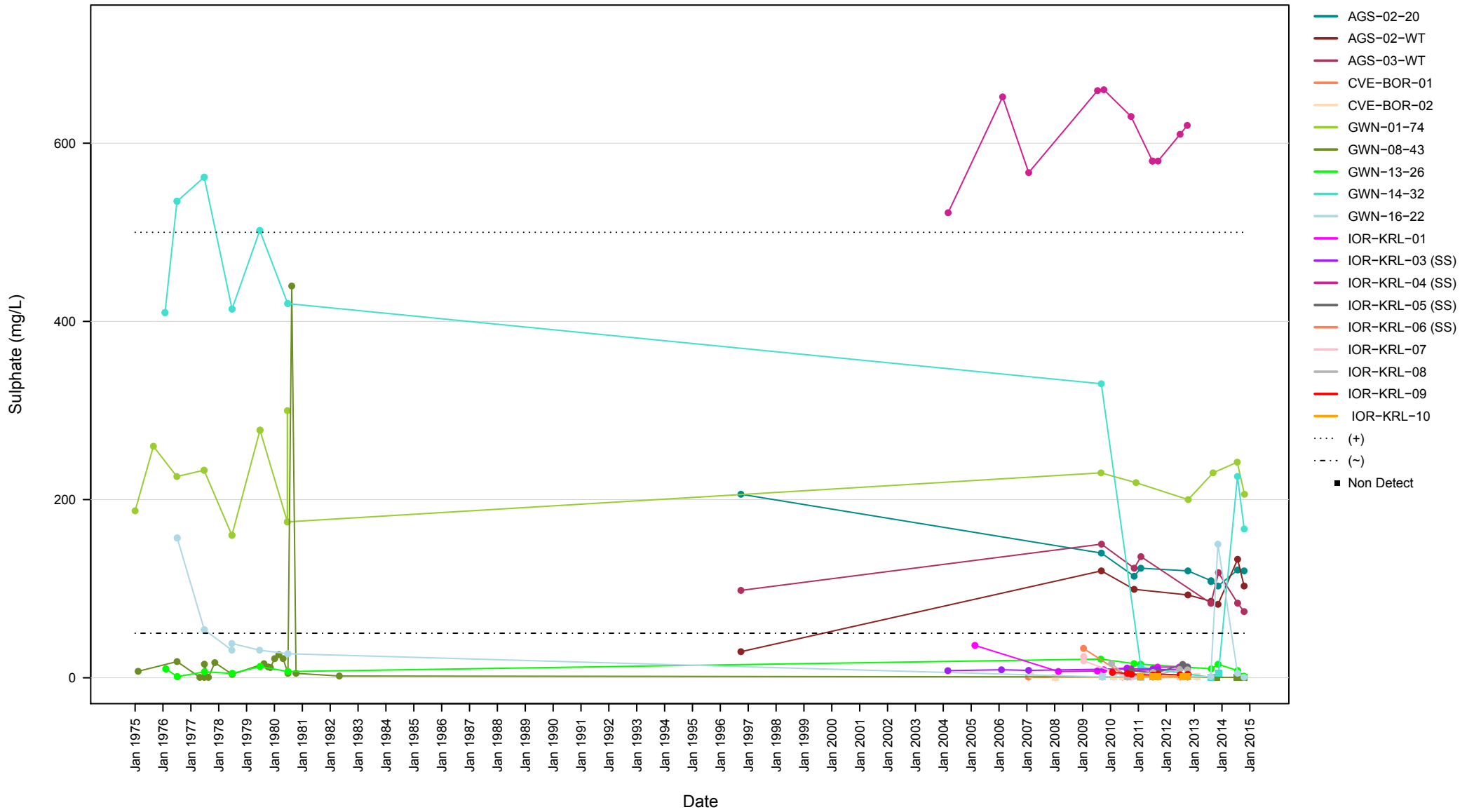
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Dissolved Chloride



- Chloride
- - - Values below detection limit
- Sen slope
- Data point not used in analysis
- Alberta Tier 1-Natural Areas -2010 = 230 mg/L
- Interim Quality Triggers for NAOS- Surficial Deposits = 20 mg/L
- ▲ CUSUM
- * Data transformed for normality
- - - Well upper control limit
- - - Well lower control limit

Appendix C4b

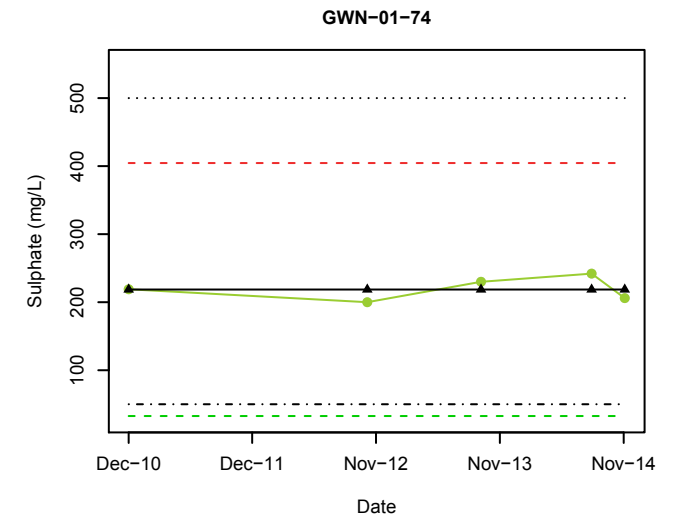
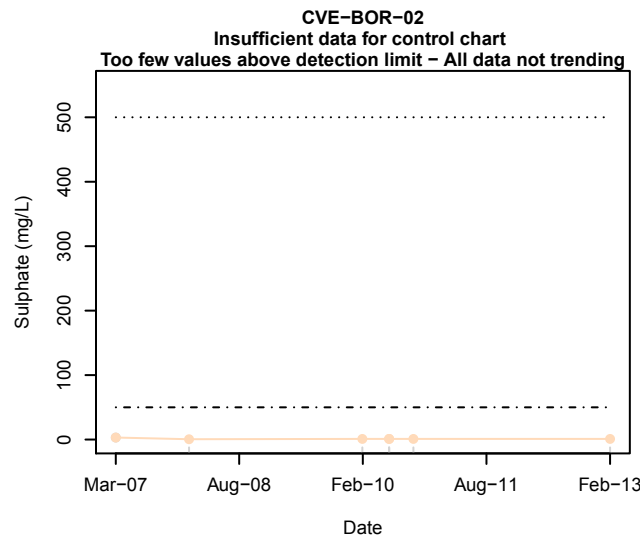
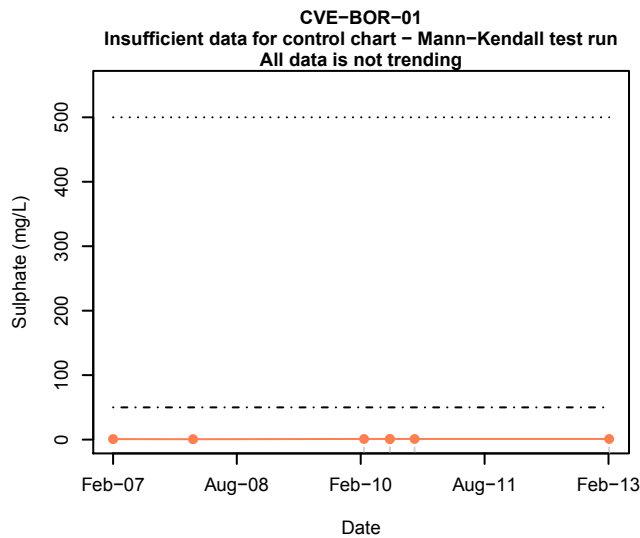
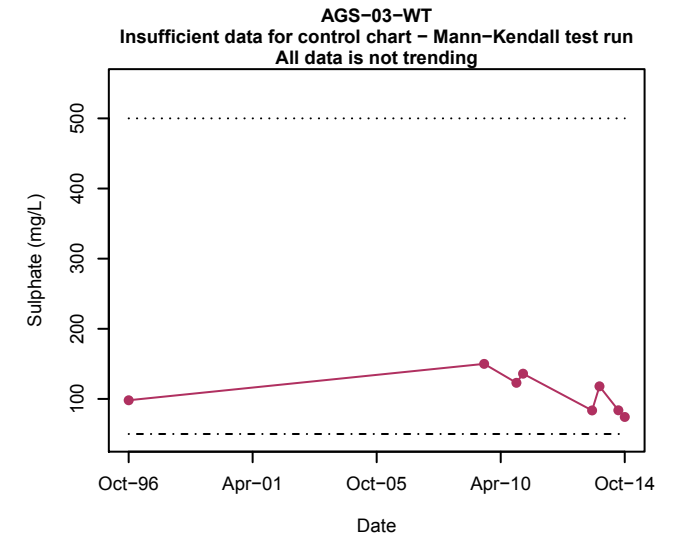
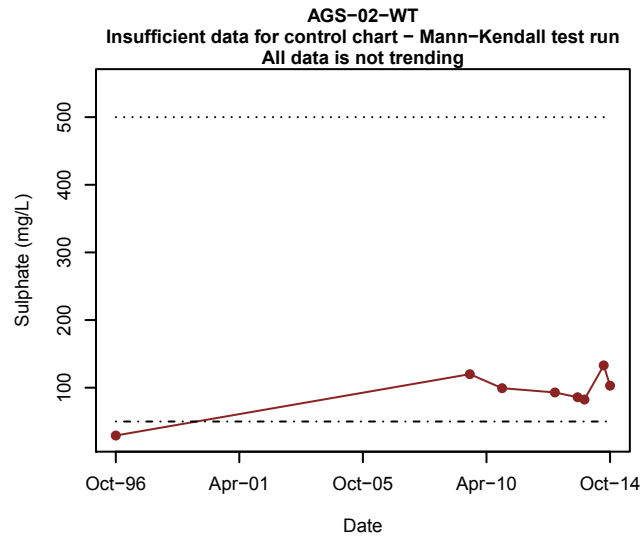
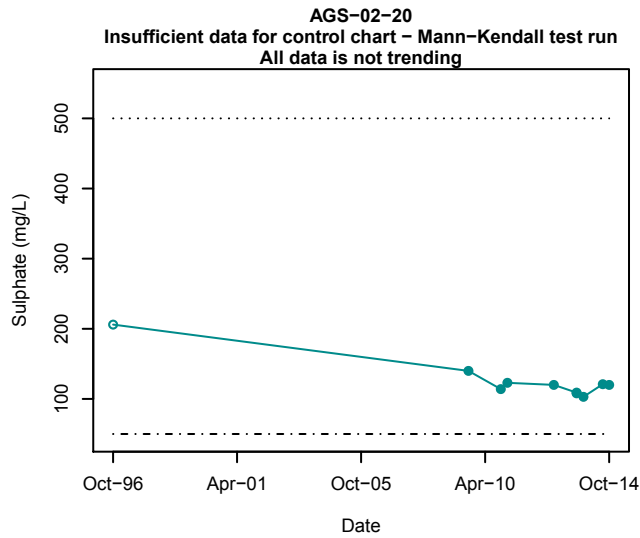
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Historical Dissolved Sulphate Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 500 mg/L
 (-) Interim Quality Triggers for NAOS- Surficial Deposits = 50 mg/L

Appendix C5a

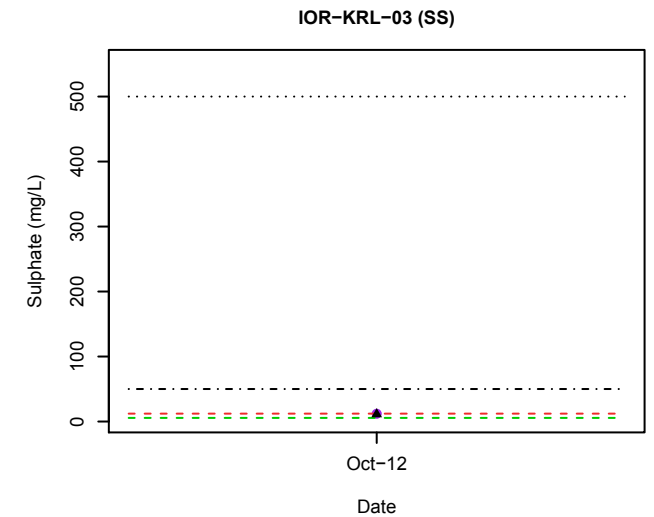
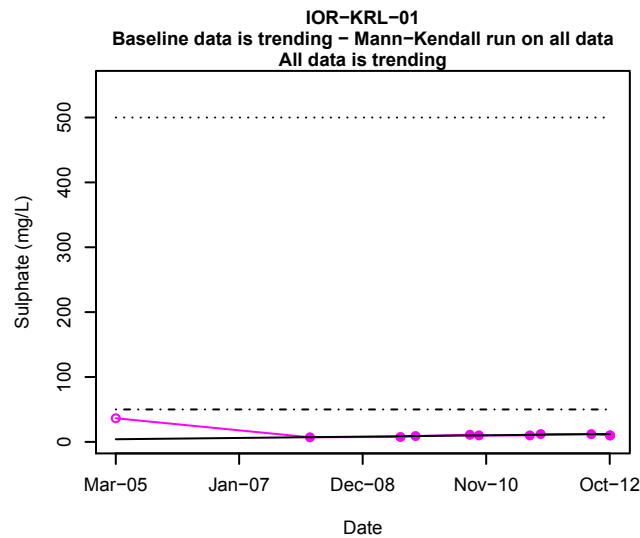
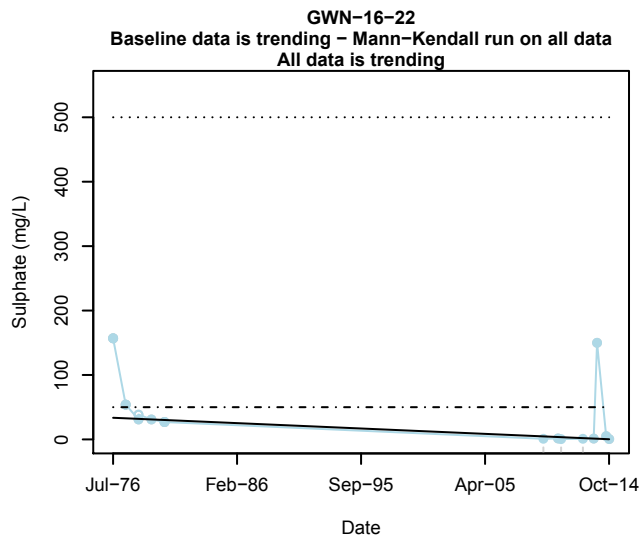
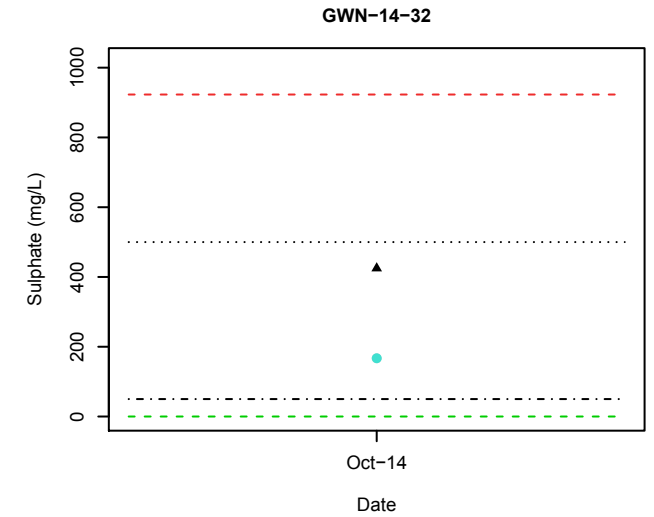
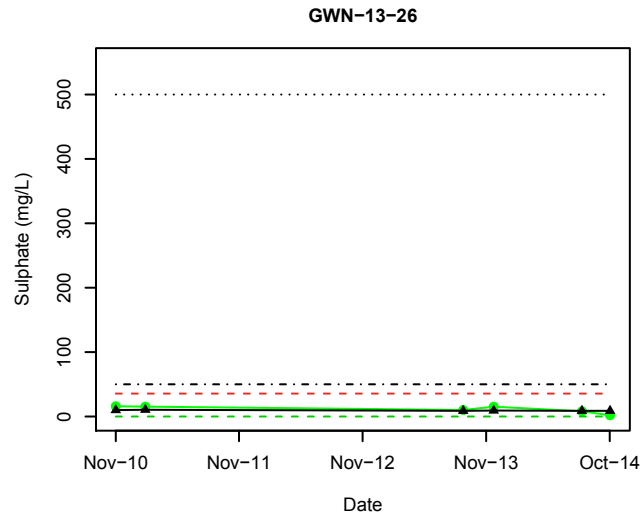
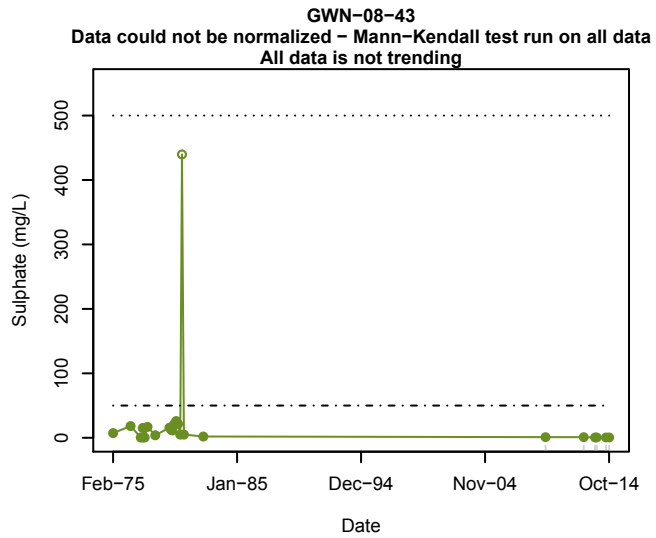
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Dissolved Sulphate



- Sulphate
- Data point not used in analysis
- ⬤ CUSUM
- ⋯ Interim Quality Triggers for NAOS- Surficial Deposits = 50 mg/L
- Values below detection limit
- Well upper control limit
- ⋯ Alberta Tier 1-Natural Areas -2010 = 500 mg/L
- Well lower control limit

Appendix C5b

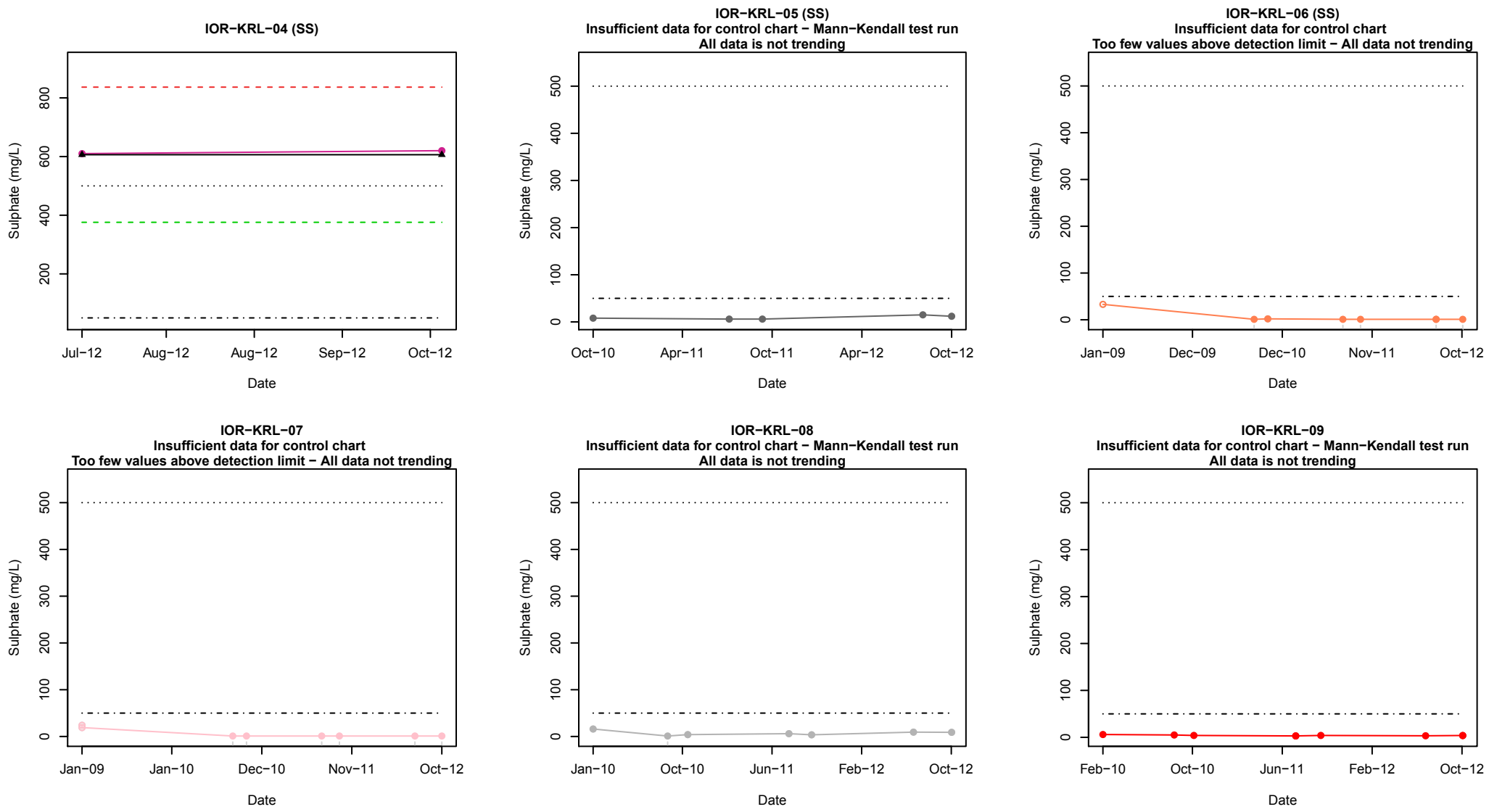
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Dissolved Sulphate



- Sulphate
- Data point not used in analysis
- Interim Quality Triggers for NAOS- Surficial Deposits = 50 mg/L
- Well upper control limit
- Well lower control limit
- Values below detection limit
- ▲ CUSUM
- Sen slope
- Alberta Tier 1-Natural Areas -2010 = 500 mg/L

Appendix C5b

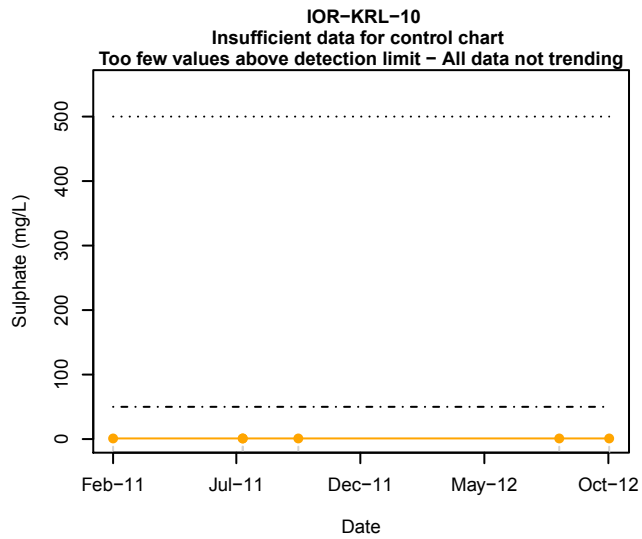
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Dissolved Sulphate



- Sulphate
- Values below detection limit
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 500 mg/L
- ⋯ Interim Quality Triggers for NAOS- Surficial Deposits = 50 mg/L
- ▲ CUSUM
- Well upper control limit
- Well lower control limit

Appendix C5b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Dissolved Sulphate

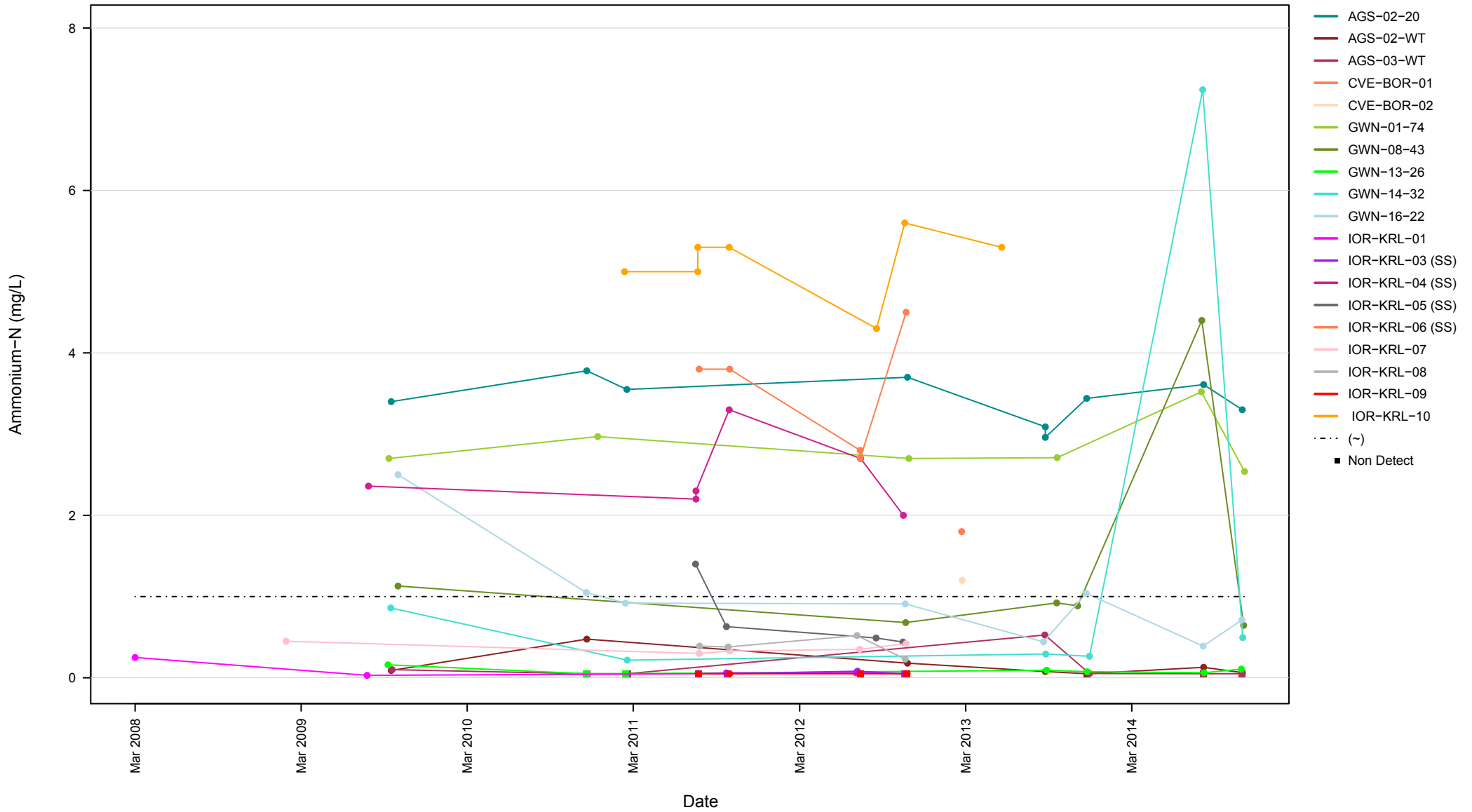


● Sulphate
 - - - Values below detection limit
 — Sen slope
 ○ Data point not used in analysis
 ⋯ Alberta Tier 1-Natural Areas -2010 = 500 mg/L

⋯⋯ Interim Quality Triggers for NAOS- Surficial Deposits = 50 mg/L
 ▲ CUSUM
 - - - Well upper control limit
 - - - Well lower control limit

Appendix C5b

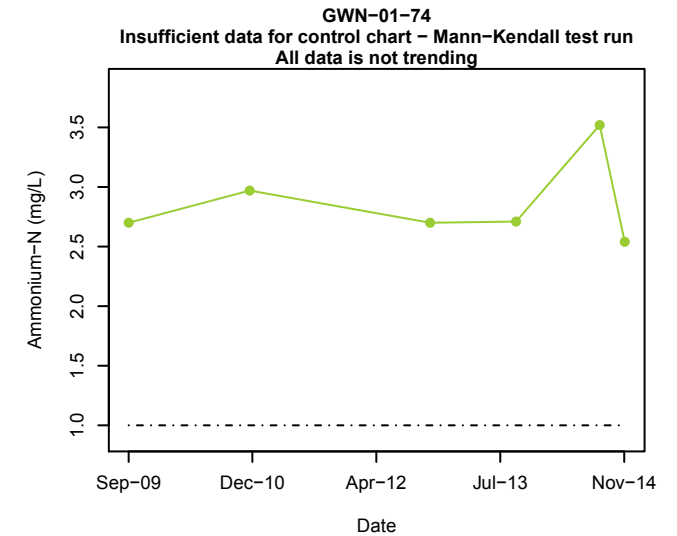
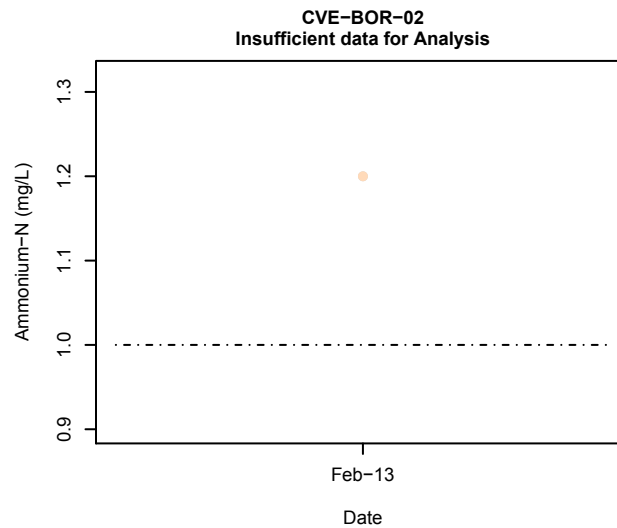
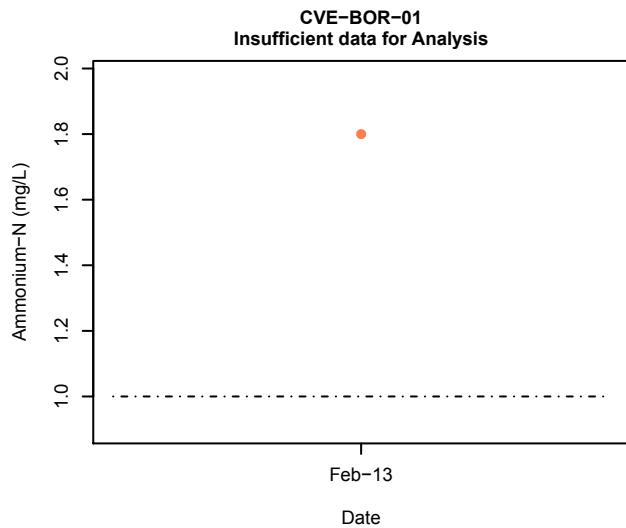
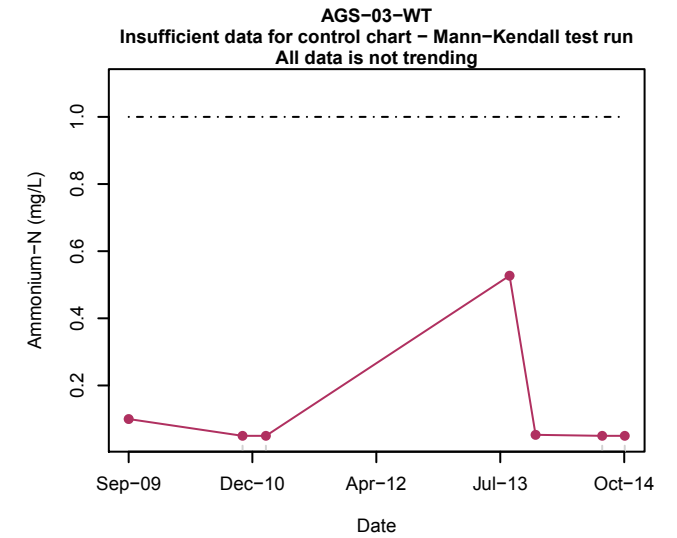
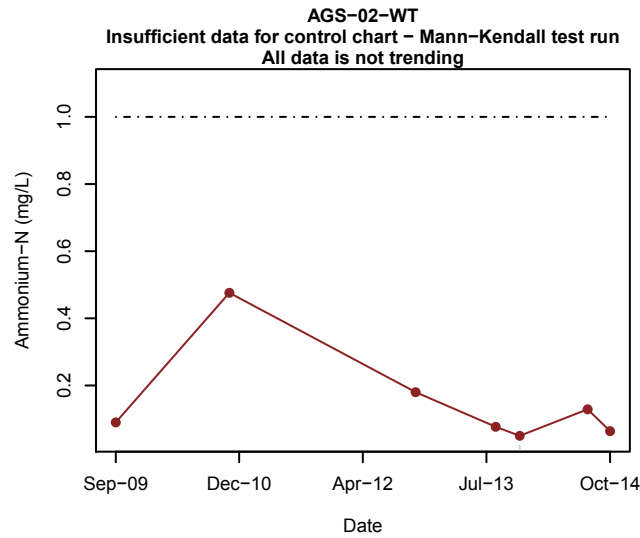
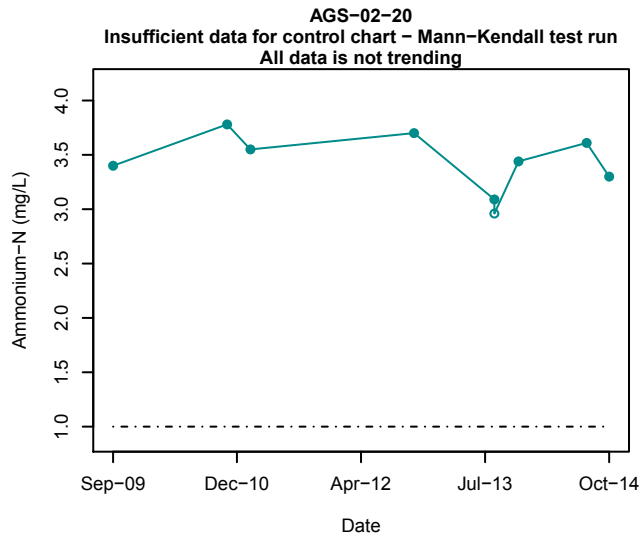
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Historical Ammonium-N Concentrations



(-) Interim Quality Triggers for NAOS- Surficial Deposits = 1 mg/L

Appendix C6a

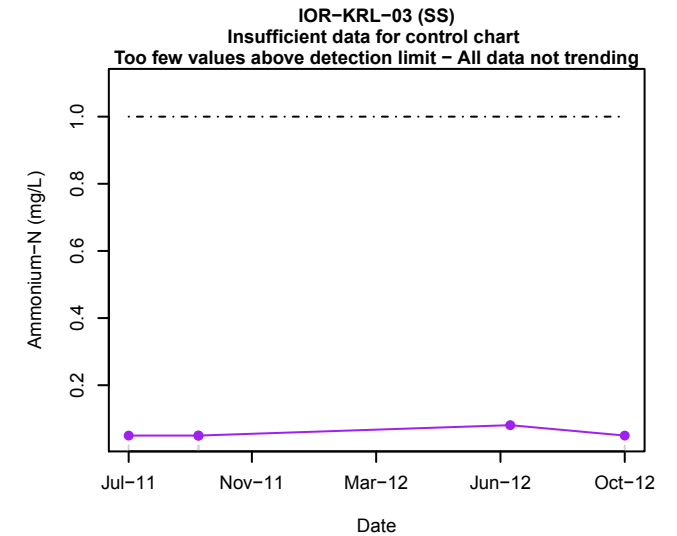
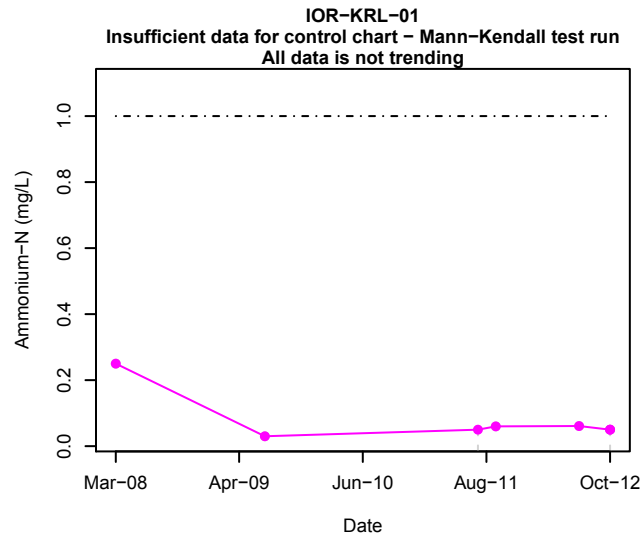
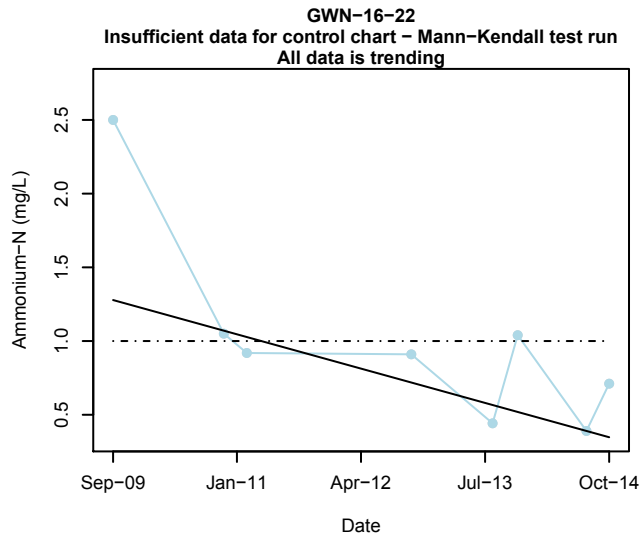
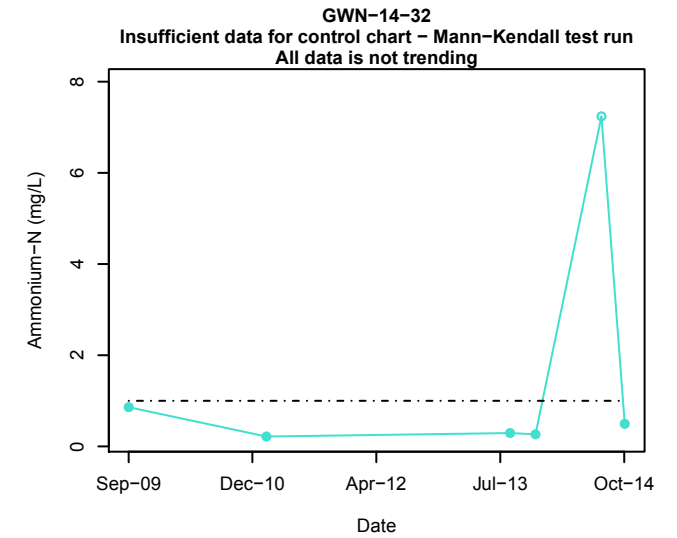
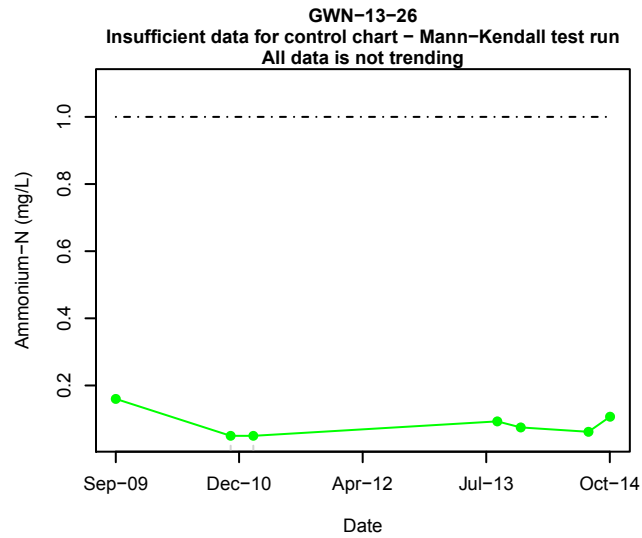
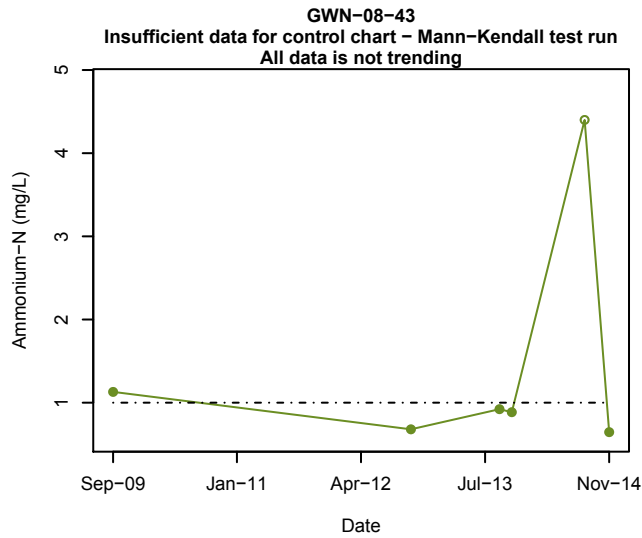
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Ammonium-N



- Ammonium-N
- - - Values below detection limit
- Data point not used in analysis
- ⋯ Interim Quality Triggers for NAOS- Surficial Deposits = 1 mg/L

Appendix C6b

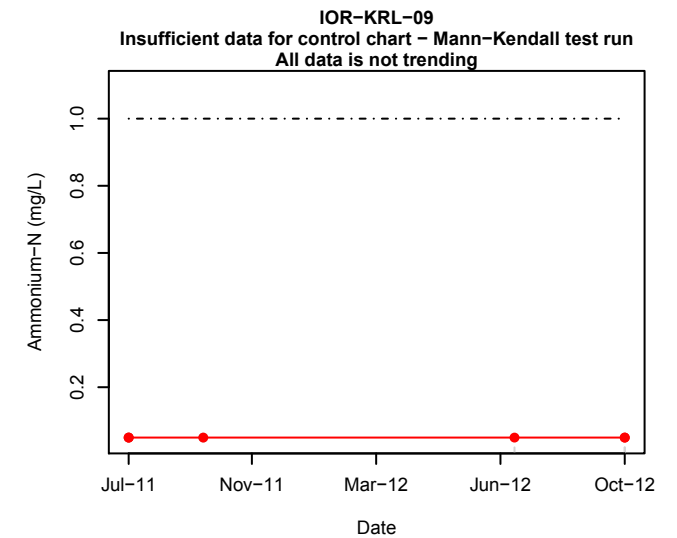
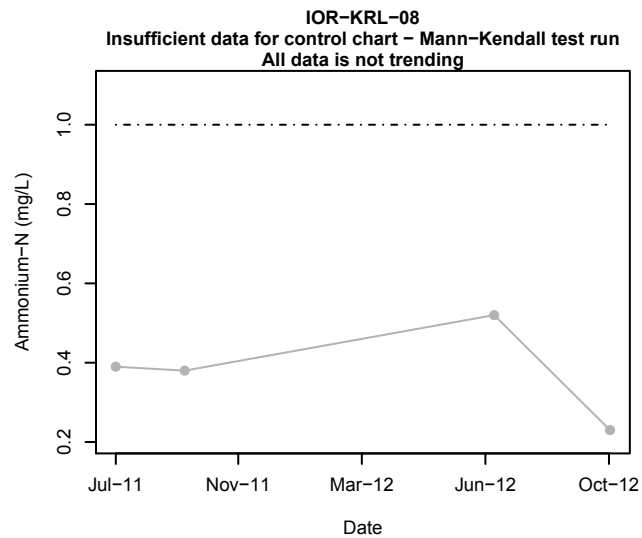
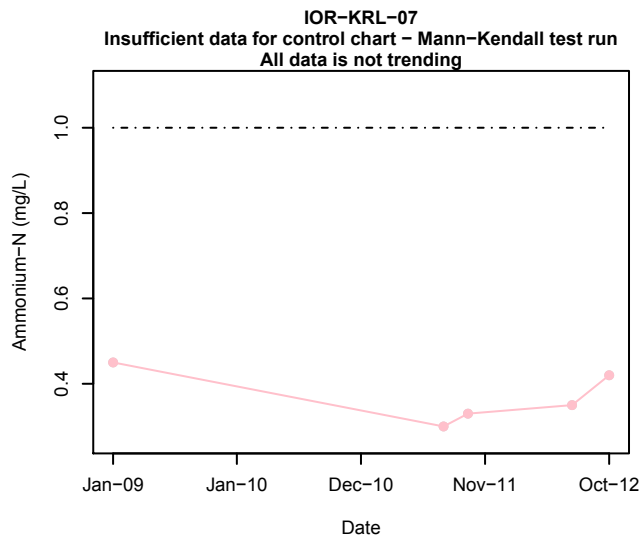
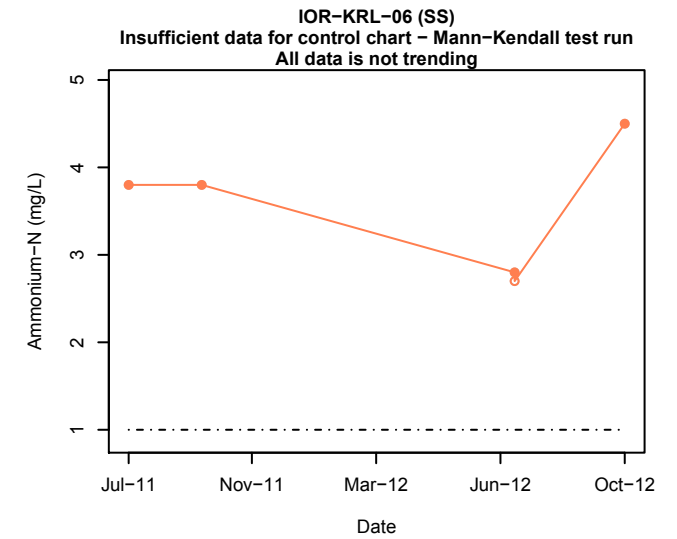
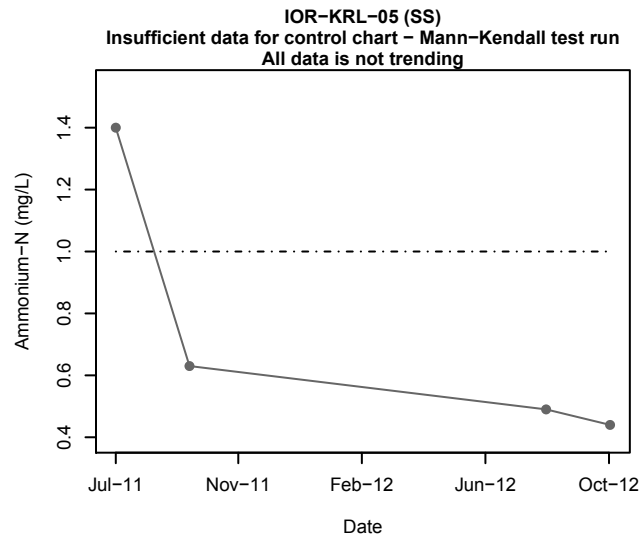
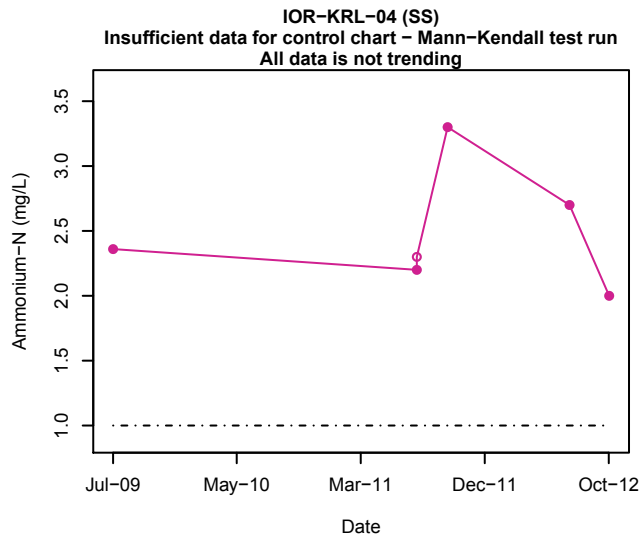
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Ammonium-N



- Ammonium-N
- - - Values below detection limit
- Sen slope
- Data point not used in analysis
- · · Interim Quality Triggers for NAOS- Surficial Deposits = 1 mg/L

Appendix C6b

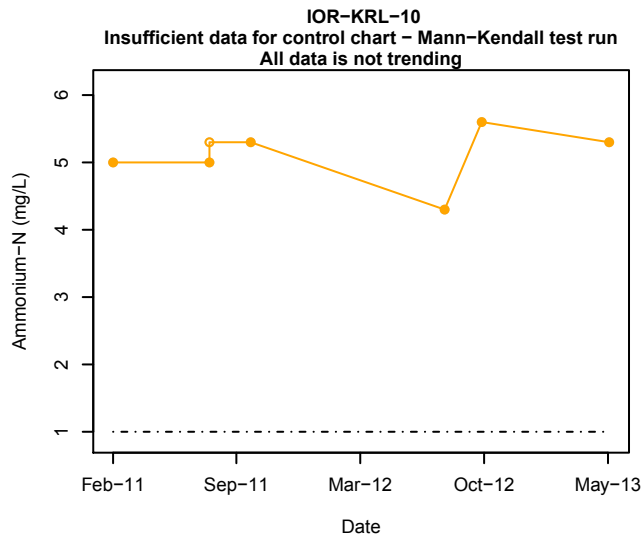
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Ammonium-N



- Ammonium-N
- - - Values below detection limit
- Sen slope
- Data point not used in analysis
- · · Interim Quality Triggers for NAOS- Surficial Deposits = 1 mg/L

Appendix C6b

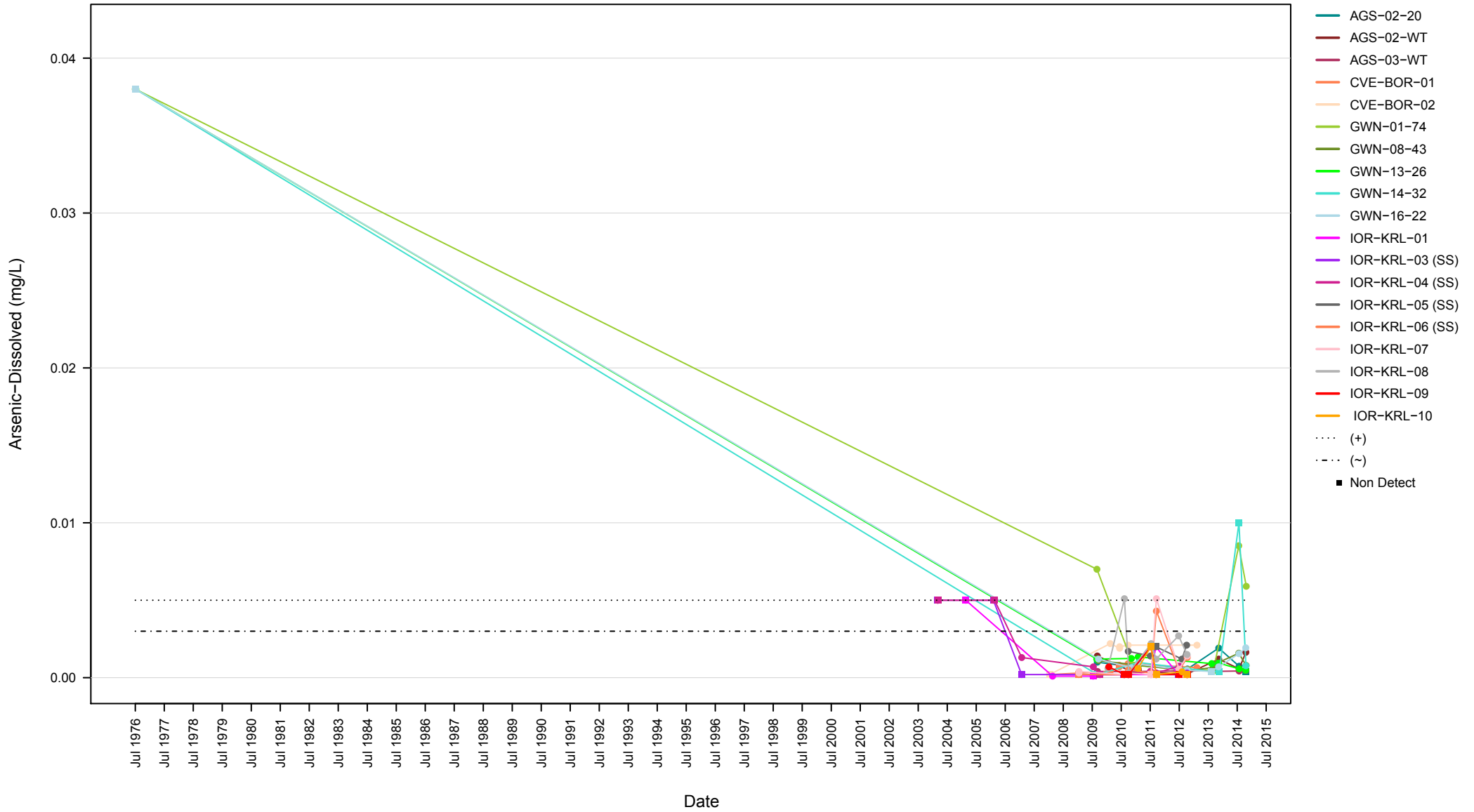
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Ammonium-N



- Ammonium-N
- - - Values below detection limit
- Sen slope
- Data point not used in analysis
- · · Interim Quality Triggers for NAOS- Surficial Deposits = 1 mg/L

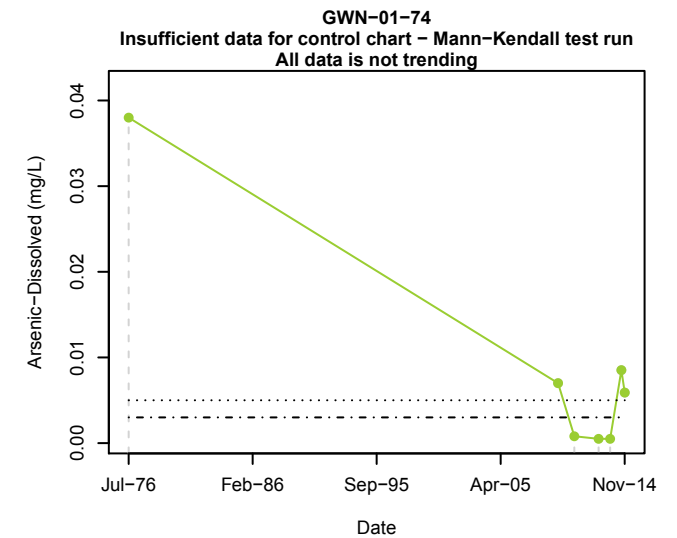
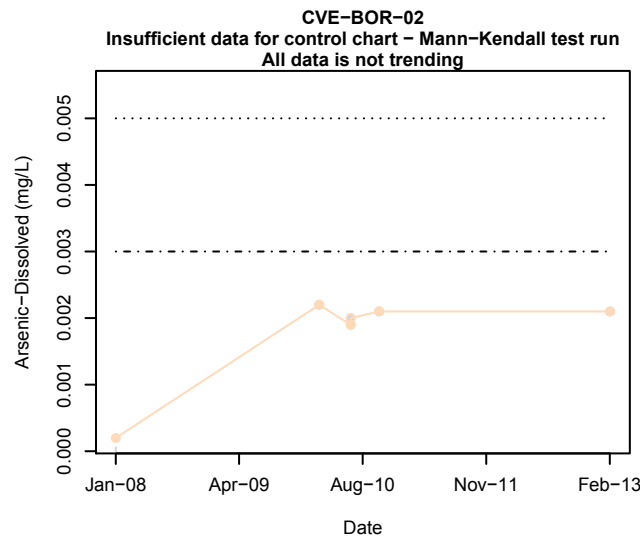
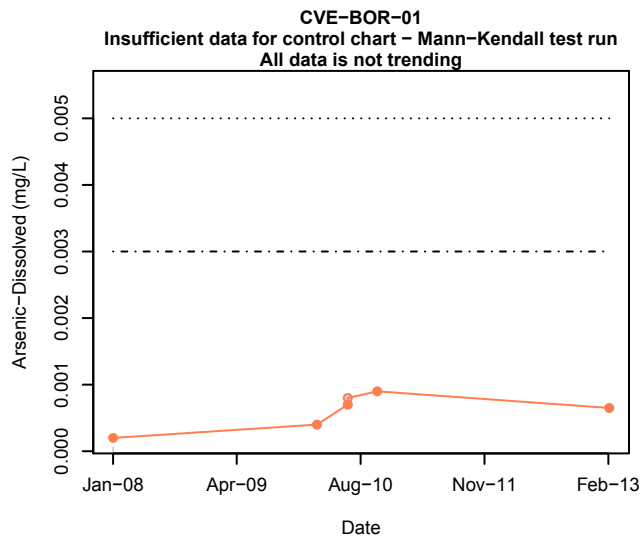
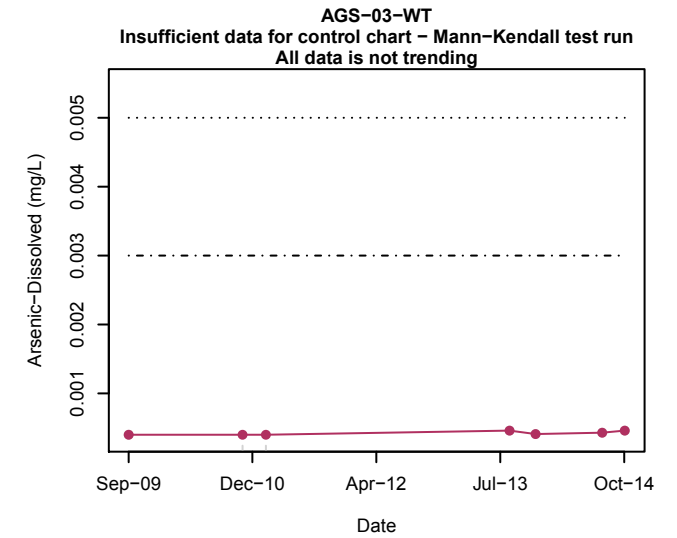
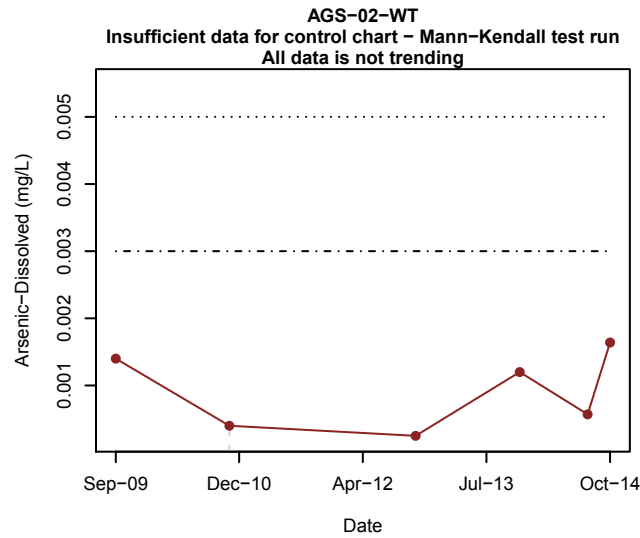
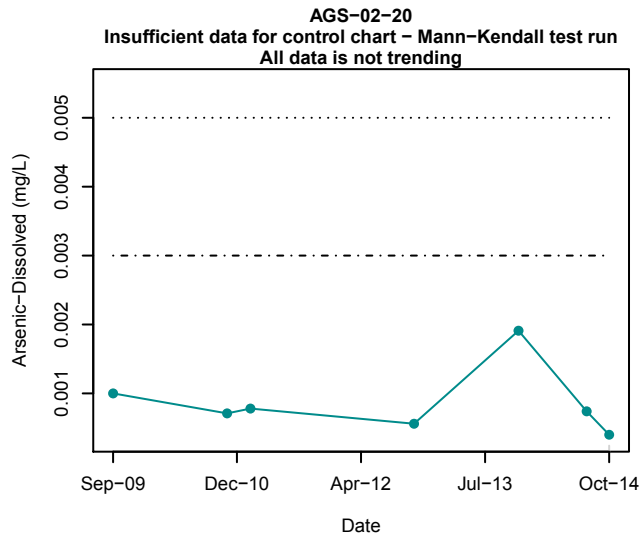
Appendix C6b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Historical Dissolved Arsenic Concentrations



Appendix C7a

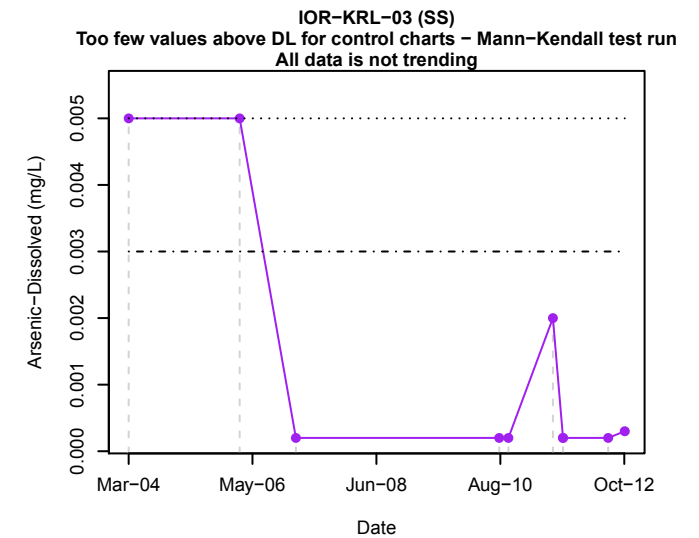
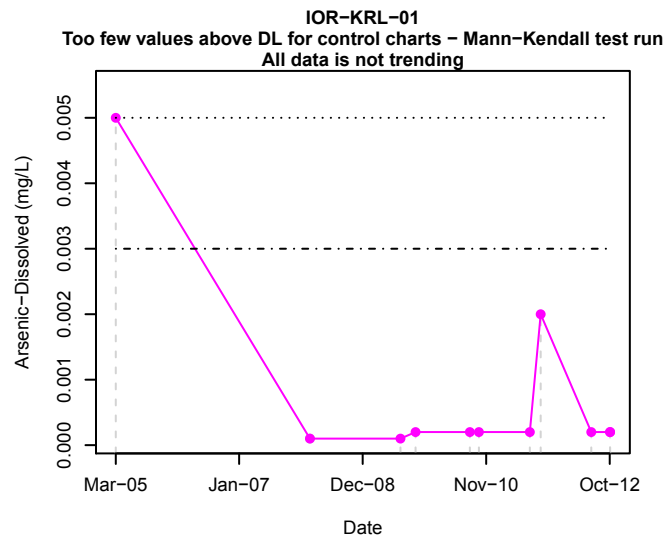
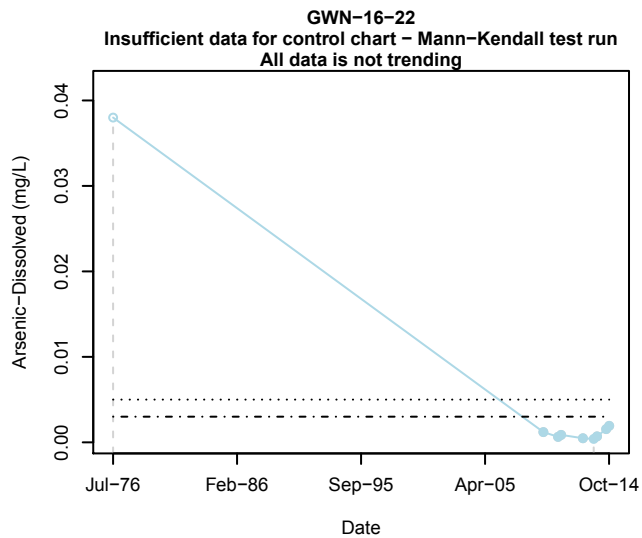
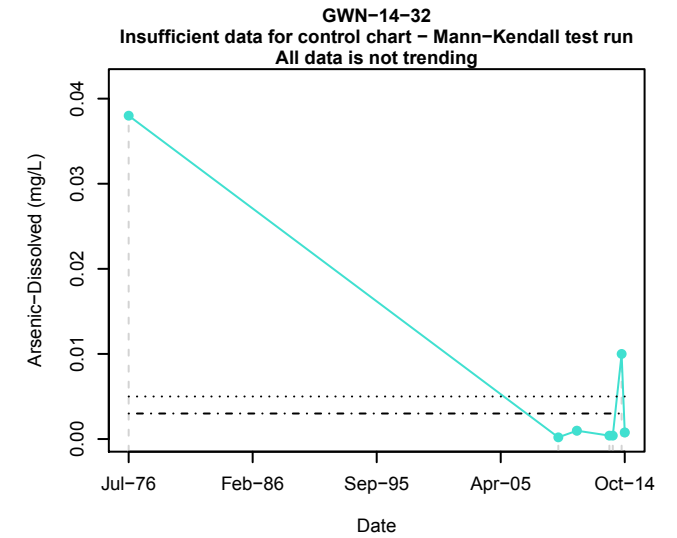
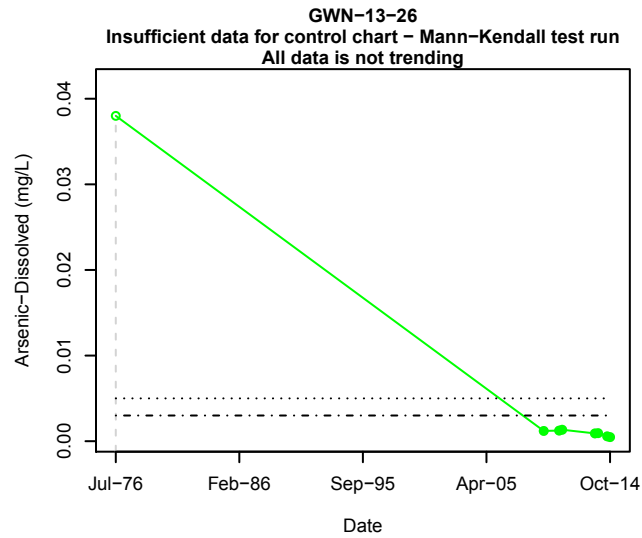
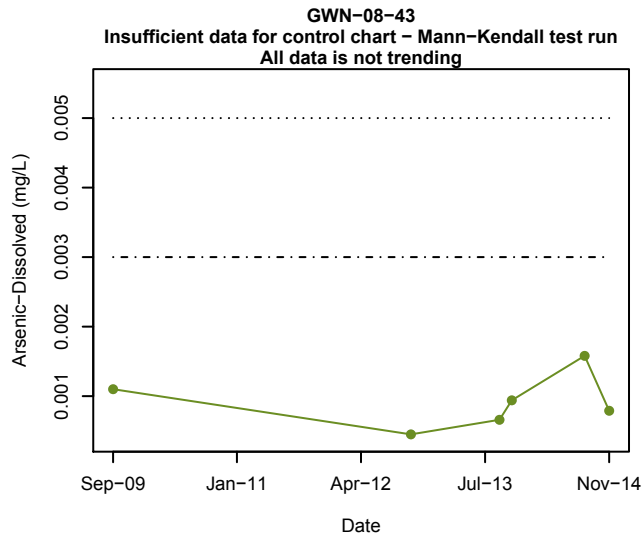
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Dissolved Arsenic



- Arsenic-Dissolved
- Values below detection limit
- Data point not used in analysis
- Alberta Tier 1-Natural Areas -2010 = 0.005 mg/L
- Interim Quality Triggers for NAOS- Surficial Deposits = 0.003 mg/L

Appendix C7b

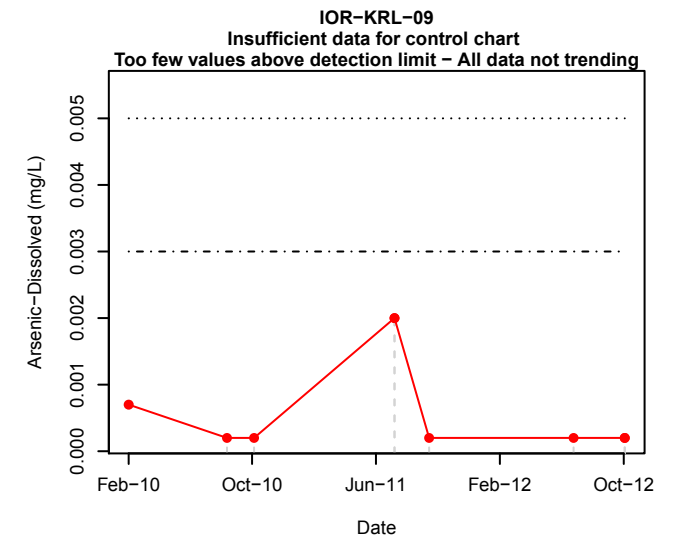
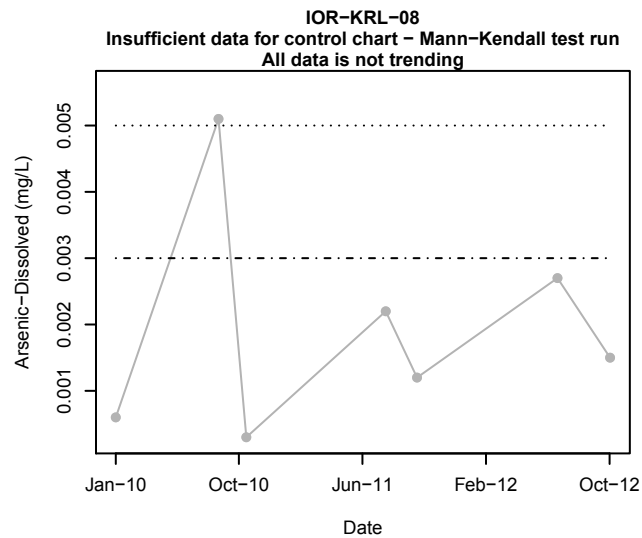
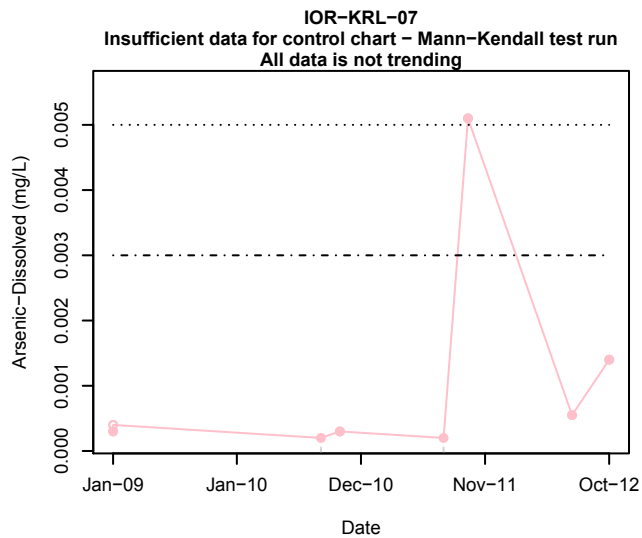
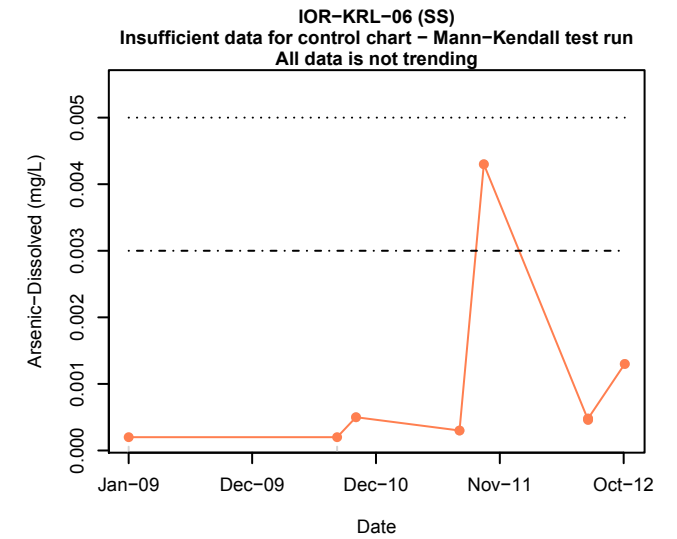
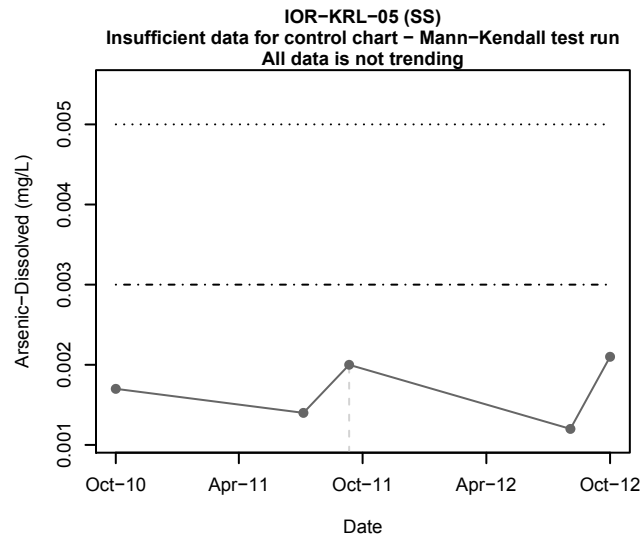
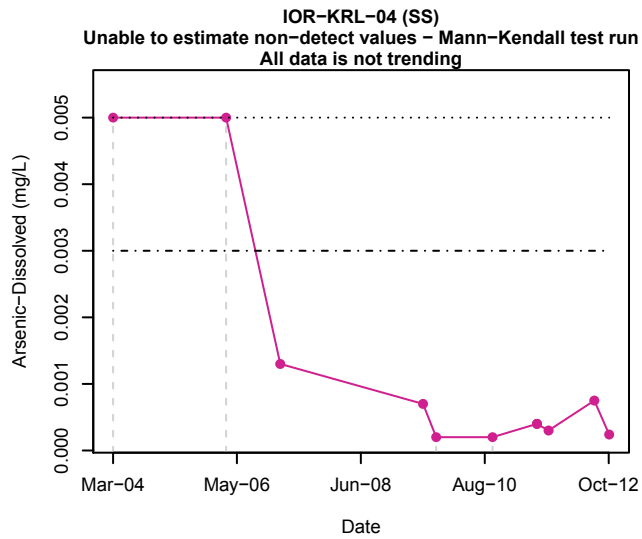
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Dissolved Arsenic



- Arsenic-Dissolved
- Values below detection limit
- Data point not used in analysis
- Alberta Tier 1-Natural Areas -2010 = 0.005 mg/L
- Interim Quality Triggers for NAOS- Surficial Deposits = 0.003 mg/L

Appendix C7b

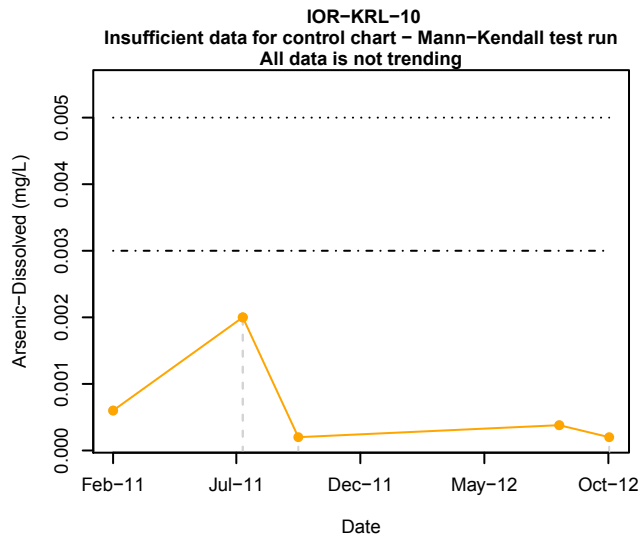
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Dissolved Arsenic



- Arsenic-Dissolved
- Values below detection limit
- Data point not used in analysis
- Alberta Tier 1-Natural Areas -2010 = 0.005 mg/L
- Interim Quality Triggers for NAOS- Surficial Deposits = 0.003 mg/L

Appendix C7b

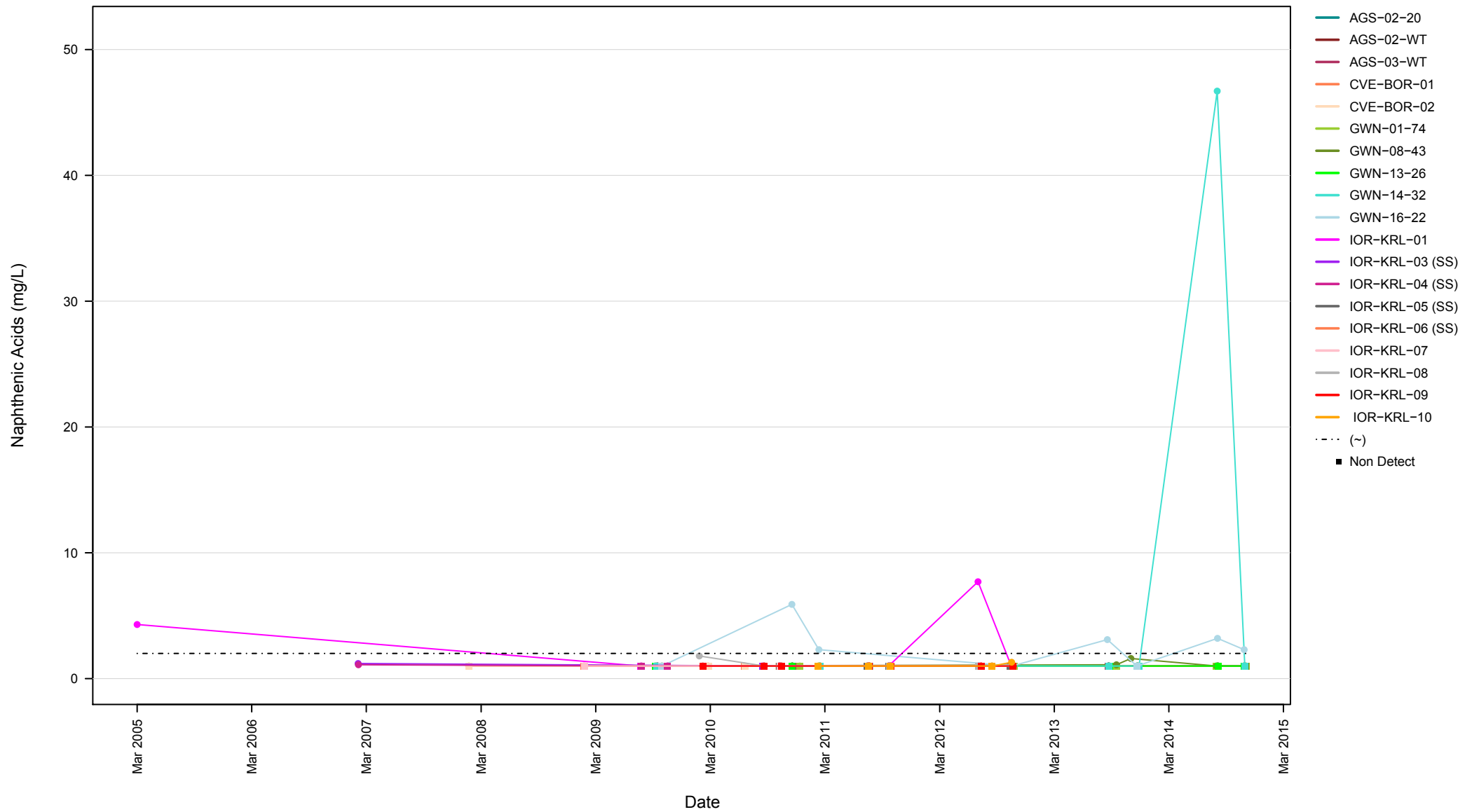
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Dissolved Arsenic



- Arsenic-Dissolved
- - - Values below detection limit
- Data point not used in analysis
- Alberta Tier 1-Natural Areas -2010 = 0.005 mg/L
- Interim Quality Triggers for NAOS- Surficial Deposits = 0.003 mg/L

Appendix C7b

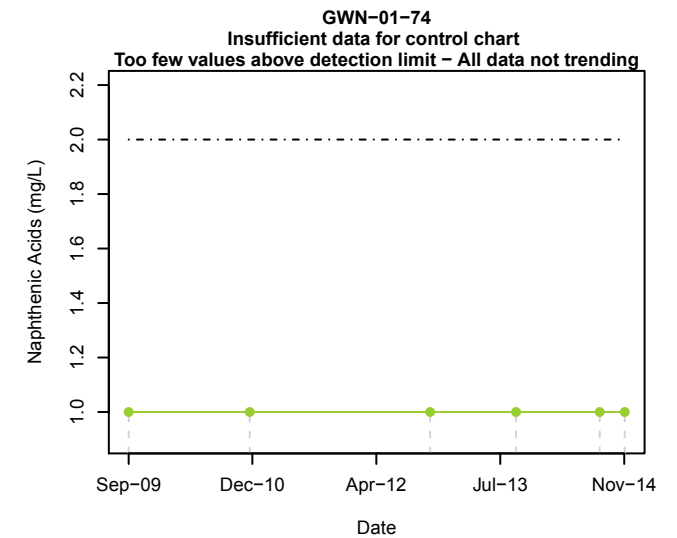
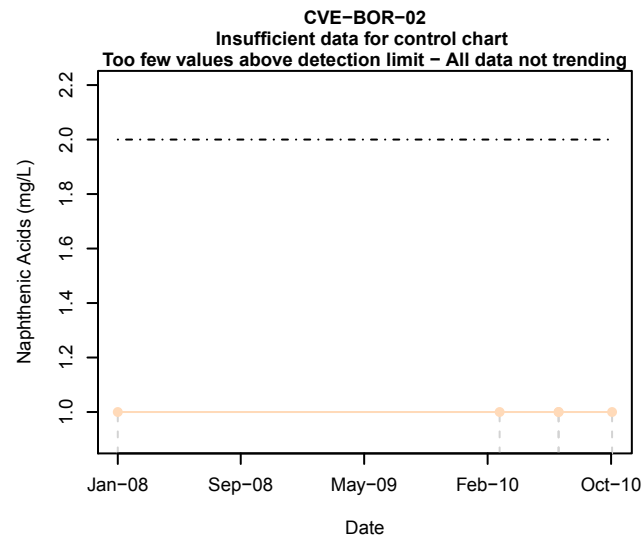
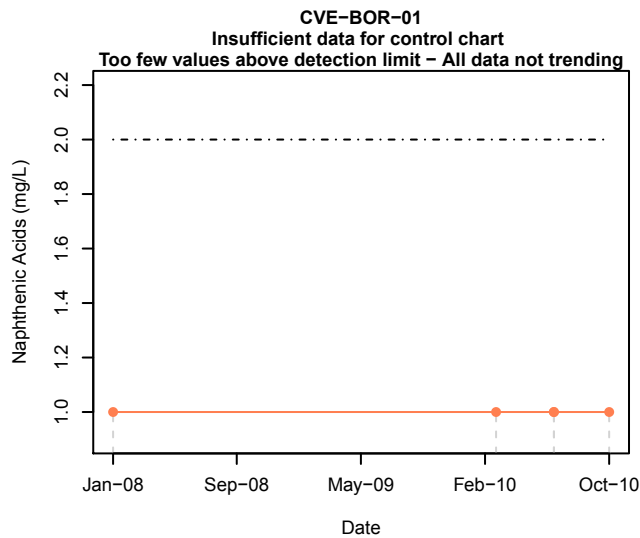
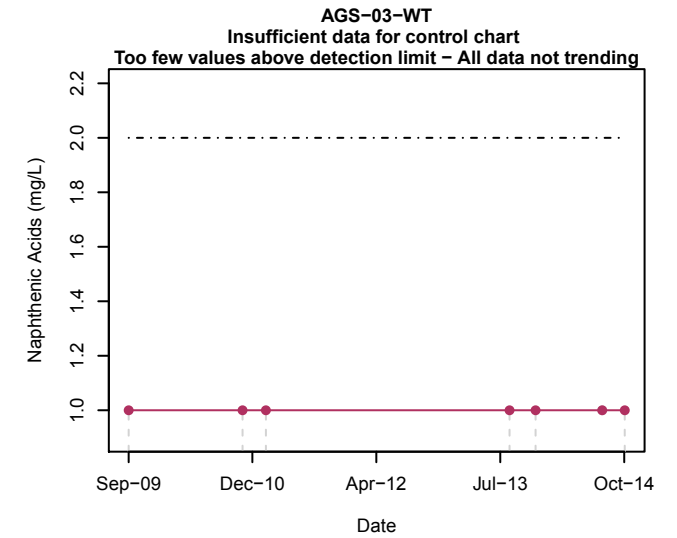
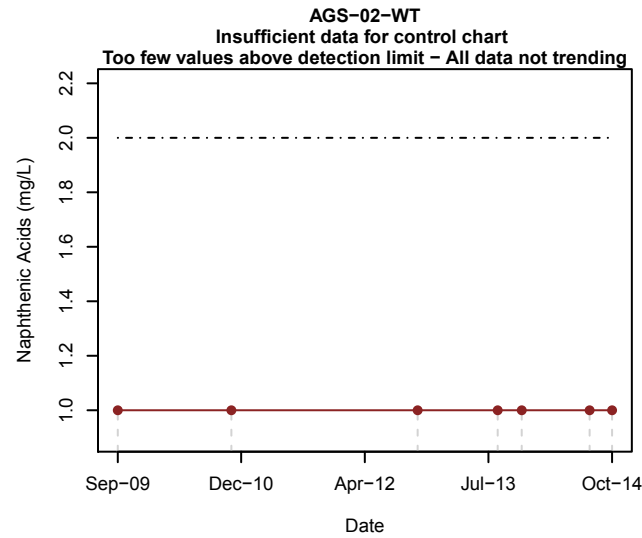
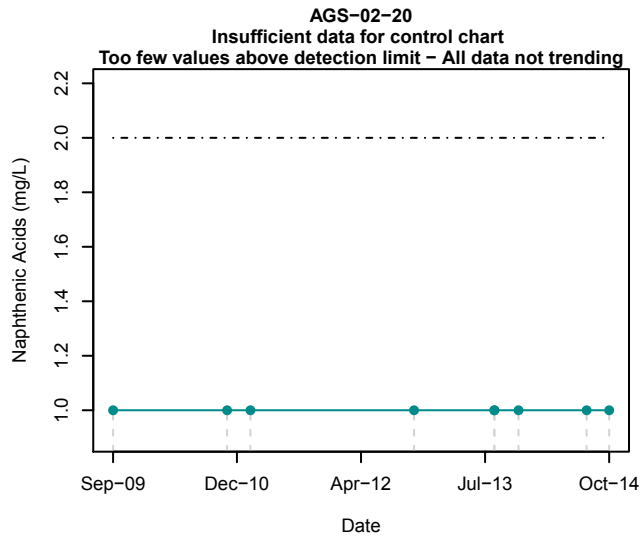
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Historical Naphthenic Acids Concentrations



(-) Interim Quality Triggers for NAOS- Surficial Deposits = 2 mg/L

Appendix C8a

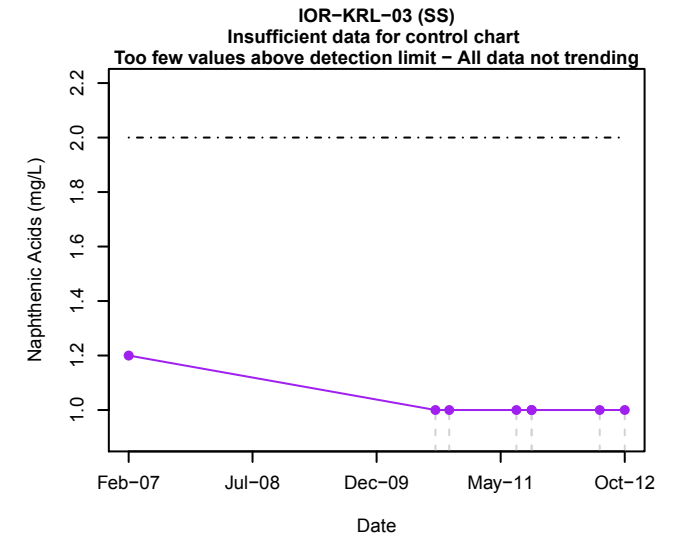
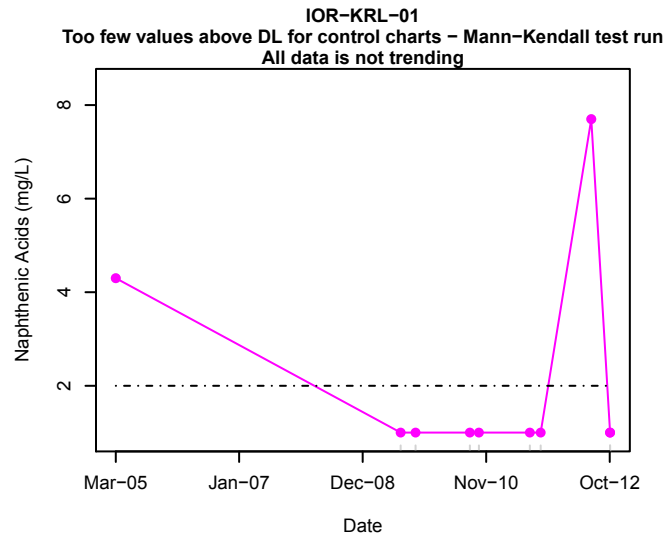
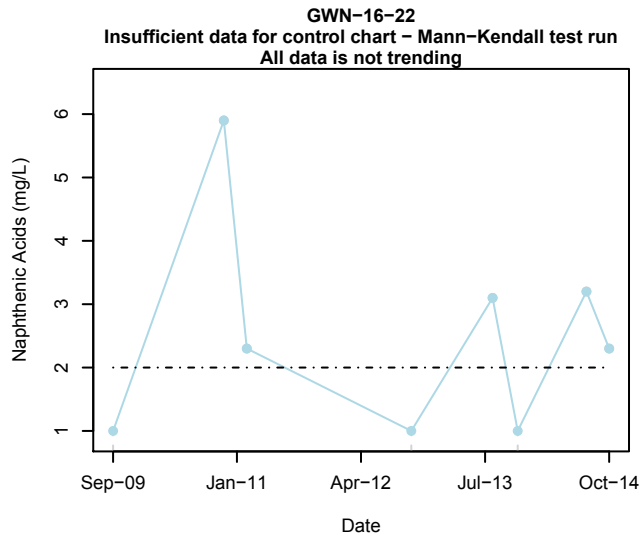
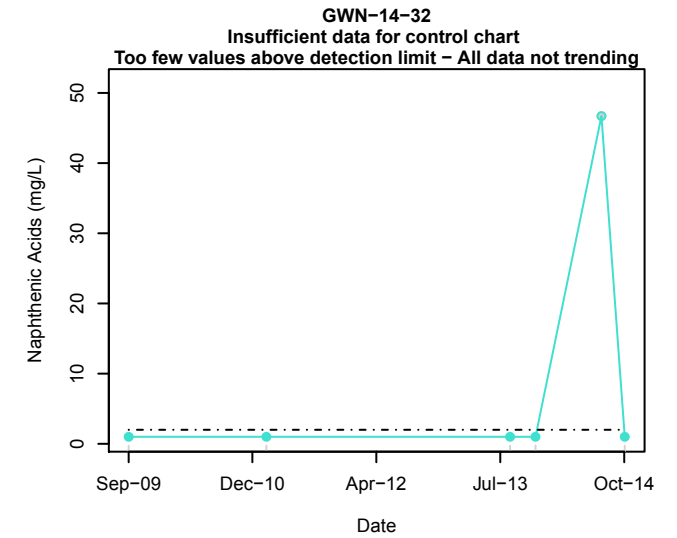
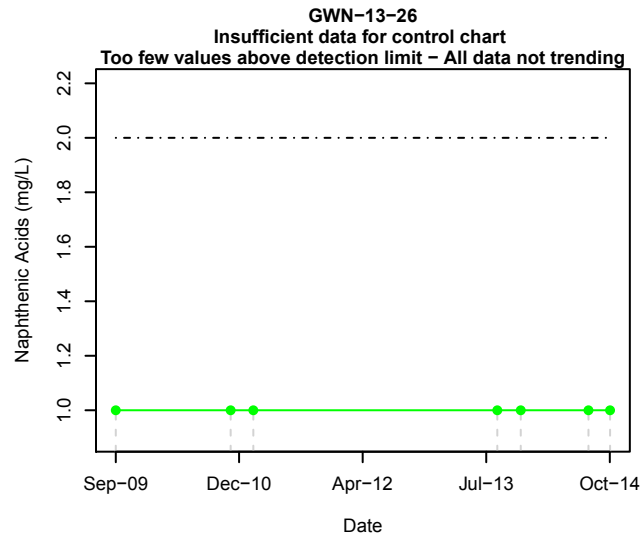
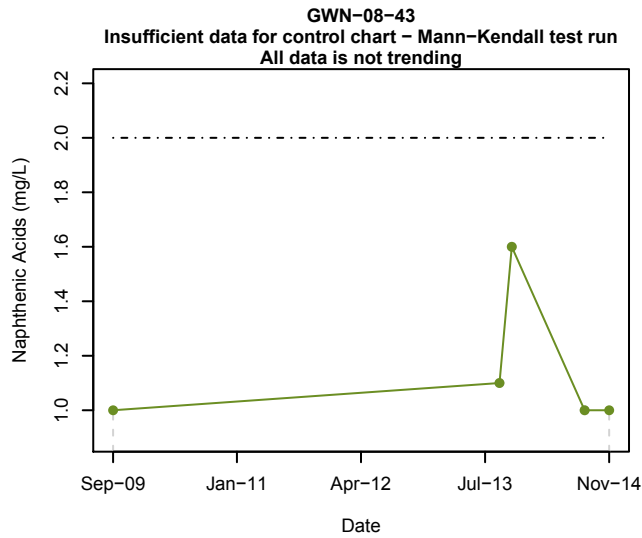
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Naphthenic Acids



- Naphthenic Acids
- - - Values below detection limit
- Data point not used in analysis
- · · Interim Quality Triggers for NAOS- Surficial Deposits = 2 mg/L

Appendix C8b

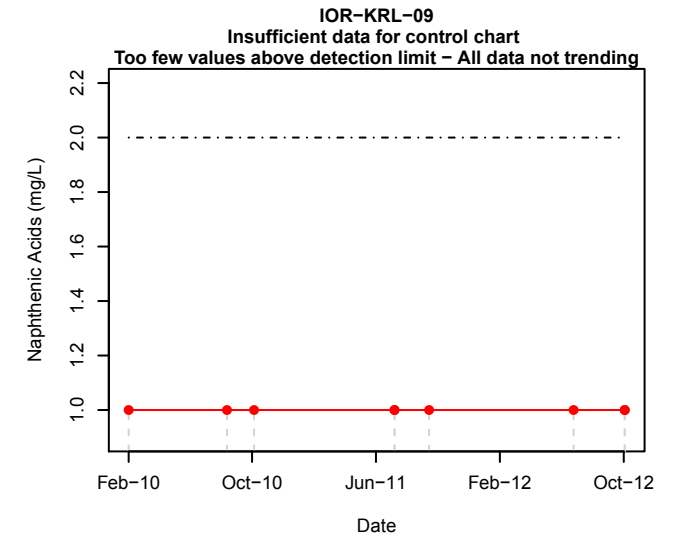
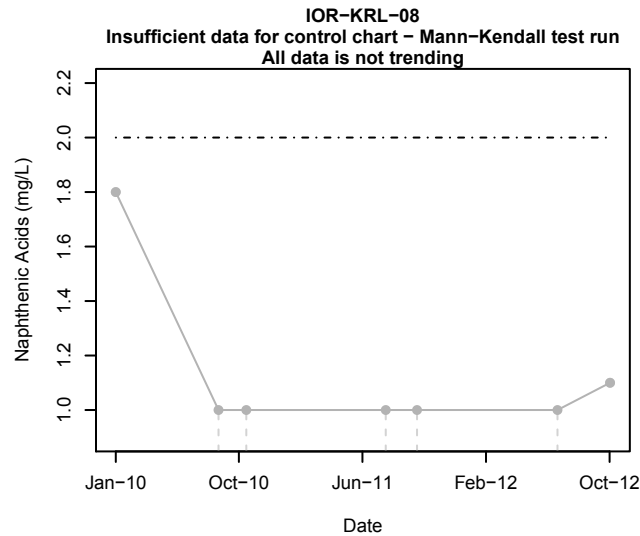
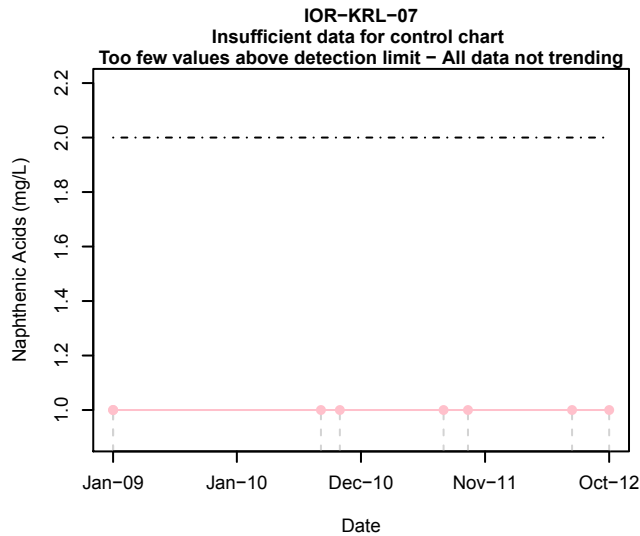
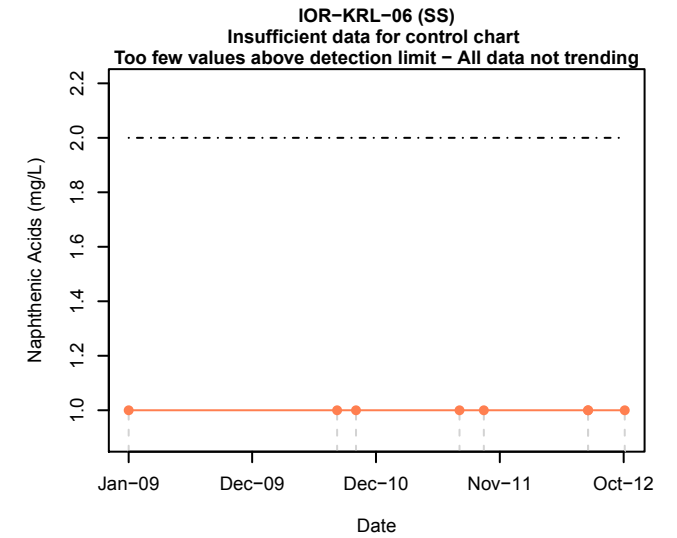
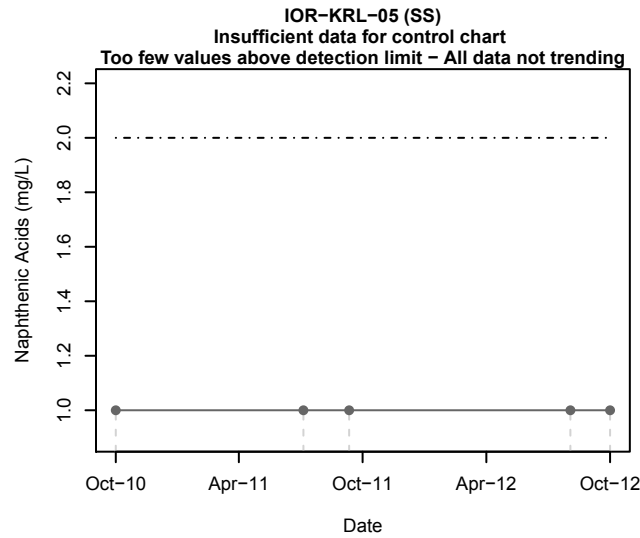
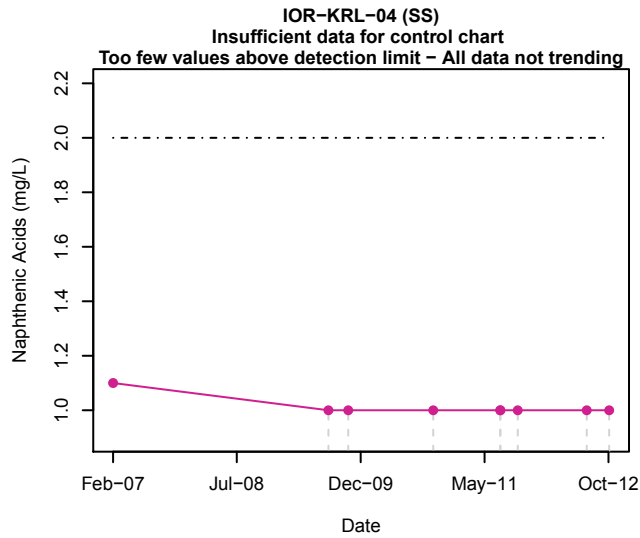
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Naphthenic Acids



- Naphthenic Acids
- - - Values below detection limit
- Data point not used in analysis
- ⋯ Interim Quality Triggers for NAOS- Surficial Deposits = 2 mg/L

Appendix C8b

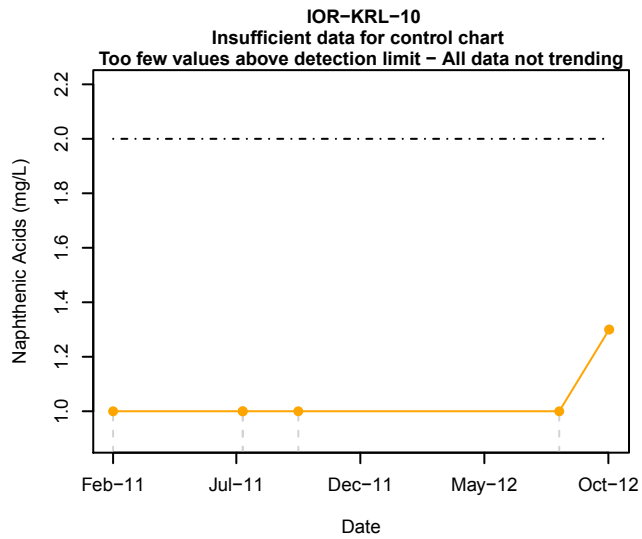
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Naphthenic Acids



- Naphthenic Acids
- - - Values below detection limit
- Data point not used in analysis
- · · Interim Quality Triggers for NAOS- Surficial Deposits = 2 mg/L

Appendix C8b

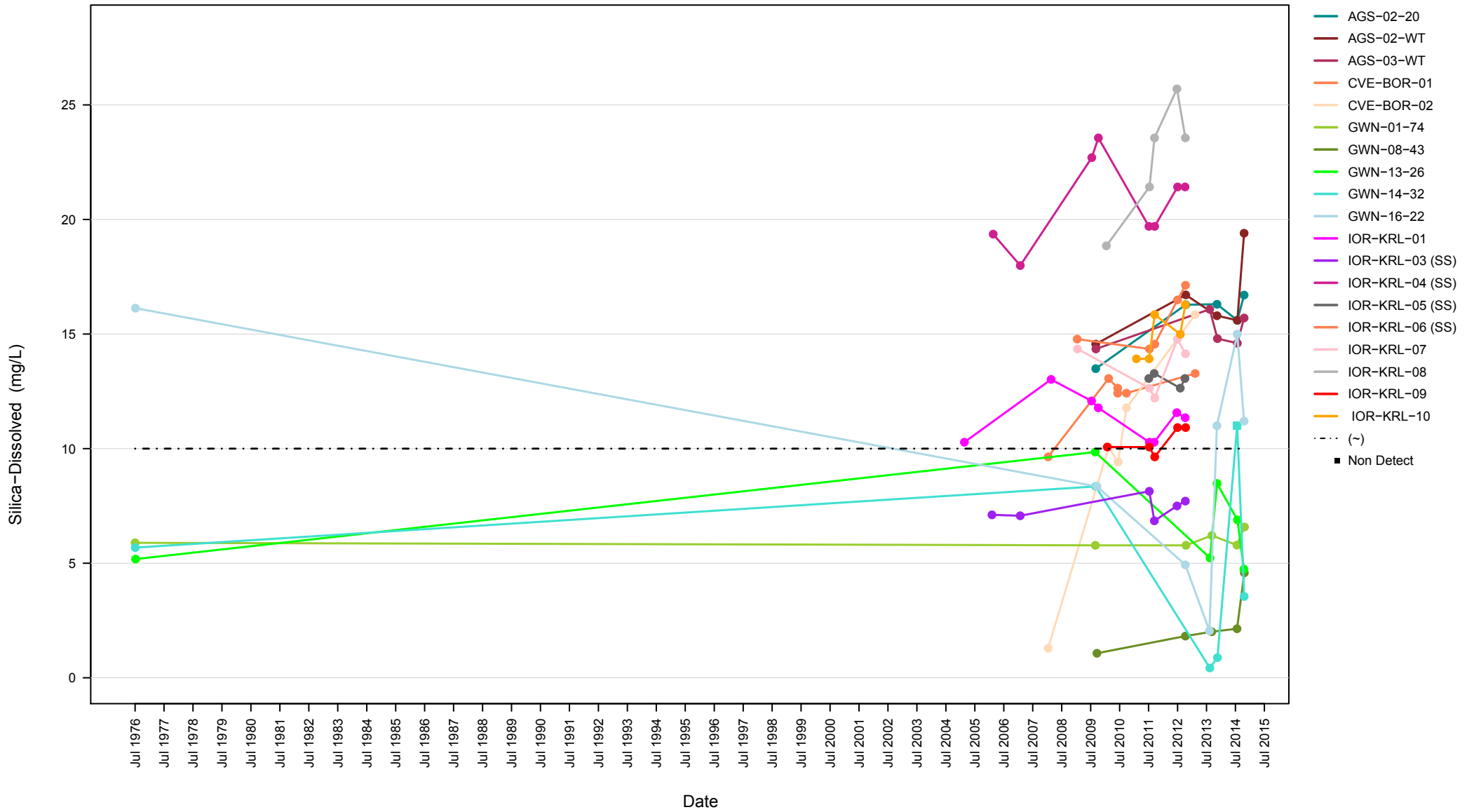
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Naphthenic Acids



- Naphthenic Acids
- Values below detection limit
- Data point not used in analysis
- ⋯ Interim Quality Triggers for NAOS- Surficial Deposits = 2 mg/L

Appendix C8b

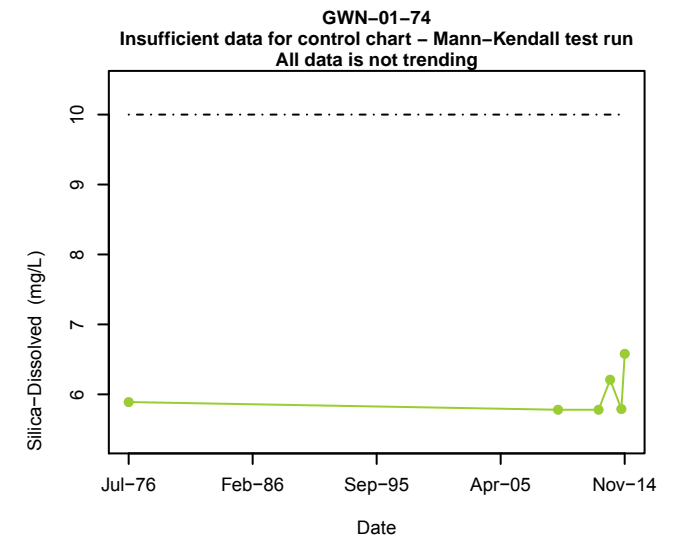
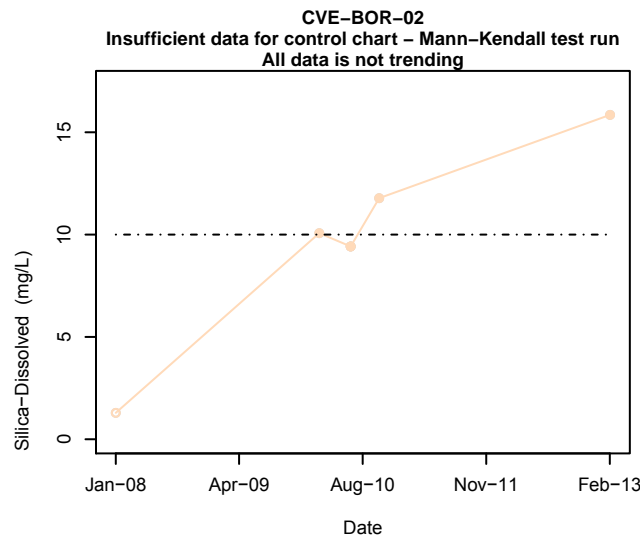
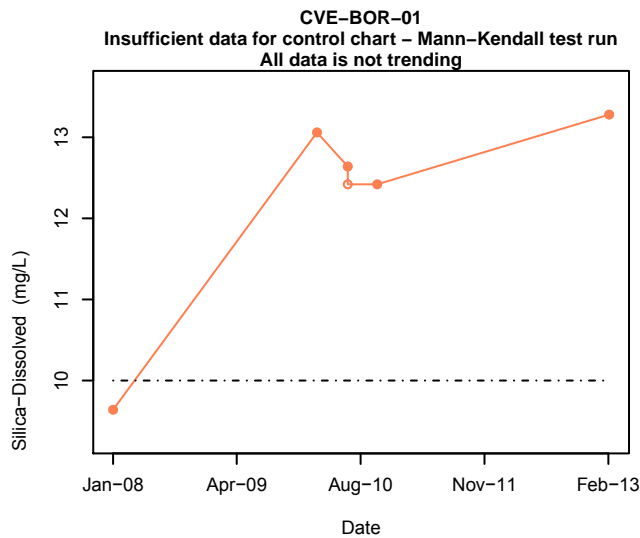
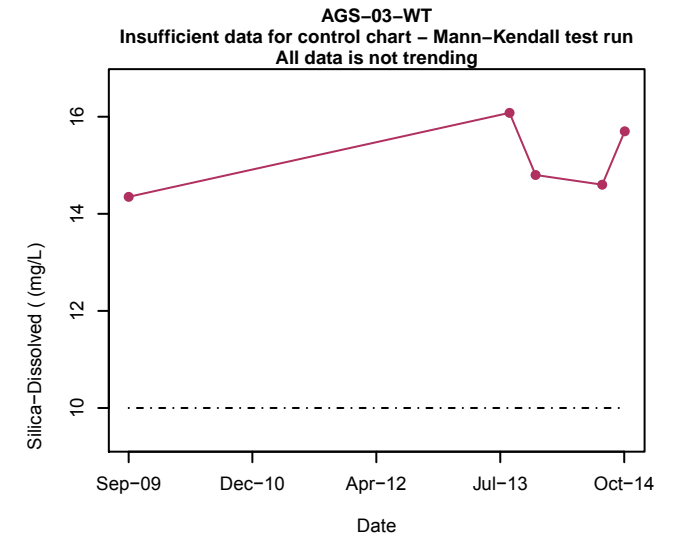
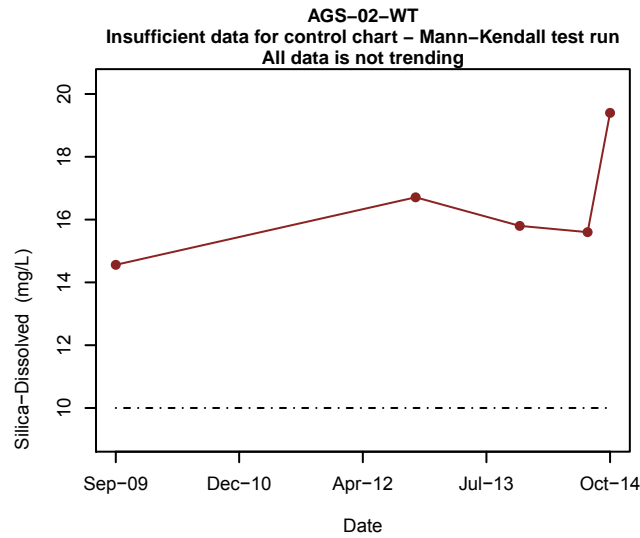
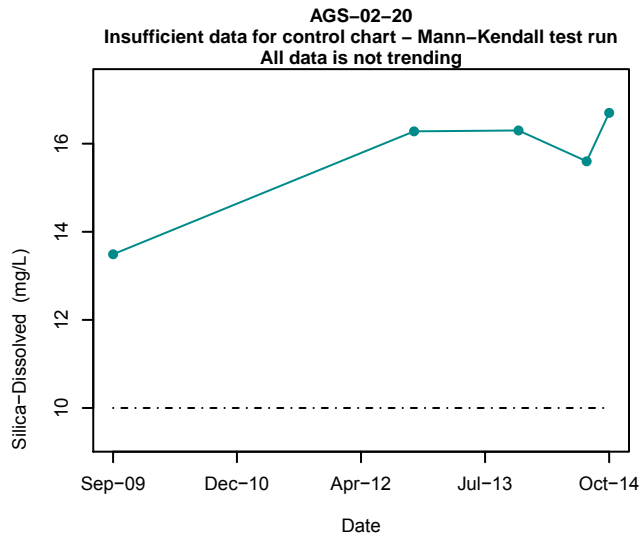
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Historical Dissolved Silica Concentrations



(~) Interim Quality Triggers for NAOS- Surficial Deposits = 10 mg/L

Appendix C9a

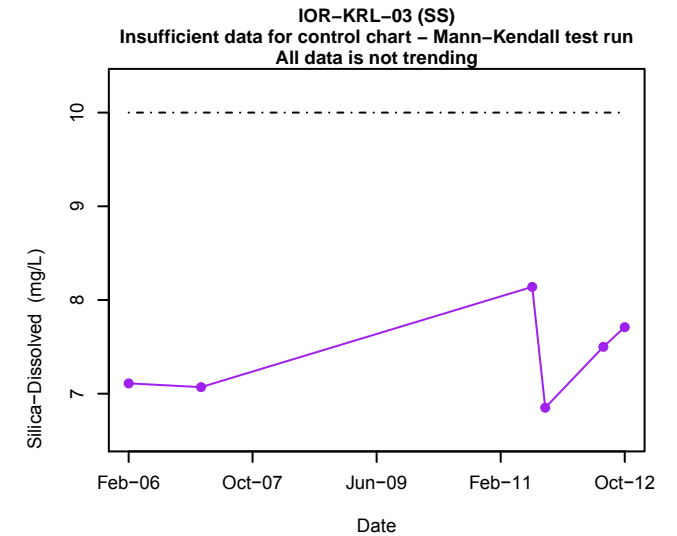
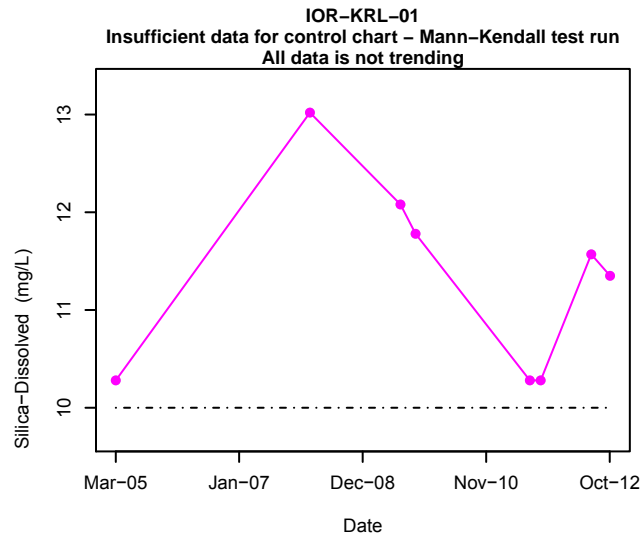
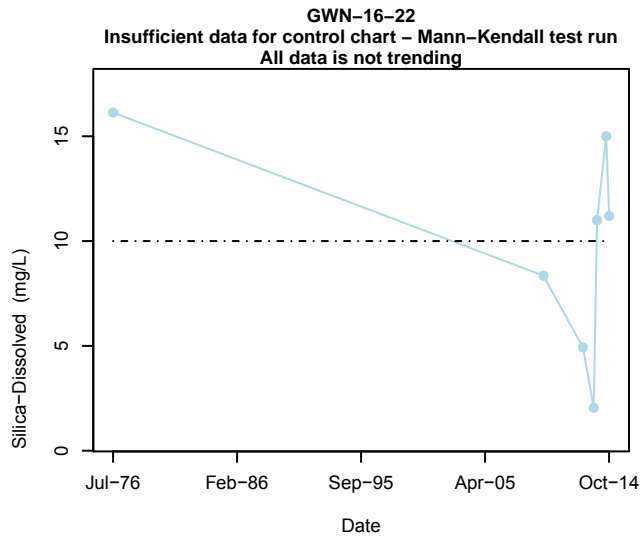
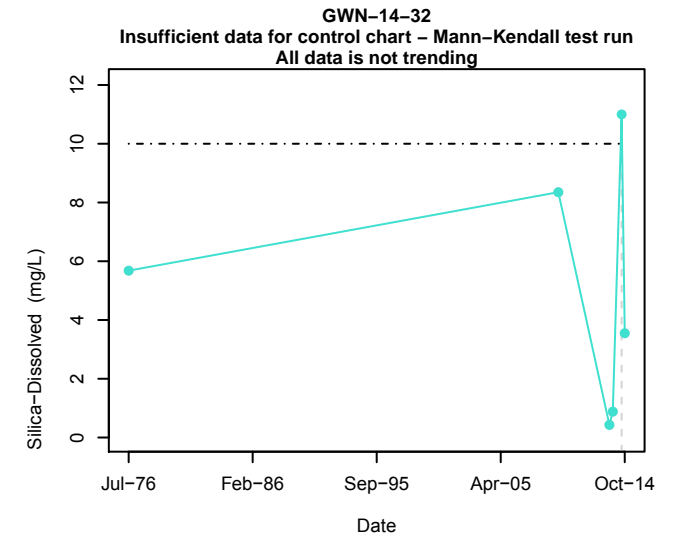
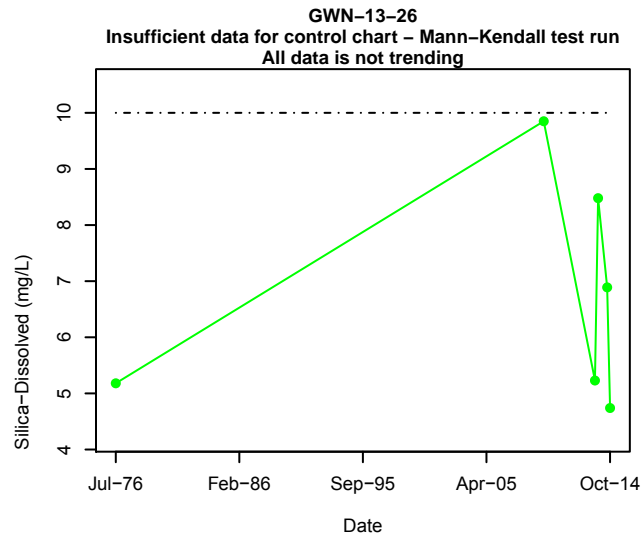
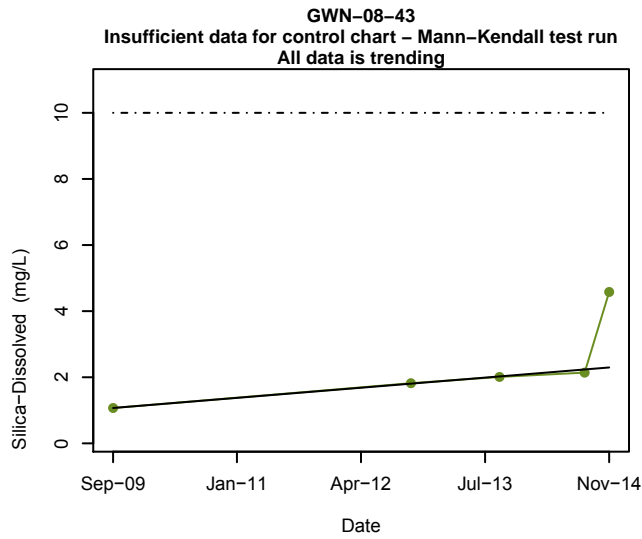
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Dissolved Silica



● Silica-Dissolved
 ○ Data point not used in analysis
 - - - Interim Quality Triggers for NAOS- Surficial Deposits = 10 mg/L

Appendix C9b

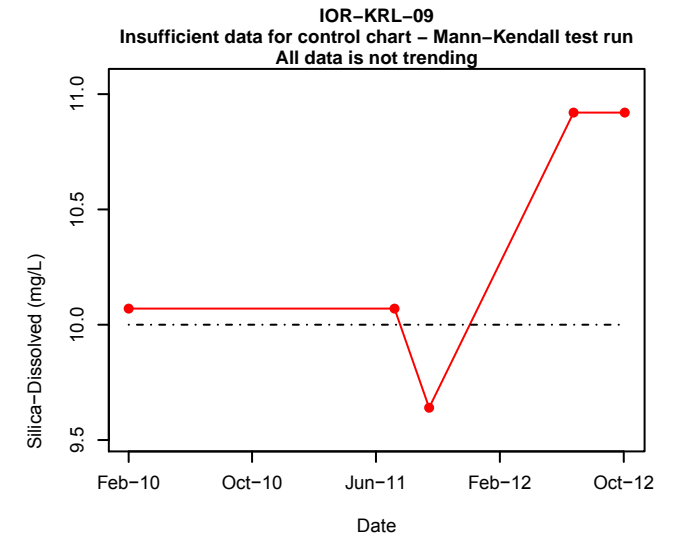
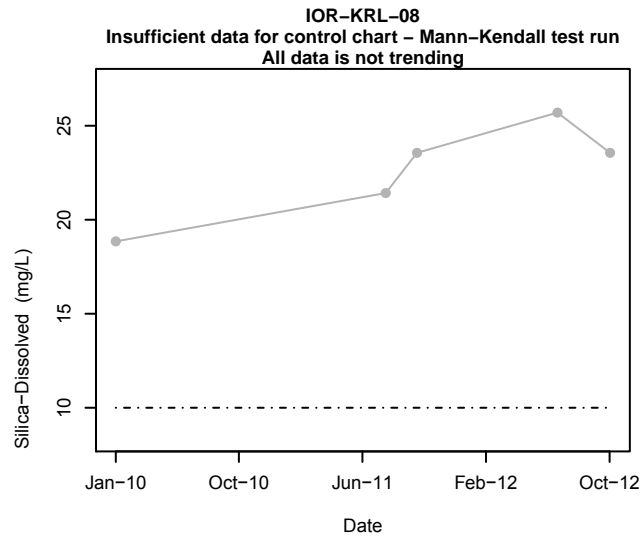
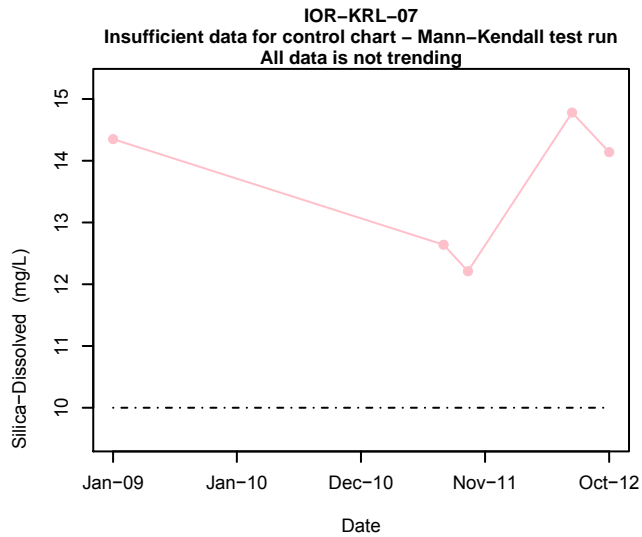
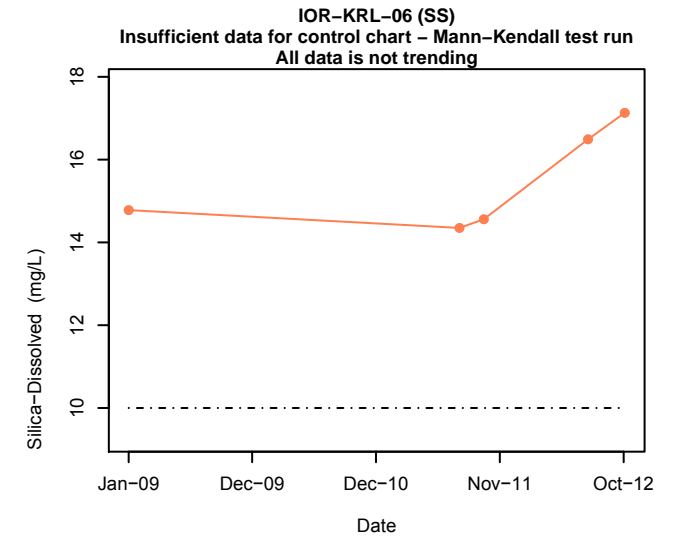
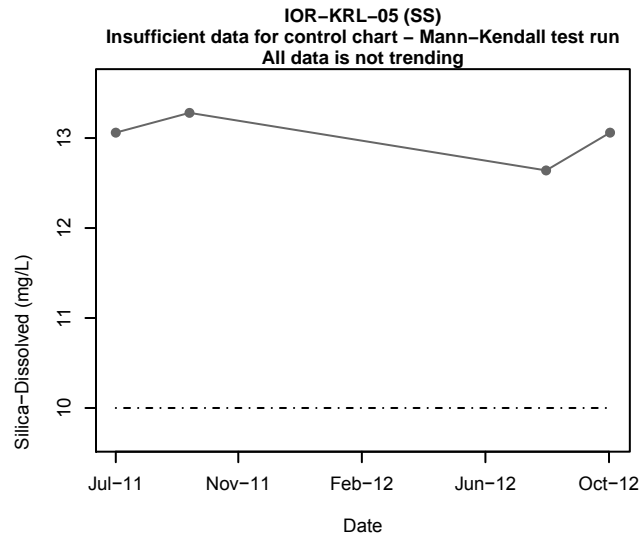
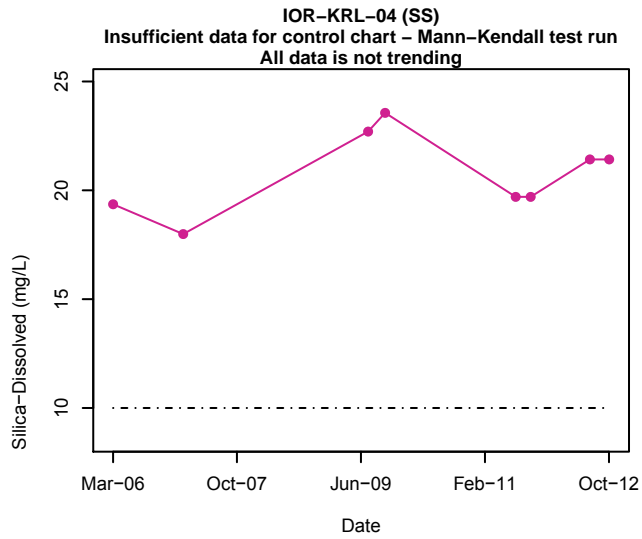
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Dissolved Silica



- Silica-Dissolved
- - - Values below detection limit
- Sen slope
- Data point not used in analysis
- · - · Interim Quality Triggers for NAOS- Surficial Deposits = 10 mg/L

Appendix C9b

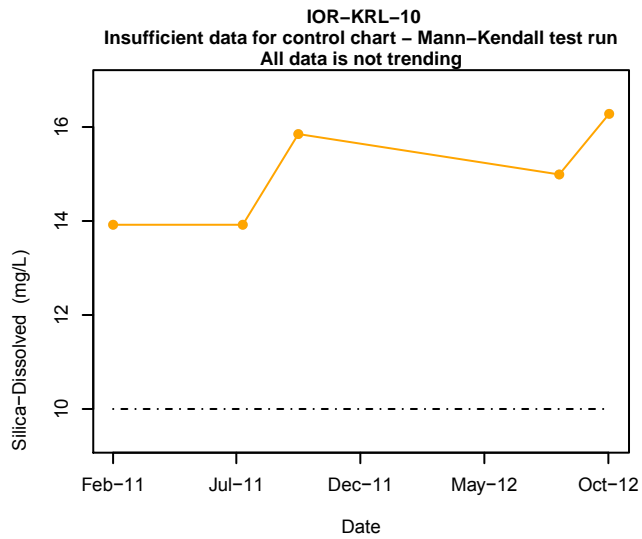
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Dissolved Silica



- Silica-Dissolved (Reactive) Calculated
- Values below detection limit
- Sen slope
- Data point not used in analysis
- Interim Quality Triggers for NAOS- Surficial Deposits = 10 mg/L

Appendix C9b.

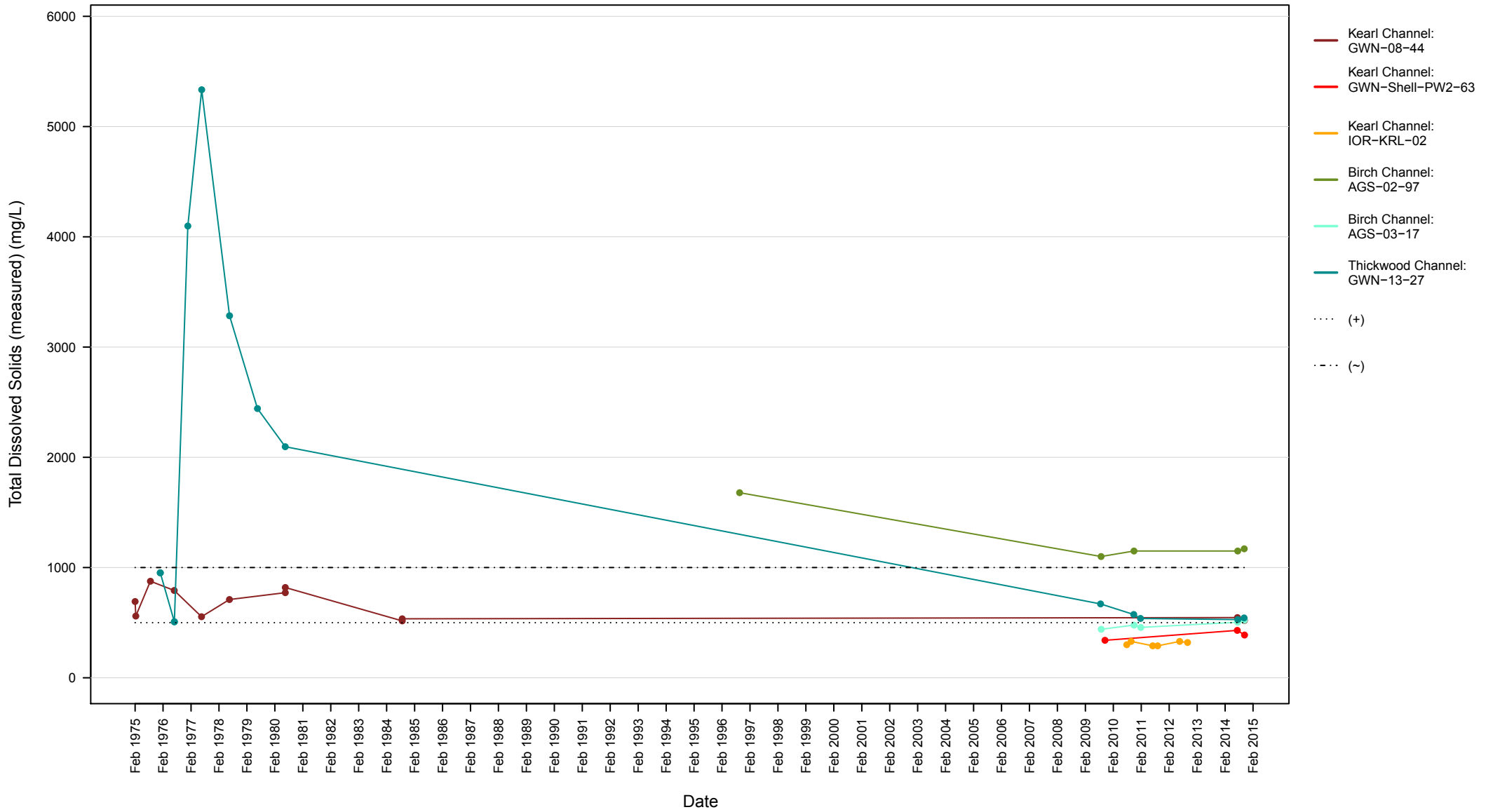
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Surficial Sands) Shewhart-CUSUM Control Charts- Dissolved Silica



- Silica-Dissolved (Reactive) Calculated
- - - Values below detection limit
- Sen slope
- Data point not used in analysis
- · - · Interim Quality Triggers for NAOS- Surficial Deposits = 10 mg/L

Appendix C9b

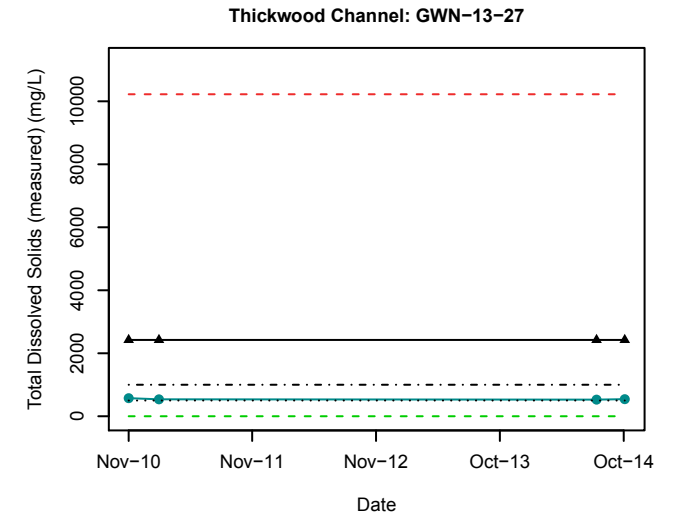
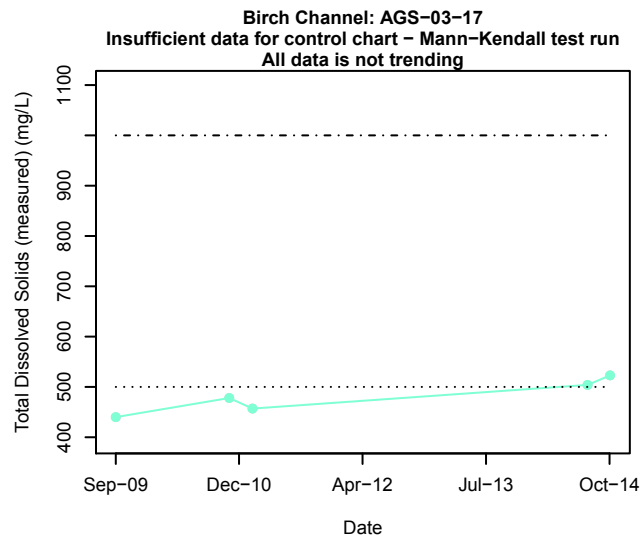
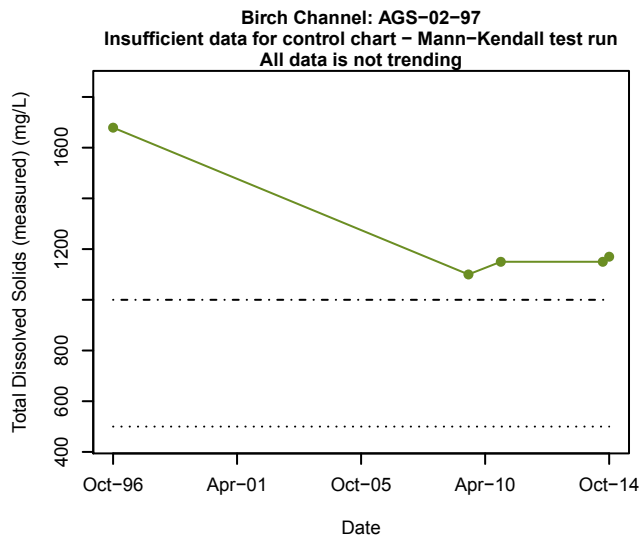
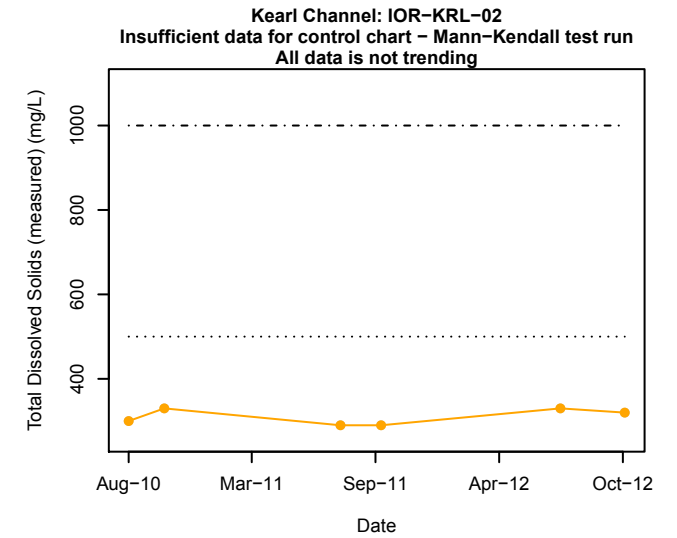
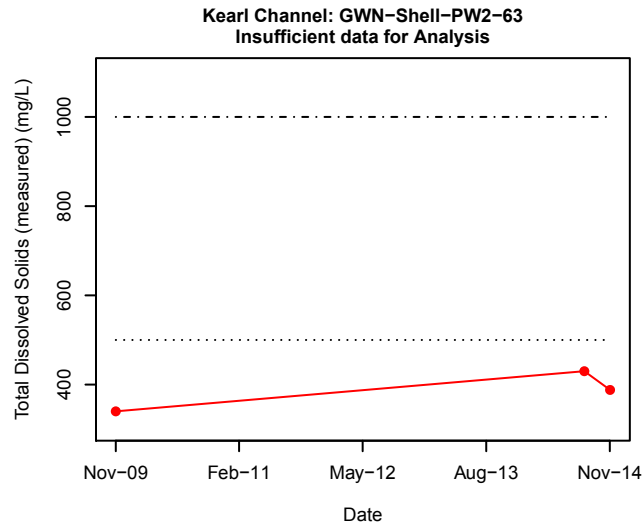
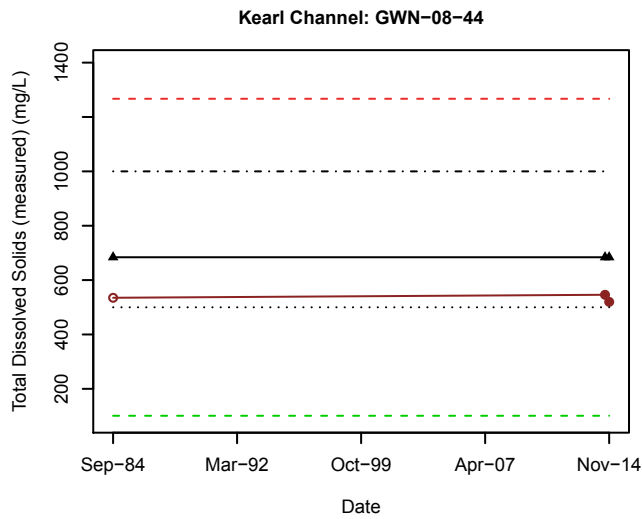
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network Historical Total Dissolved Solid Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 500 mg/L
 (-) Interim Quality Triggers for NAOS- Buried Channels = 1000 mg/L

Appendix C10a

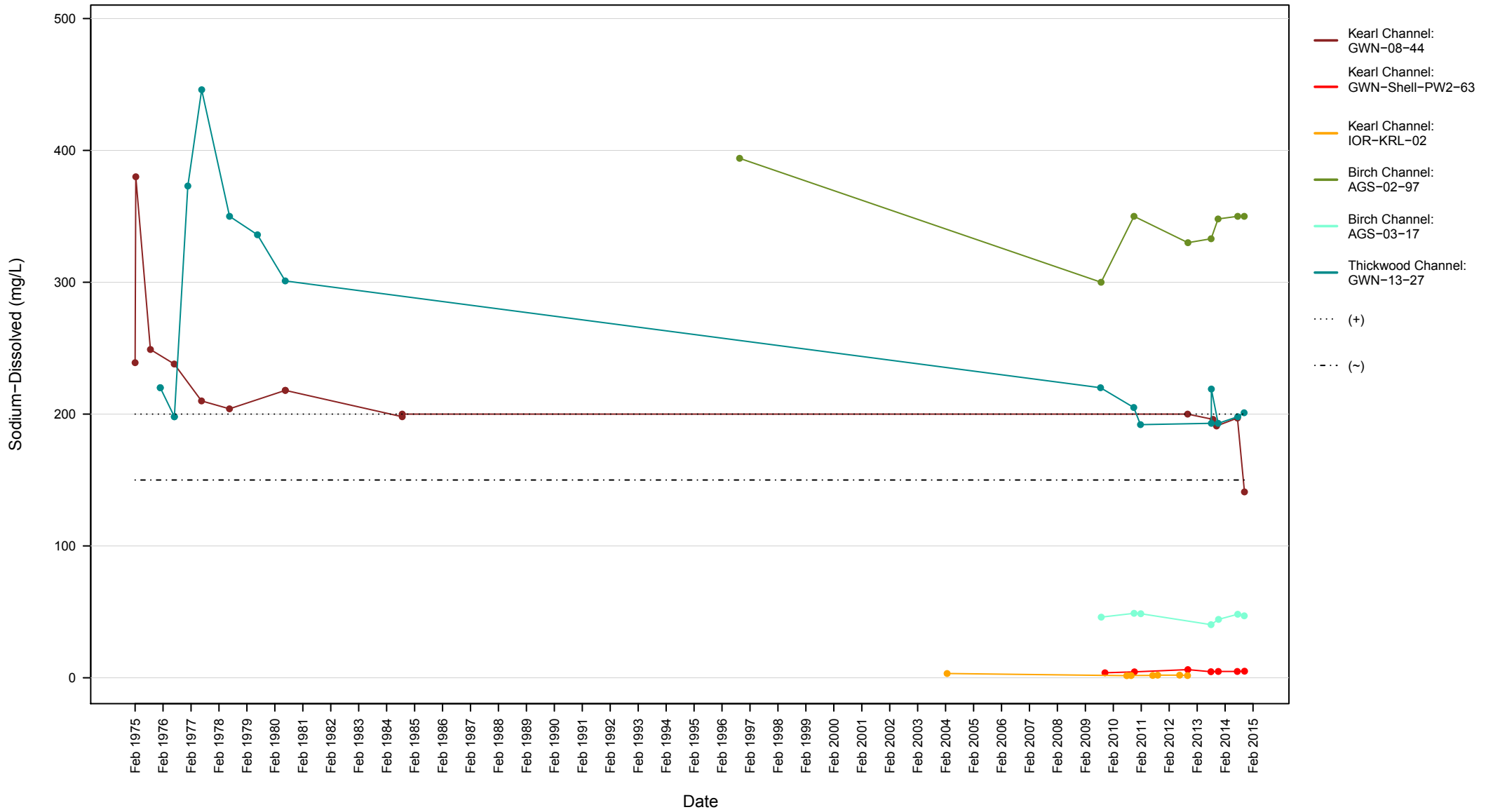
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network Shewhart-CUSUM Control Charts- Total Dissolved Solids



- Total Dissolved Solids (measured)
- Data point not used in analysis
- Alberta Tier 1-Natural Areas -2010 = 500 mg/L
- Interim Quality Triggers for NAOS- Buried Channels = 1000 mg/L
- ▲ CUSUM
- Well upper control limit
- Well lower control limit

Appendix C10b

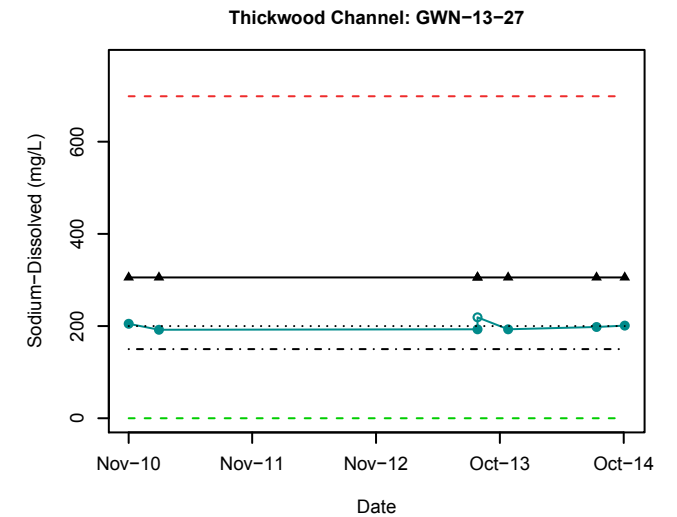
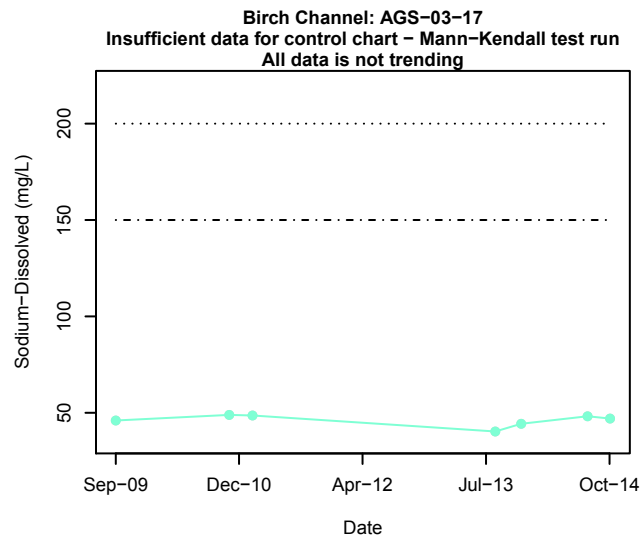
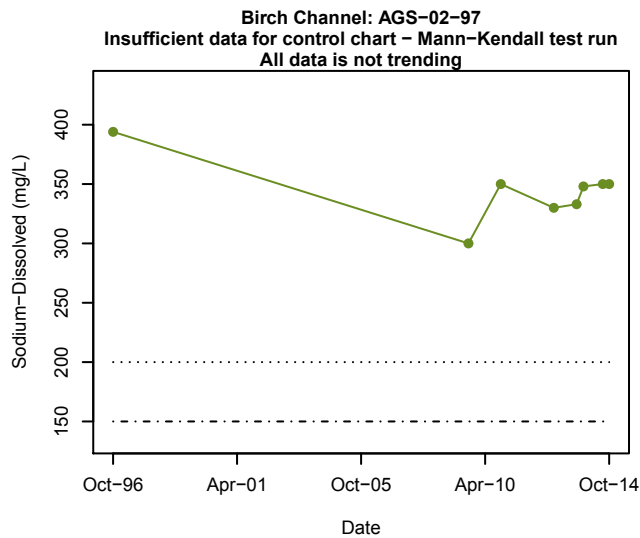
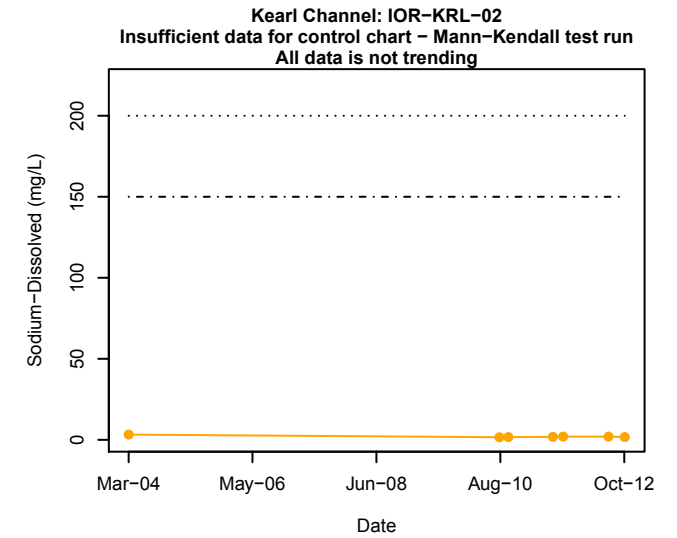
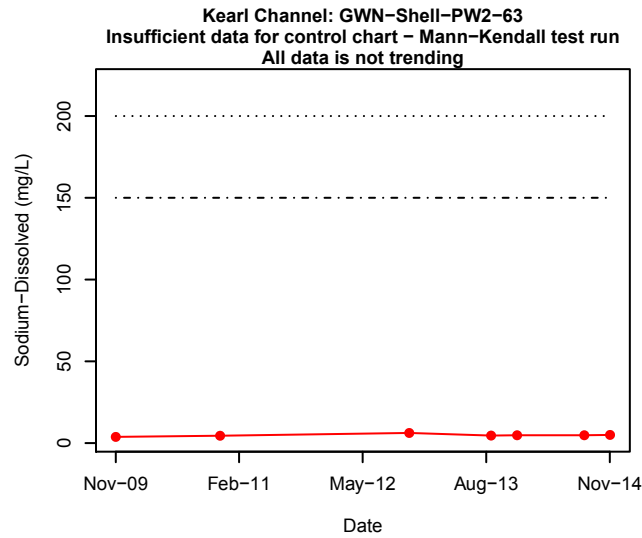
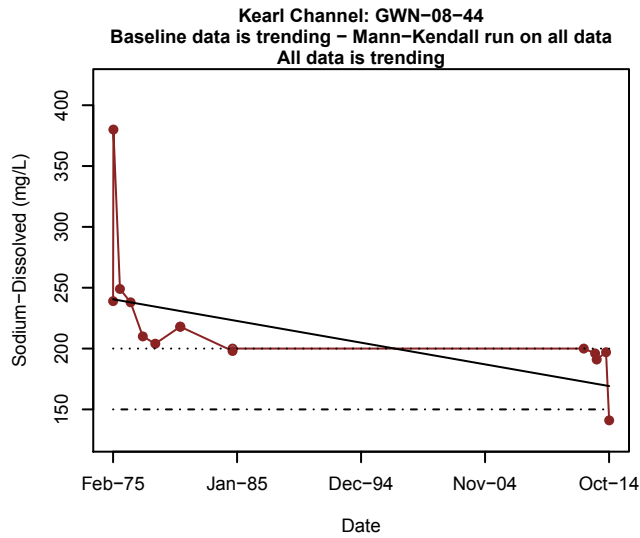
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network Historical Dissolved Sodium Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 200 mg/L
 (-) Interim Quality Triggers for NAOS- Buried Channels = 150 mg/L

Appendix C11a

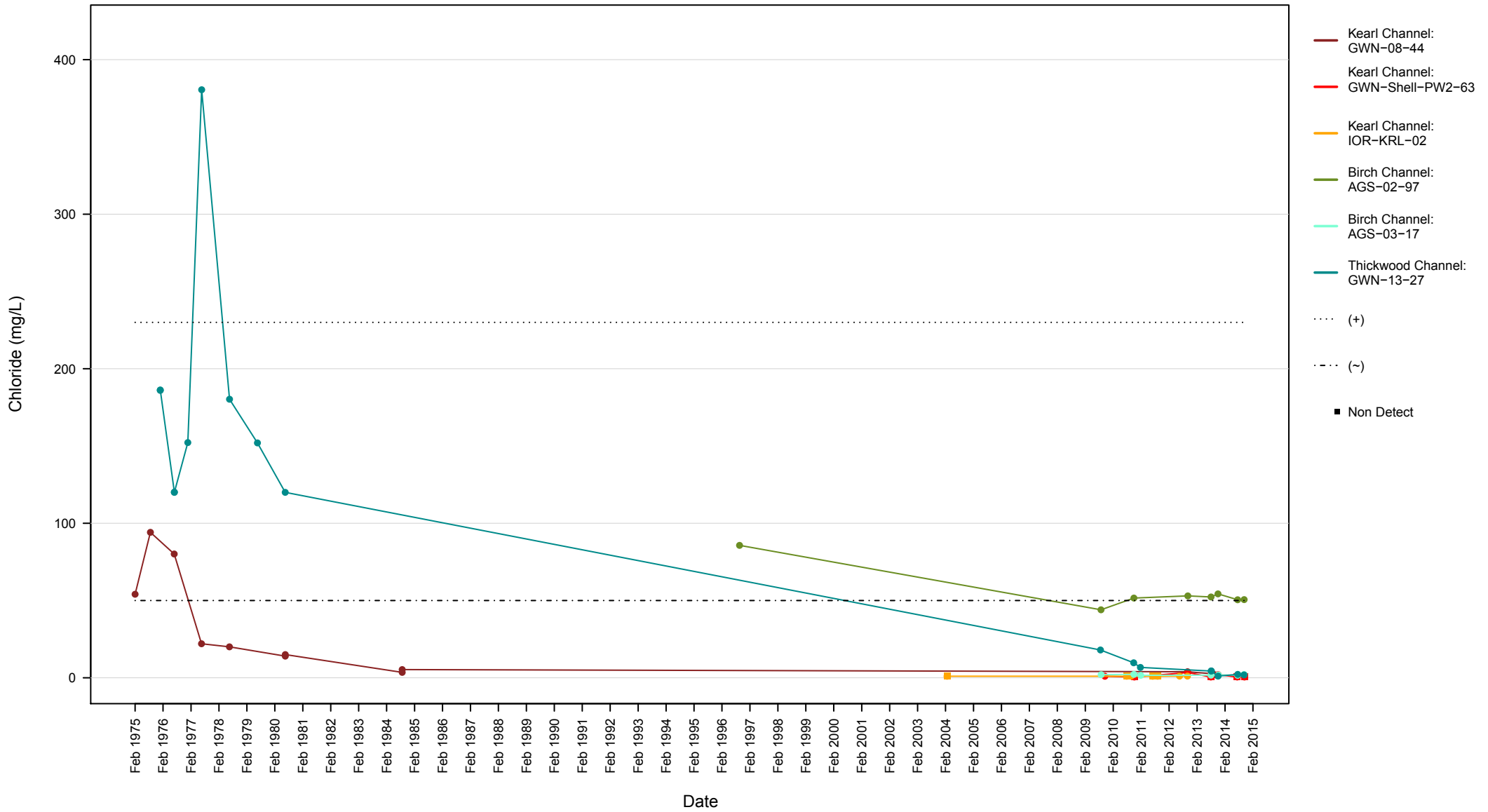
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network Shewhart-CUSUM Control Charts- Dissolved Sodium



- Sodium-Dissolved
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 200 mg/L
- ⋯ Interim Quality Triggers for NAOS- Buried Channels = 150 mg/L
- ▲ CUSUM
- - - Well upper control limit
- - - Well lower control limit

Appendix C11b

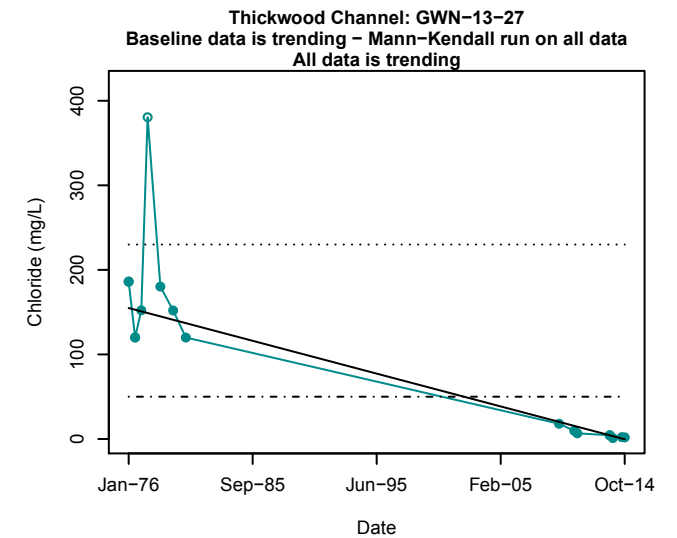
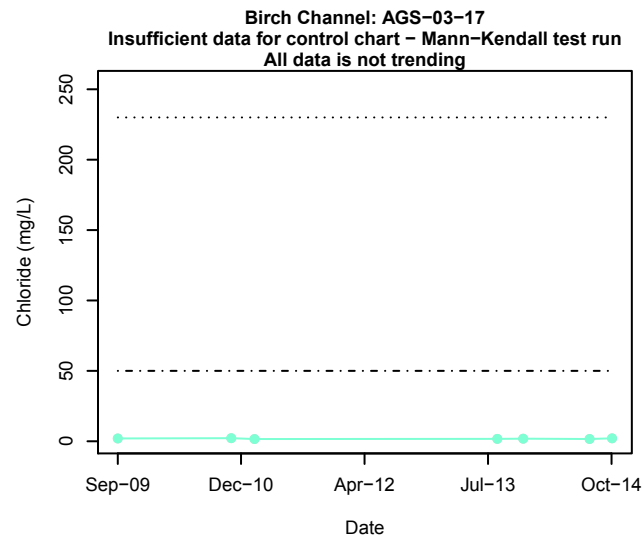
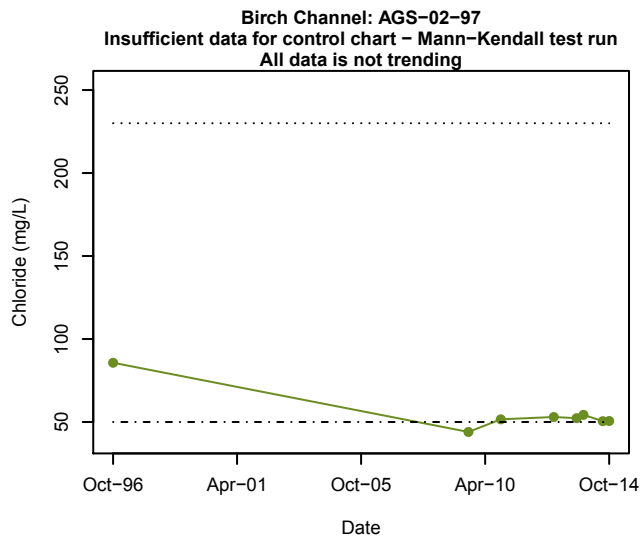
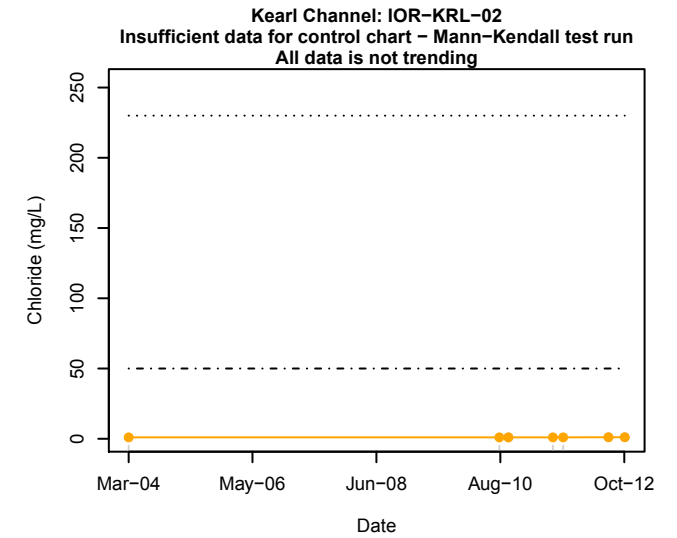
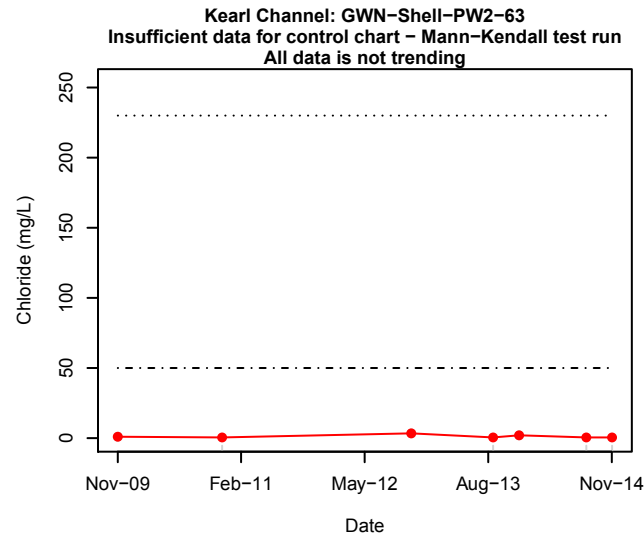
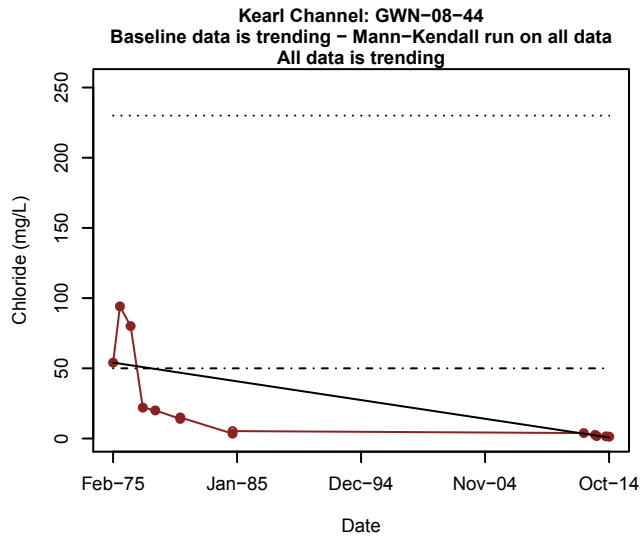
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network Historical Dissolved Chloride Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 230 mg/L
 (-) Interim Quality Triggers for NAOS- Buried Channels = 50 mg/L

Appendix C12a

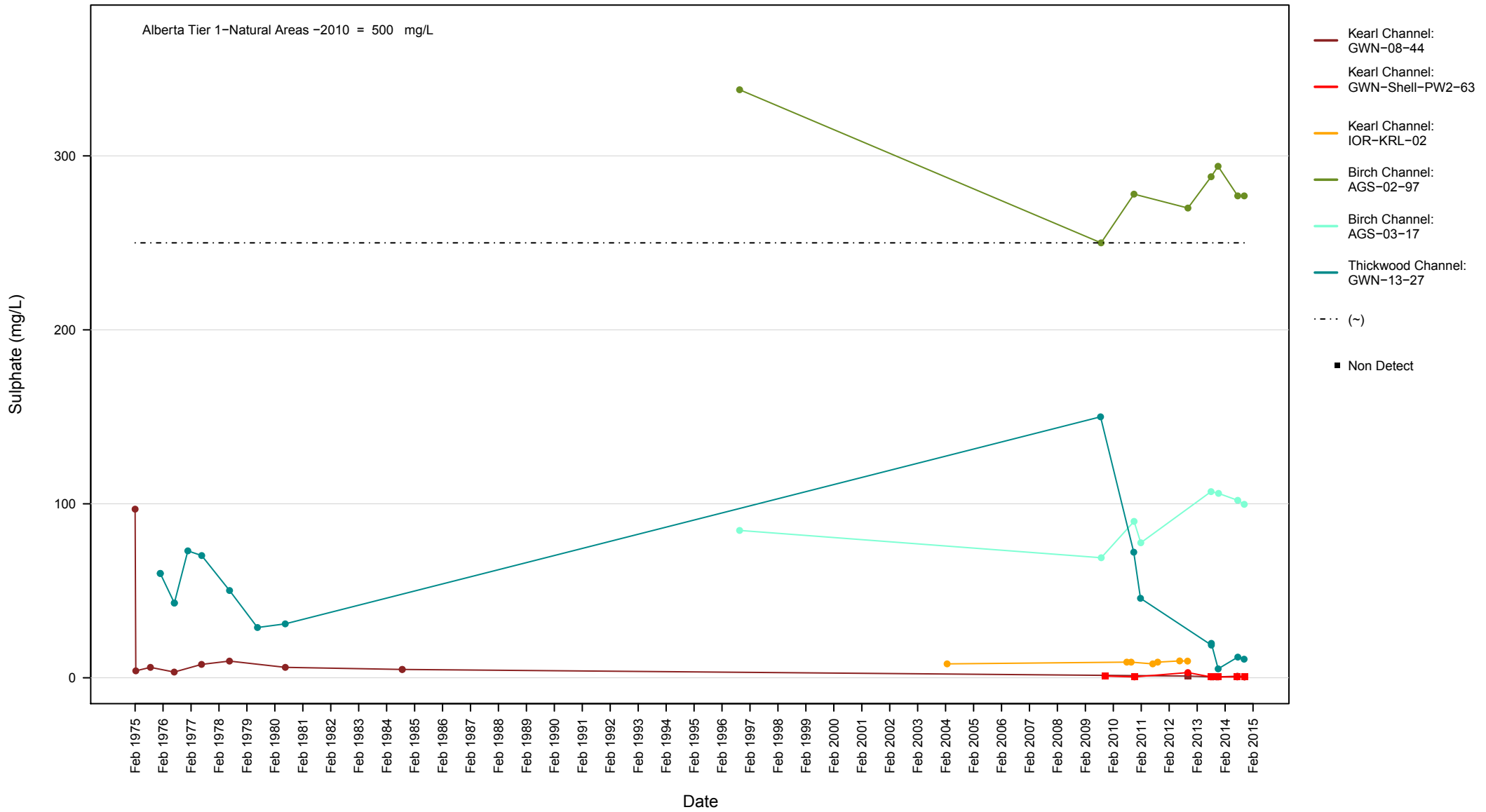
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network Shewhart-CUSUM Control Charts- Dissolved Chloride



- Chloride
- Data point not used in analysis
- Values below detection limit
- Alberta Tier 1-Natural Areas –2010 = 230 mg/L
- Sen slope
- Interim Quality Triggers for NAOS- Buried Channels = 50 mg/L

Appendix C12b

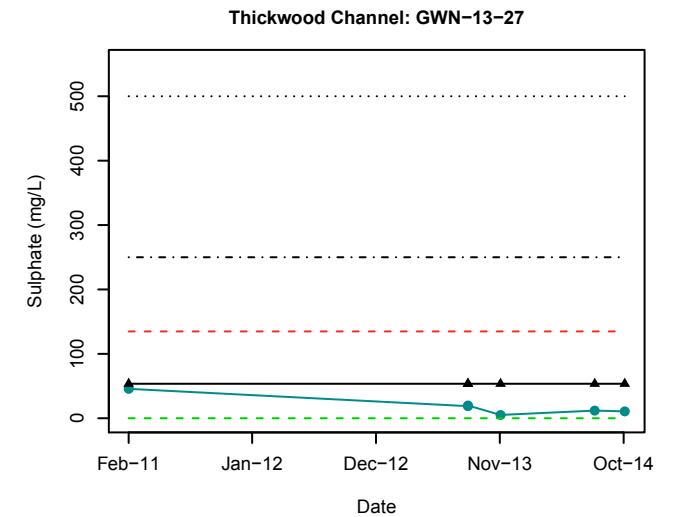
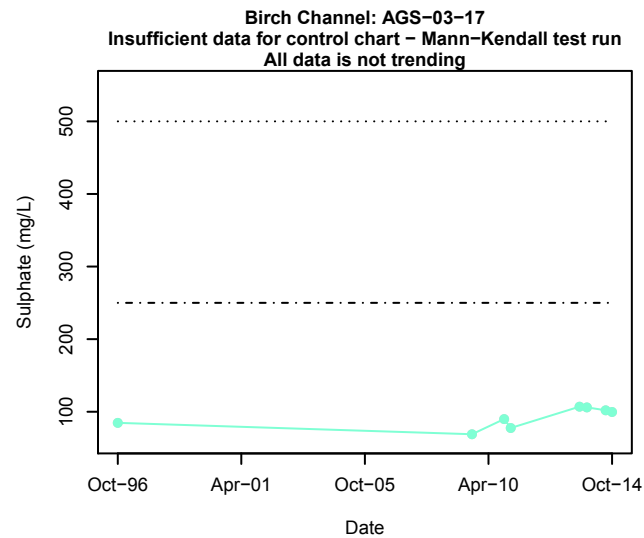
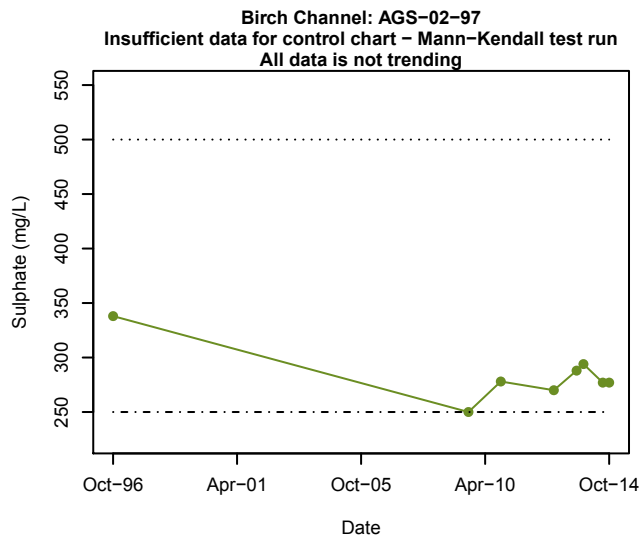
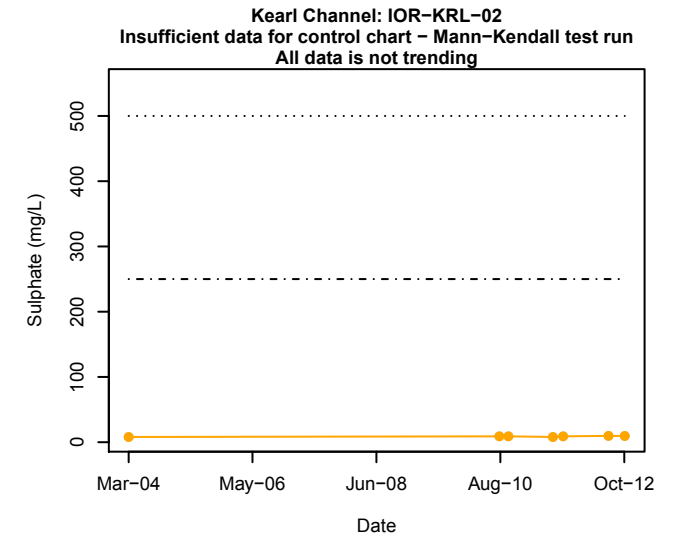
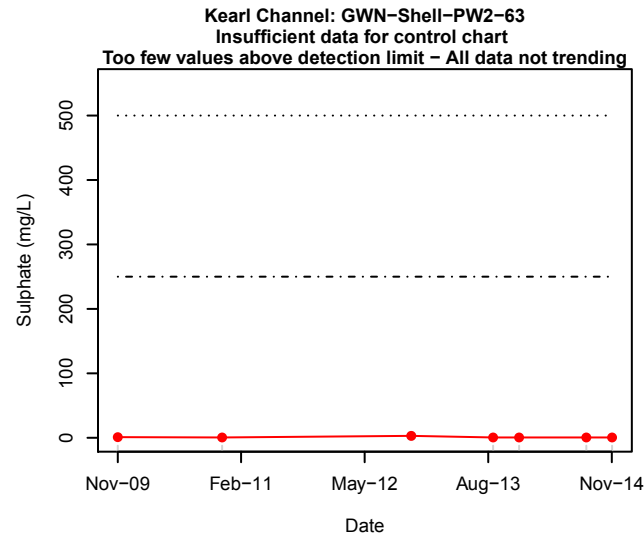
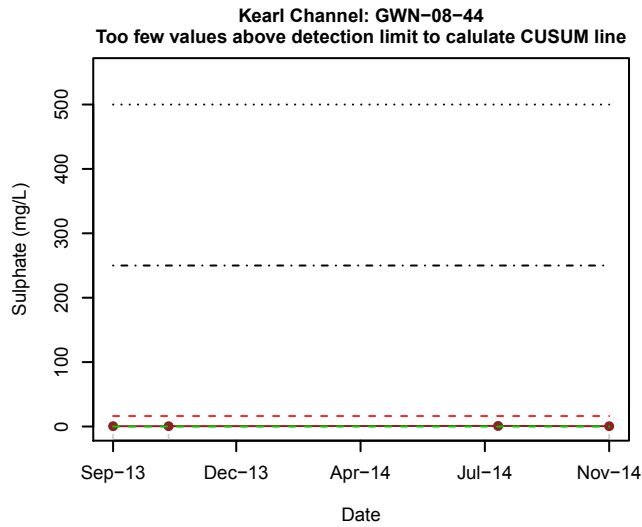
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network Historical Dissolved Sulphate Concentrations



(-) Interim Quality Triggers for NAOS- Buried Channels = 250 mg/L

Appendix C13a

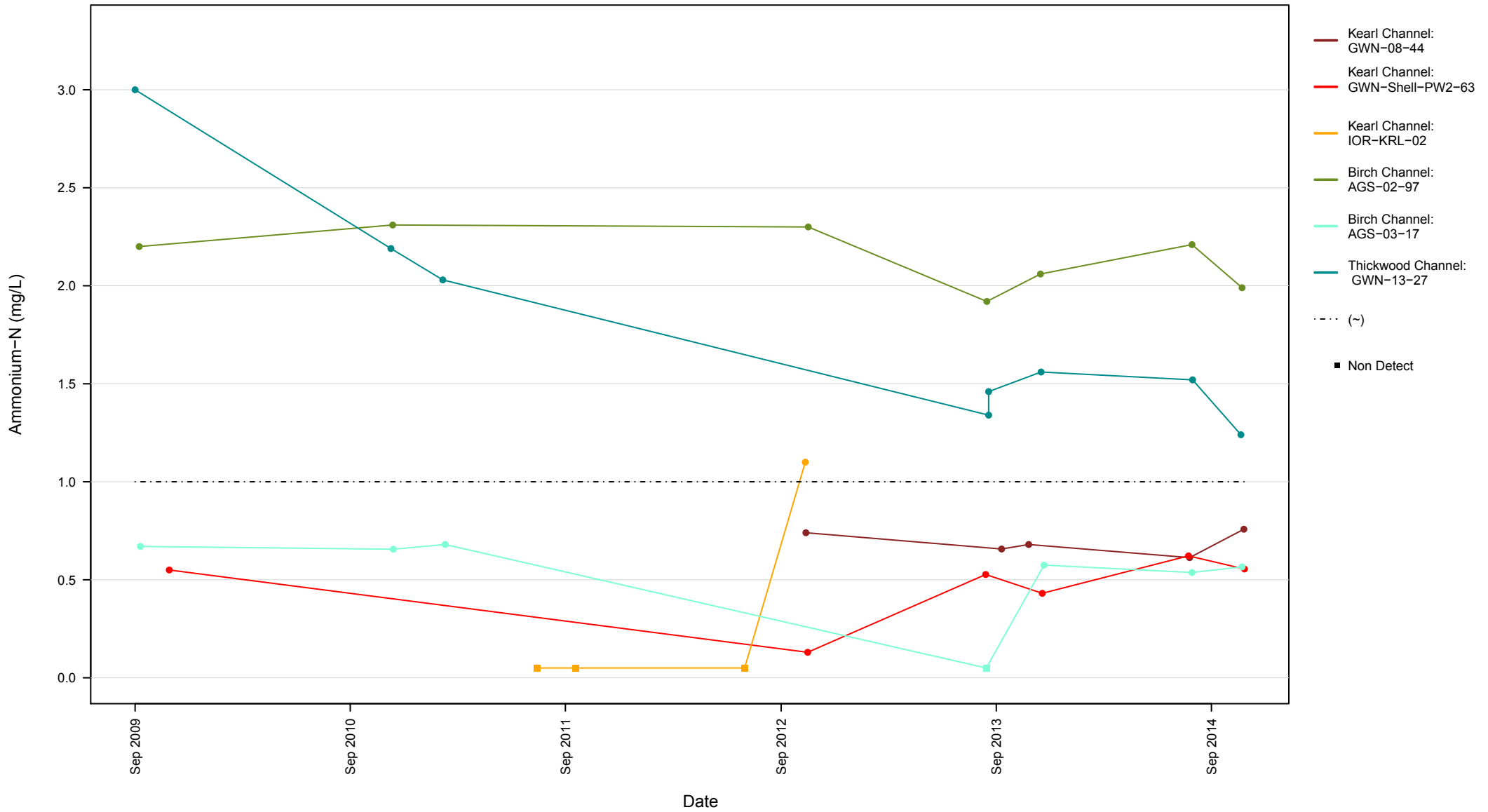
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network Shewhart-CUSUM Control Charts- Dissolved Sulphate



- Sulphate
- - - Values below detection limit
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 500 mg/L
- ⋯ Interim Quality Triggers for NAOS- Buried Channels = 250 mg/L
- ▲ CUSUM
- - - Well upper control limit
- - - Well lower control limit

Appendix C13b

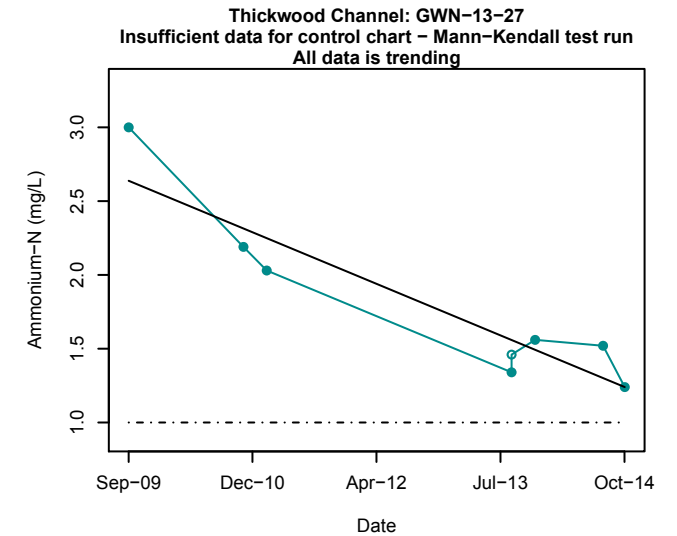
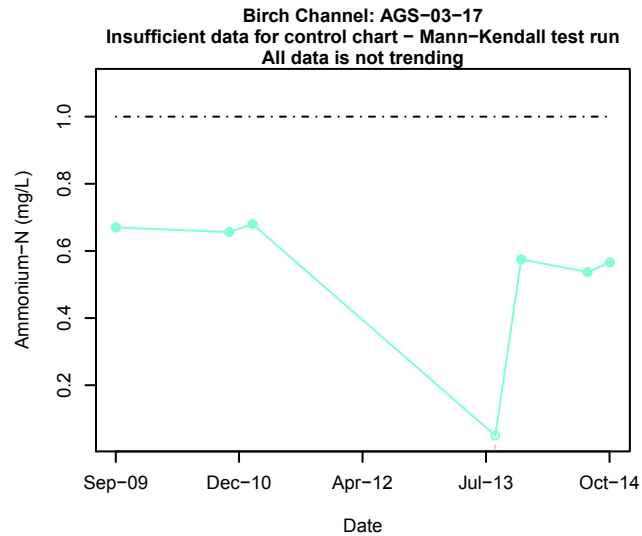
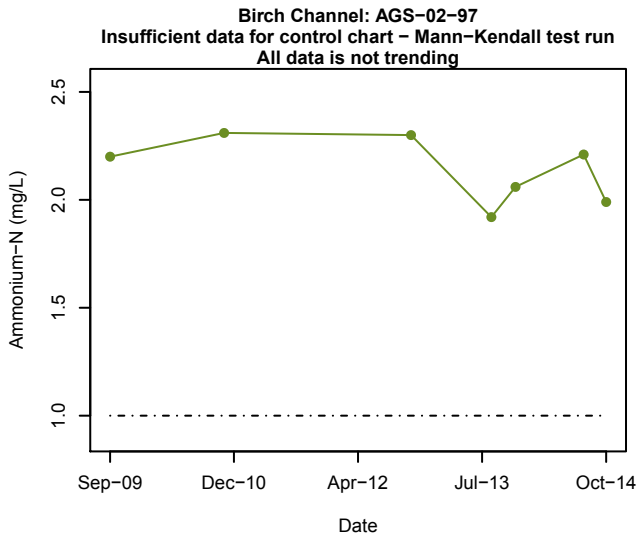
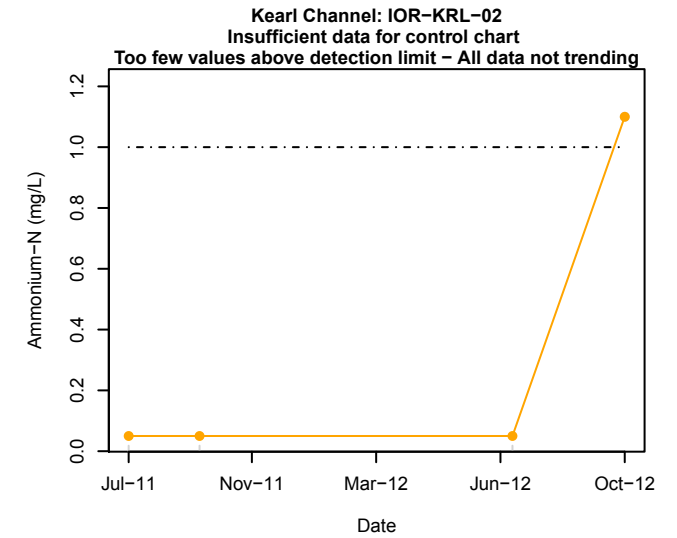
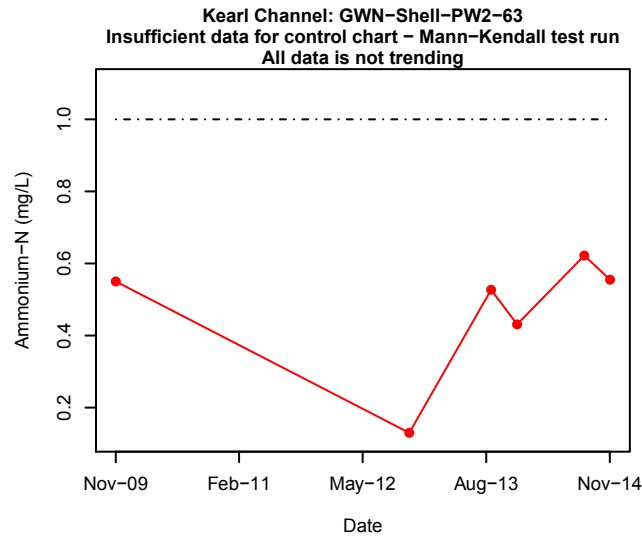
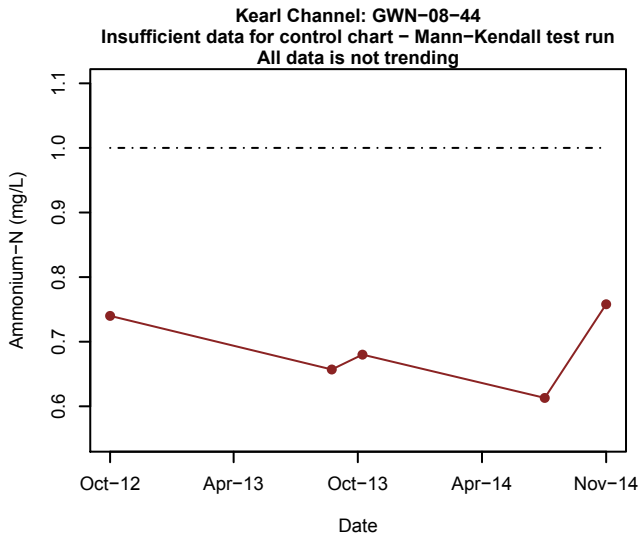
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network Historical Ammonium-N Concentrations



(-) Interim Quality Triggers for NAOS- Buried Channels = 1 mg/L

Appendix C14a

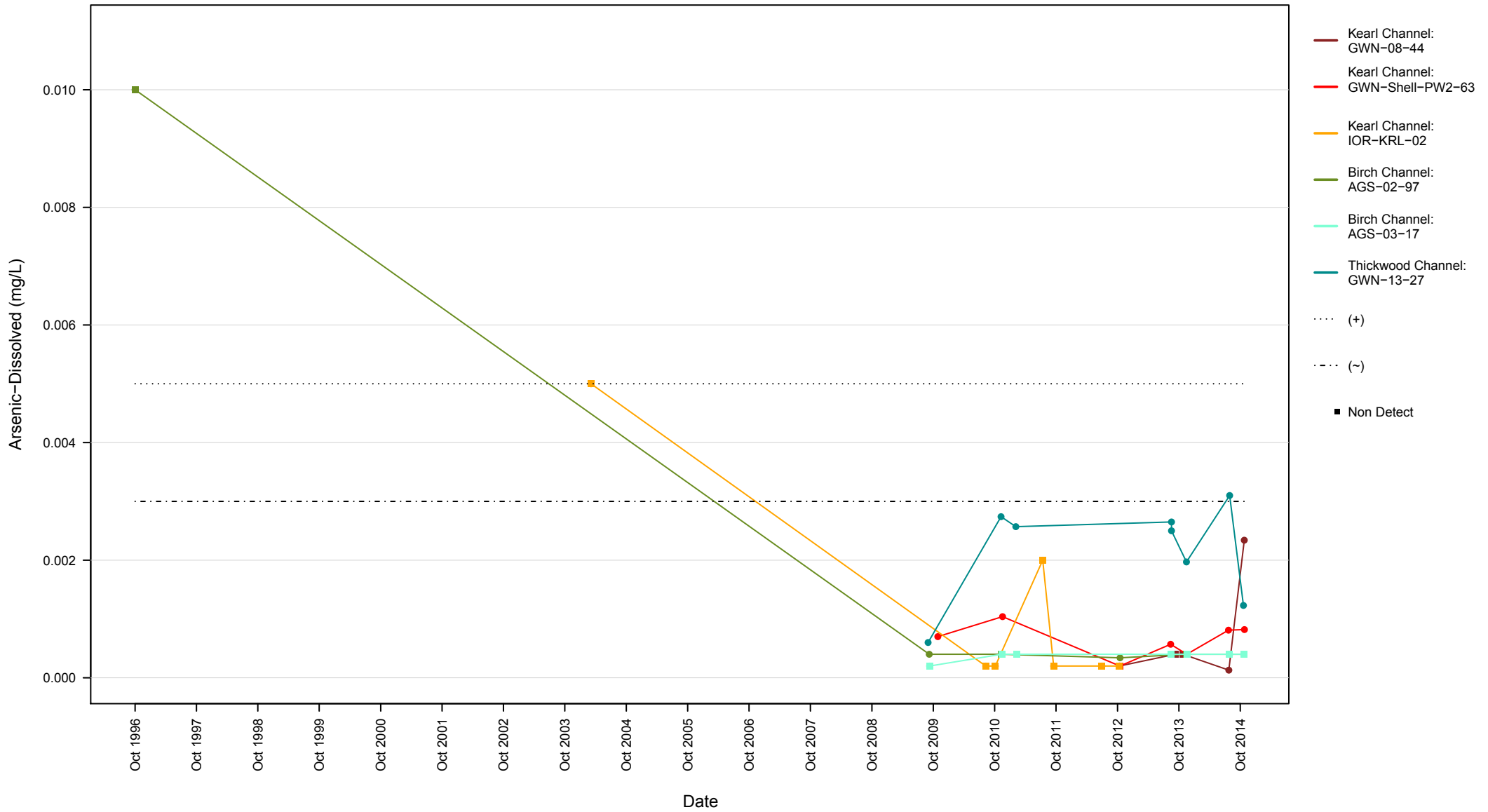
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network Shewhart-CUSUM Control Charts- Ammonium-N



- Ammonium-N
- - - Values below detection limit
- Sen slope
- Data point not used in analysis
- · · Interim Quality Triggers for NAOS- Buried Channels = 1 mg/L

Appendix C14b

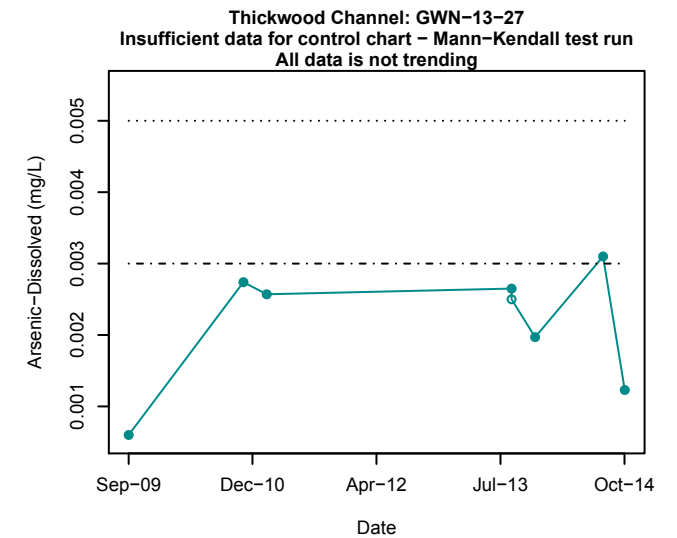
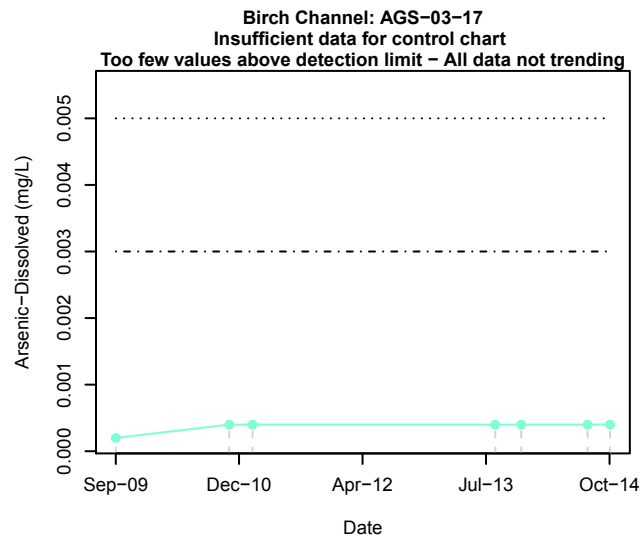
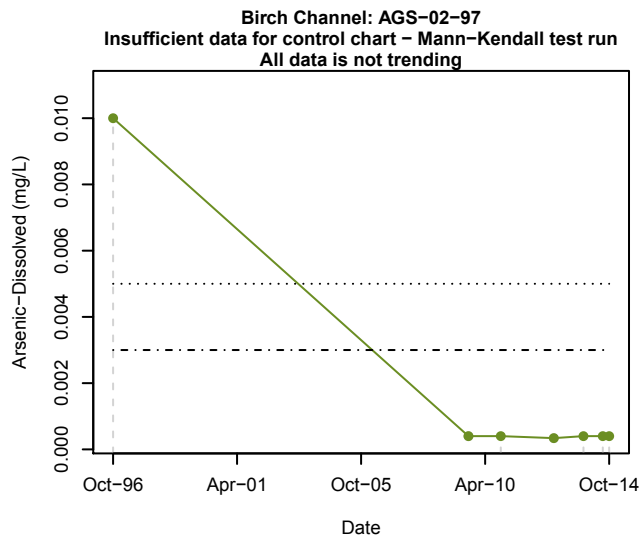
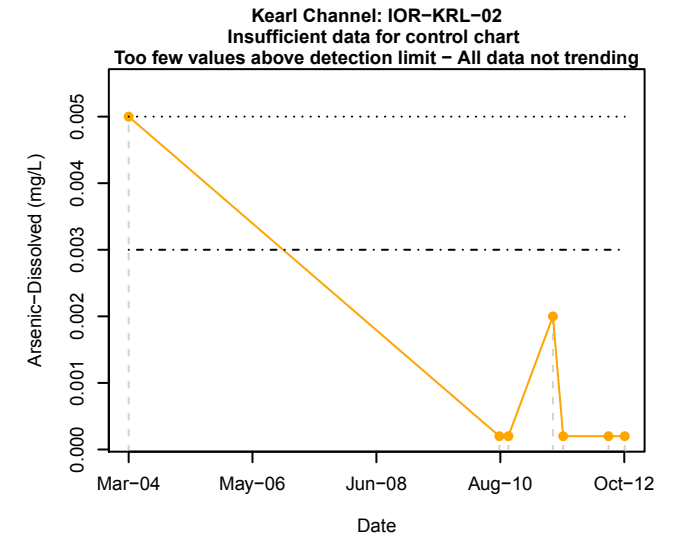
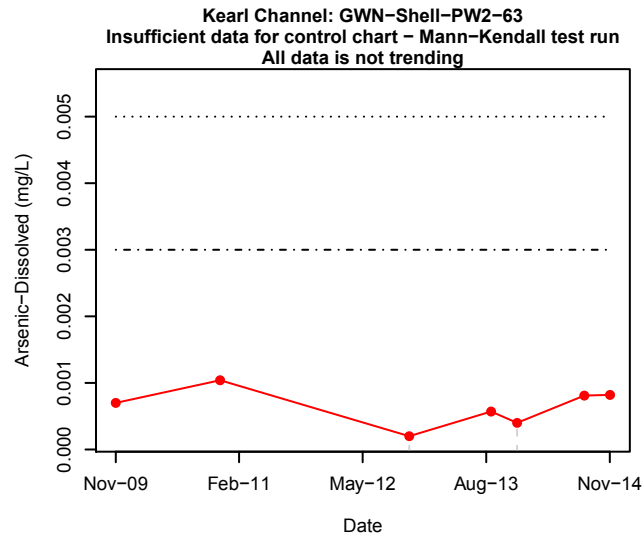
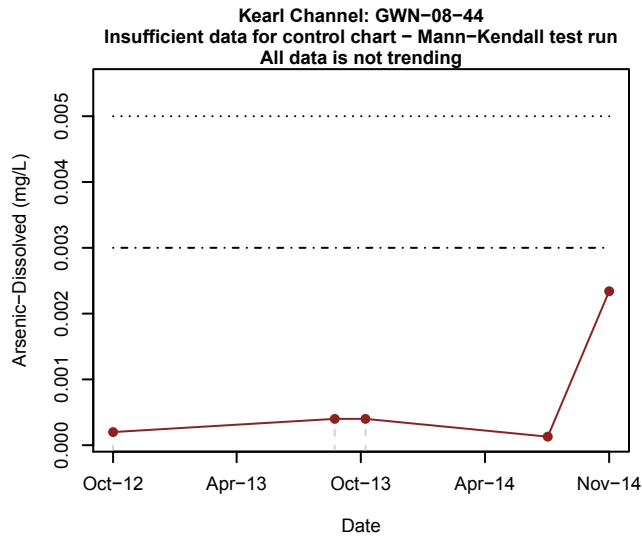
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network Historical Dissolved Arsenic Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 0.005 mg/L
 (-) Interim Quality Triggers for NAOS- Buried Channels = 0.003 mg/L

Appendix C15a

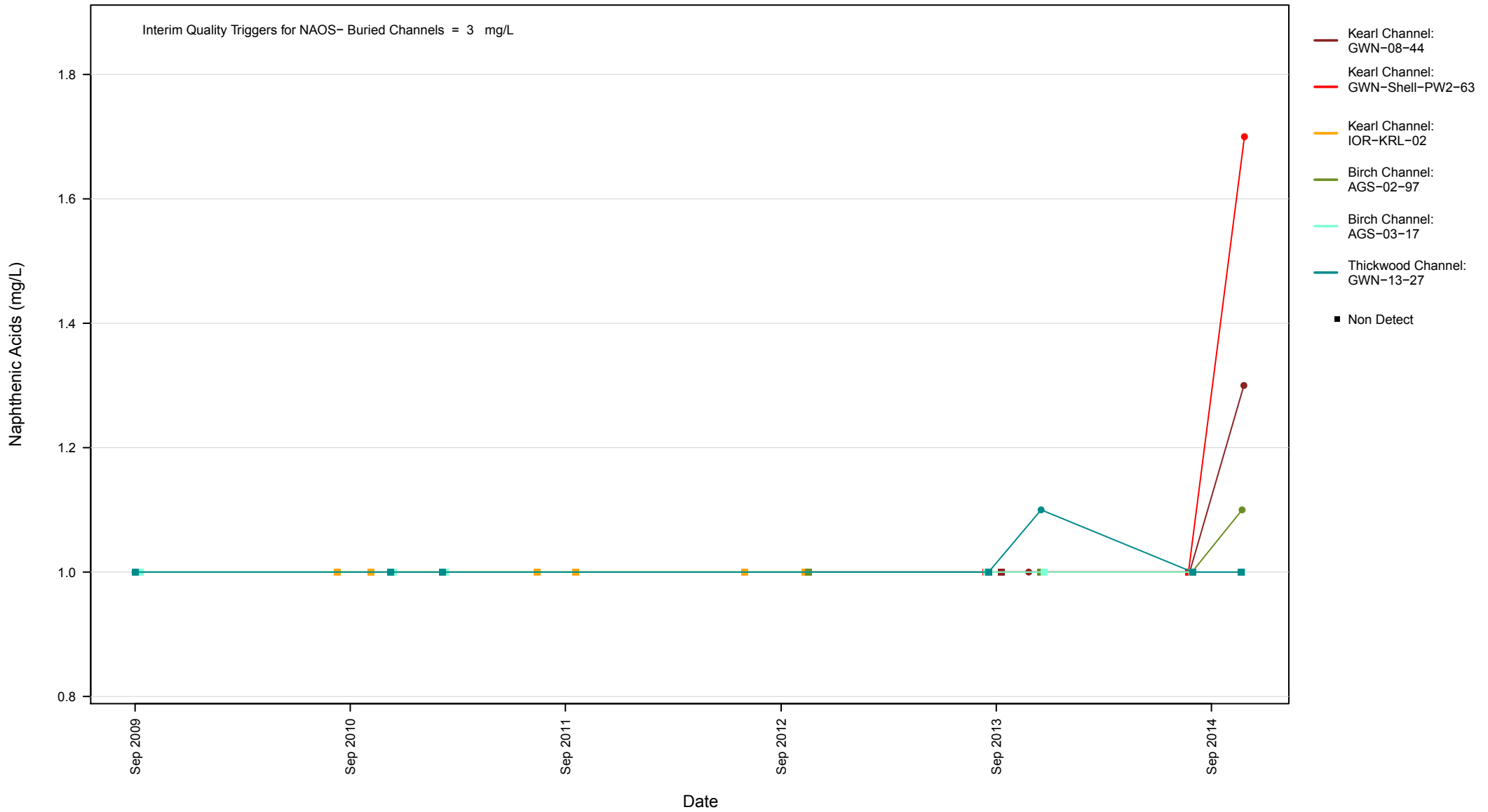
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network Shewhart-CUSUM Control Charts- Dissolved Arsenic



- Arsenic-Dissolved
- Values below detection limit
- Data point not used in analysis
- Alberta Tier 1-Natural Areas -2010 = 0.005 mg/L
- Interim Quality Triggers for NAOS- Buried Channels = 0.003 mg/L

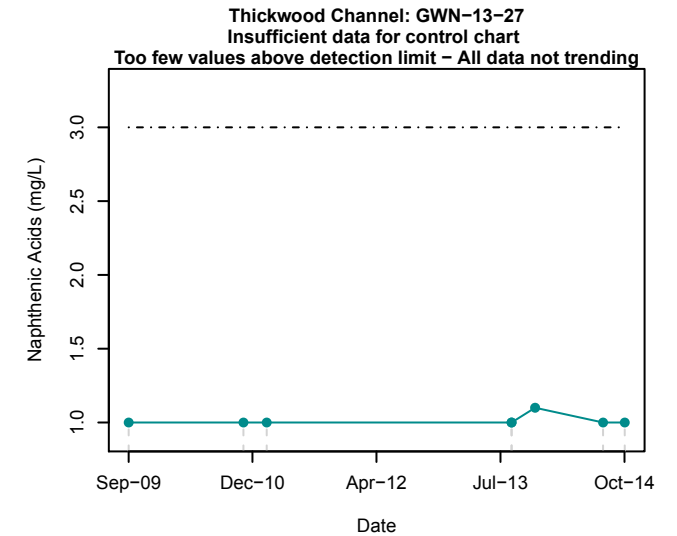
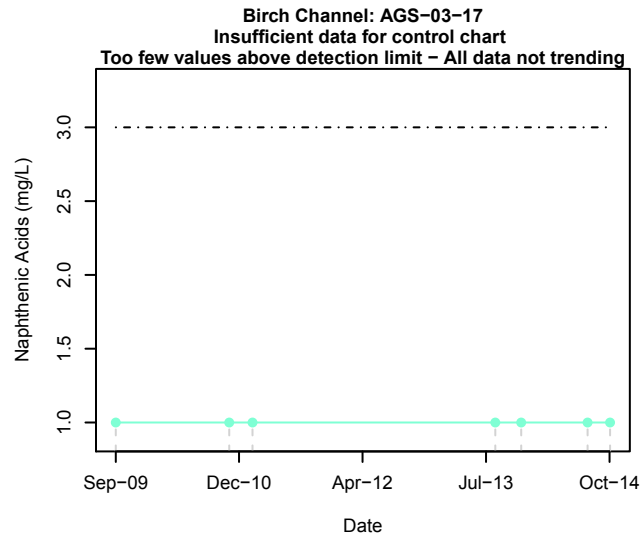
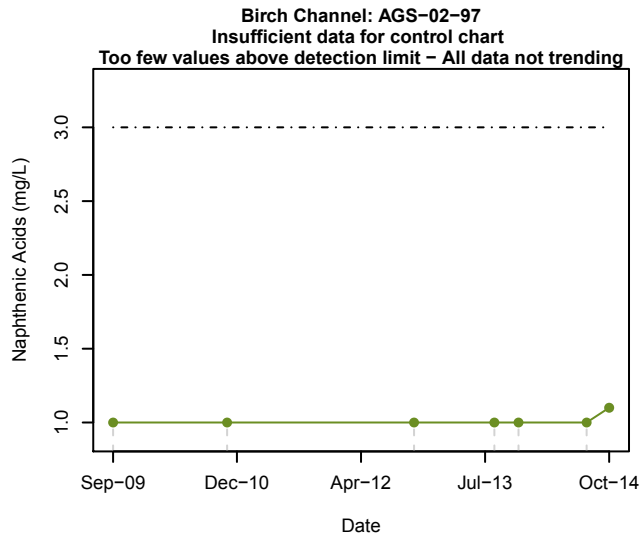
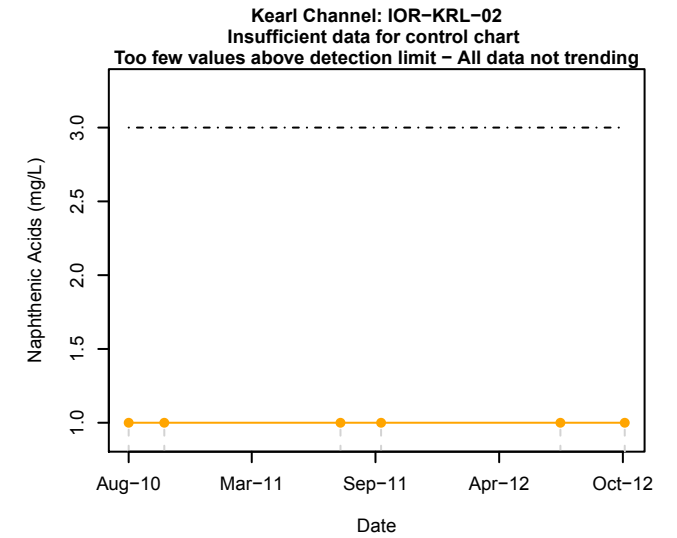
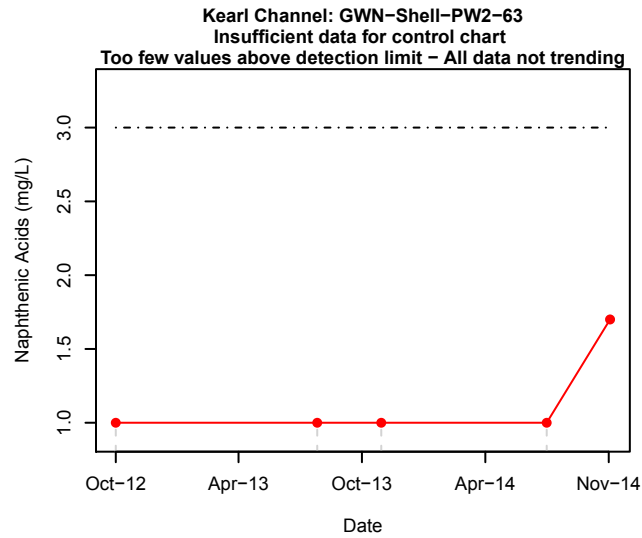
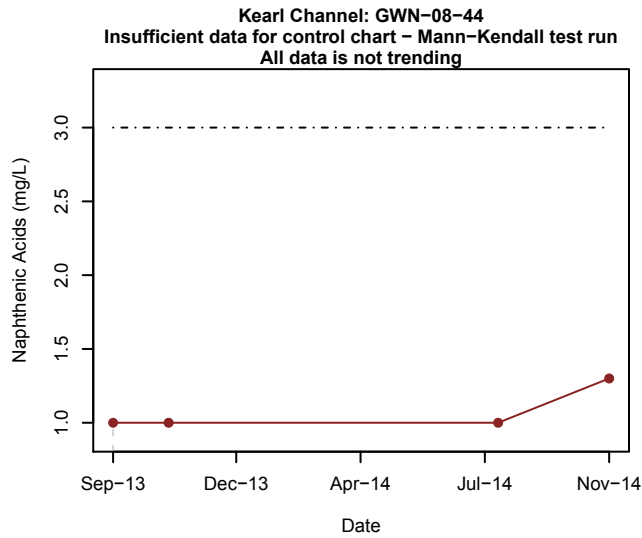
Appendix C15b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network Historical Naphthenic Acids Concentrations



Appendix C16a

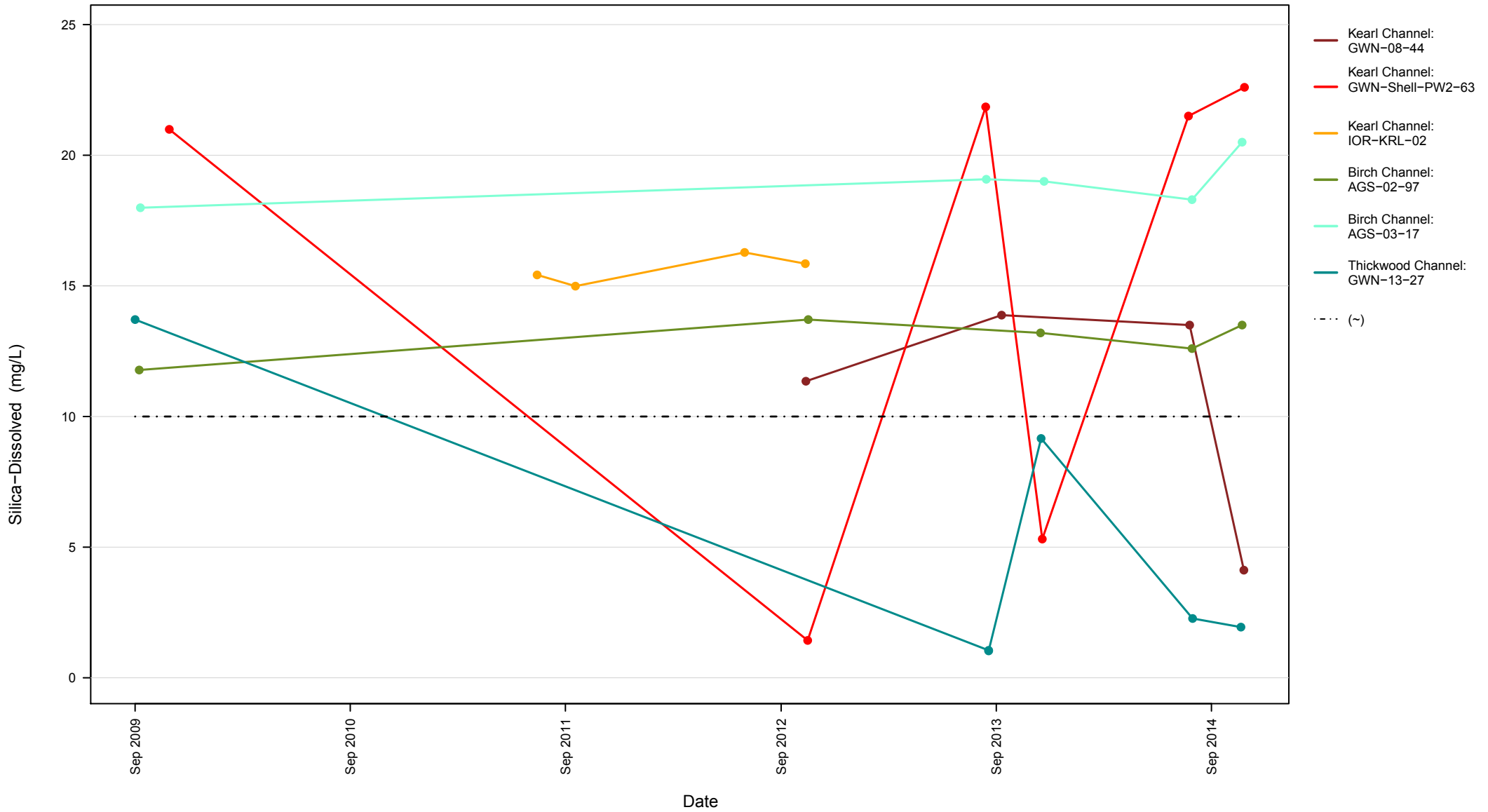
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network Shewhart-CUSUM Control Charts- Naphthenic Acids



- Naphthenic Acids
- - - Values below detection limit
- Data point not used in analysis
- · · Interim Quality Triggers for NAOS- Buried Channels = 3 mg/L

Appendix C16b

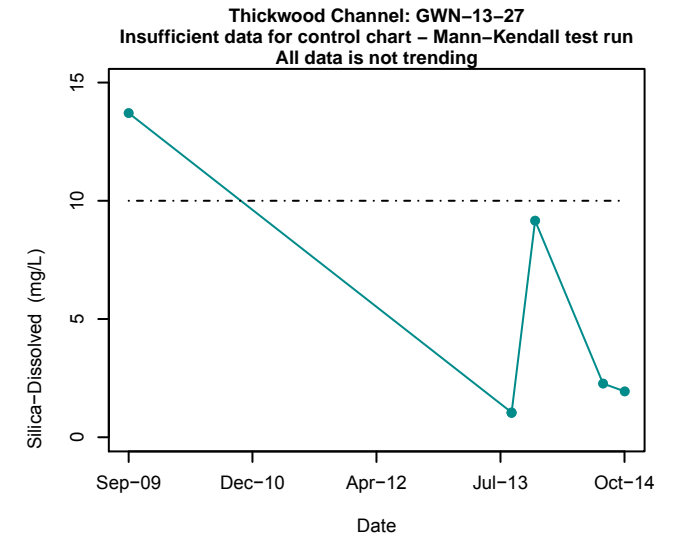
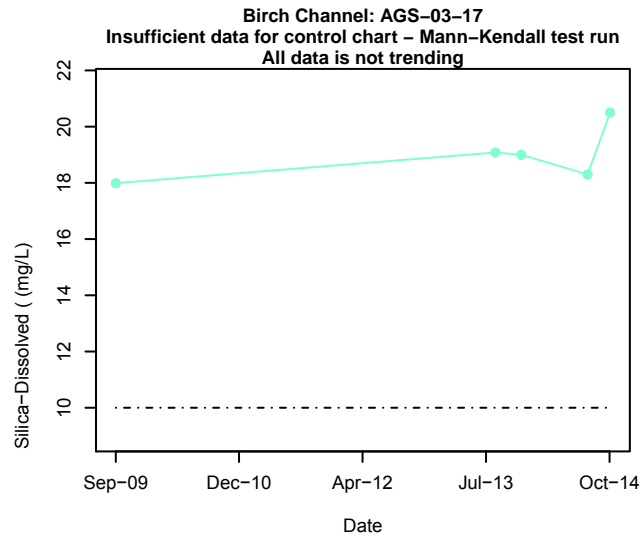
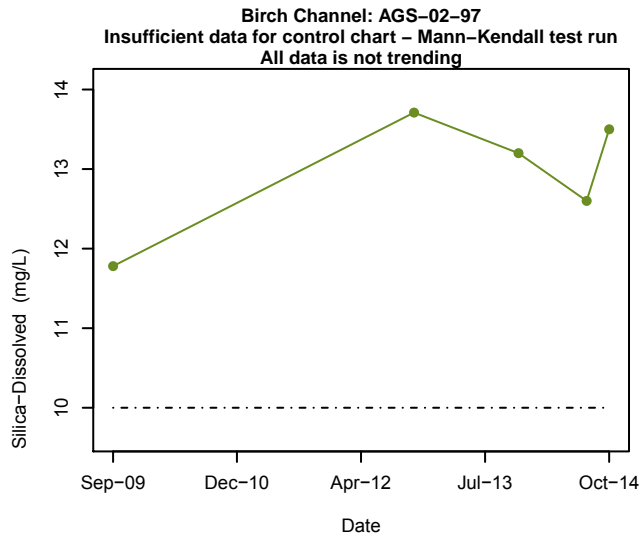
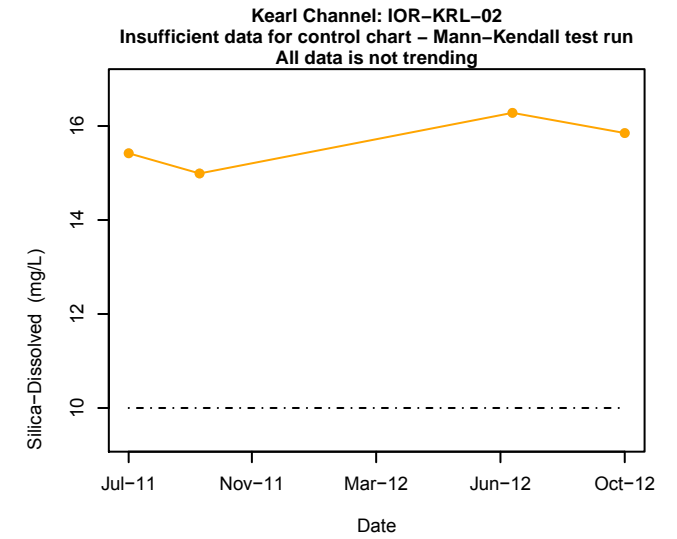
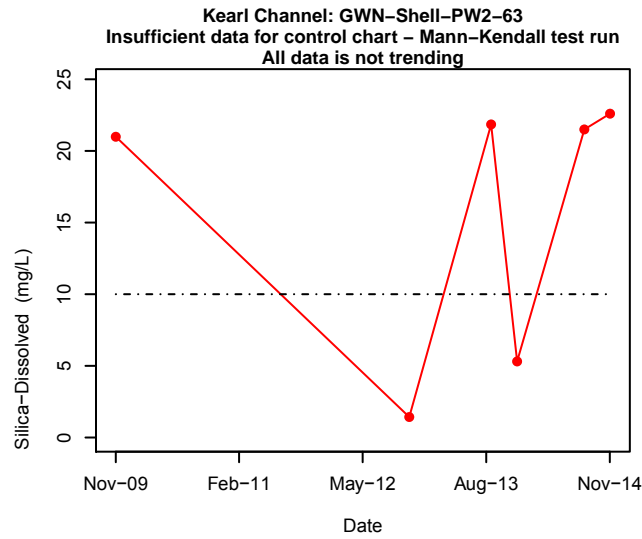
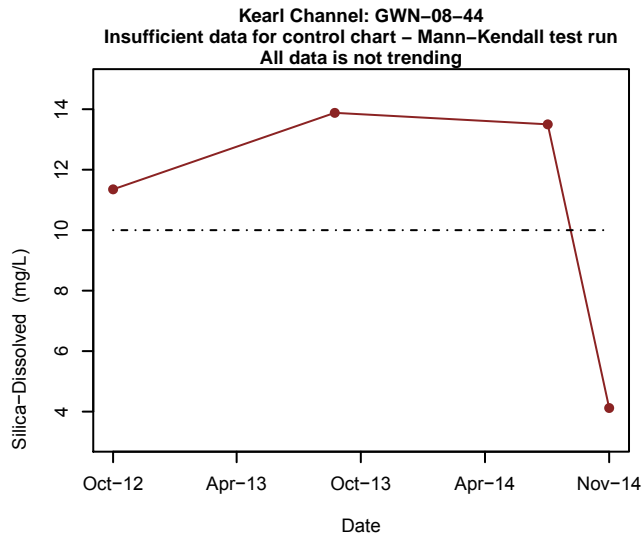
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network Historical Dissolved Silica Concentrations



(~) Interim Quality Triggers for NAOS- Buried Channels = 10 mg/L

Appendix C17a

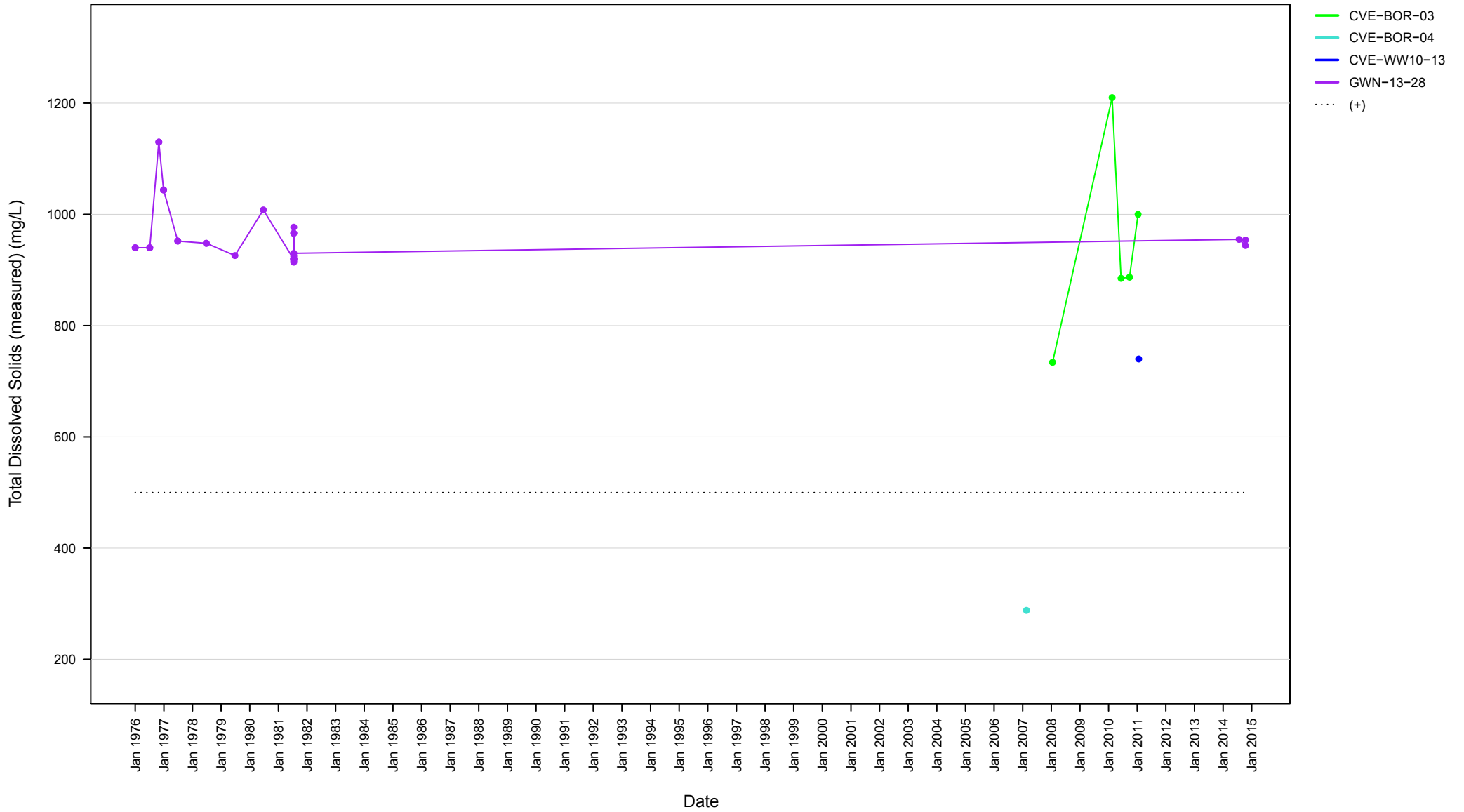
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network Shewhart-CUSUM Control Charts- Dissolved Silica



- Silica-Dissolved
- Data point not used in analysis
- Interim Quality Triggers for NAOS- Buried Channels = 10 mg/L

Appendix C17b

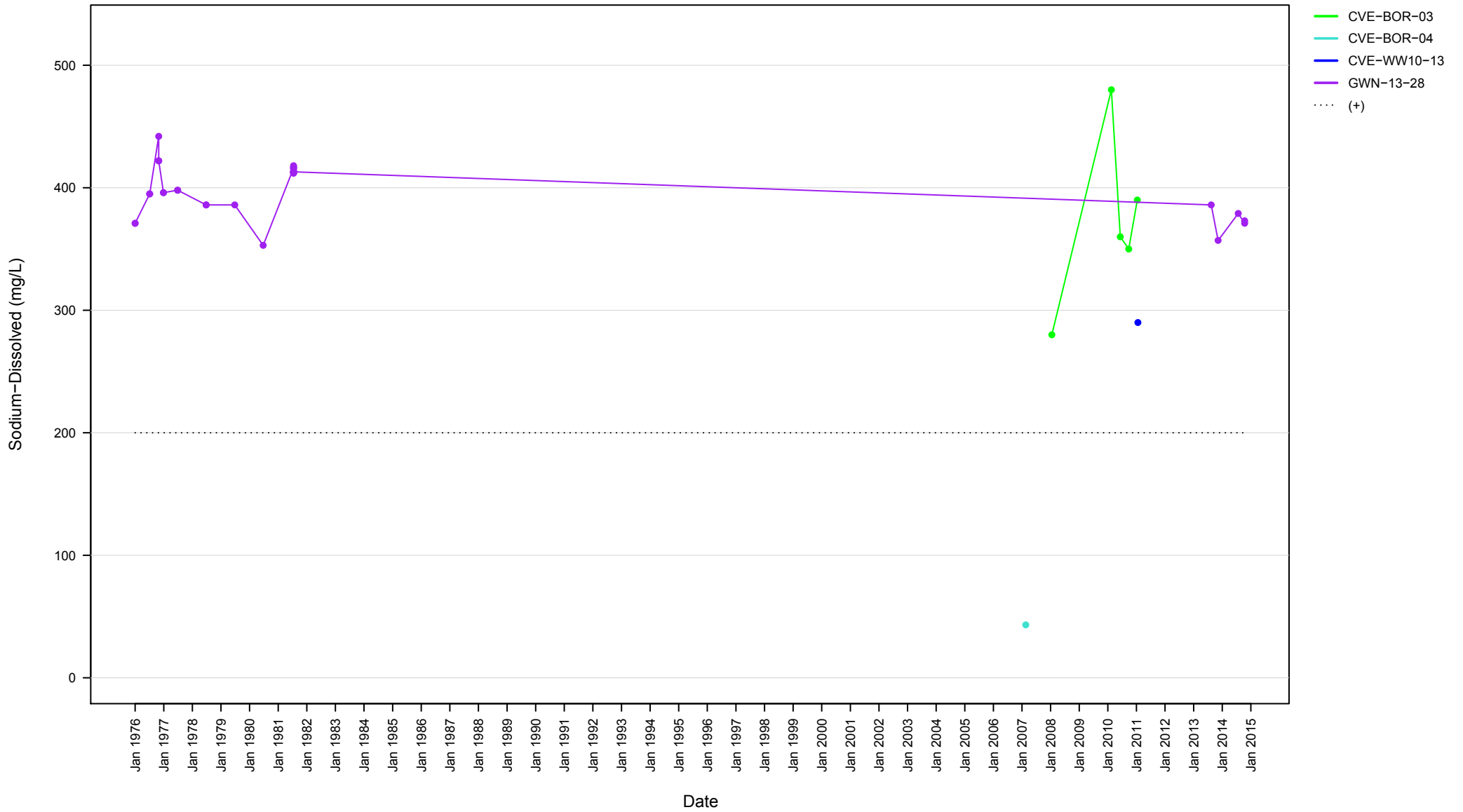
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Grand Rapids Formation) Historical Total Dissolved Solid Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 500 mg/L

Appendix C18a

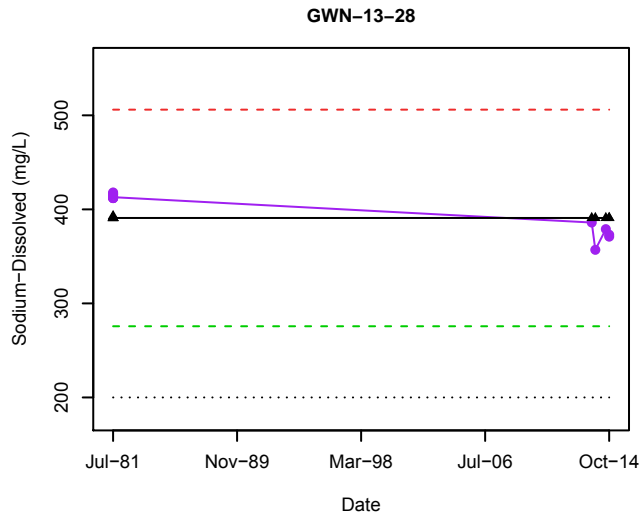
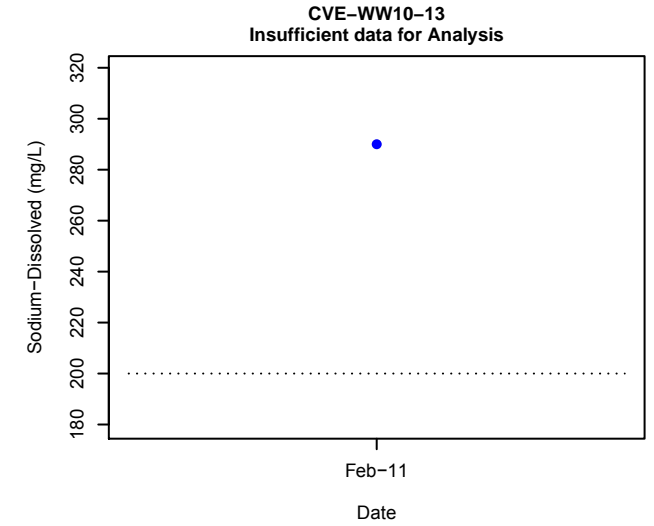
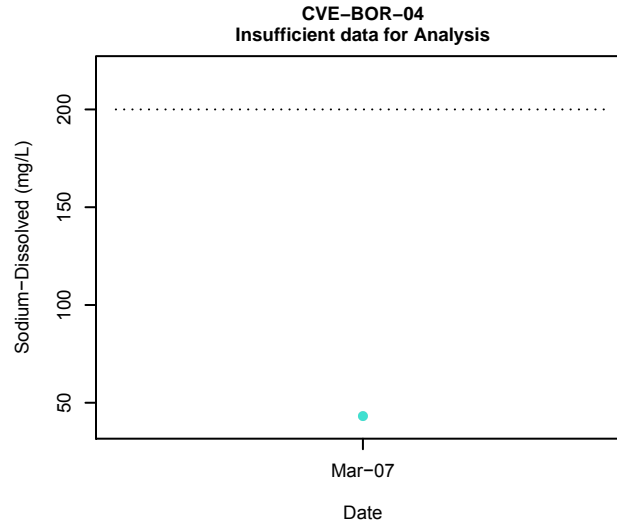
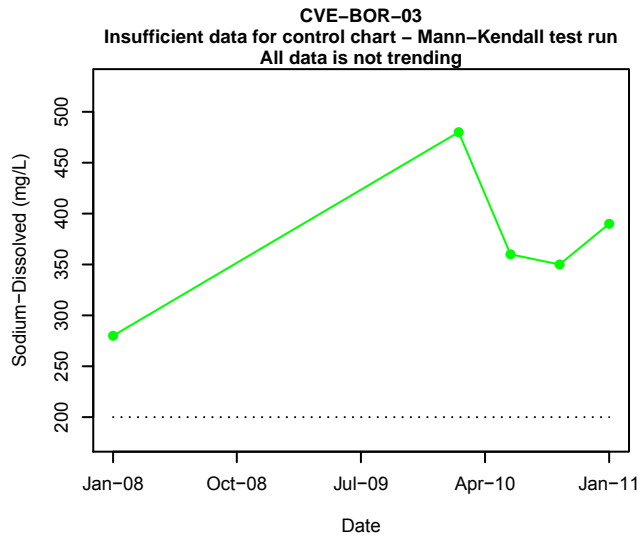
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Grand Rapids Formation) Historical Dissolved Sodium Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 200 mg/L

Appendix C19a

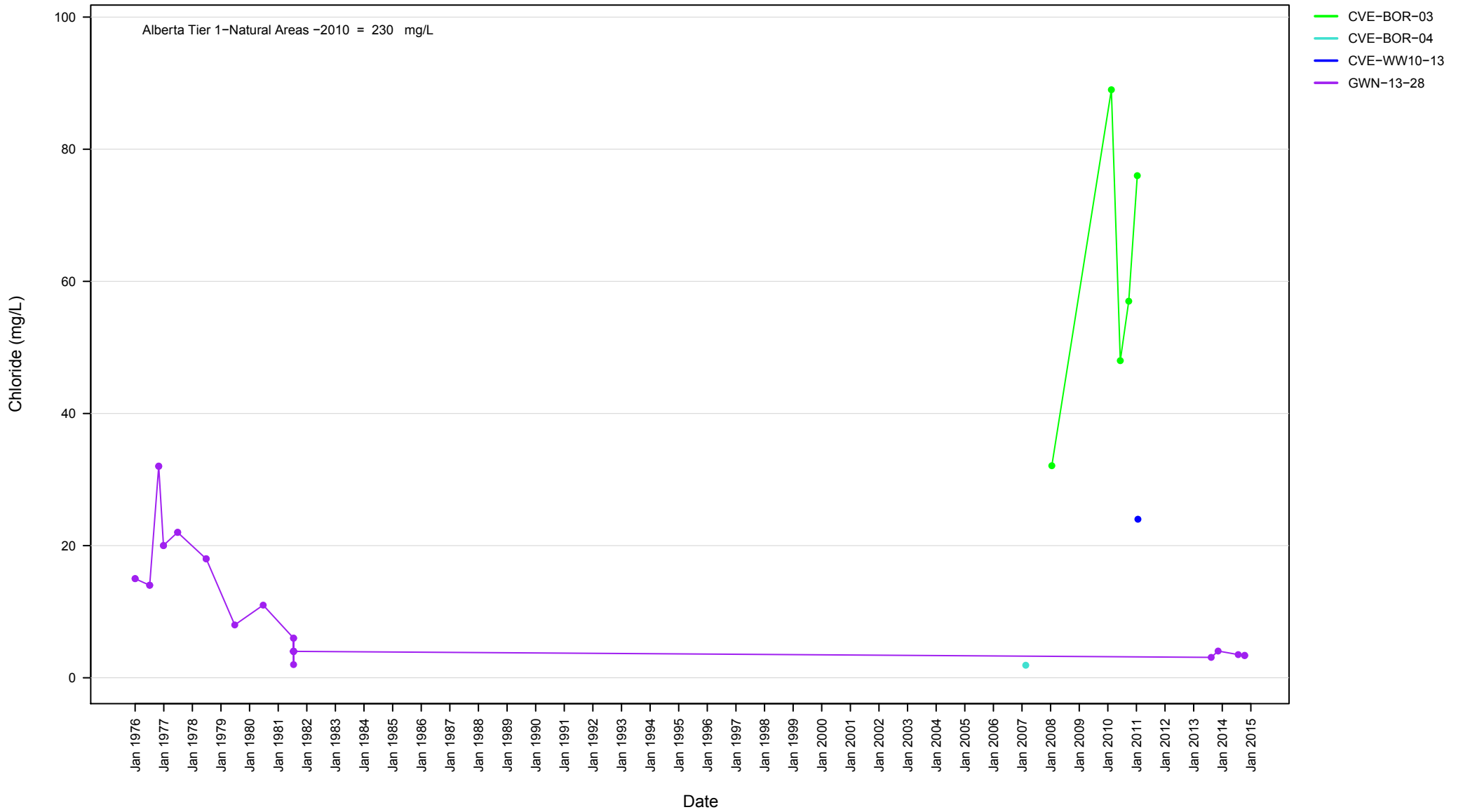
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Grand Rapids Formation) Shewhart-CUSUM Control Charts- Dissolved Sodium



- Sodium-Dissolved
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 200 mg/L
- ▲ CUSUM
- - - Well upper control limit
- - - Well lower control limit

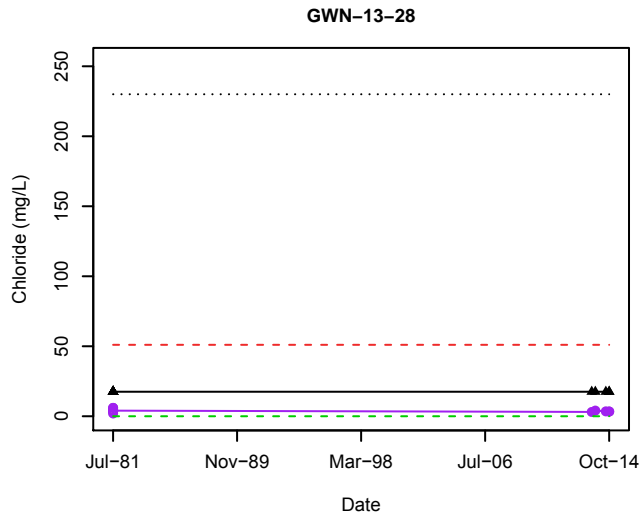
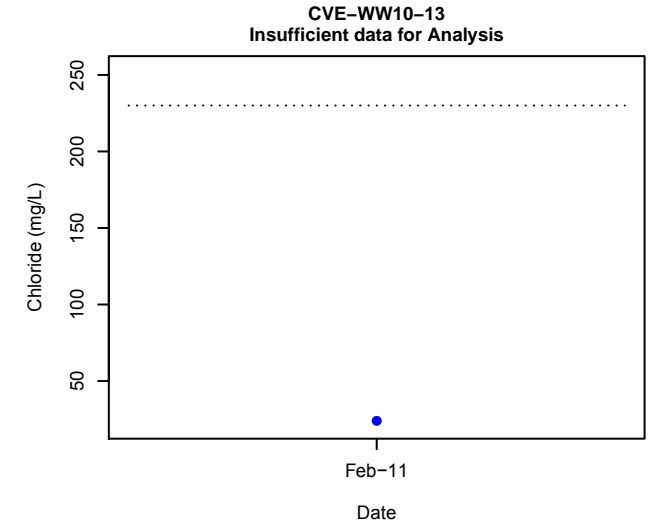
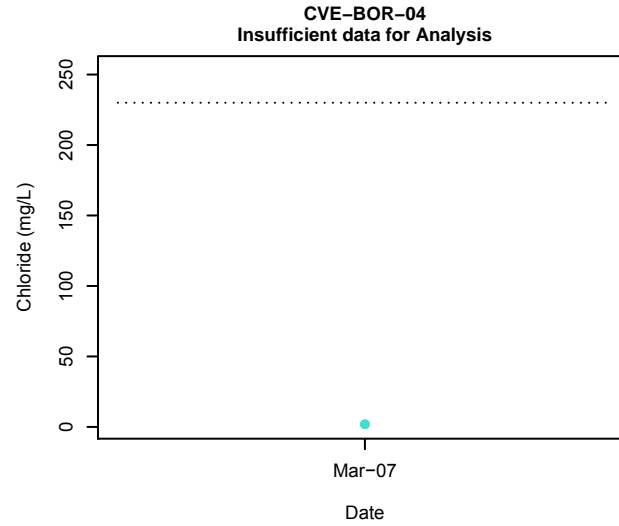
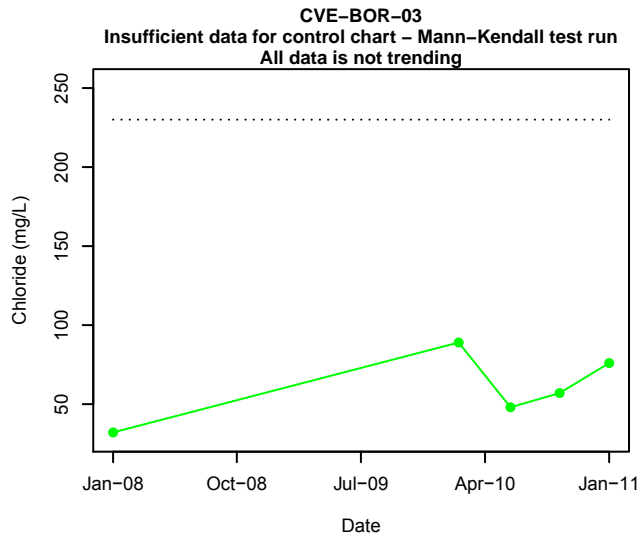
Appendix C19b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Grand Rapids Formation) Historical Dissolved Chloride Concentrations



Appendix C20a

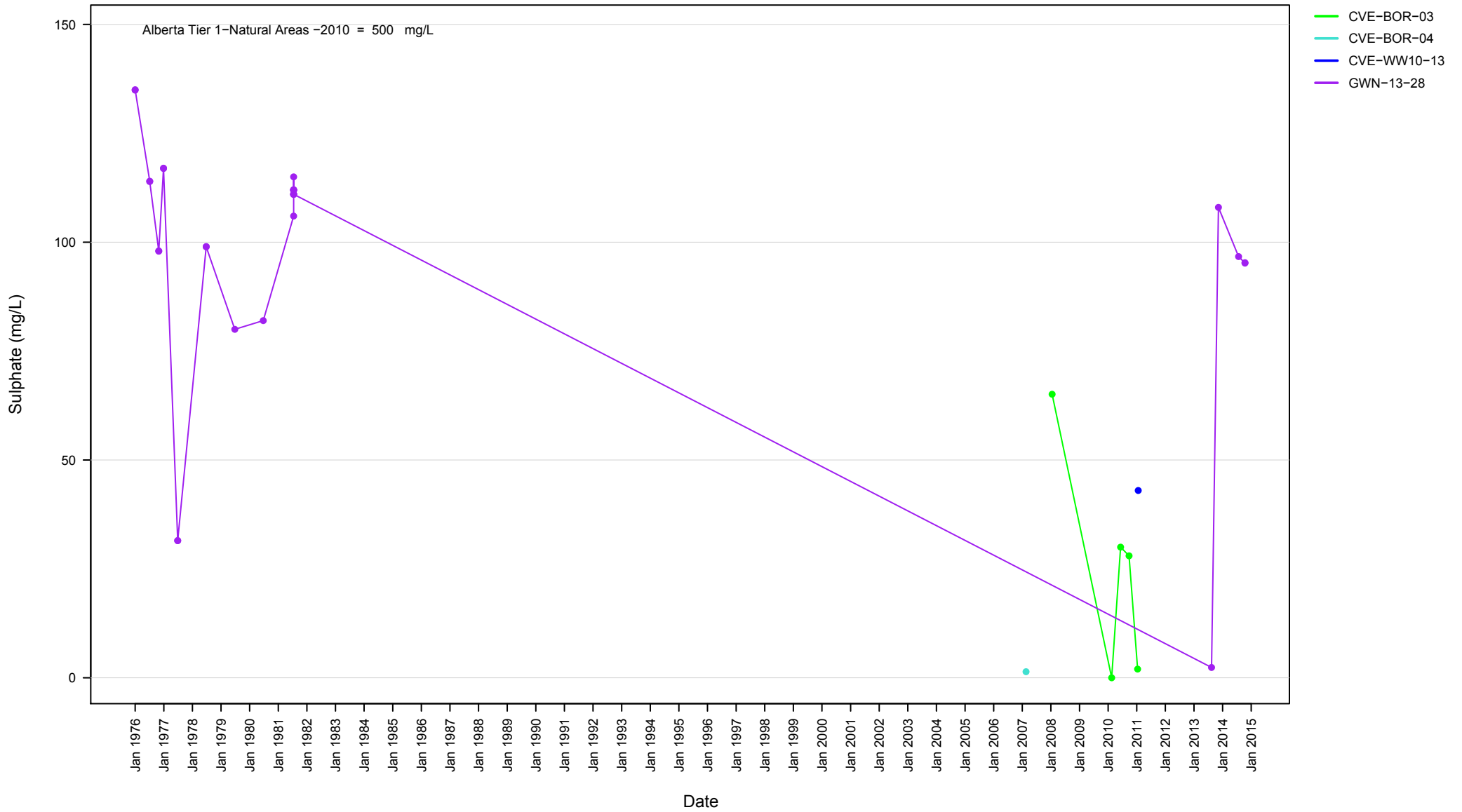
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Grand Rapids Formation) Shewhart-CUSUM Control Charts- Dissolved Chloride



- Chloride
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 230 mg/L
- ▲ CUSUM
- - - Well upper control limit
- - - Well lower control limit

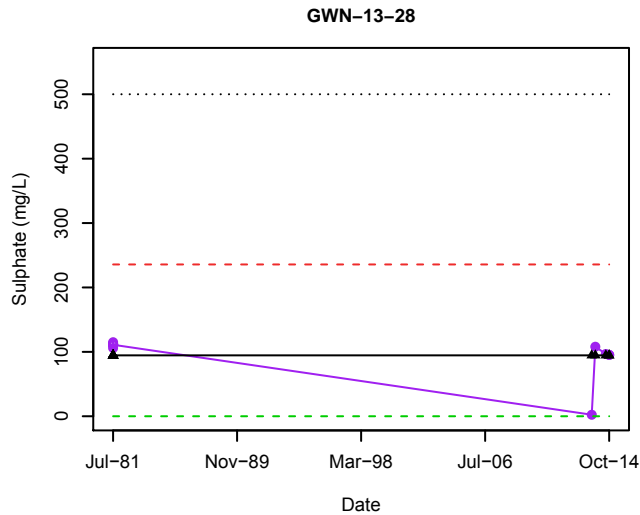
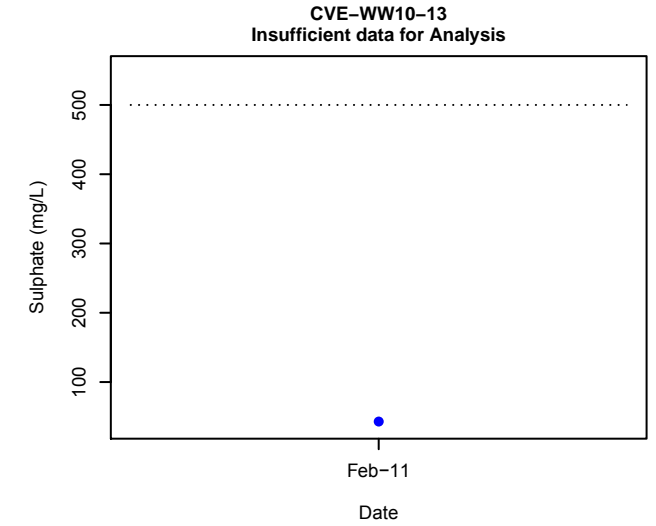
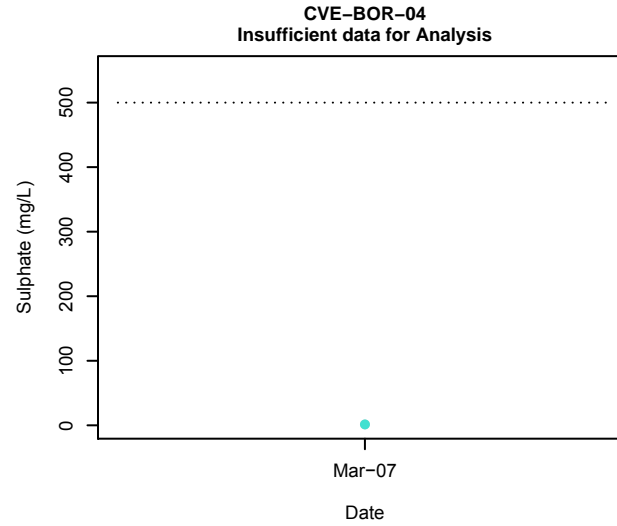
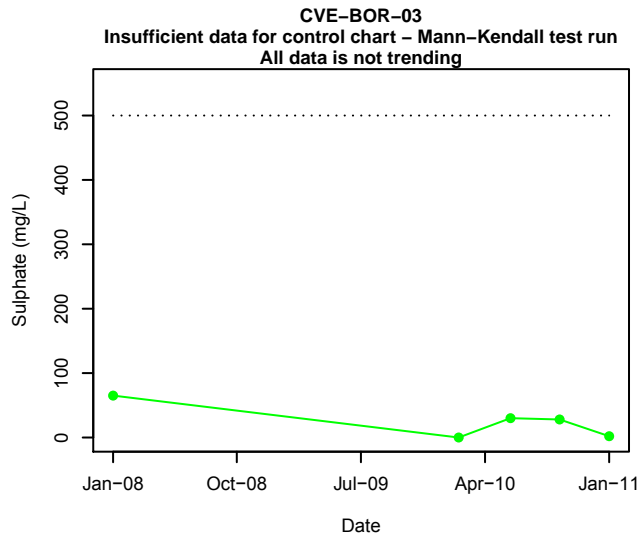
Appendix C20b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Grand Rapids Formation) Historical Dissolved Sulphate Concentrations



Appendix C21a

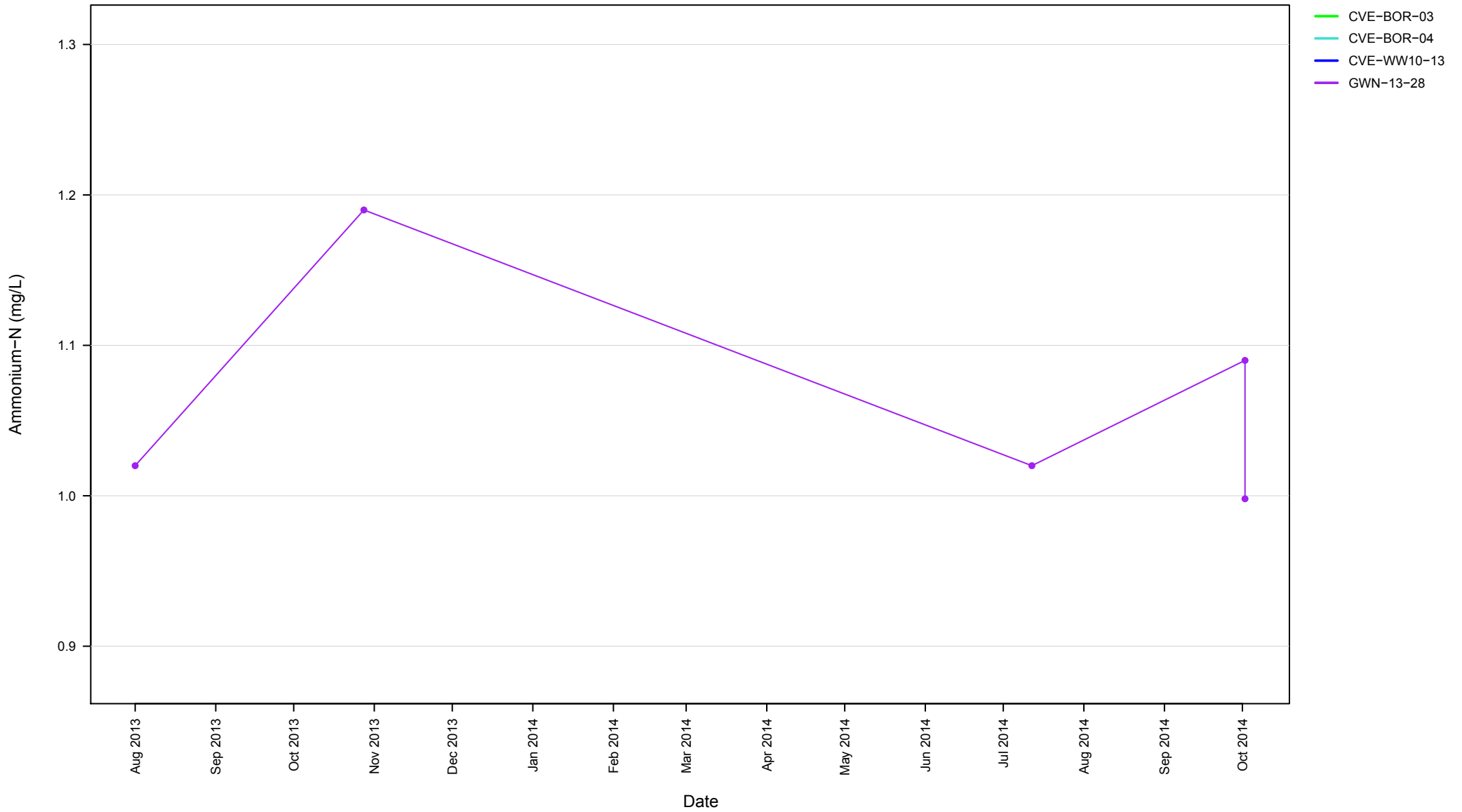
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Grand Rapids Formation) Shewhart-CUSUM Control Charts- Dissolved Sulphate



- Sulphate
- Data point not used in analysis
- ⬤ CUSUM
- Well upper control limit
- Well lower control limit
- ⋯ Alberta Tier 1-Natural Areas -2010 = 500 mg/L

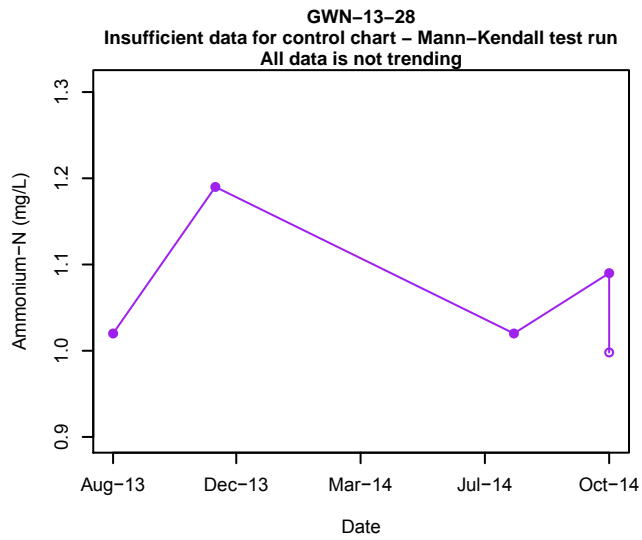
Appendix C21b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Grand Rapids Formation) Historical Ammonium-N Concentrations



Appendix C22a

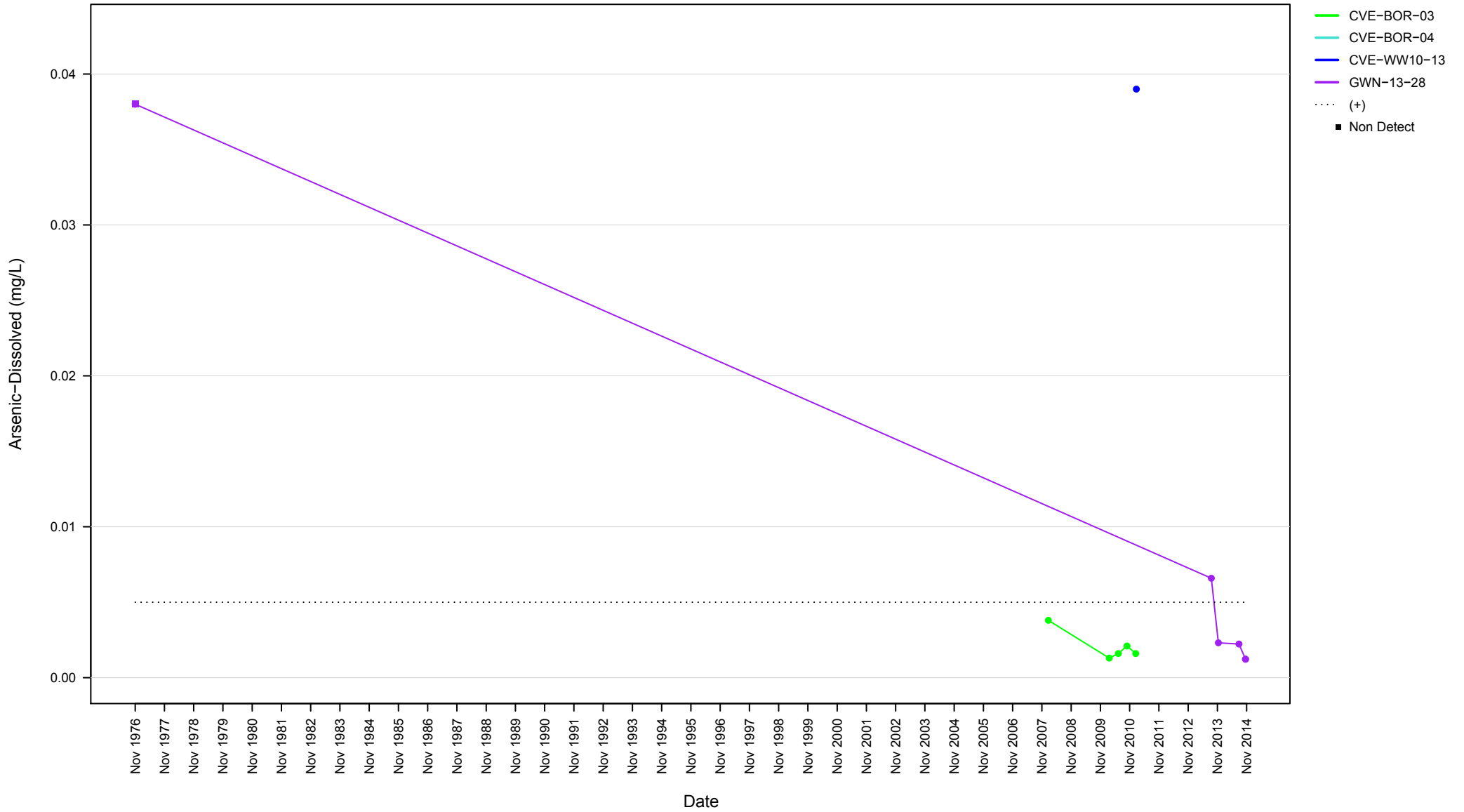
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Grand Rapids Formation) Shewhart-CUSUM Control Charts- Ammonium-N



● Ammonium-N
○ Data point not used in analysis

Appendix C22b

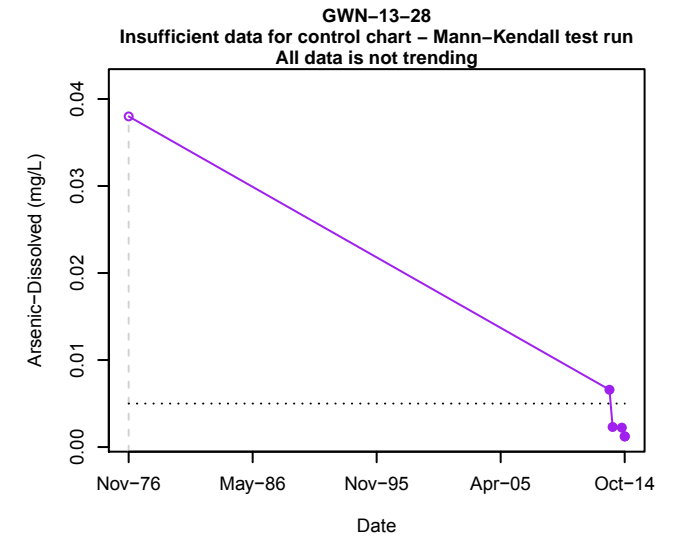
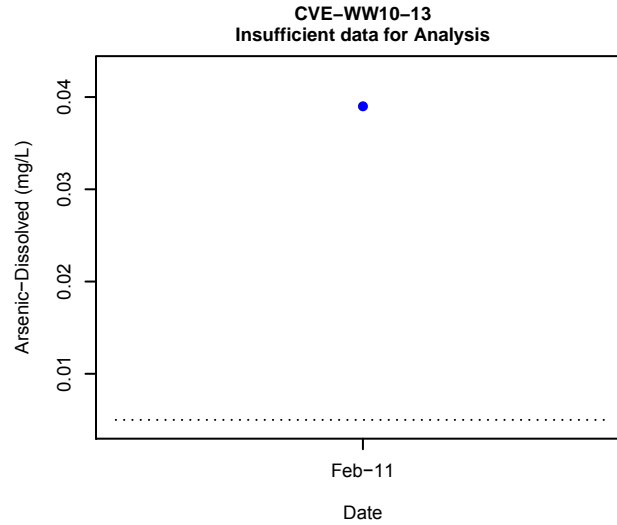
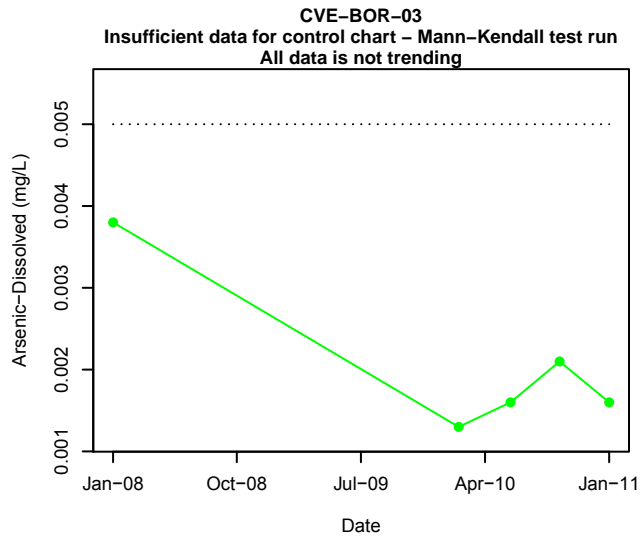
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Grand Rapids Formation) Historical Dissolved Arsenic Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 0.005 mg/L

Appendix C23a

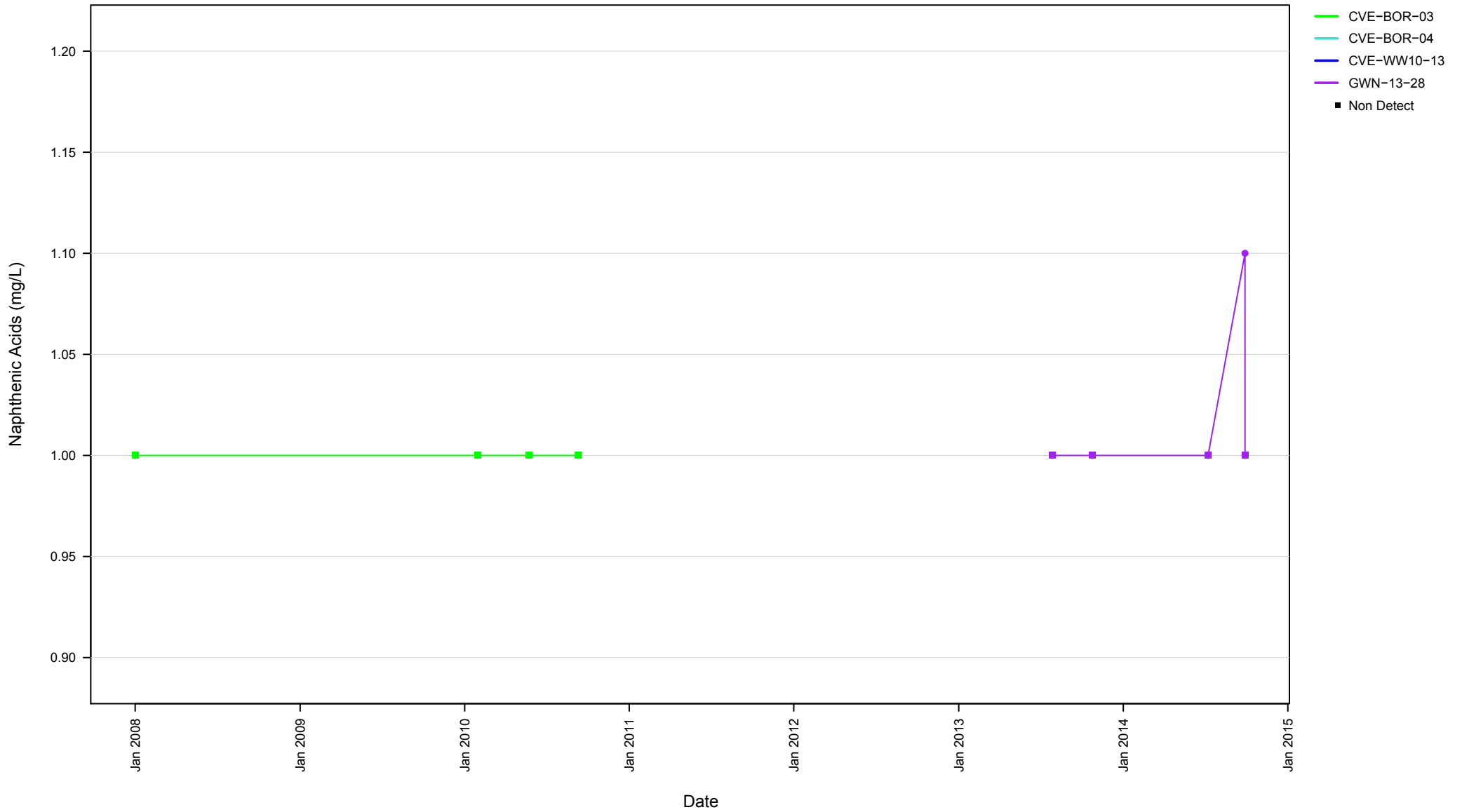
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Grand Rapids Formation) Shewhart-CUSUM Control Charts- Dissolved Arsenic



- Arsenic-Dissolved
- - Values below detection limit
- Data point not used in analysis
- Alberta Tier 1-Natural Areas -2010 = 0.005 mg/L

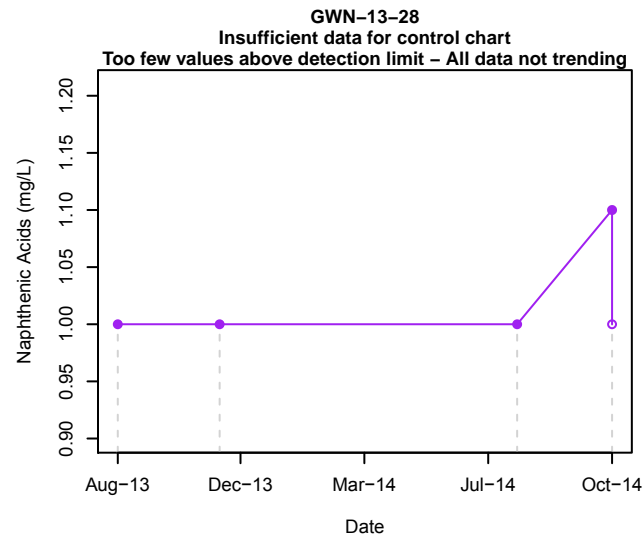
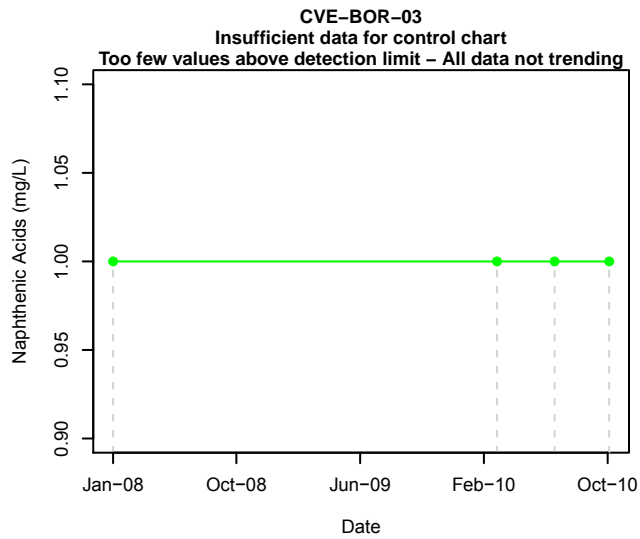
Appendix C23b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Grand Rapids Formation) Historical Naphthenic Acids Concentrations



Appendix C24a

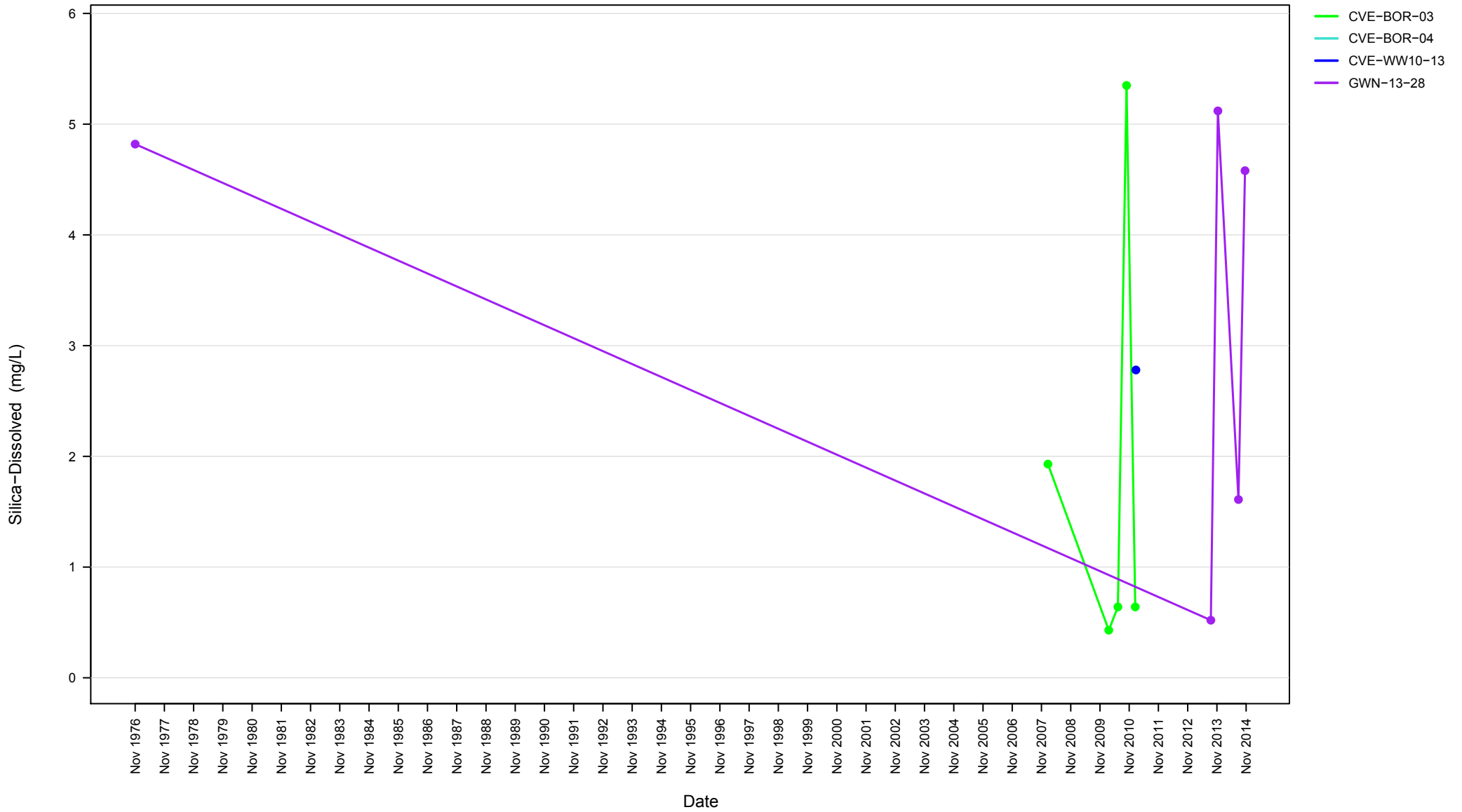
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Grand Rapids Formation) Shewhart-CUSUM Control Charts- Naphthenic Acids



- Naphthenic Acids
- - Values below detection limit
- Data point not used in analysis

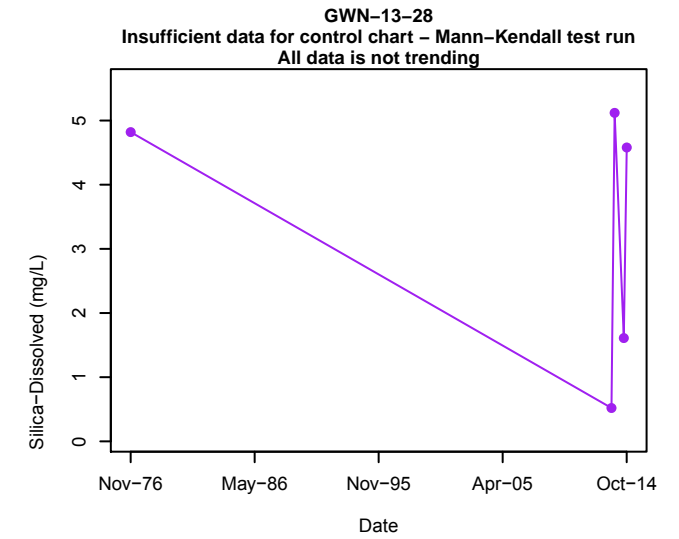
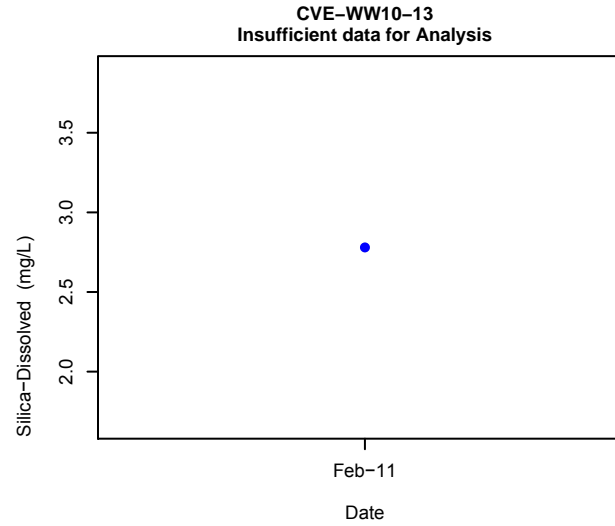
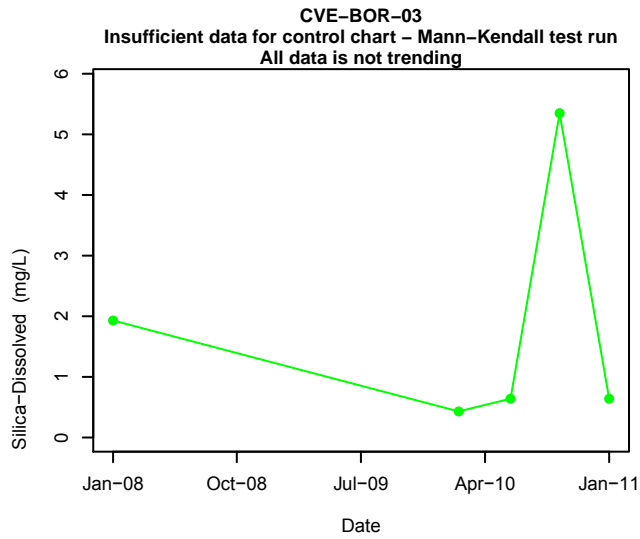
Appendix C24b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Grand Rapids Formation) Historical Dissolved Silica Concentrations



Appendix C25a

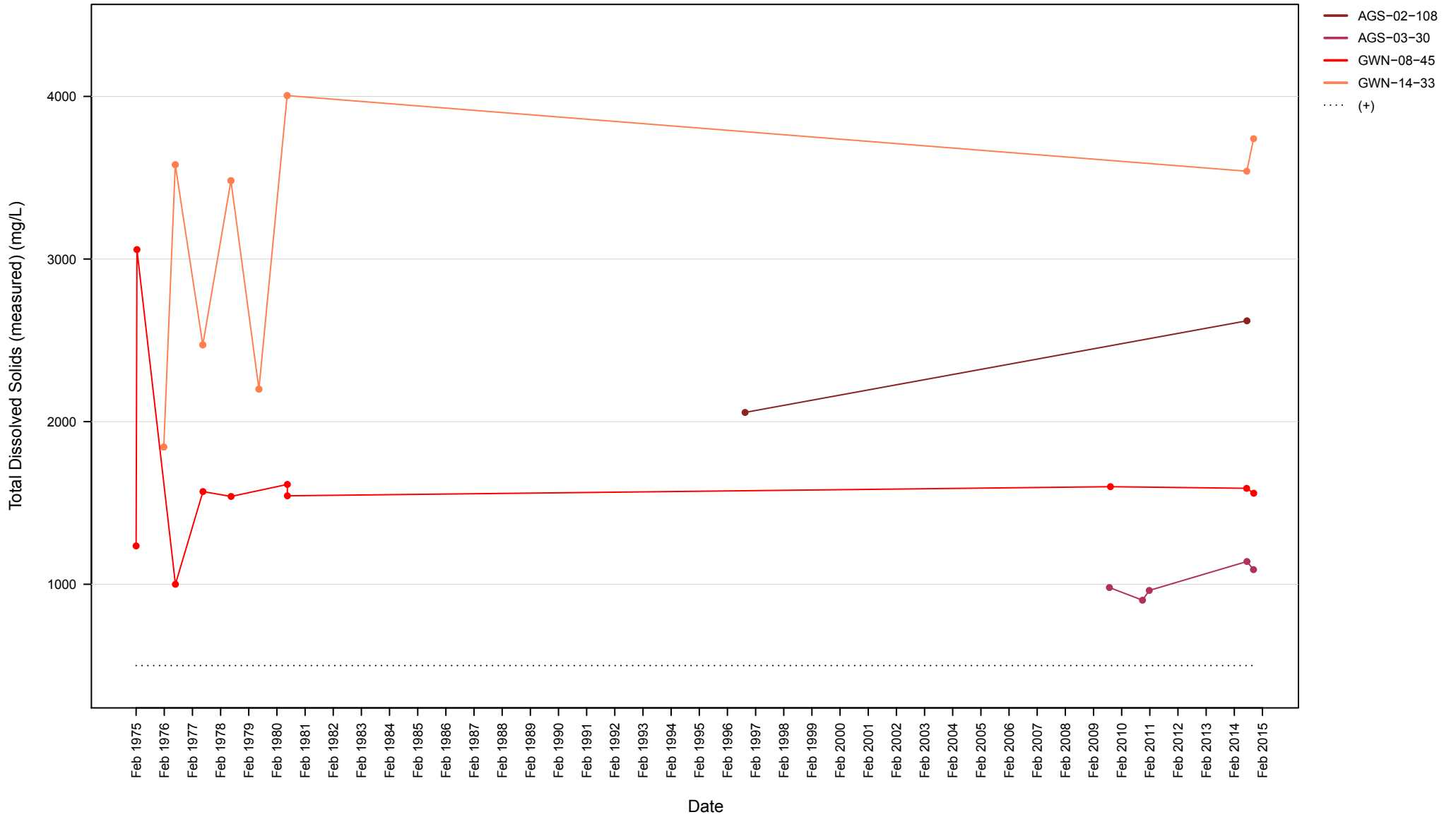
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Grand Rapids Formation) Shewhart-CUSUM Control Charts- Dissolved Silica



● Silica-Dissolved

Appendix C25b

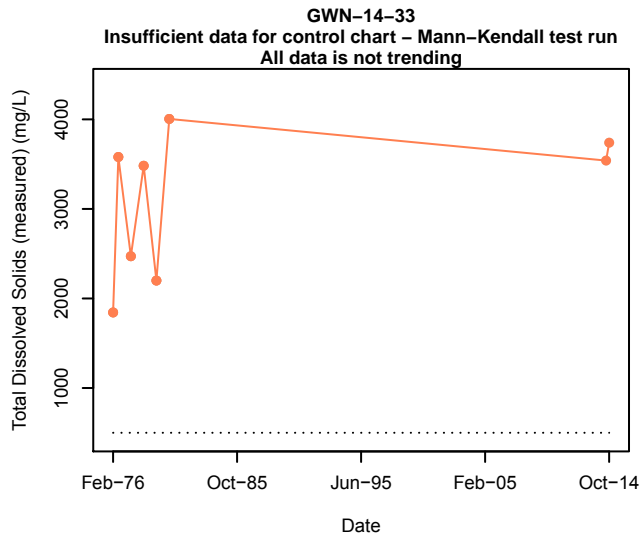
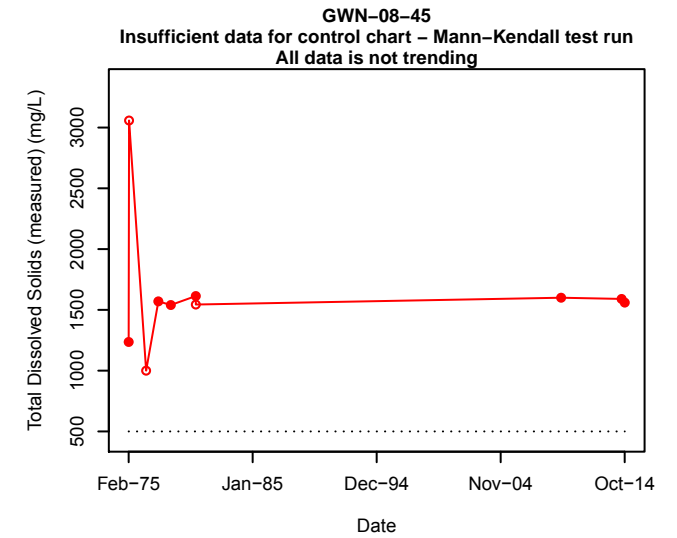
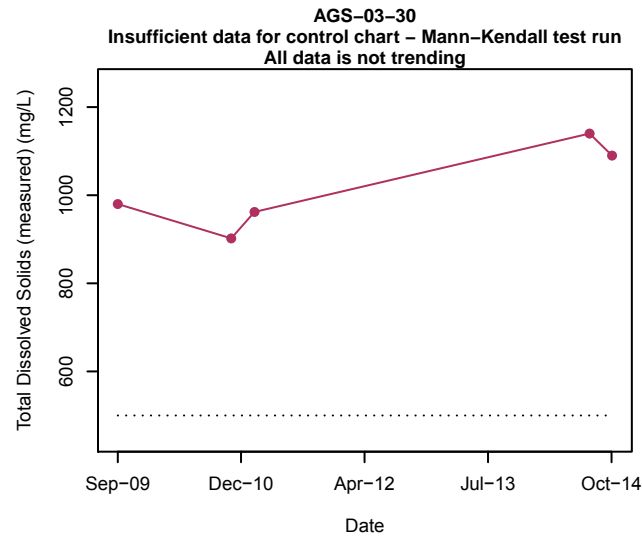
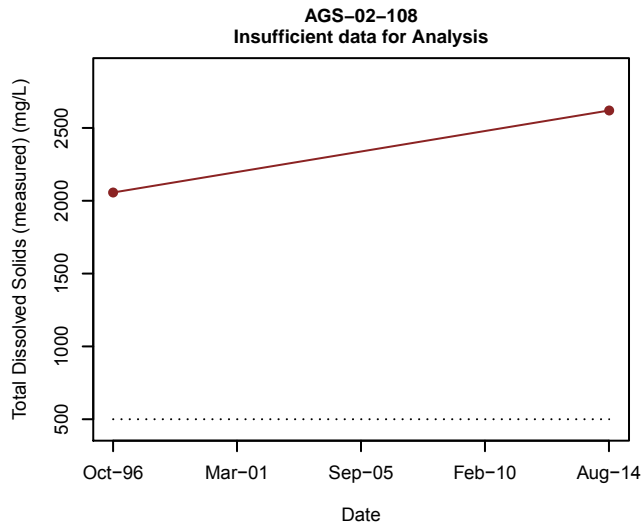
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Clearwater Formation) Historical Total Dissolved Solid Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 500 mg/L

Appendix C26a

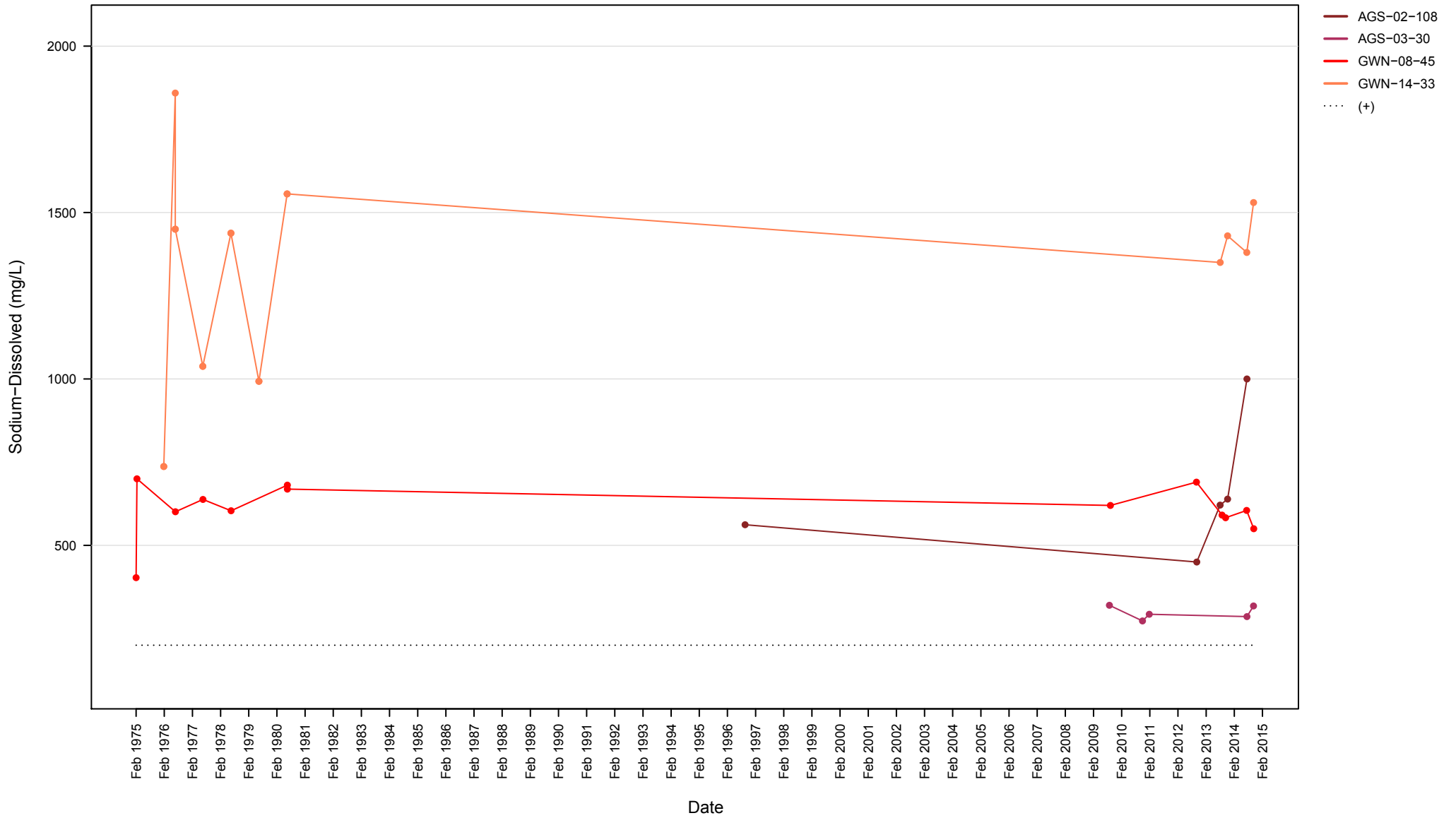
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Clearwater Formation) Shewhart-CUSUM Control Charts- Total Dissolved Solids



- Total Dissolved Solids (measured)
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 500 mg/L

Appendix C26b

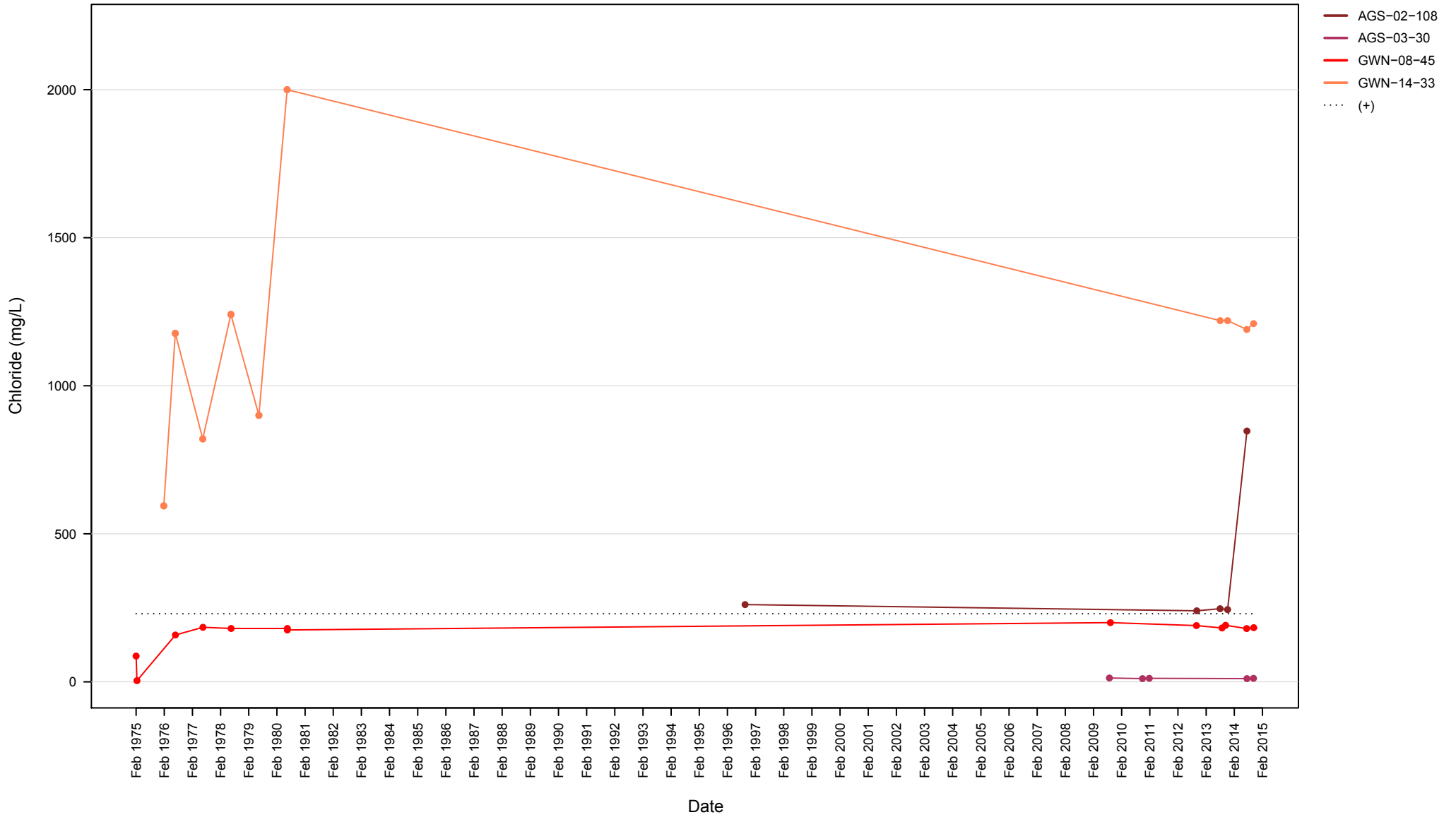
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Clearwater Formation) Historical Dissolved Sodium Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 200 mg/L

Appendix C27a

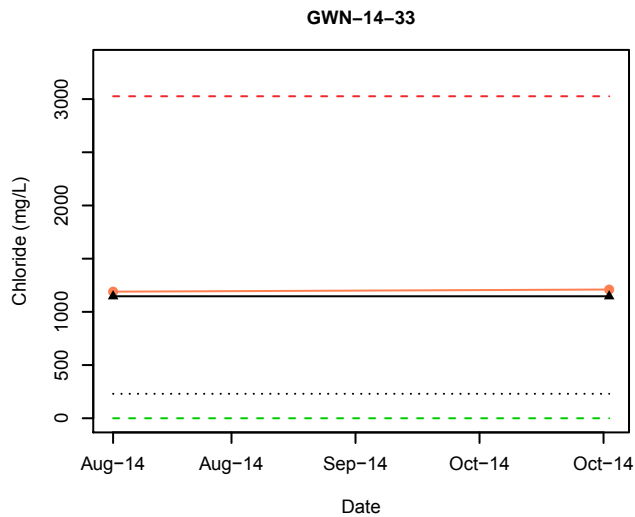
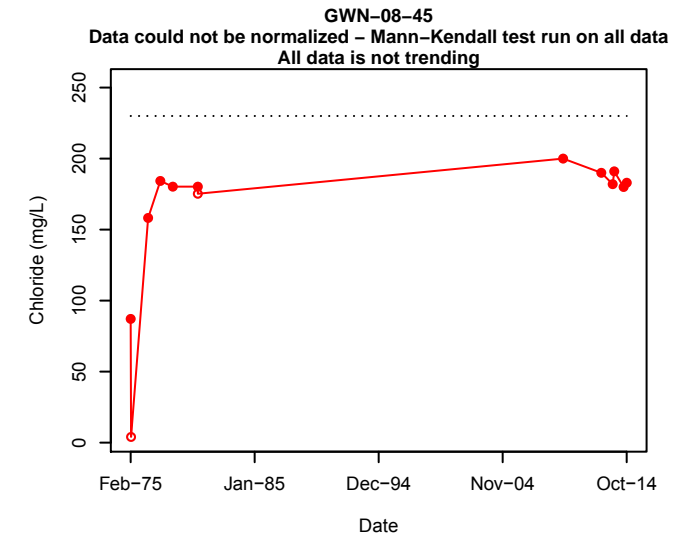
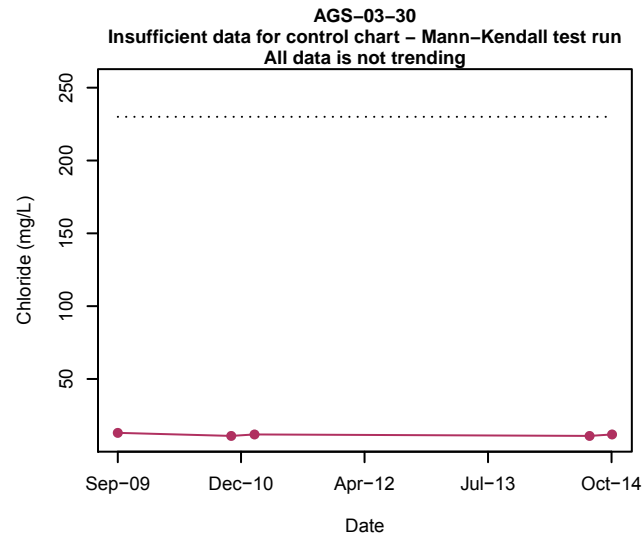
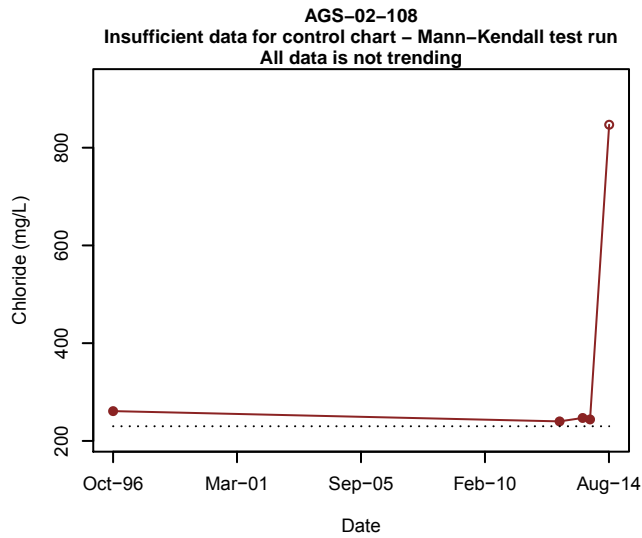
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Clearwater Formation) Historical Dissolved Chloride Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 230 mg/L

Appendix C28a

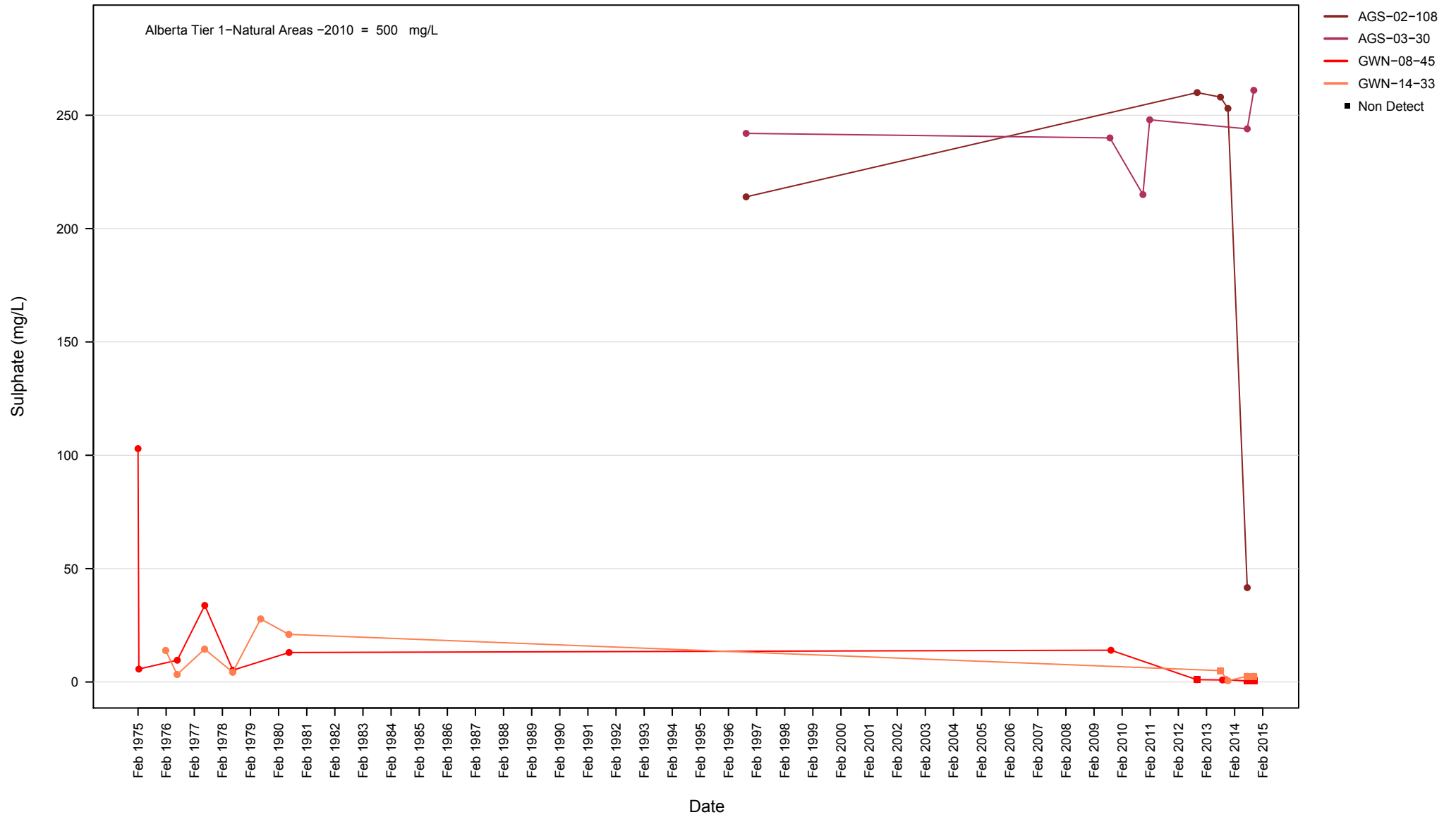
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Clearwater Formation) Shewhart-CUSUM Control Charts- Dissolved Chloride



- Chloride
- Data point not used in analysis
- ⬮ CUSUM
- ⋯ Alberta Tier 1-Natural Areas -2010 = 230 mg/L
- Well upper control limit
- Well lower control limit

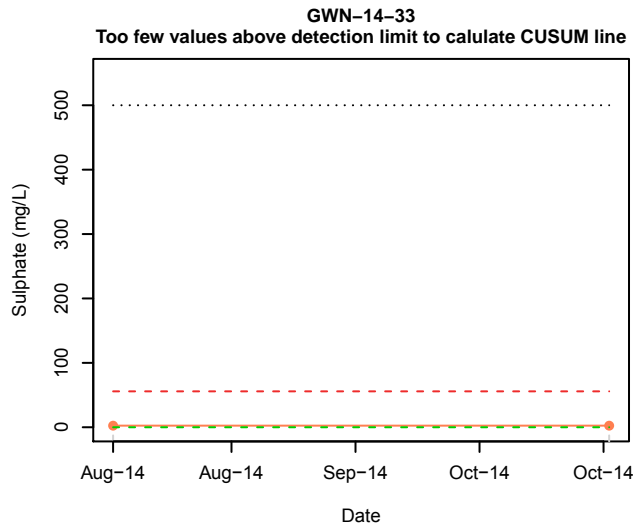
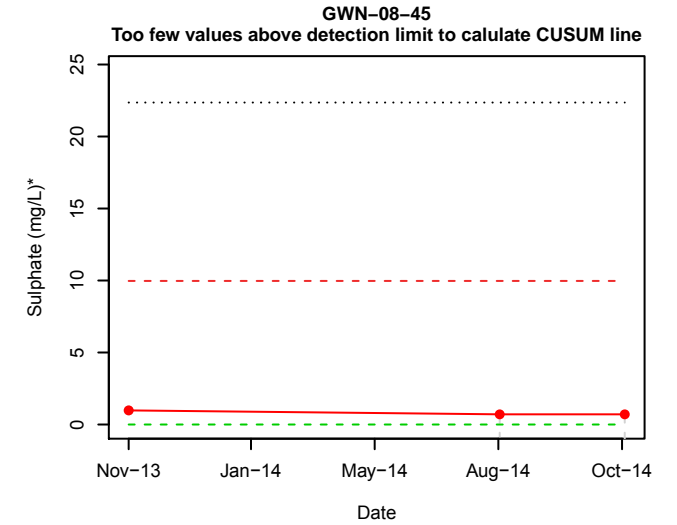
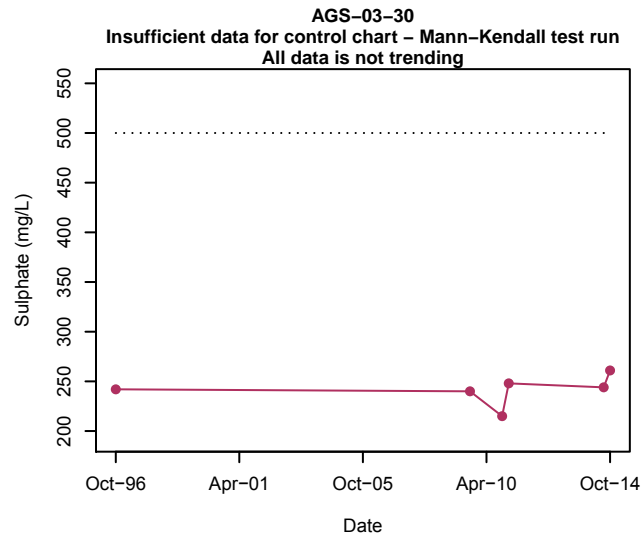
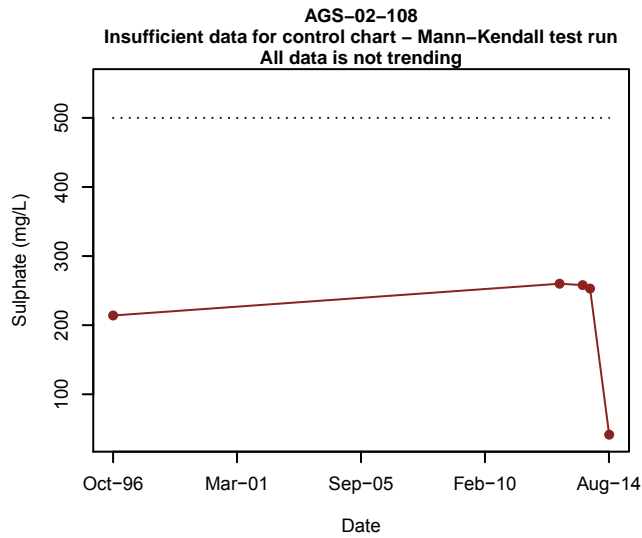
Appendix C28b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Clearwater Formation) Historical Dissolved Sulphate Concentrations



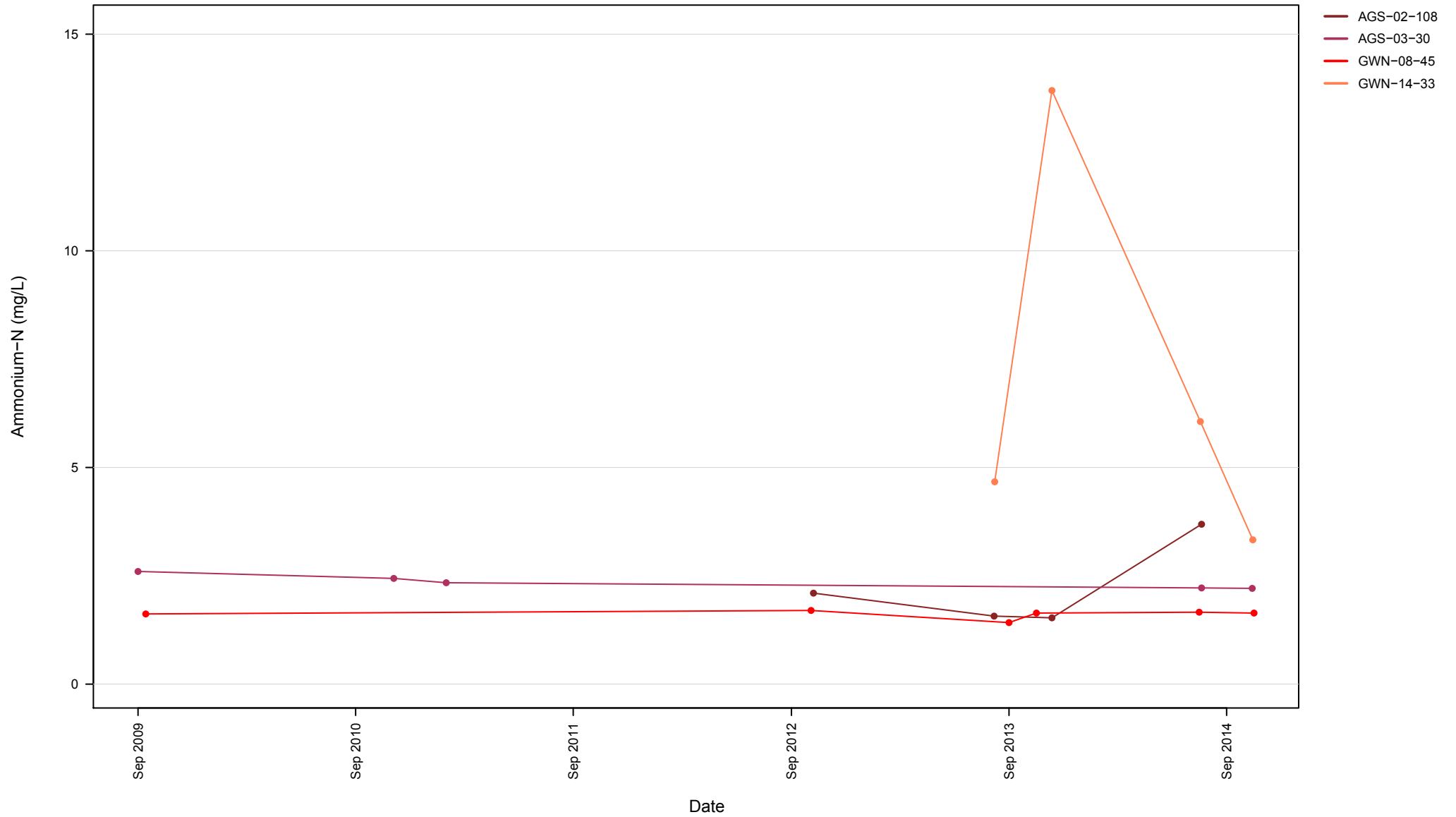
Appendix C29a

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Clearwater Formation) Shewhart-CUSUM Control Charts- Dissolved Sulphate



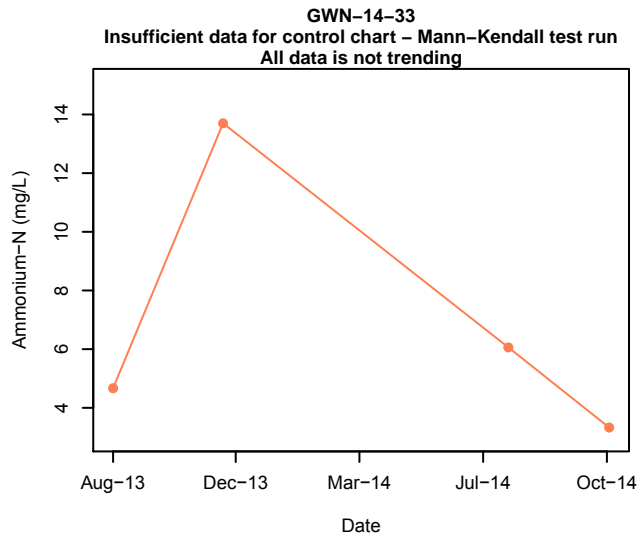
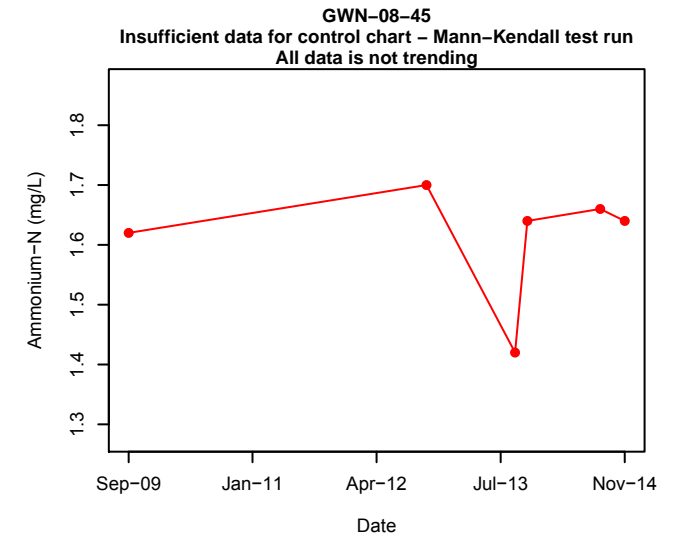
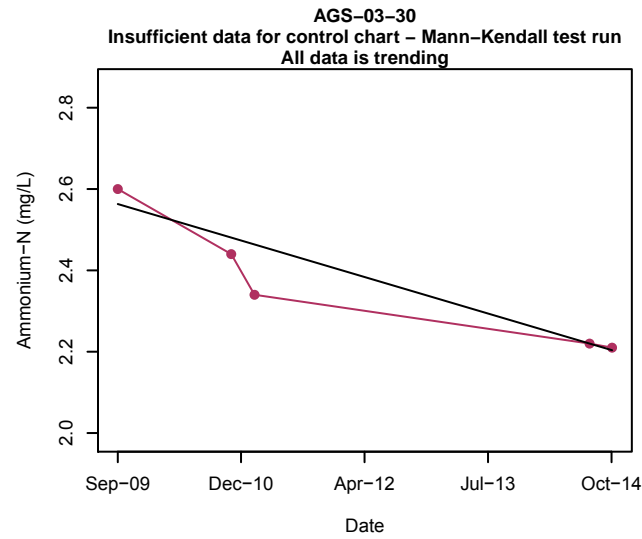
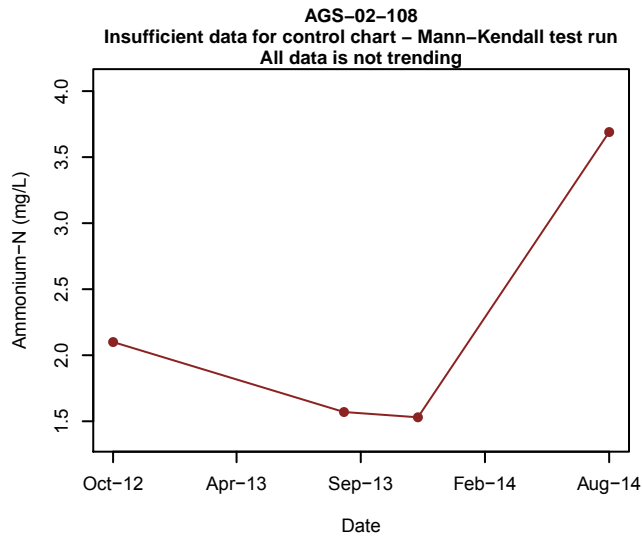
- Sulphate
- Values below detection limit
- Alberta Tier 1-Natural Areas -2010 = 500 mg/L
- * Data transformed for normality
- - - Well upper control limit
- - - Well lower control limit

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Clearwater Formation) Historical Ammonium-N Concentrations



Appendix C30a

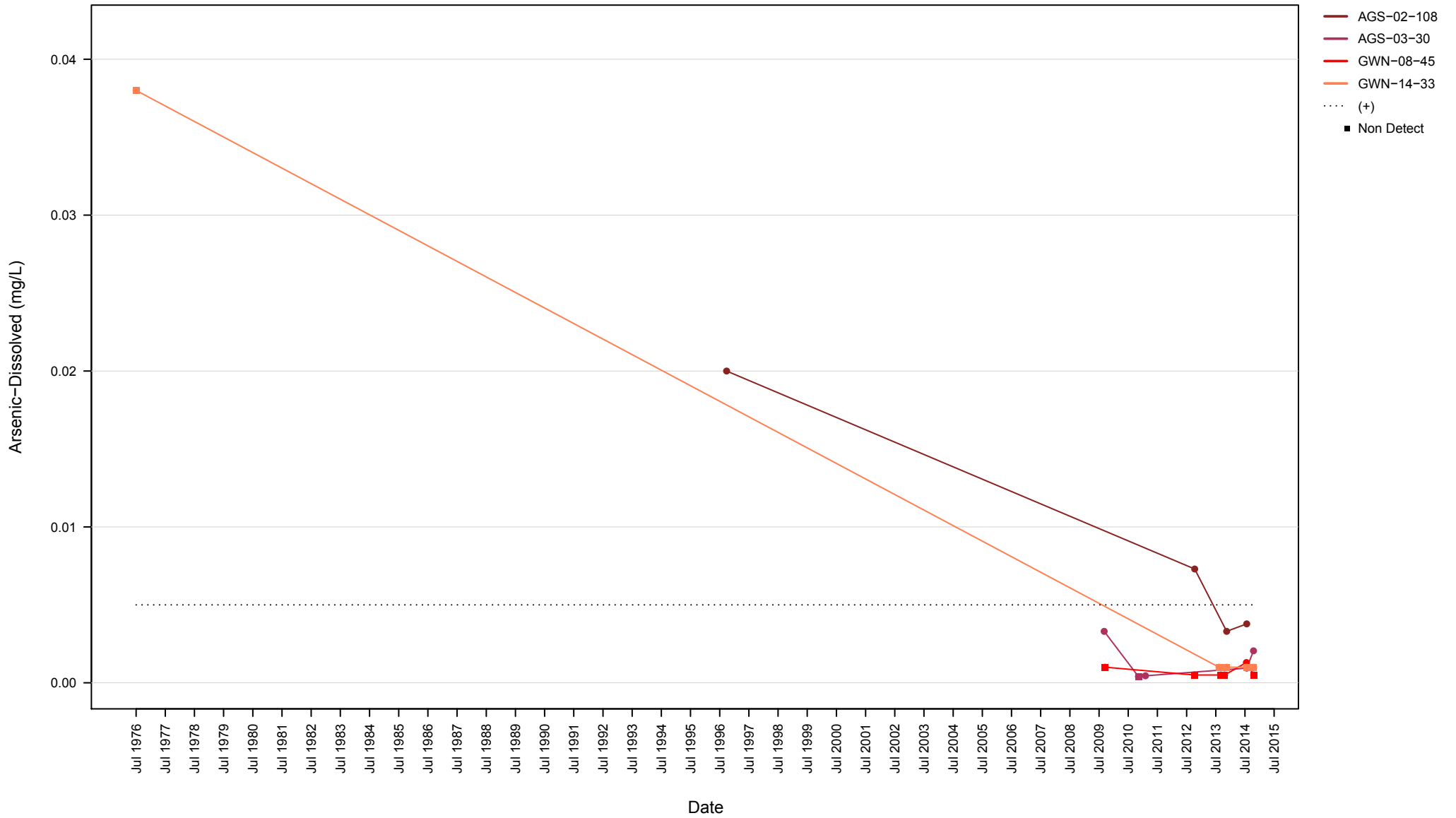
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Clearwater Formation) Shewhart-CUSUM Control Charts- Ammonium-N



● Ammonium-N
— Sen slope

Appendix C30b

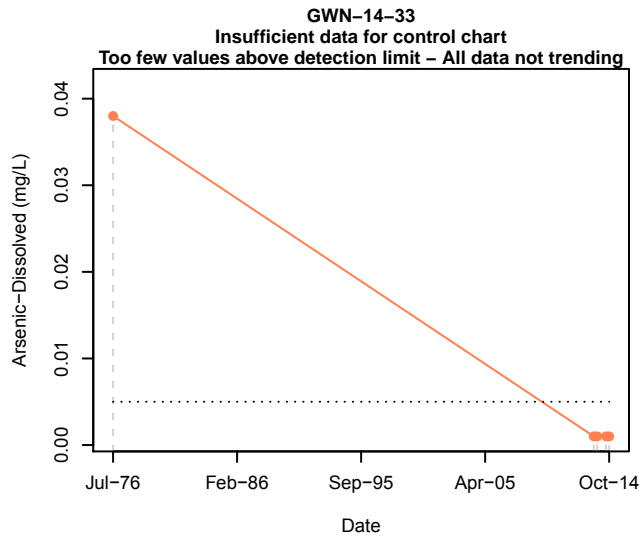
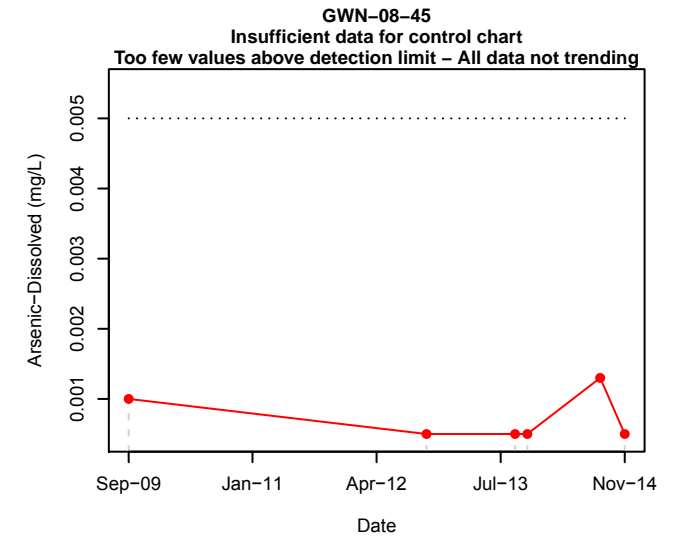
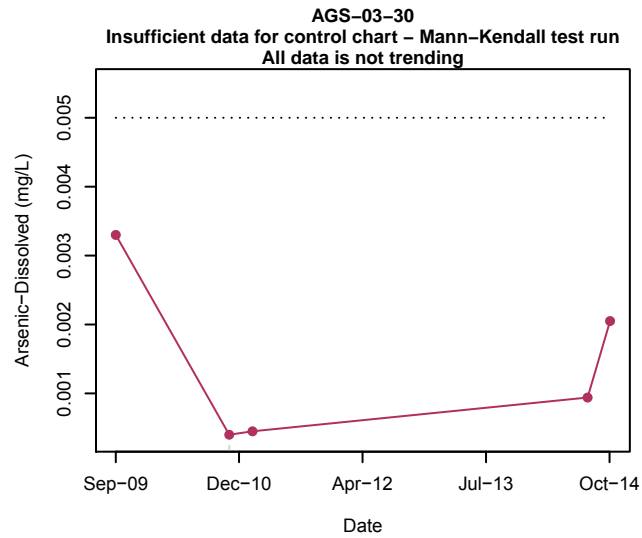
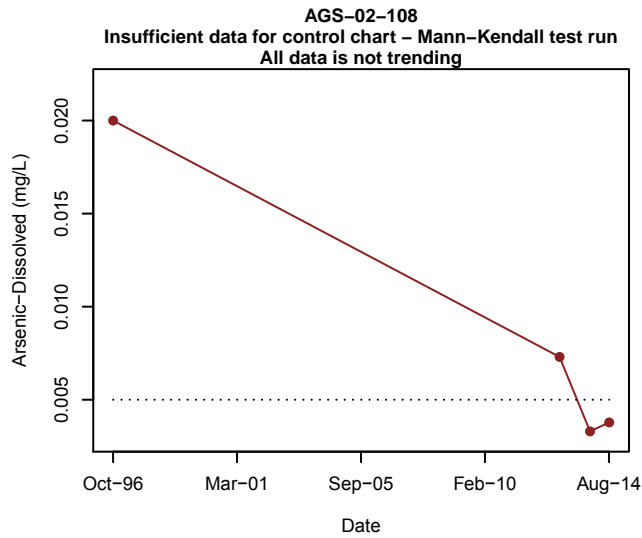
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Clearwater Formation) Historical Dissolved Arsenic Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 0.005 mg/L

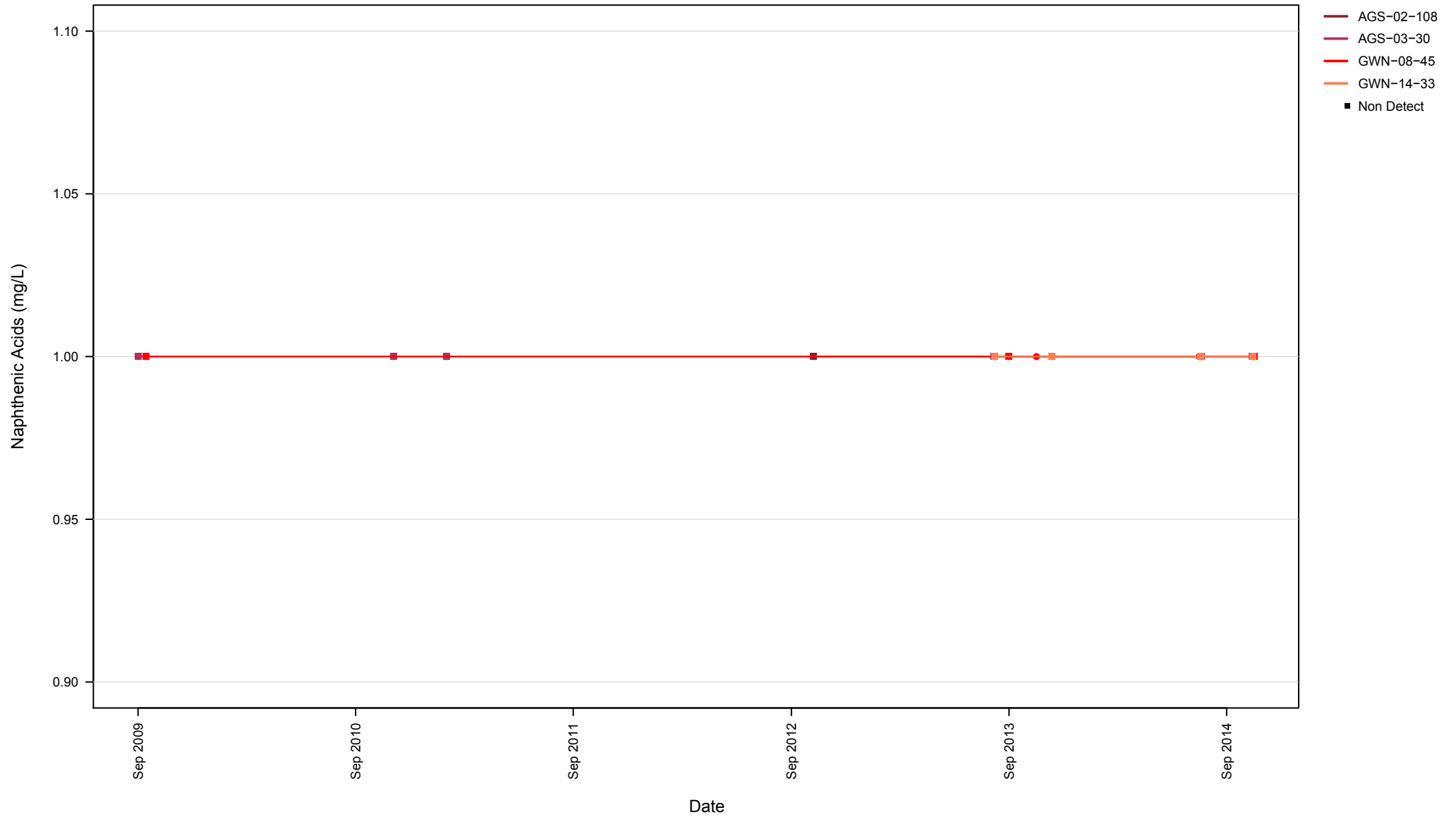
Appendix C31a

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Clearwater Formation) Shewhart-CUSUM Control Charts- Dissolved Arsenic



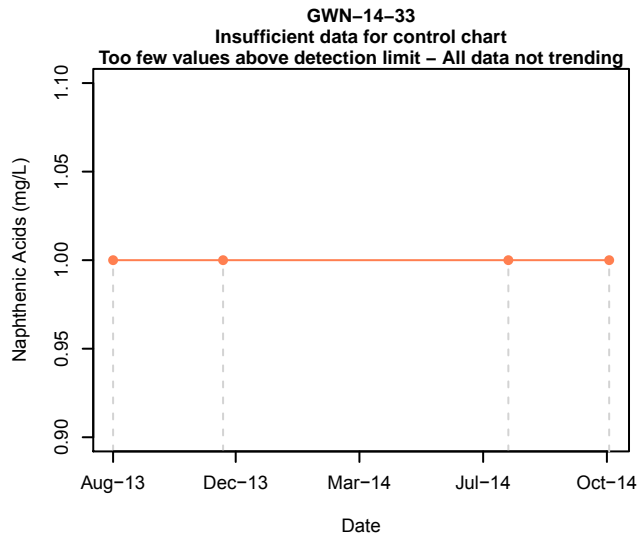
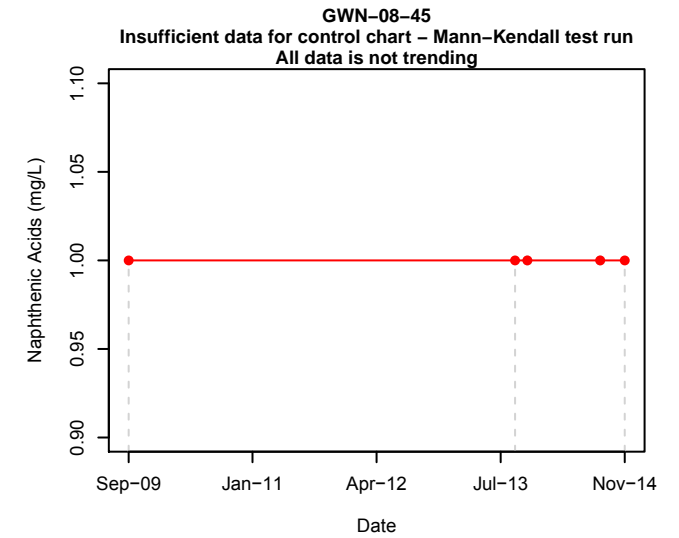
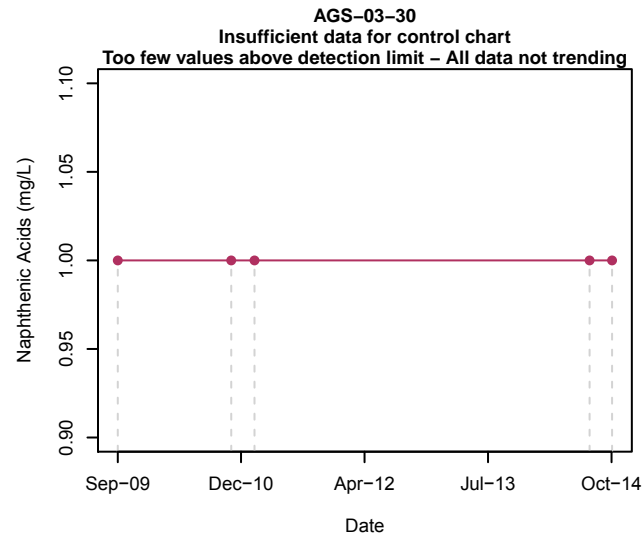
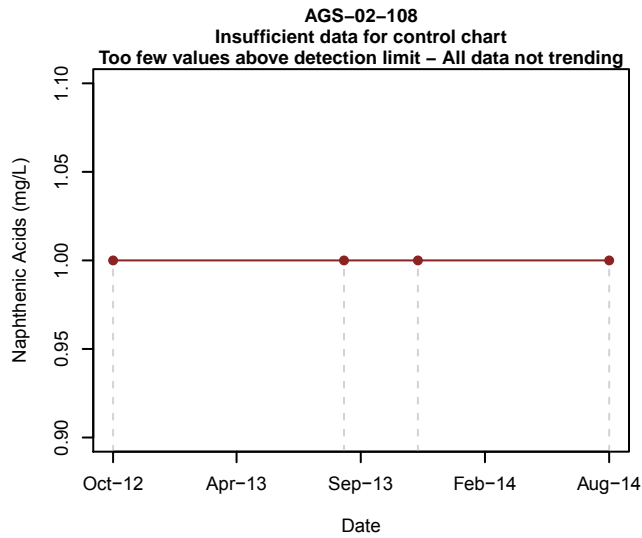
- Arsenic-Dissolved
- - - Values below detection limit
- Alberta Tier 1-Natural Areas -2010 = 0.005 mg/L

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Clearwater Formation) Historical Naphthenic Acids Concentrations



Appendix C32a

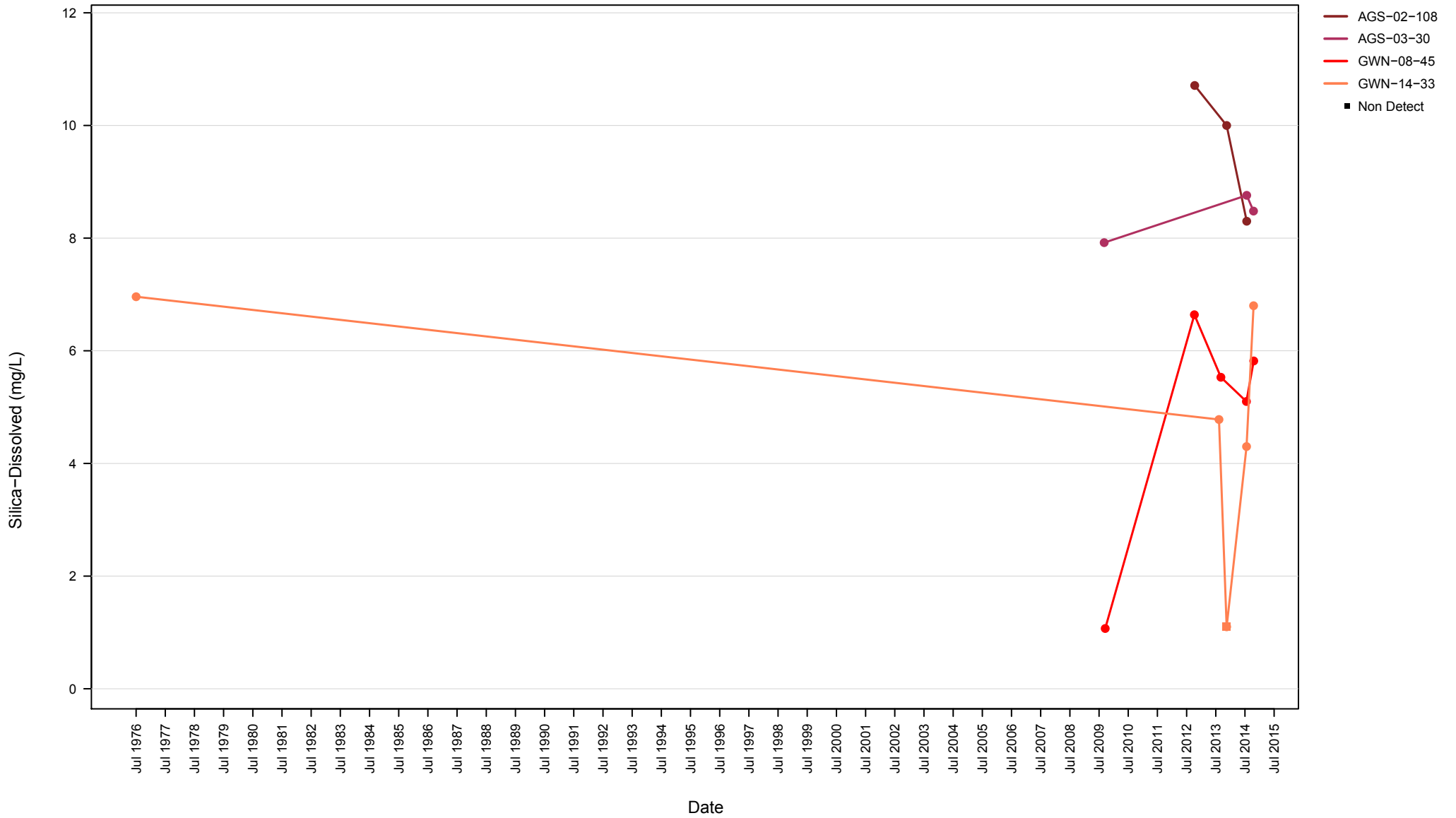
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Clearwater Formation) Shewhart-CUSUM Control Charts- Naphthenic Acids



● Naphthenic Acids
- - Values below detection limit

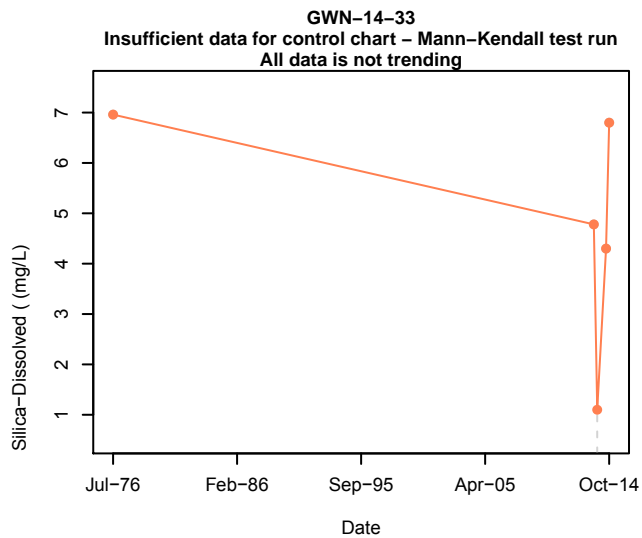
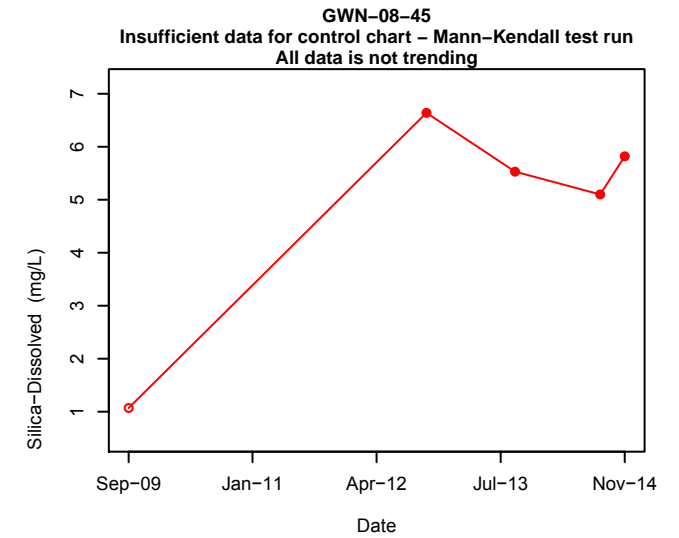
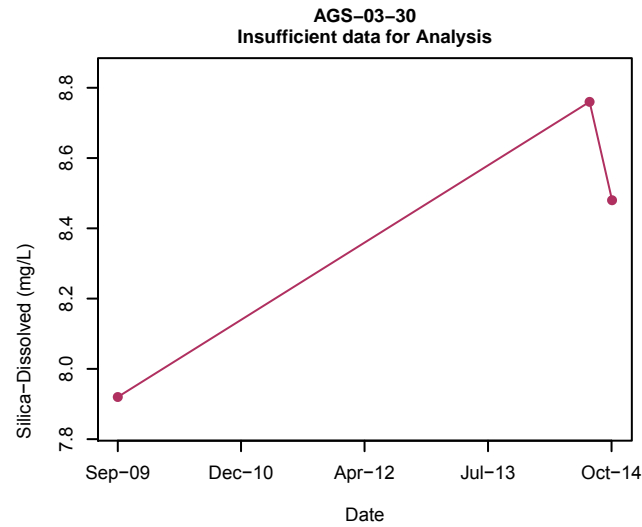
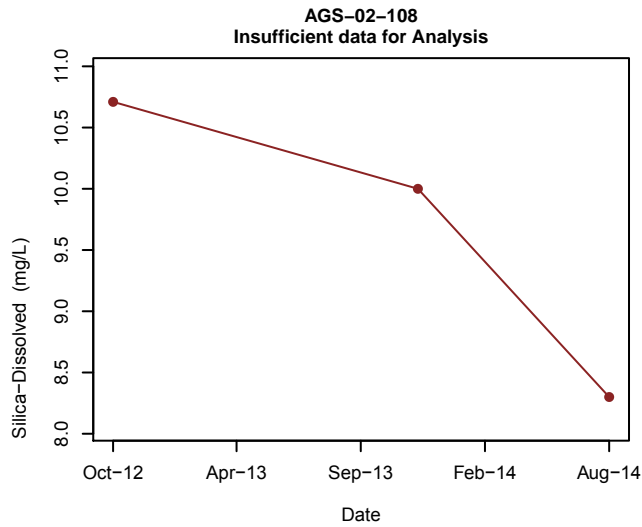
Appendix C32b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Clearwater Formation) Historical Dissolved Silica Concentrations



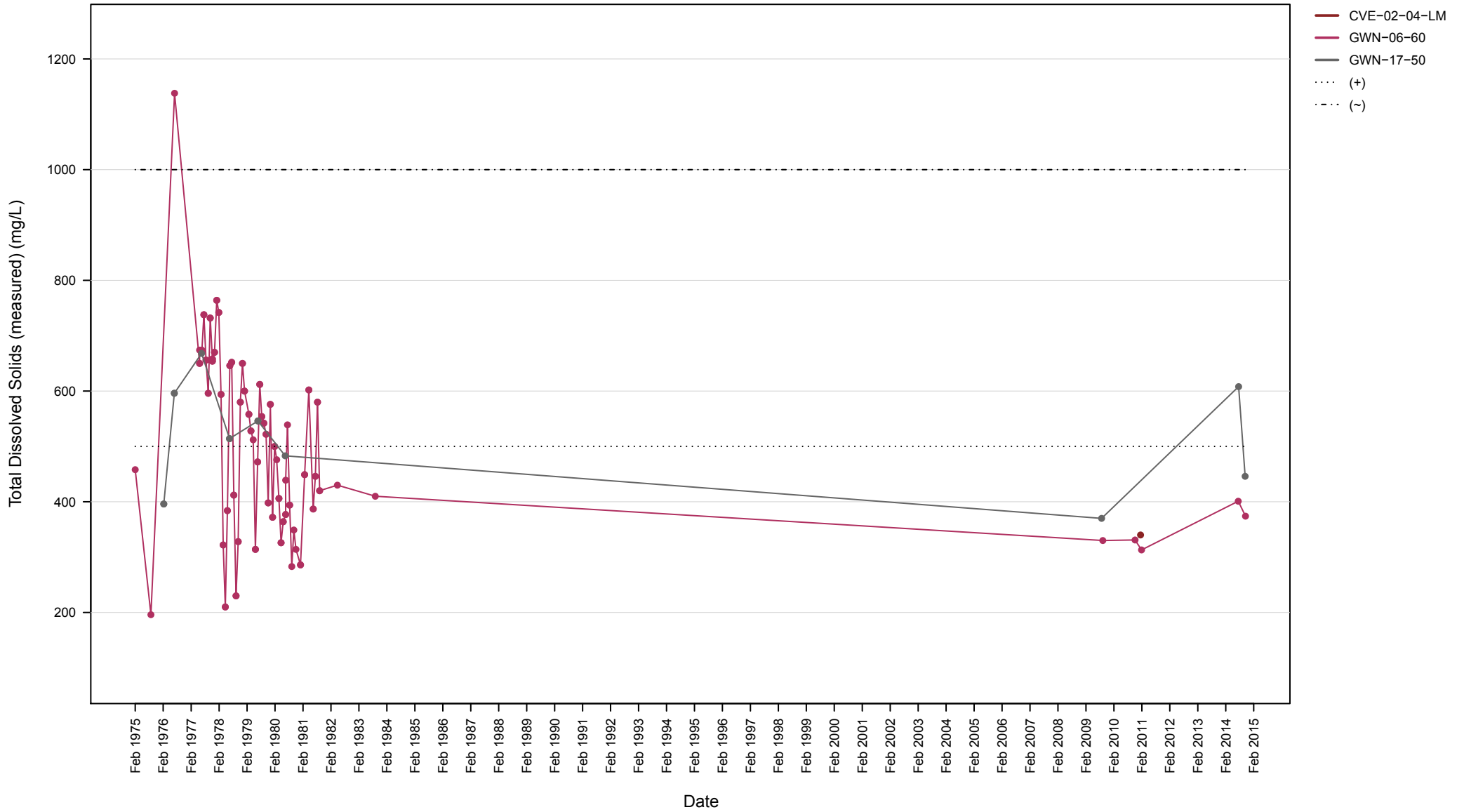
Appendix C33a

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Clearwater Formation) Shewhart-CUSUM Control Charts- Dissolved Silica



- Silica-Dissolved
- - Values below detection limit
- Data point not used in analysis

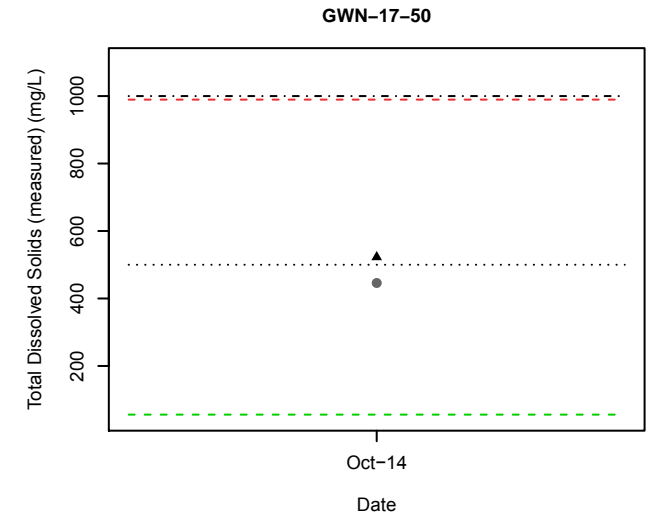
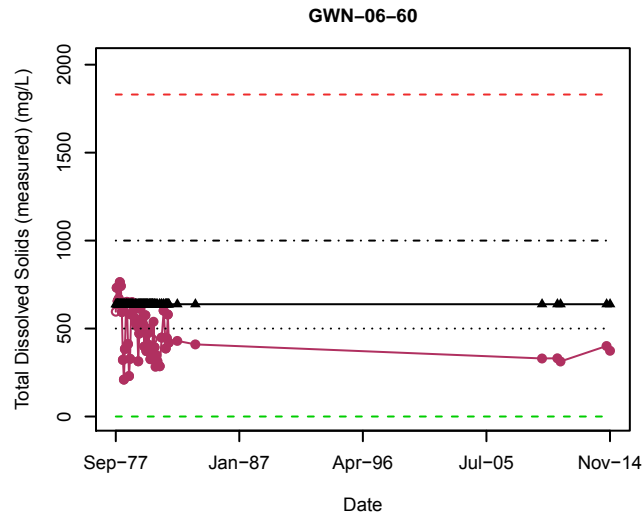
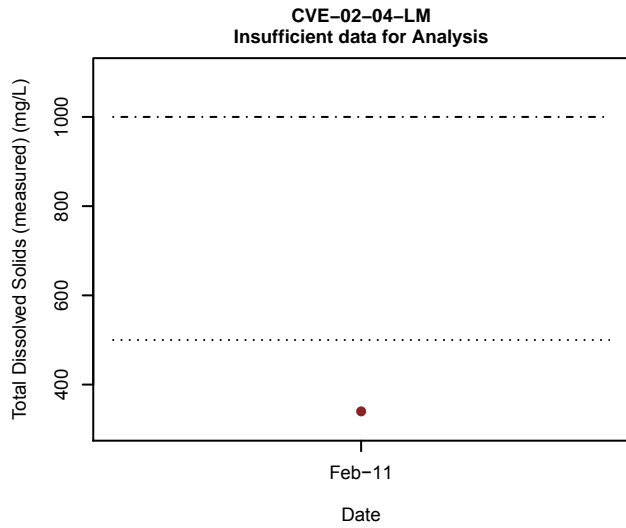
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU1) Historical Total Dissolved Solid Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 500 mg/L
 (-) Interim Quality Triggers for NAOS- AMU1 = 1000 mg/L

Appendix C34a

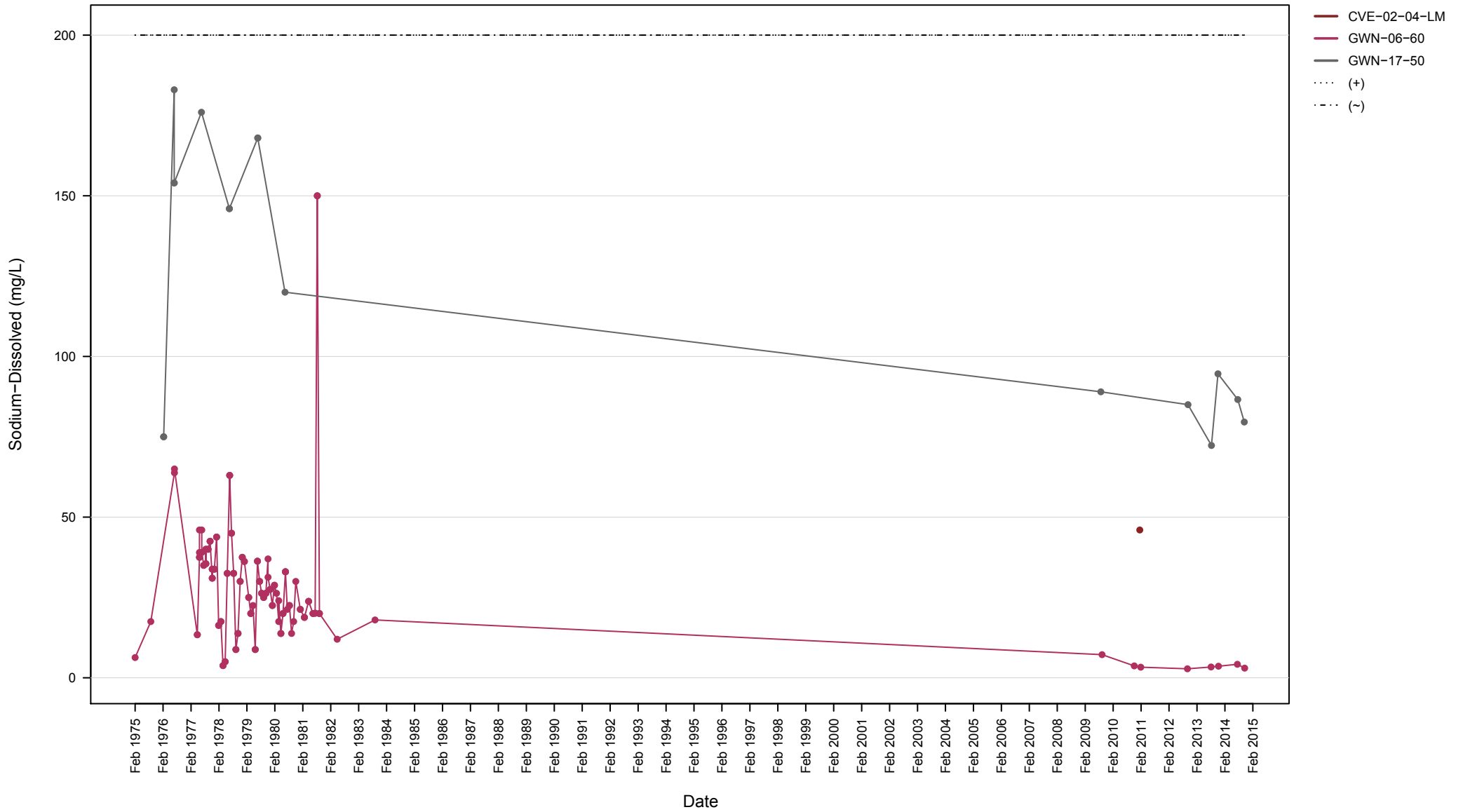
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU1) Shewhart-CUSUM Control Charts- Total Dissolved Solids



- Total Dissolved Solids (measured)
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 500 mg/L
- ⋯ Interim Quality Triggers for NAOS- AMU1 = 1000 mg/L
- ▲ CUSUM
- - - Well upper control limit
- - - Well lower control limit

Appendix C34b

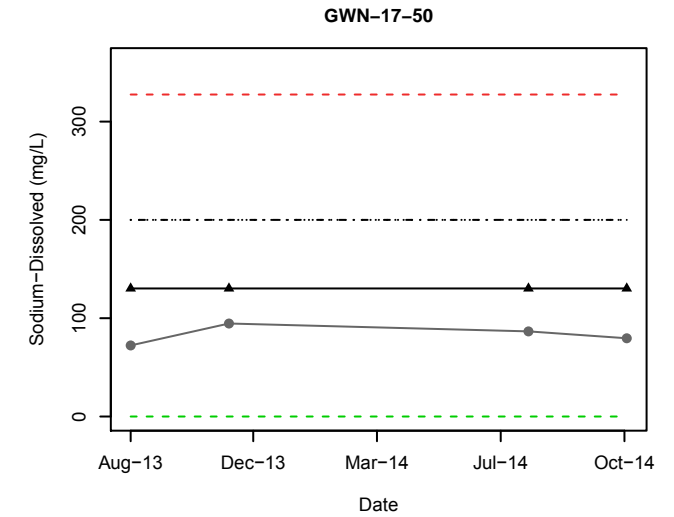
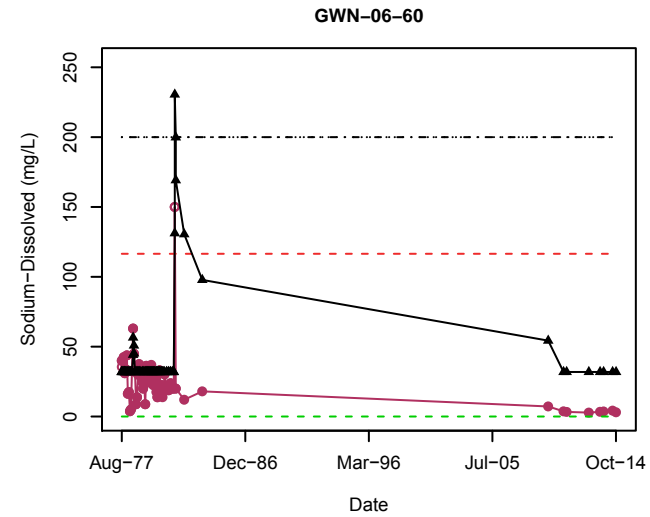
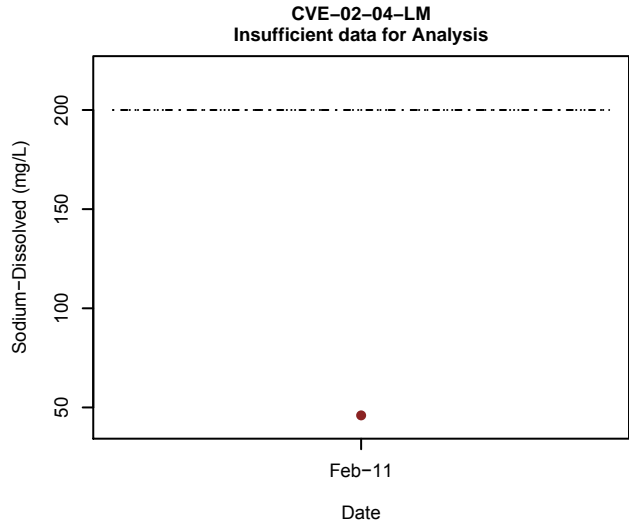
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU1) Historical Dissolved Sodium Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 200 mg/L
 (-) Interim Quality Triggers for NAOS- AMU1 = 200 mg/L

Appendix C35a

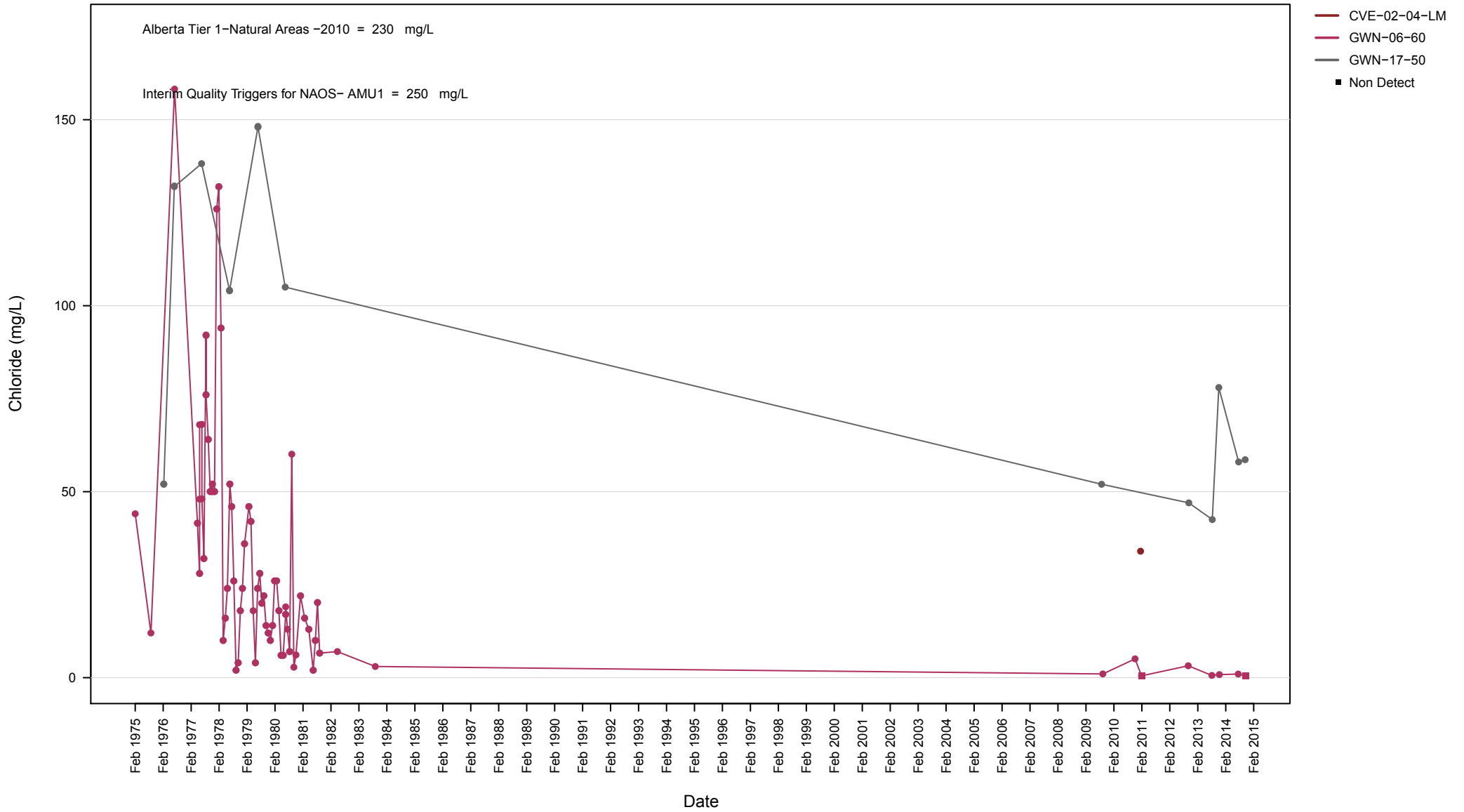
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU1) Shewhart-CUSUM Control Charts- Dissolved Sodium



- Sodium-Dissolved
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 200 mg/L
- ⋯ Interim Quality Triggers for NAOS- AMU1 = 200 mg/L
- ▲ CUSUM
- Well upper control limit
- Well lower control limit

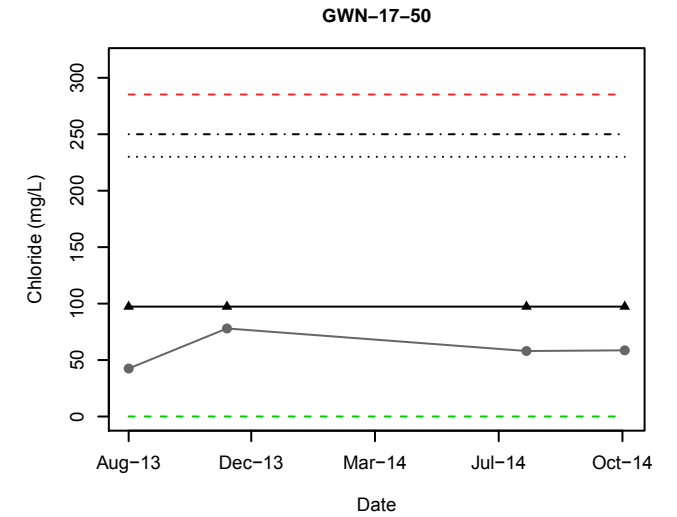
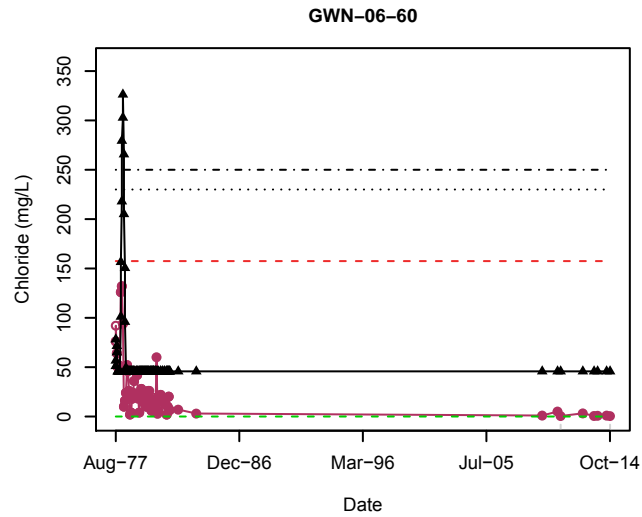
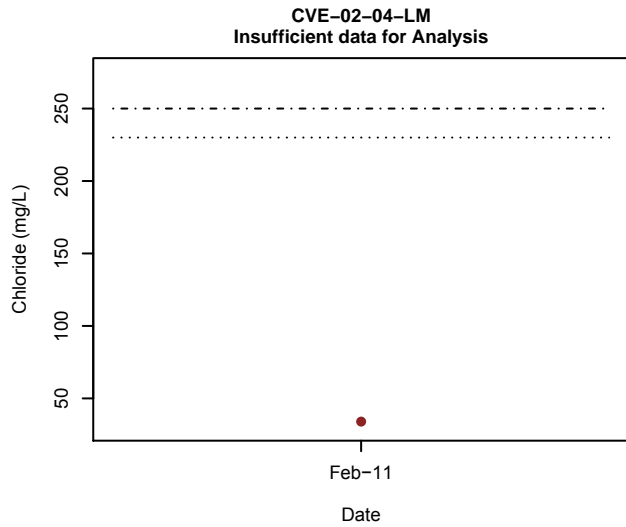
Appendix C35b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU1) Historical Dissolved Chloride Concentrations



Appendix C36a

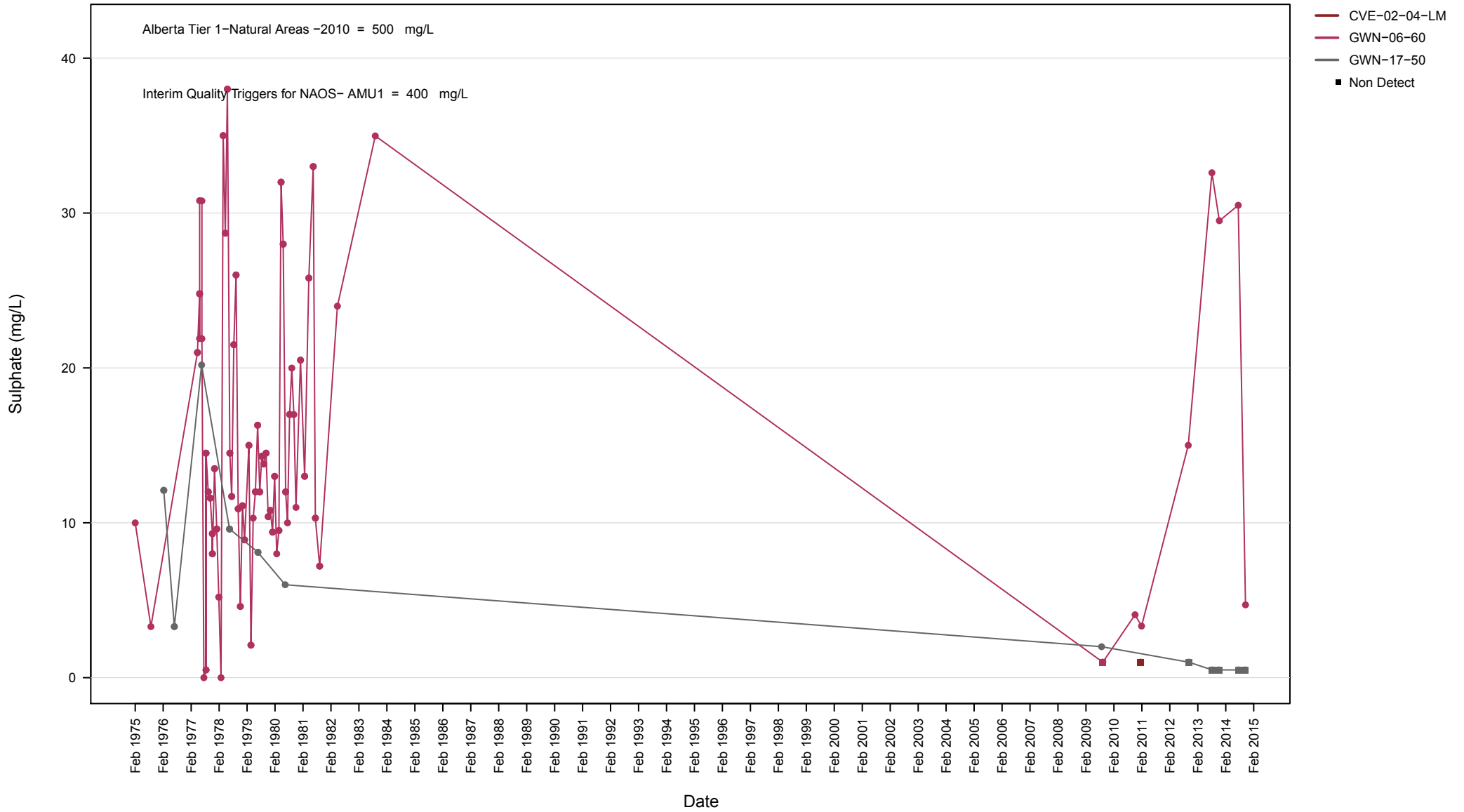
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU1) Shewhart-CUSUM Control Charts- Dissolved Chloride



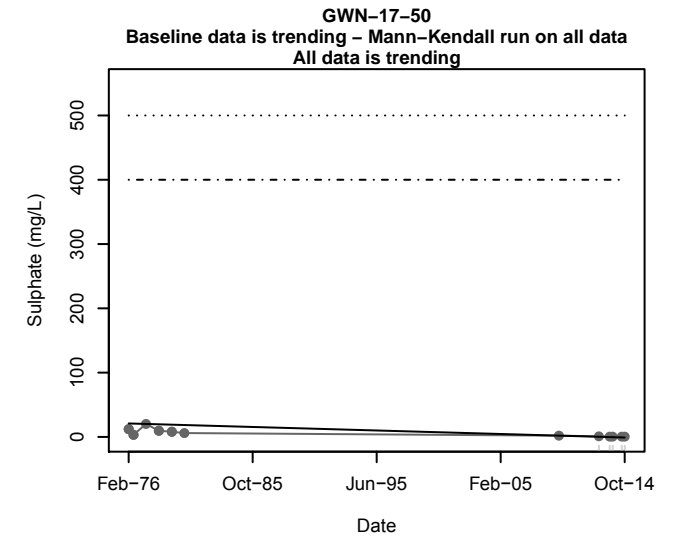
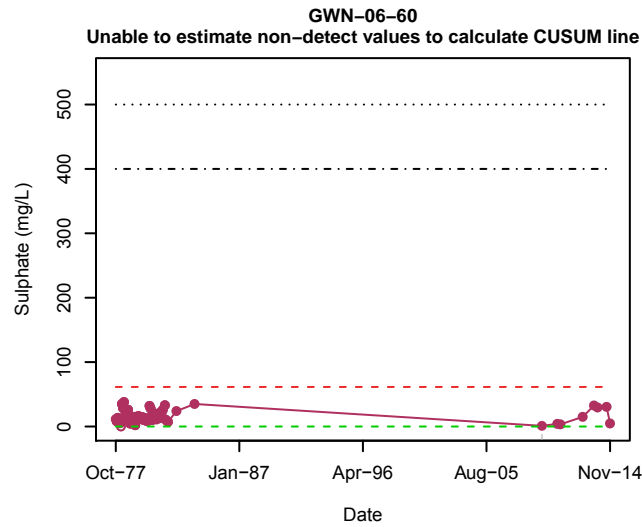
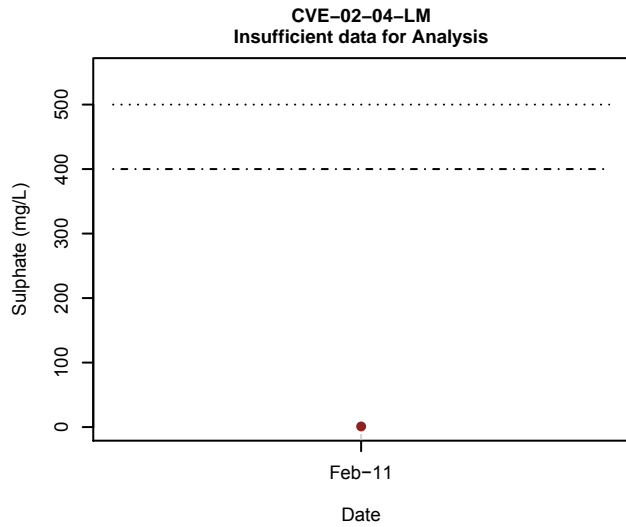
- Chloride
- Data point not used in analysis
- ⬆ CUSUM
- ⋯ Alberta Tier 1-Natural Areas -2010 = 230 mg/L
- ⋯ Interim Quality Triggers for NAOS- AMU1 = 250 mg/L
- Values below detection limit
- Well upper control limit
- Well lower control limit

Appendix C36b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU1) Historical Dissolved Sulphate Concentrations



North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU1) Shewhart-CUSUM Control Charts- Dissolved Sulphate

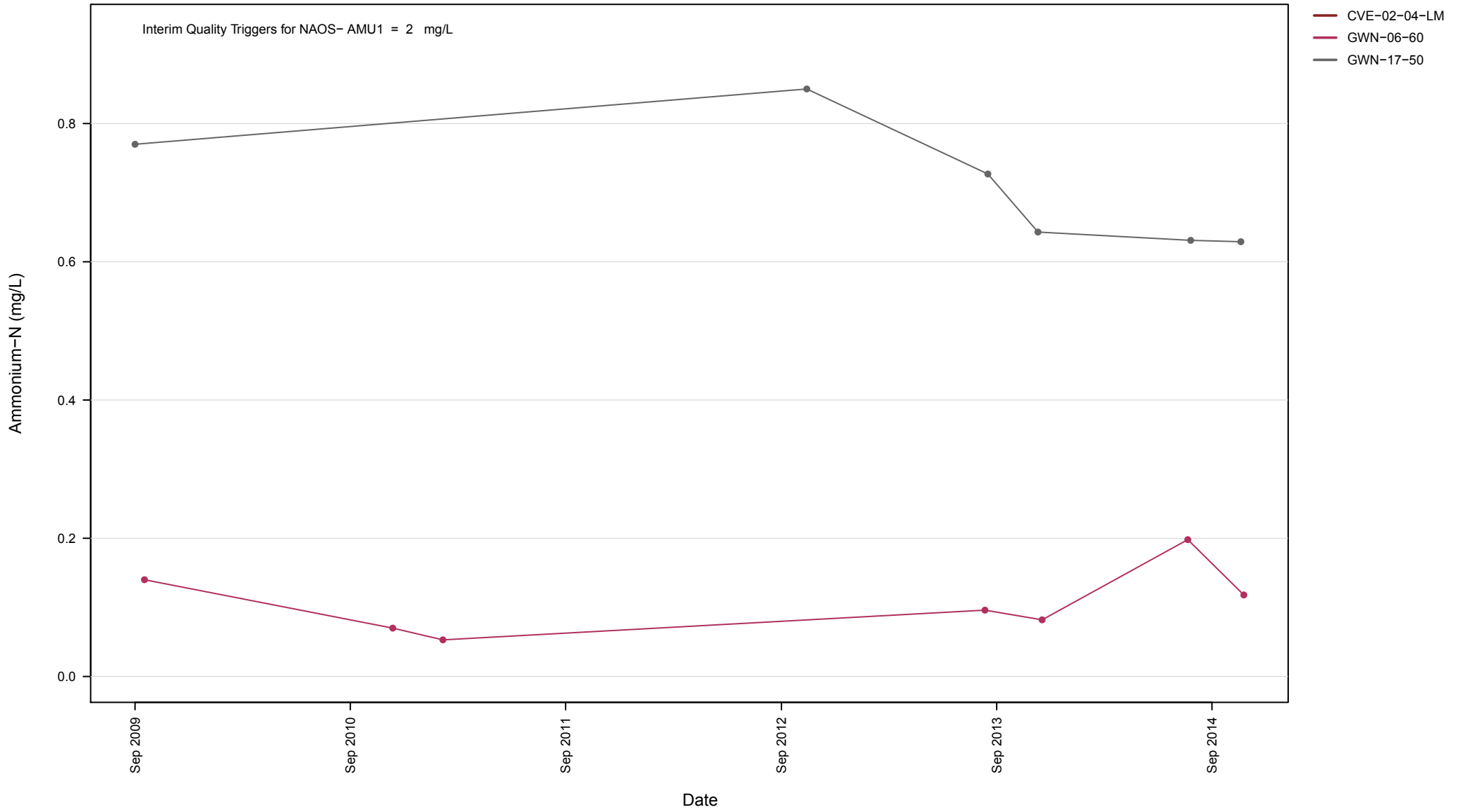


- Sulphate
- Values below detection limit
- Sen slope
- Data point not used in analysis

- Alberta Tier 1-Natural Areas ~2010 = 500 mg/L
- Interim Quality Triggers for NAOS- AMU1 = 400 mg/L
- Well upper control limit
- Well lower control limit

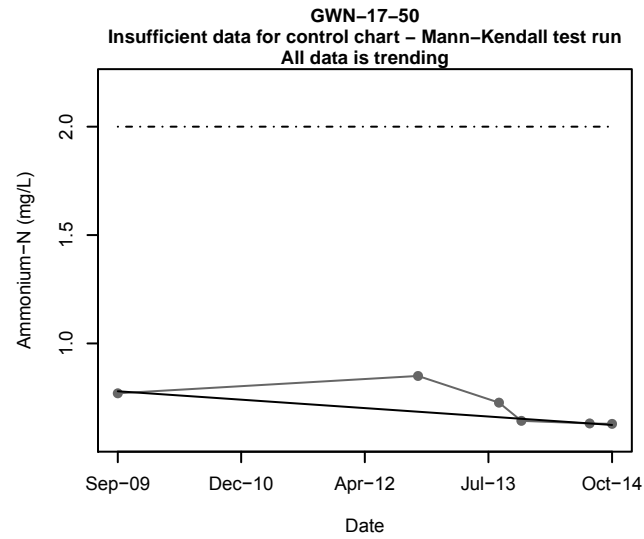
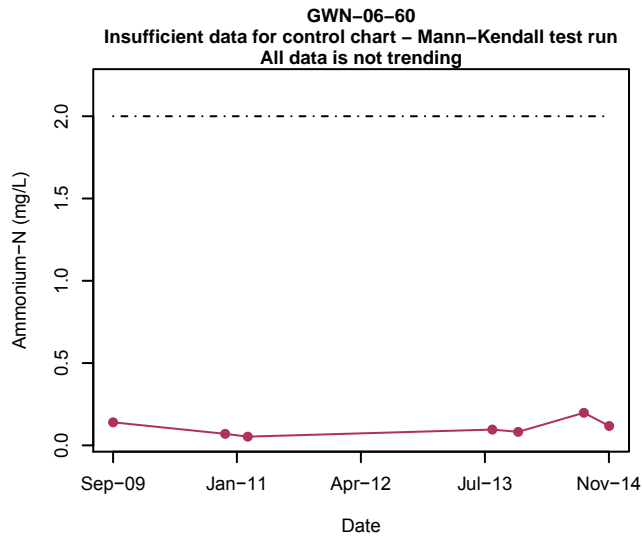
Appendix C37b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU1) Historical Ammonium-N Concentrations



Appendix C38a

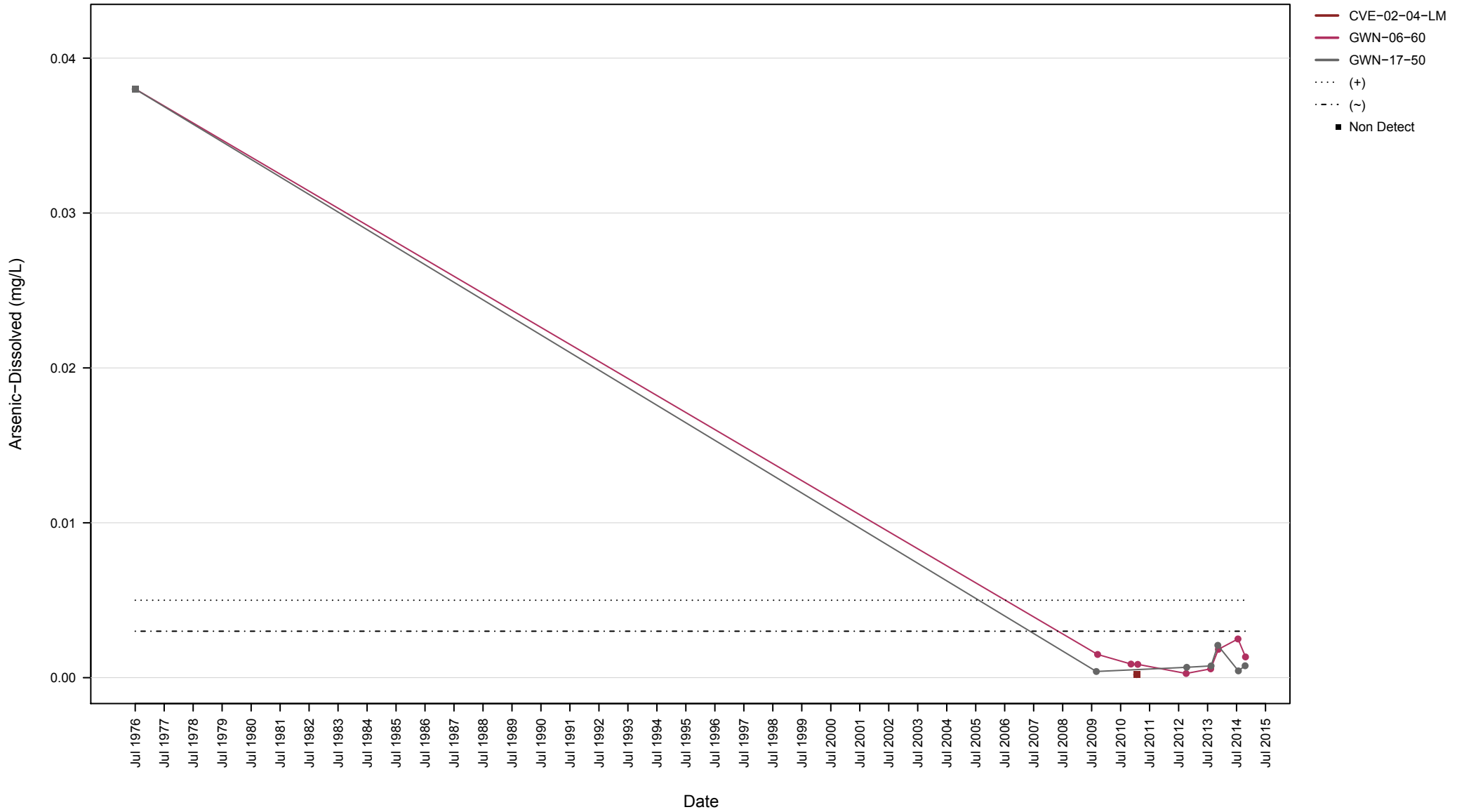
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU1) Shewhart-CUSUM Control Charts- Ammonium-N



● Ammonium-N
 — Sen slope
 - - - Interim Quality Triggers for NAOS- AMU1 = 2 mg/L

Appendix C38b

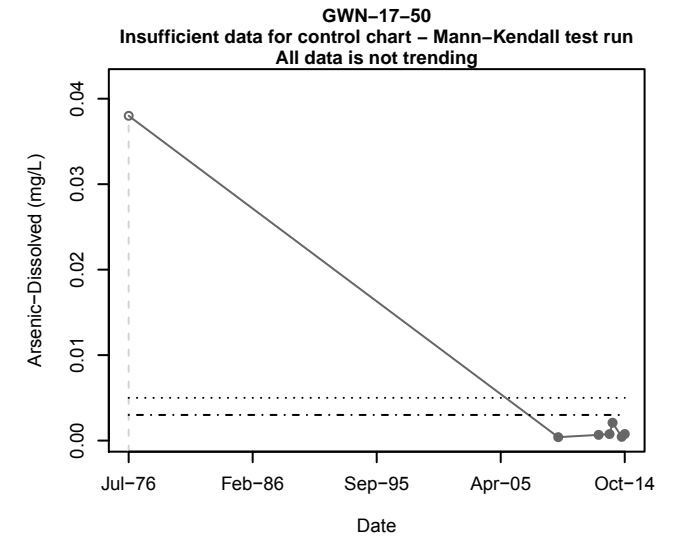
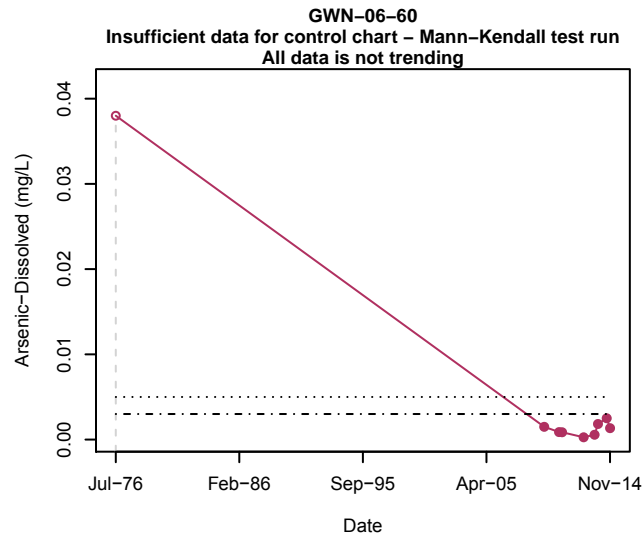
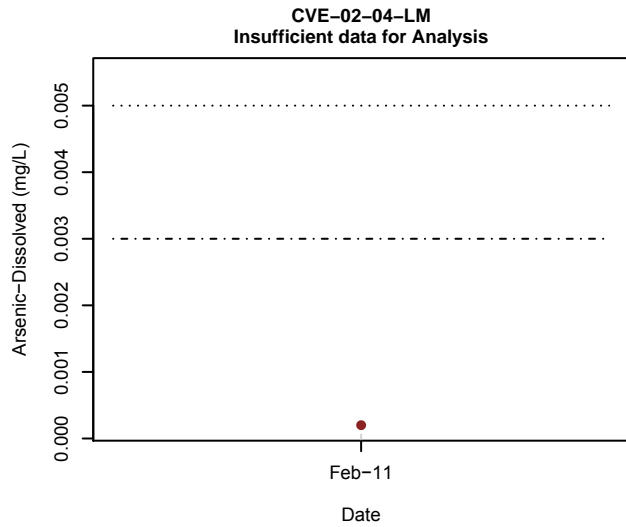
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU1) Historical Dissolved Arsenic Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 0.005 mg/L
 (-) Interim Quality Triggers for NAOS- AMU1 = 0.003 mg/L

Appendix C39a

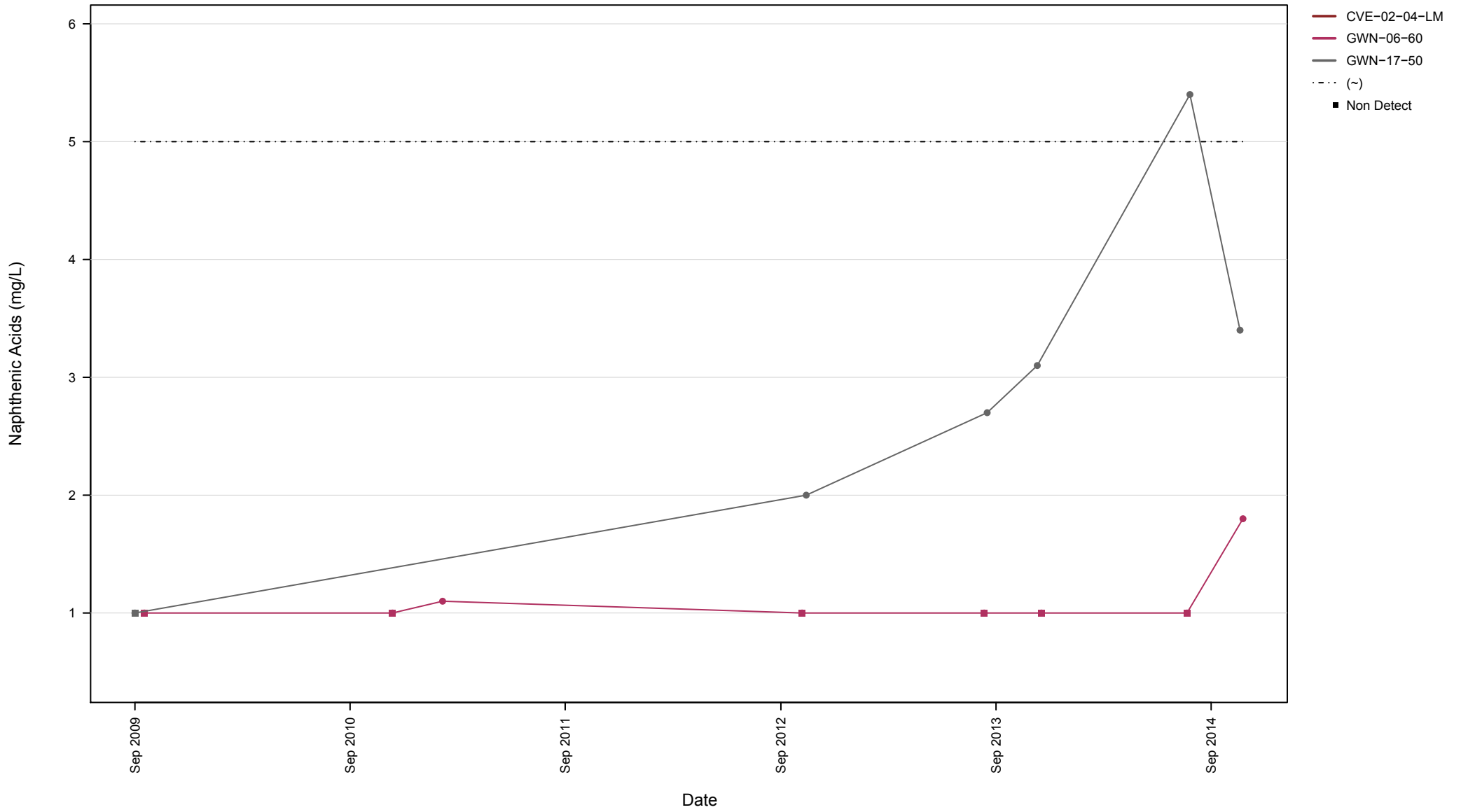
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU1) Shewhart-CUSUM Control Charts- Dissolved Arsenic



- Arsenic-Dissolved
- - - Values below detection limit
- Data point not used in analysis
- Alberta Tier 1-Natural Areas -2010 = 0.005 mg/L
- Interim Quality Triggers for NAOS- AMU1 = 0.003 mg/L

Appendix C39b

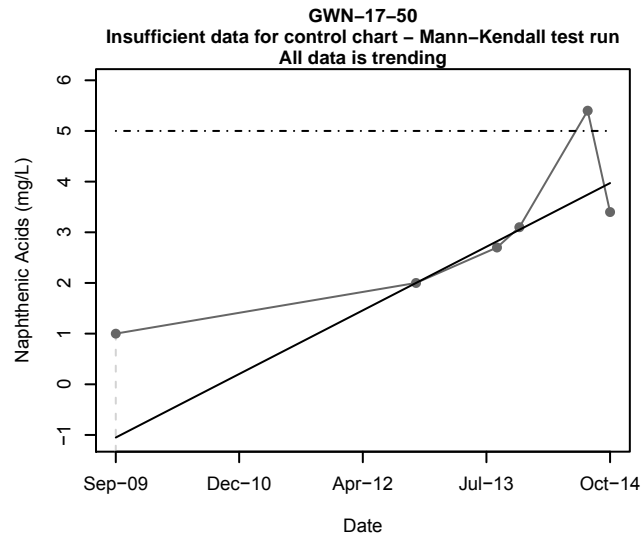
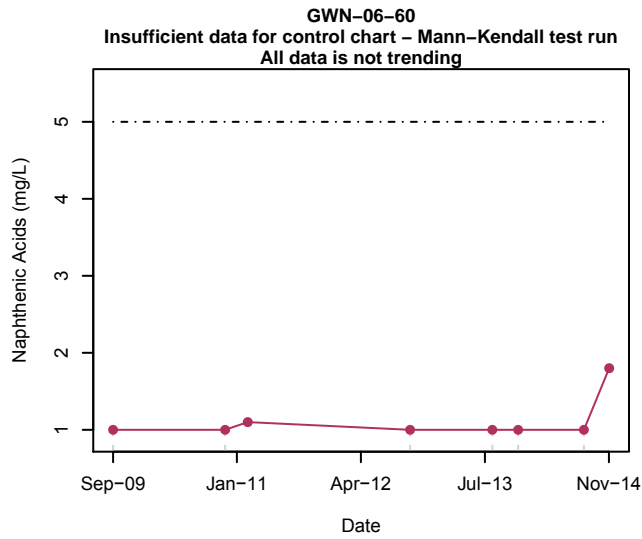
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU1) Historical Naphthenic Acids Concentrations



(-) Interim Quality Triggers for NAOS- AMU1 = 5 mg/L

Appendix C40a

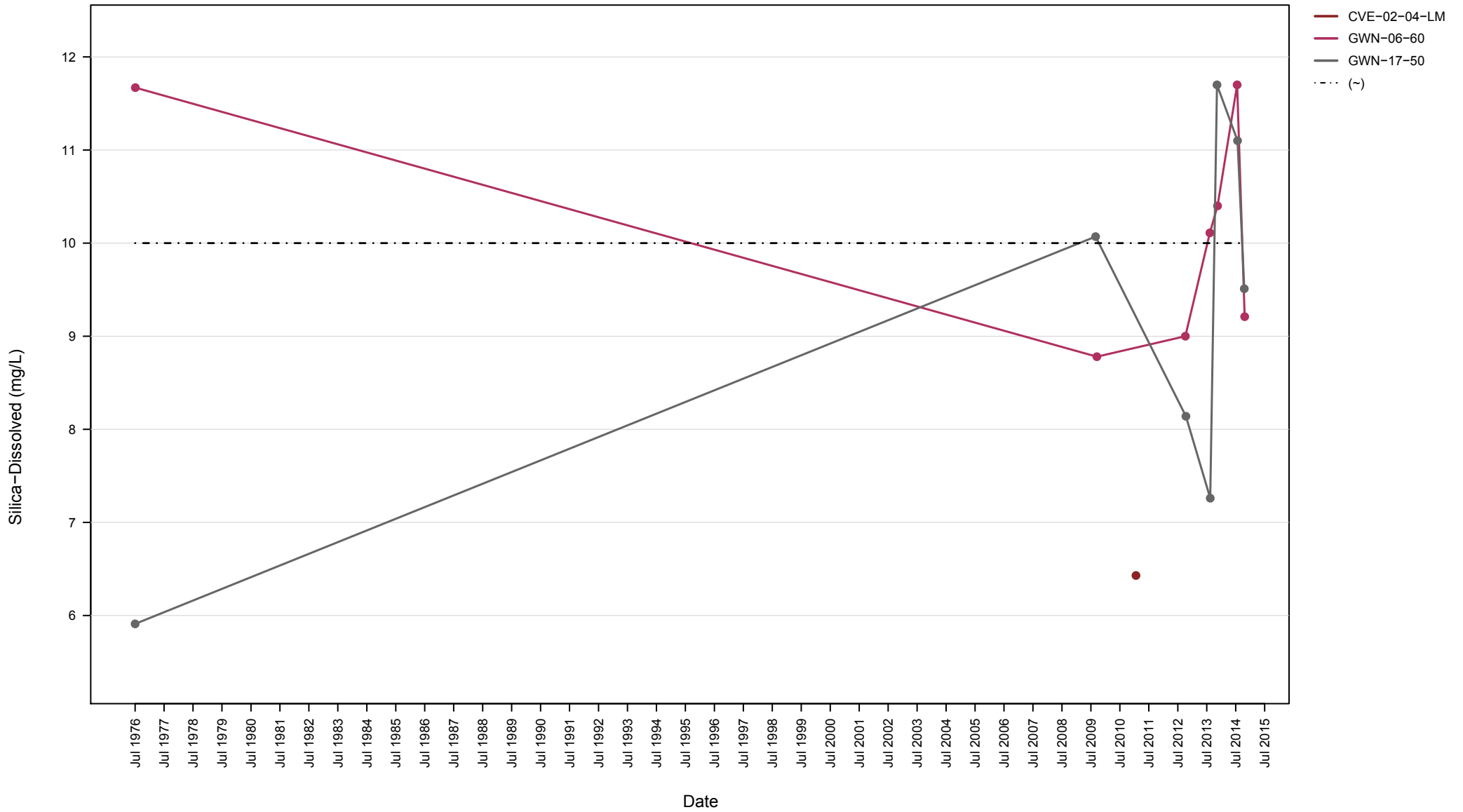
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU1) Shewhart-CUSUM Control Charts- Naphthenic Acids



- Naphthenic Acids
- - - Values below detection limit
- Sen slope
- · · Interim Quality Triggers for NAOS- AMU1 = 5 mg/L

Appendix C40b

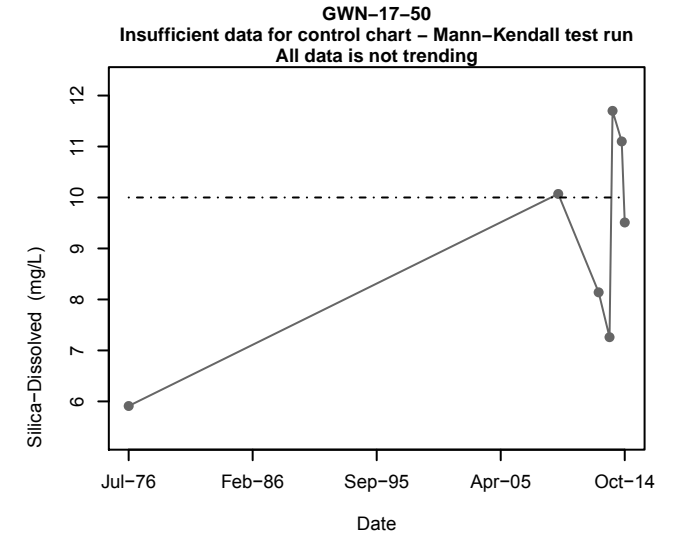
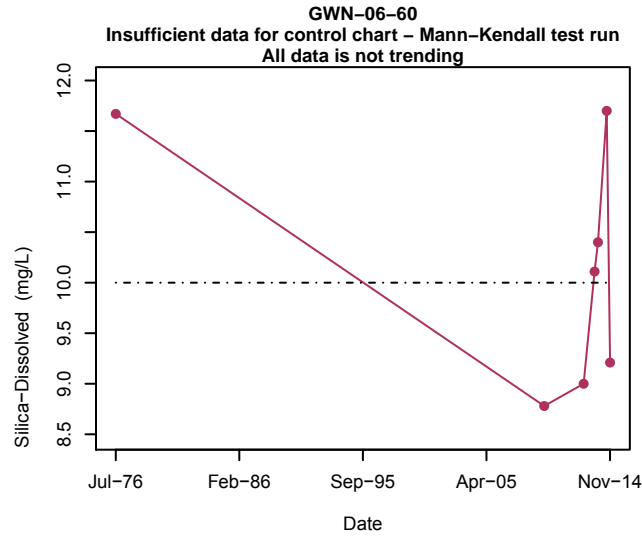
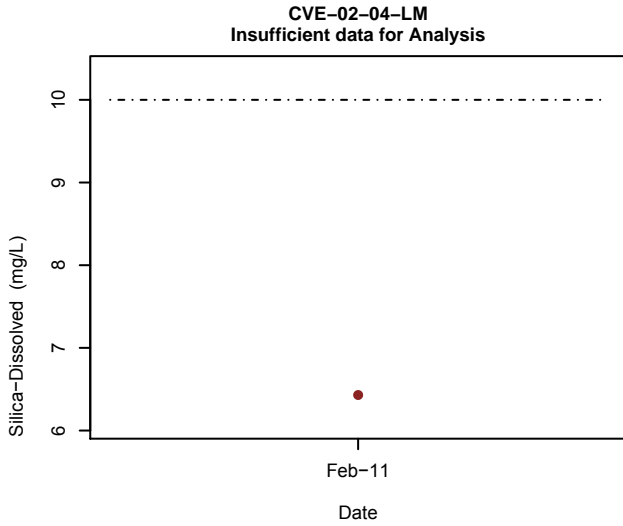
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU1) Historical Dissolved Silica Concentrations



(~) Interim Quality Triggers for NAOS- AMU1 = 10 mg/L

Appendix C41a

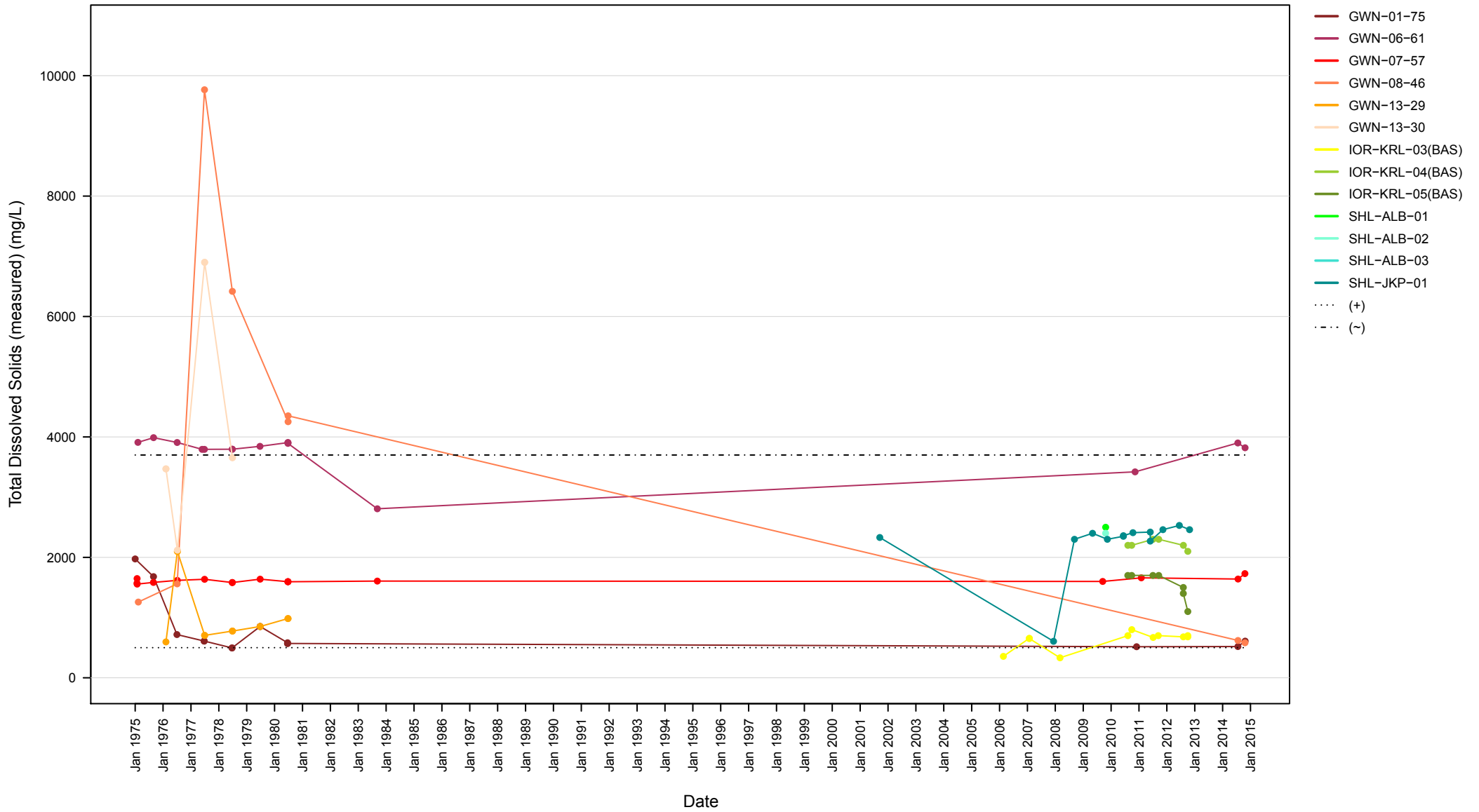
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU1) Shewhart-CUSUM Control Charts- Dissolved Silica



● Silica-Dissolved
- - - Interim Quality Triggers for NAOS- AMU1 = 10 mg/L

Appendix C41b

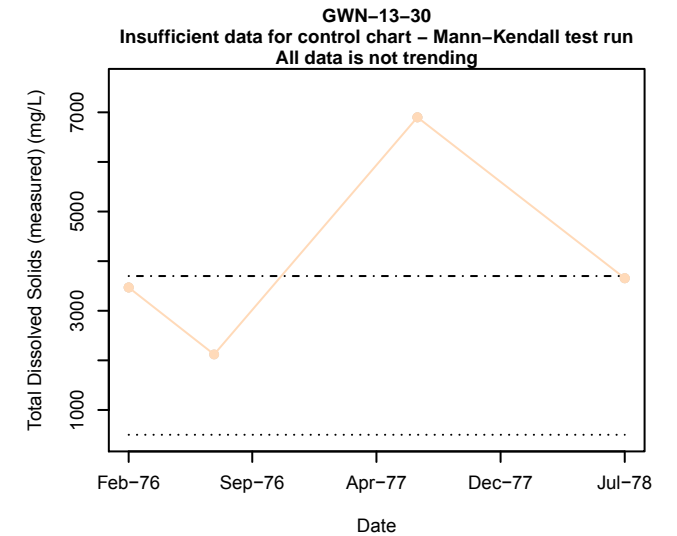
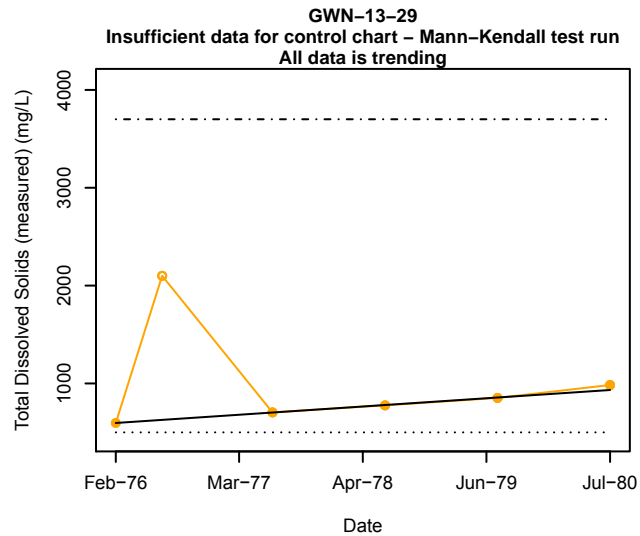
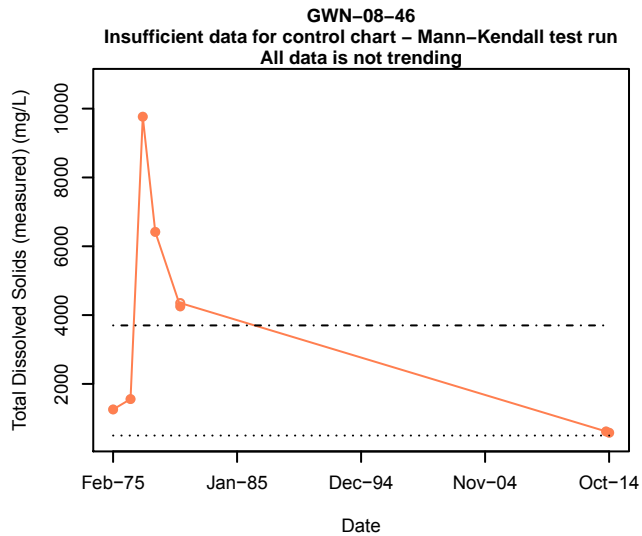
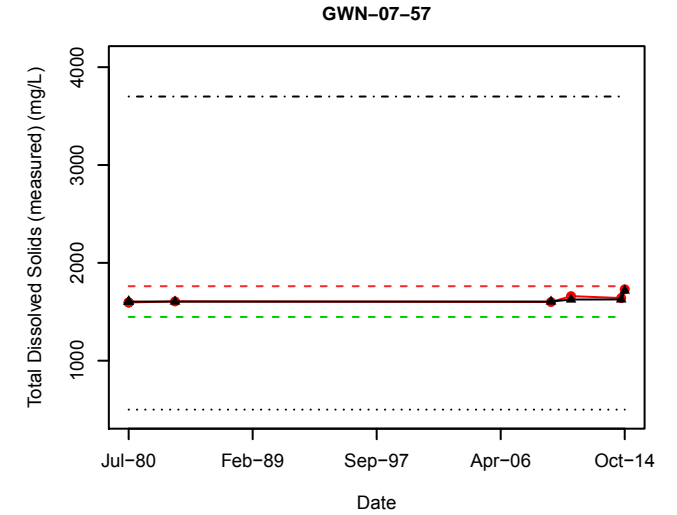
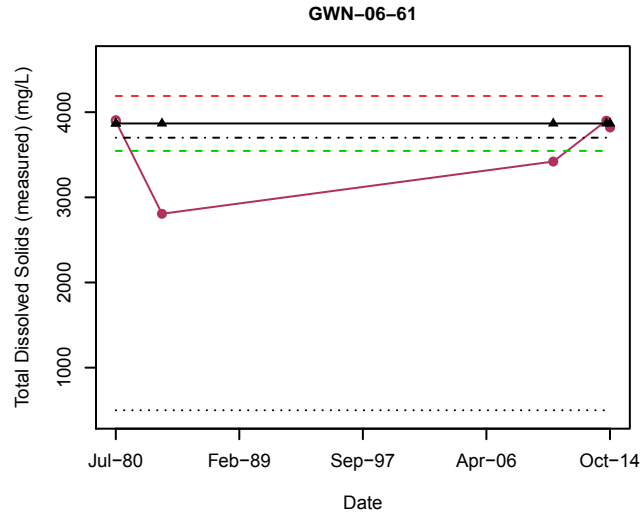
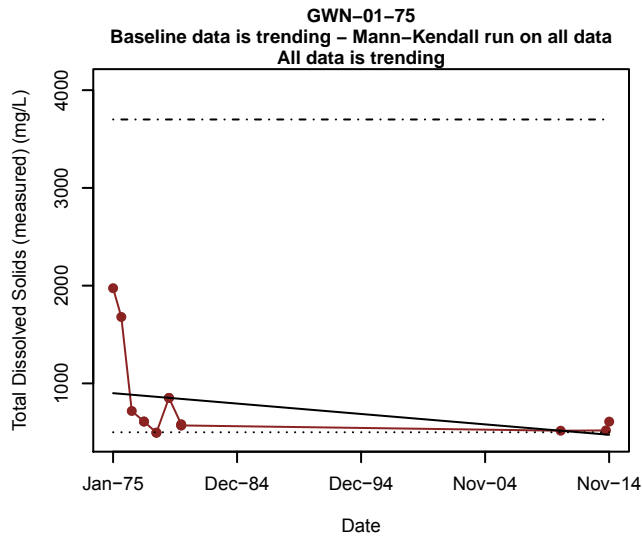
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Historical Total Dissolved Solid Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 500 mg/L
 (-) Interim Quality Triggers for NAOS- AMU2 = 3700 mg/L

Appendix C42a

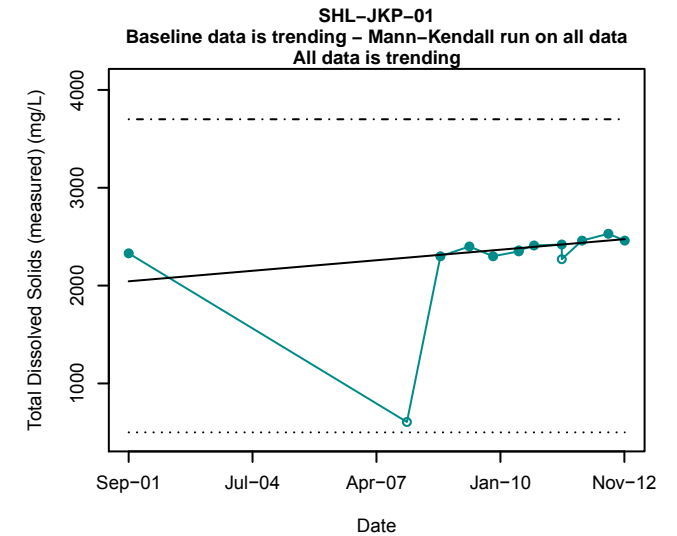
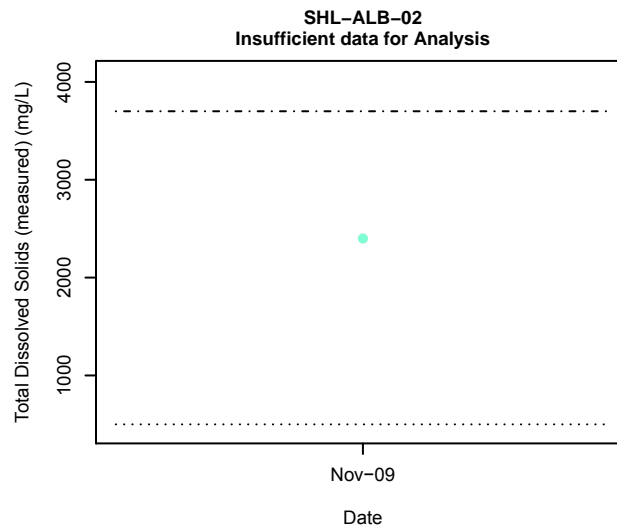
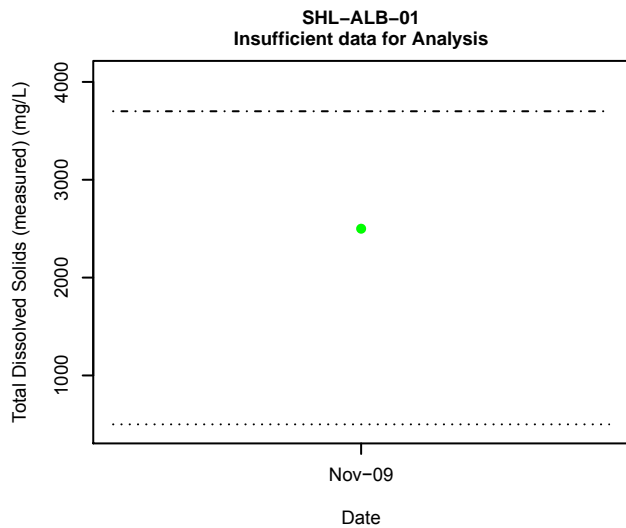
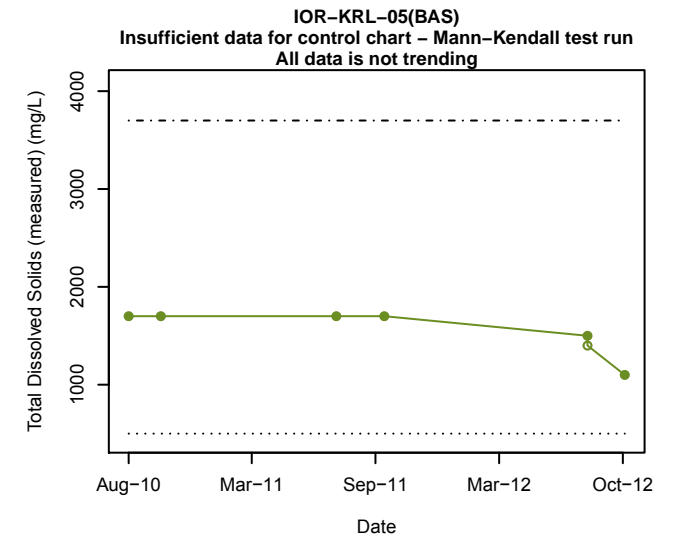
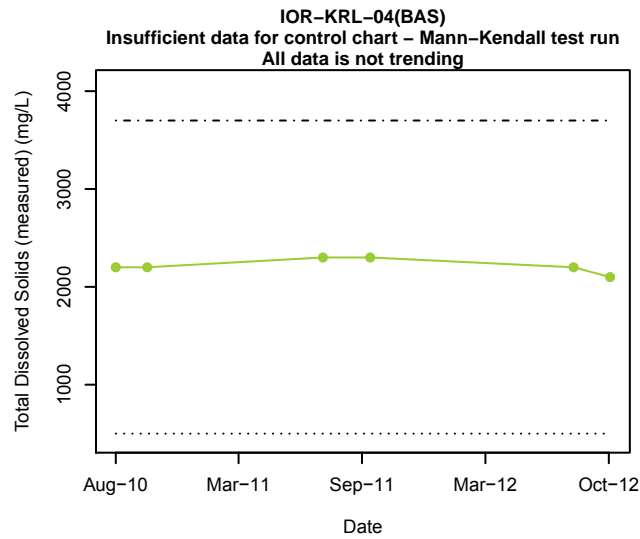
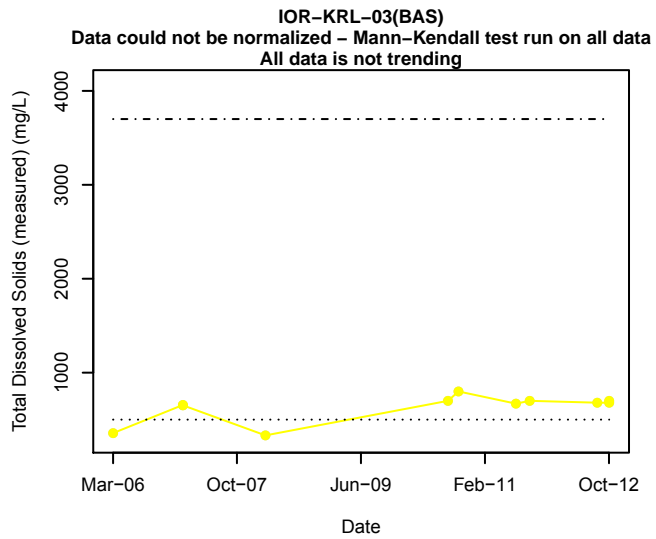
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Shewhart-CUSUM Control Charts- Total Dissolved Solids



- Total Dissolved Solids (measured)
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 500 mg/L
- - - Interim Quality Triggers for NAOS- AMU2 = 3700 mg/L
- ▲ CUSUM
- - - Well upper control limit
- - - Well lower control limit

Appendix C42b

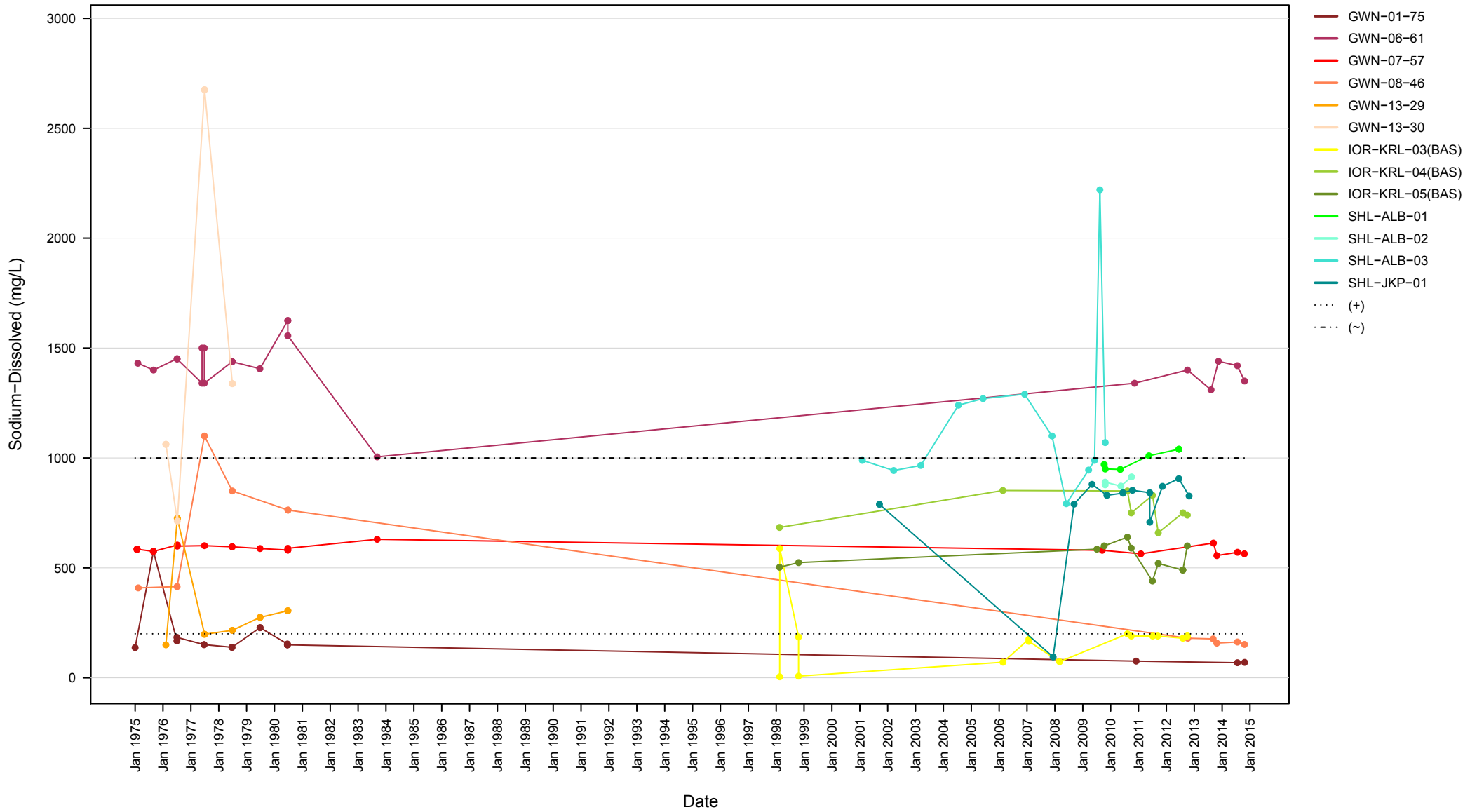
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Shewhart-CUSUM Control Charts- Total Dissolved Solids



- Total Dissolved Solids (measured)
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 500 mg/L
- - - Interim Quality Triggers for NAOS- AMU2 = 3700 mg/L
- ▲ CUSUM
- - - Well upper control limit
- - - Well lower control limit

Appendix C42b

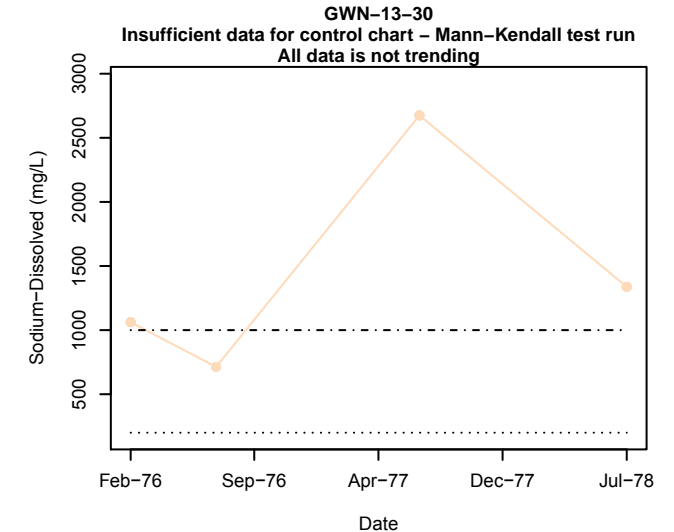
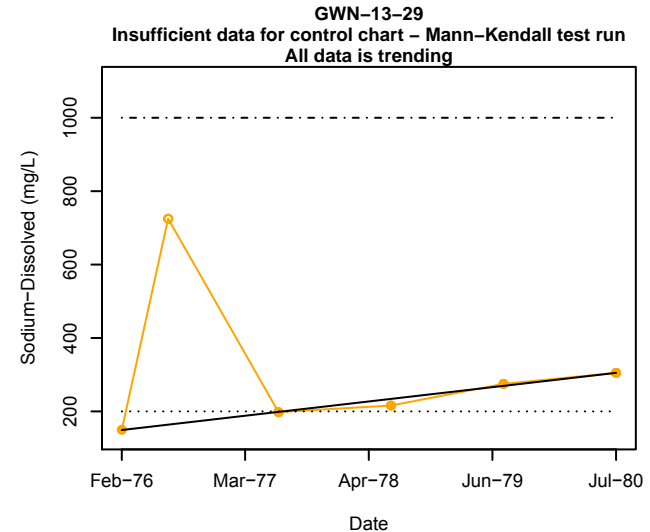
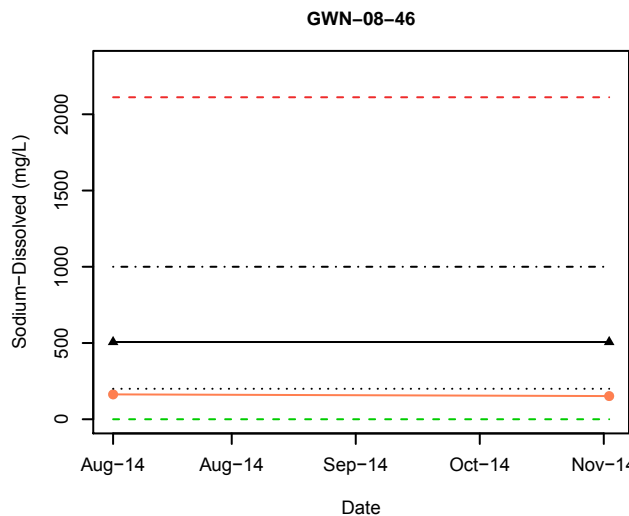
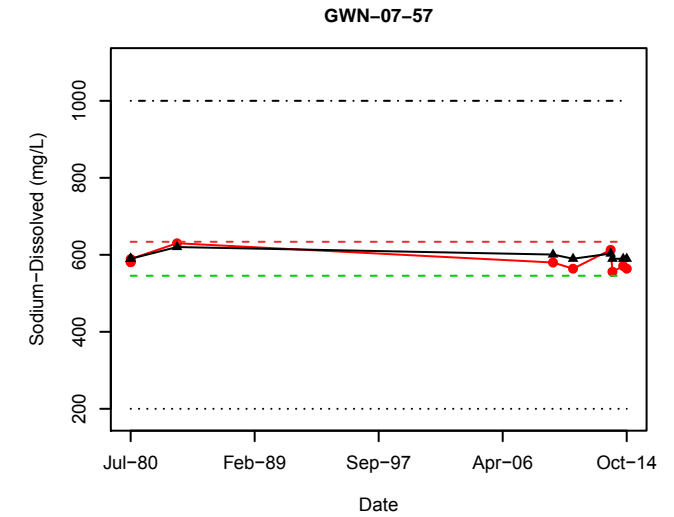
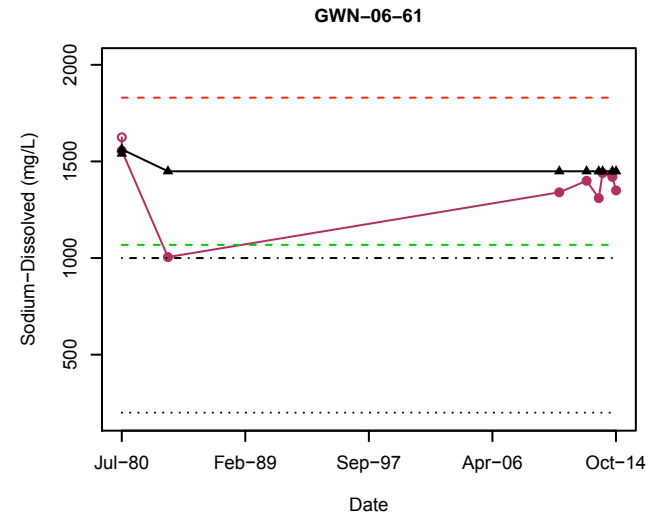
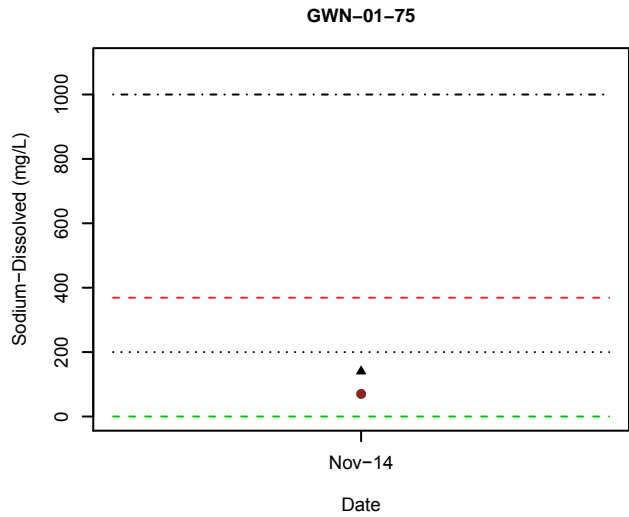
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Historical Dissolved Sodium Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 200 mg/L
 (-) Interim Quality Triggers for NAOS- AMU2 = 1000 mg/L

Appendix C43a

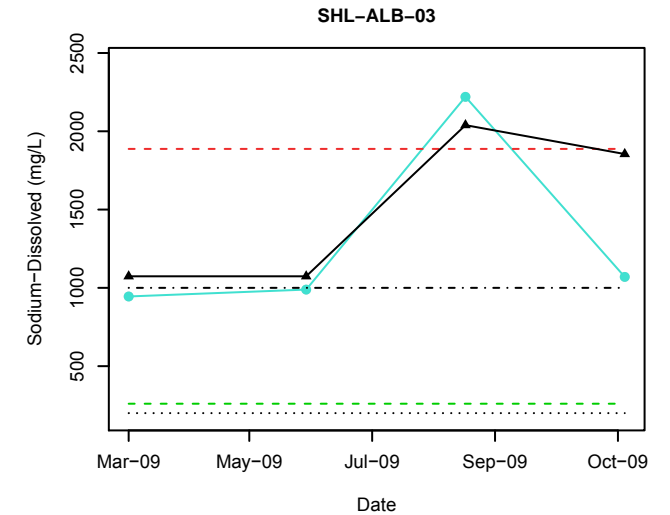
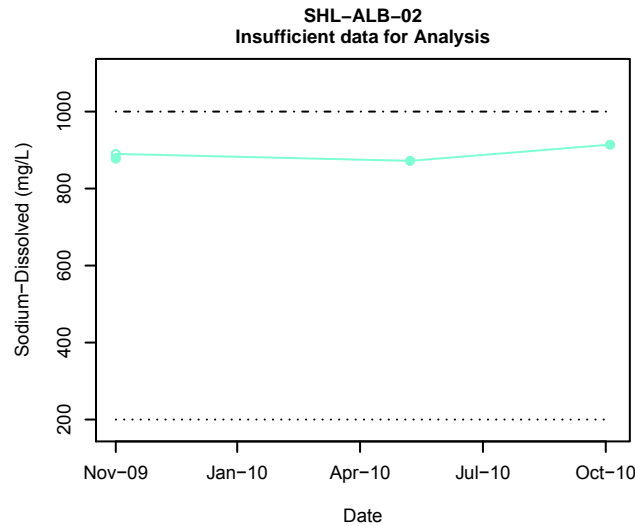
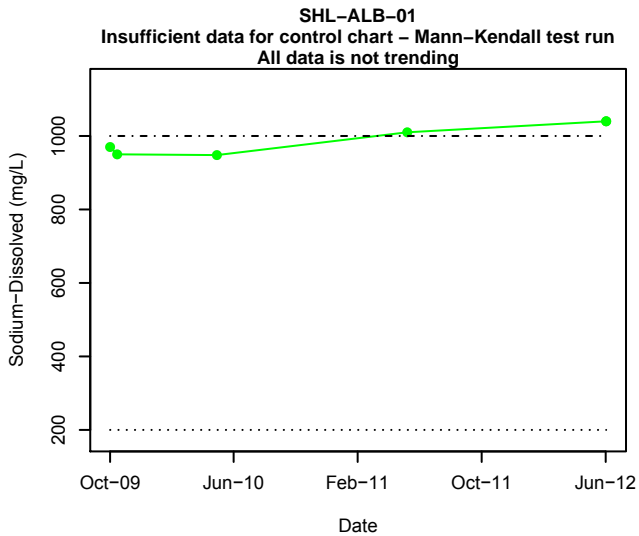
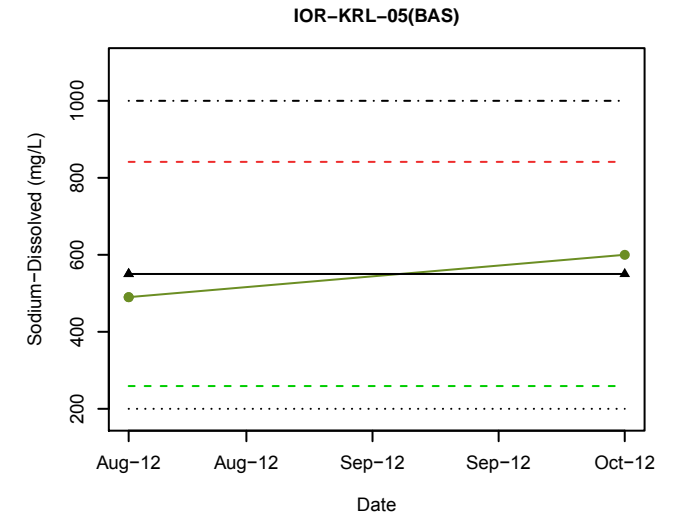
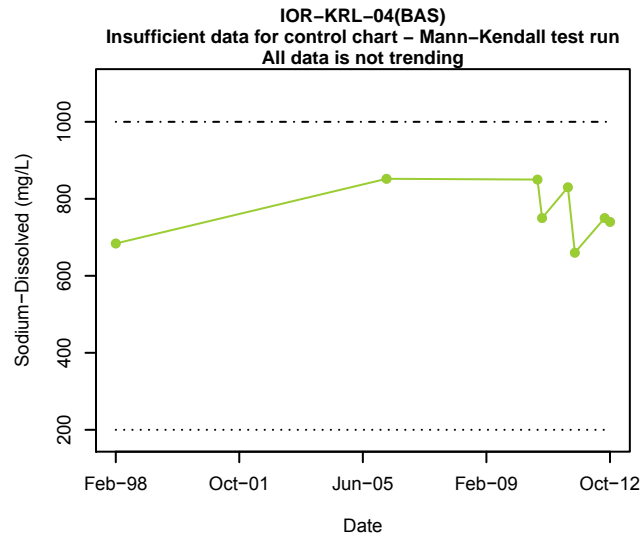
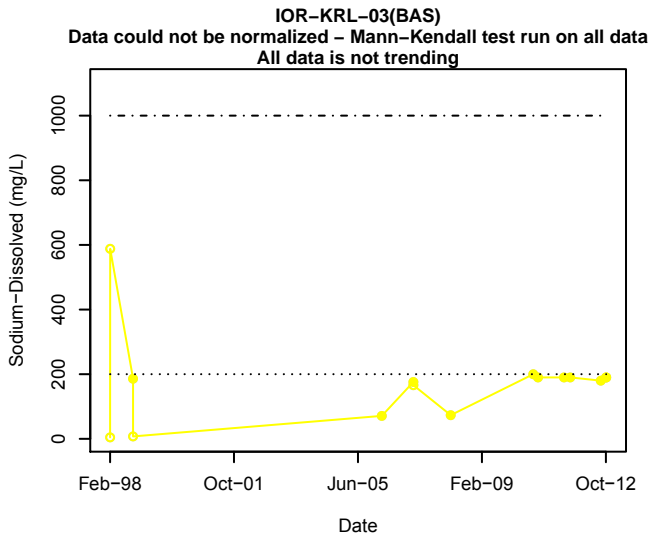
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Shewhart-CUSUM Control Charts- Dissolved Sodium



- Sodium-Dissolved
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 200 mg/L
- ⋯ Interim Quality Triggers for NAOS- AMU2 = 1000 mg/L
- ▲ CUSUM
- Well upper control limit
- Well lower control limit

Appendix C43b

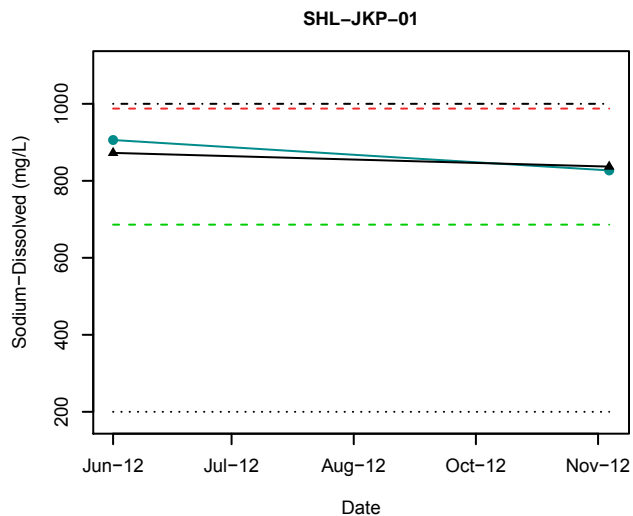
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Shewhart-CUSUM Control Charts- Dissolved Sodium



- Sodium-Dissolved
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 200 mg/L
- - - Interim Quality Triggers for NAOS- AMU2 = 1000 mg/L
- ▲ CUSUM
- - - Well upper control limit
- - - Well lower control limit

Appendix C44b

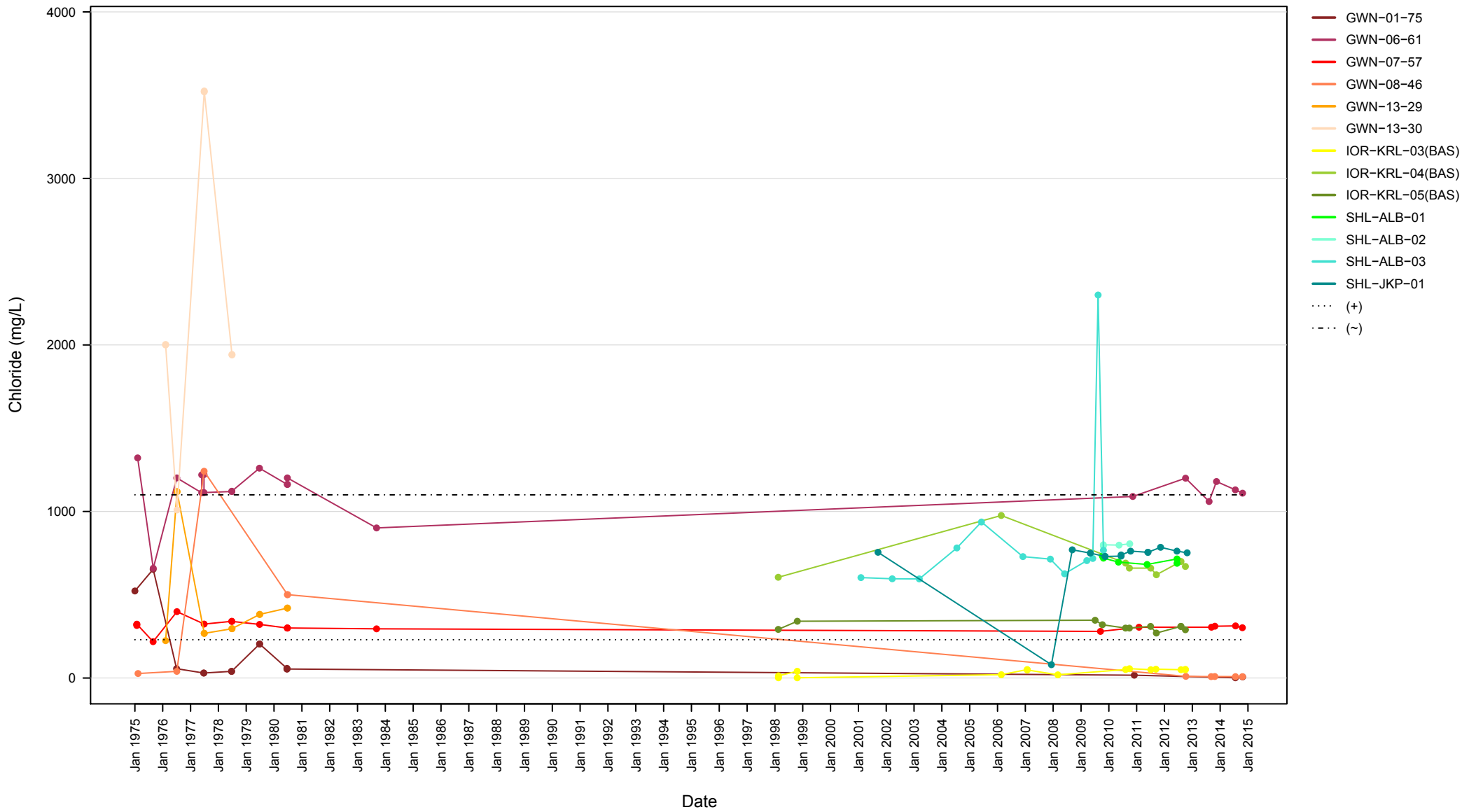
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Shewhart-CUSUM Control Charts- Dissolved Sodium



- Sodium-Dissolved
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 200 mg/L
- ⋯ Interim Quality Triggers for NAOS- AMU2 = 1000 mg/L
- ▲ CUSUM
- - Well upper control limit
- - Well lower control limit

Appendix C44b

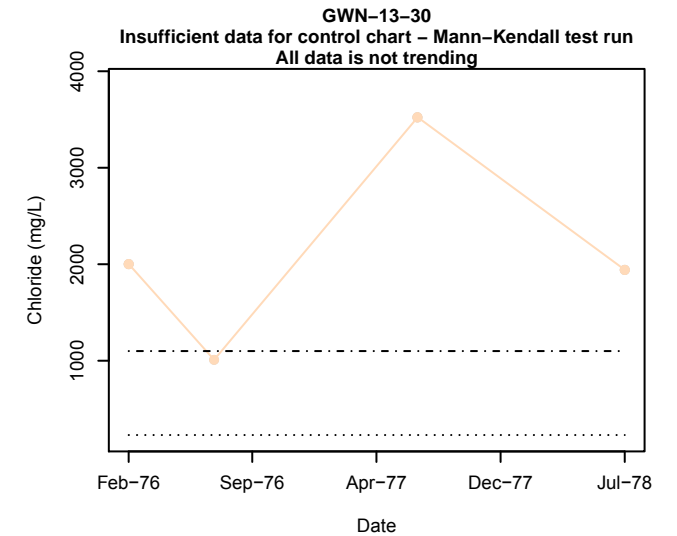
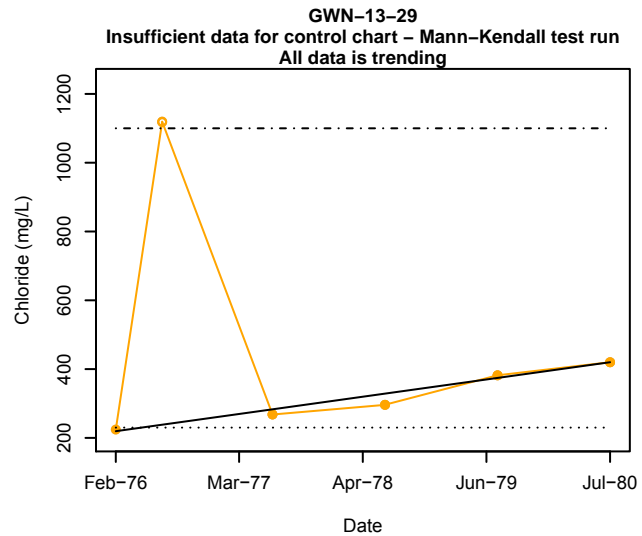
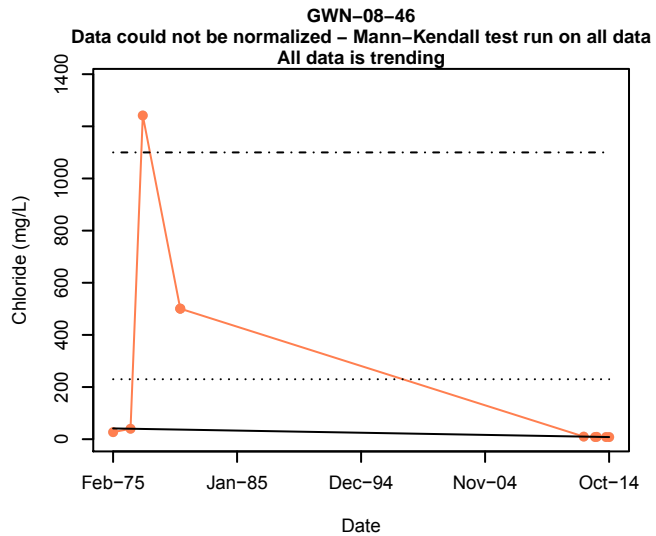
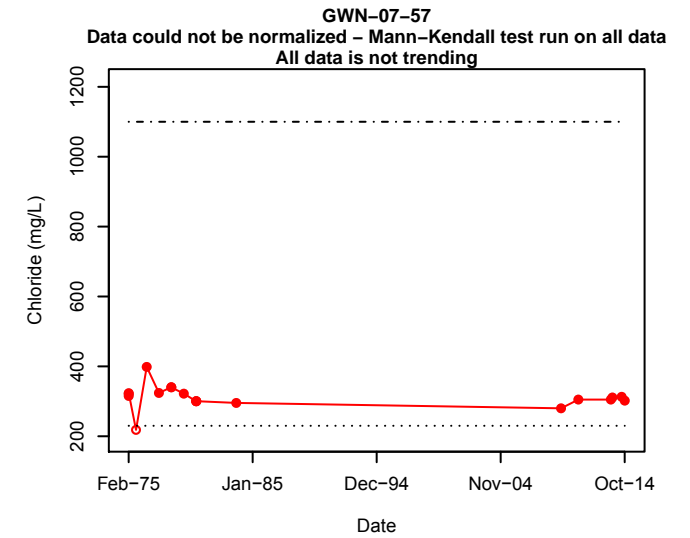
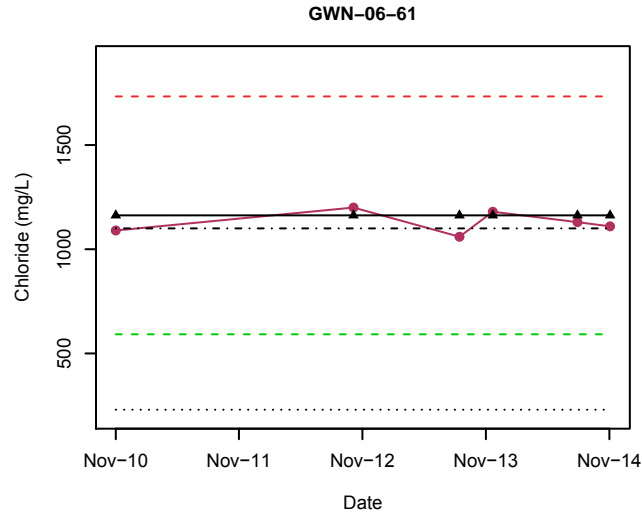
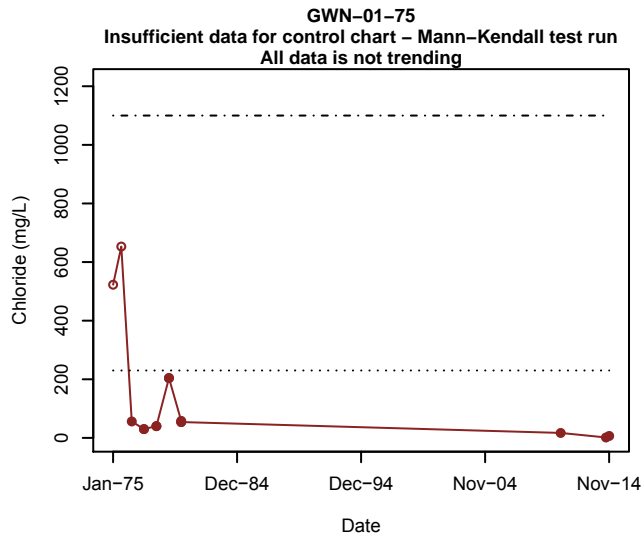
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Historical Dissolved Chloride Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 230 mg/L
 (-) Interim Quality Triggers for NAOS- AMU2 = 1100 mg/L

Appendix C45a

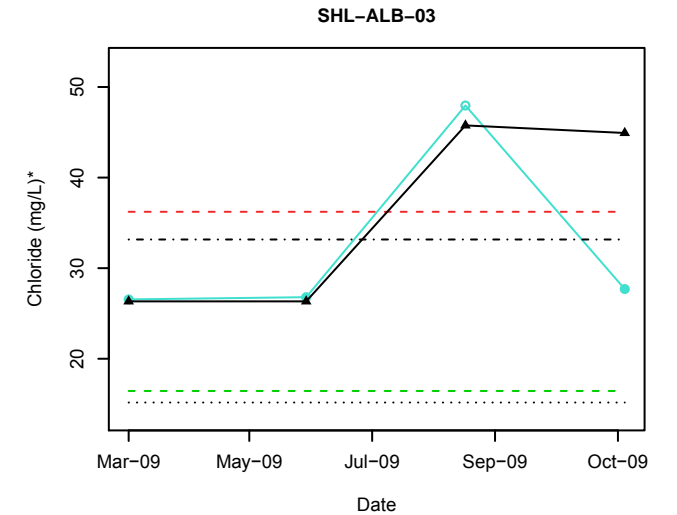
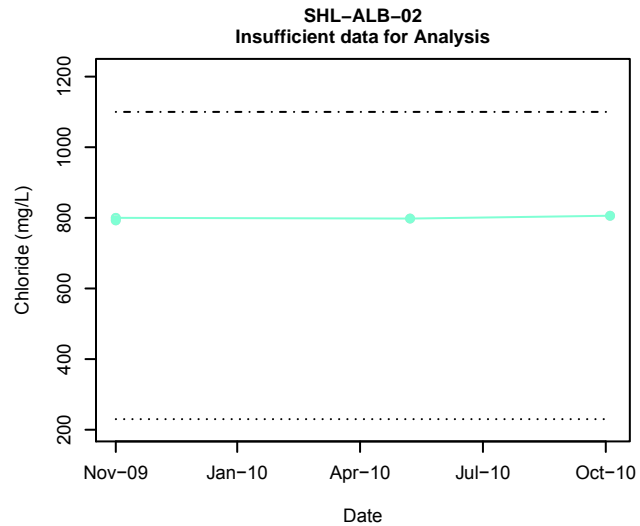
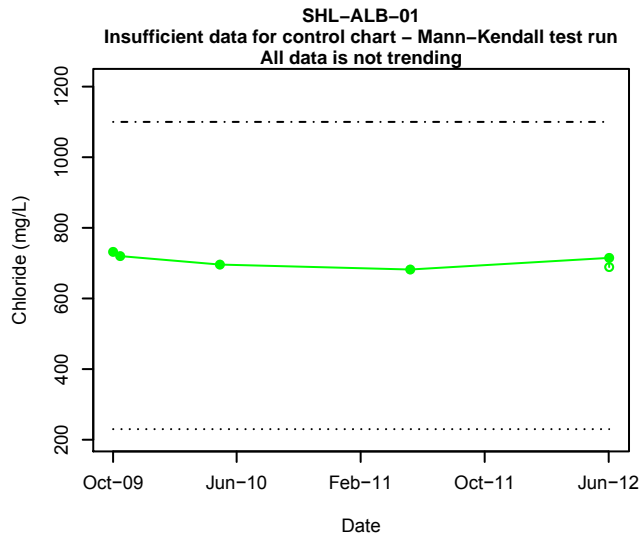
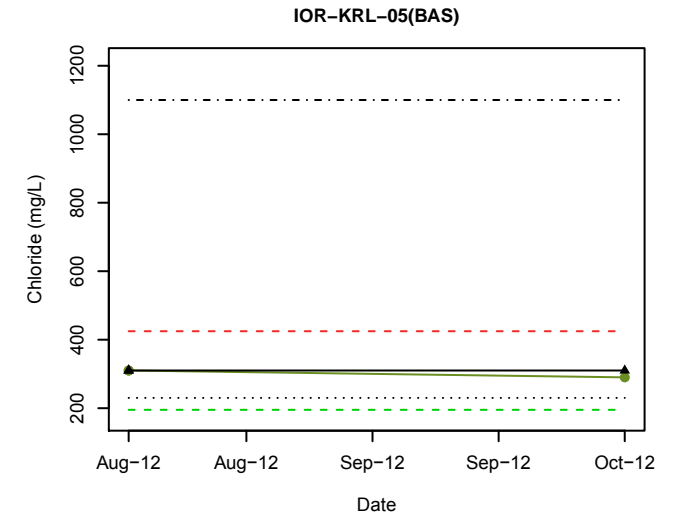
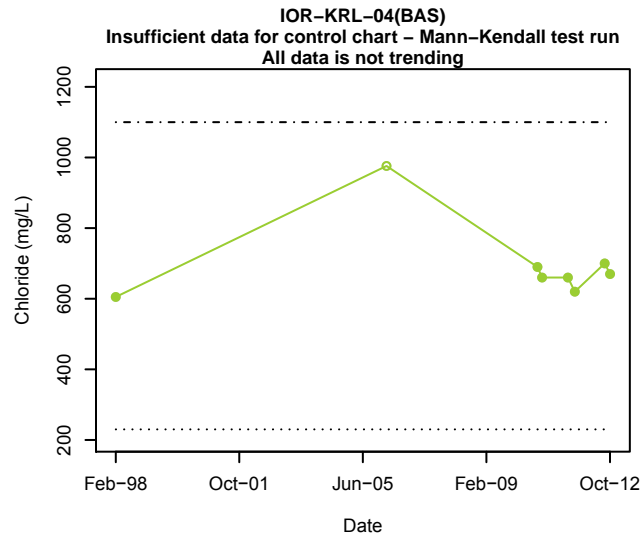
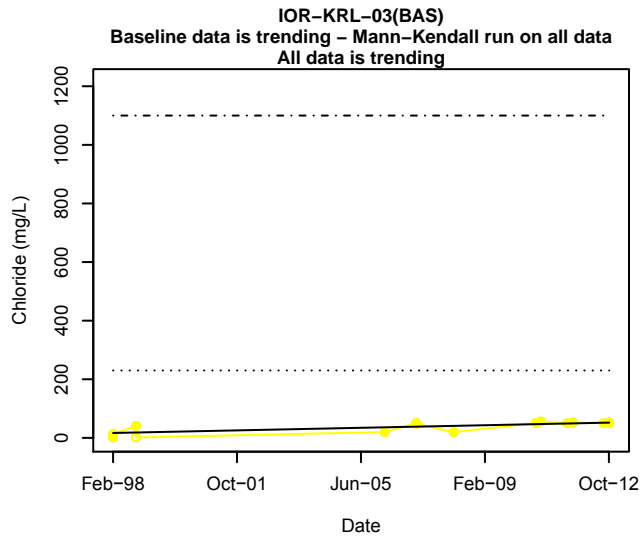
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Shewhart-CUSUM Control Charts- Dissolved Chloride



- Chloride
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 230 mg/L
- ⋯ Interim Quality Triggers for NAOS- AMU2 = 1100 mg/L
- ▲ CUSUM
- - - Well upper control limit
- - - Well lower control limit

Appendix C45b

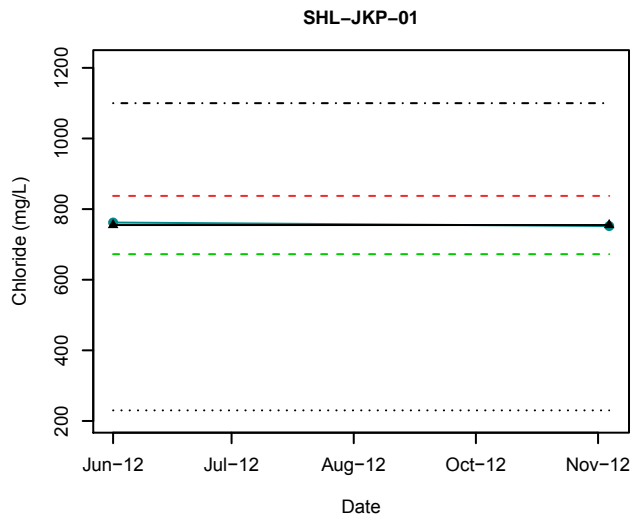
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Shewhart-CUSUM Control Charts- Dissolved Chloride



- Chloride
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 230 mg/L
- ⋯ Interim Quality Triggers for NAOS- AMU2 = 1100 mg/L
- ▲ CUSUM
- * Data transformed for normality
- - - Well upper control limit
- - - Well lower control limit

Appendix C45b

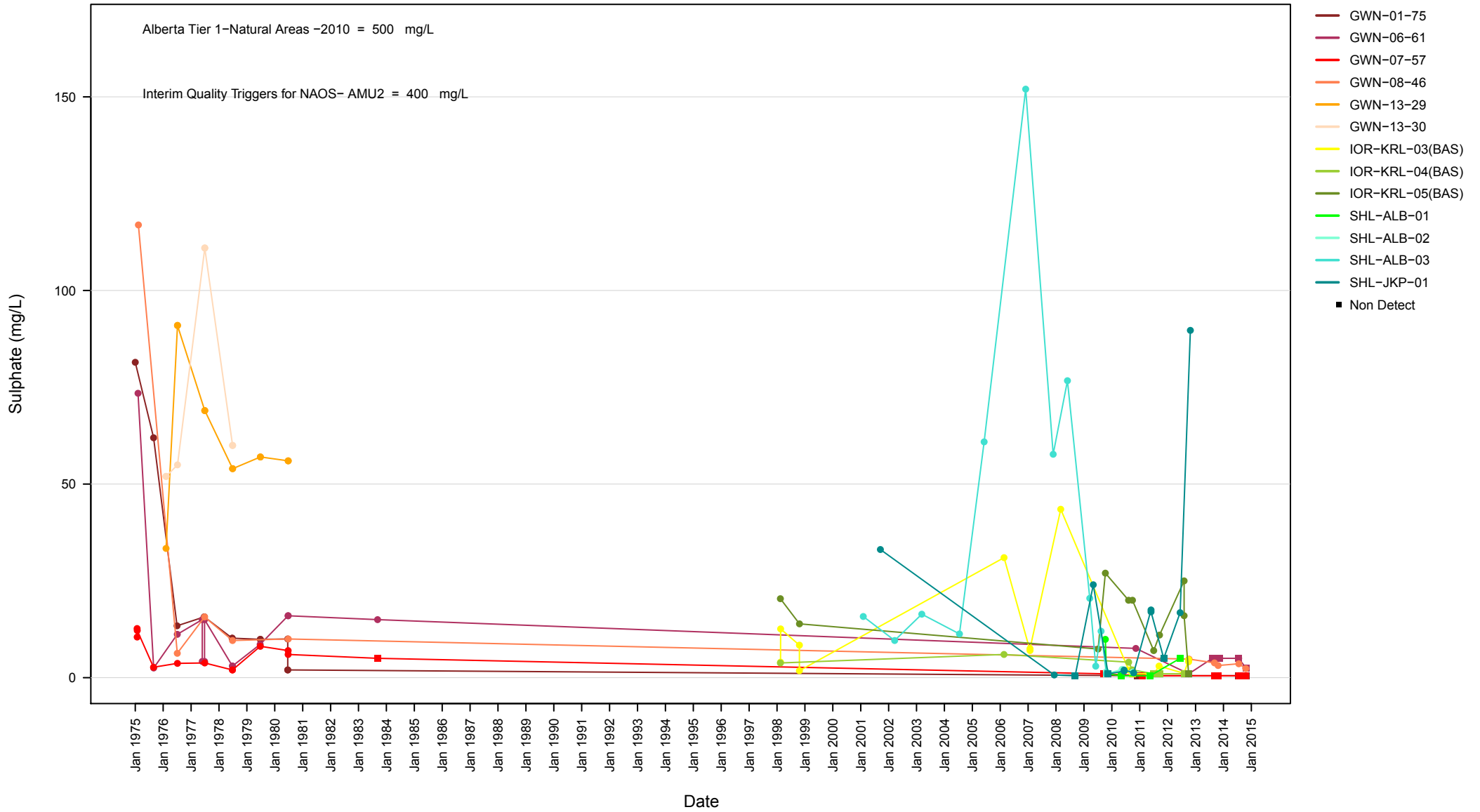
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Shewhart-CUSUM Control Charts- Dissolved Chloride



- Chloride
- Sen slope
- Data point not used in analysis
- Alberta Tier 1-Natural Areas -2010 = 230 mg/L
- .-. Interim Quality Triggers for NAOS-AMU2 = 1100 mg/L
- ▲ CUSUM
- * Data transformed for normality
- - - Well upper control limit
- - - Well lower control limit

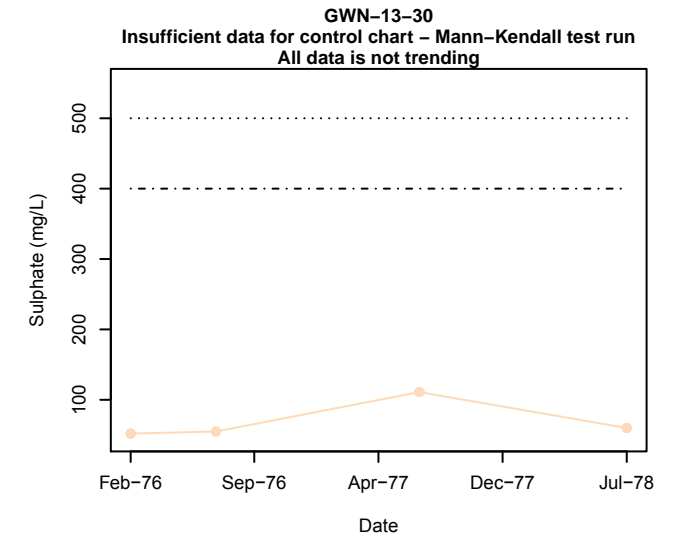
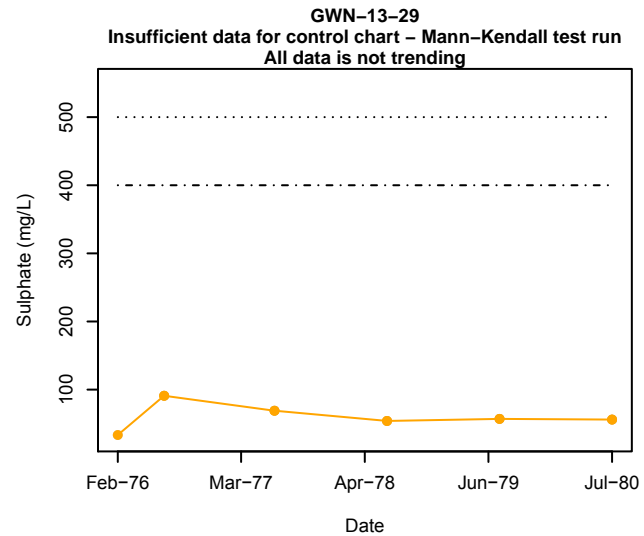
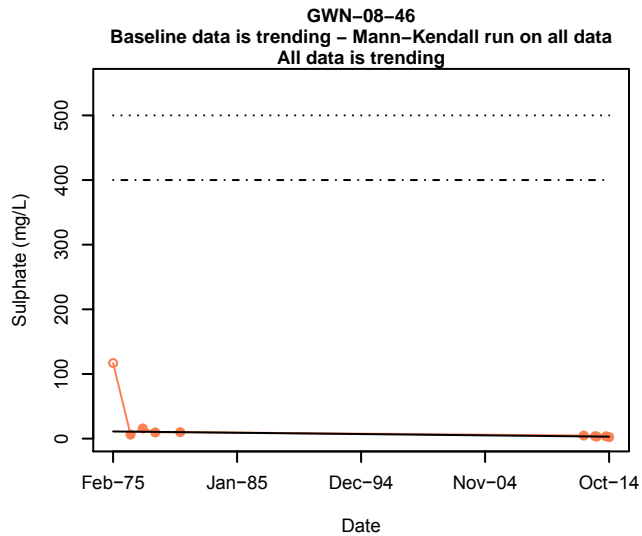
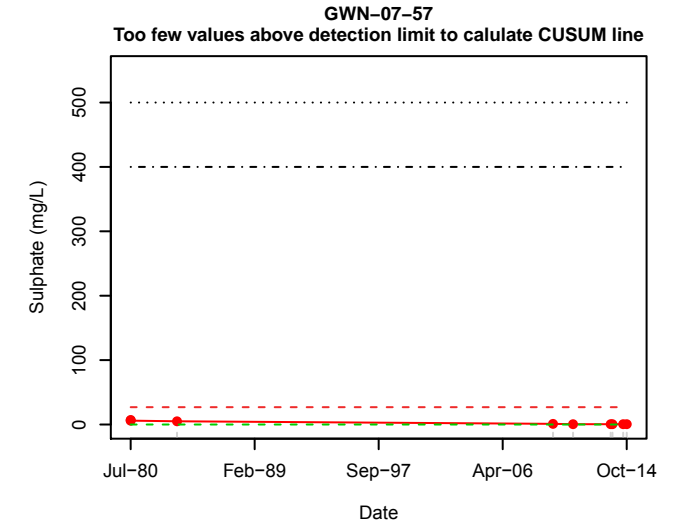
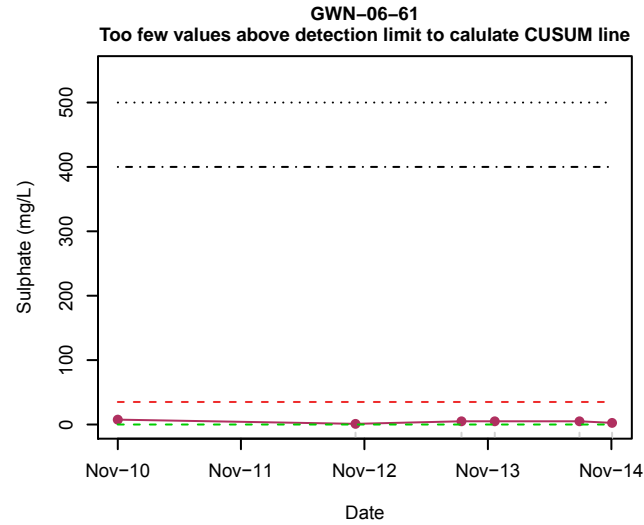
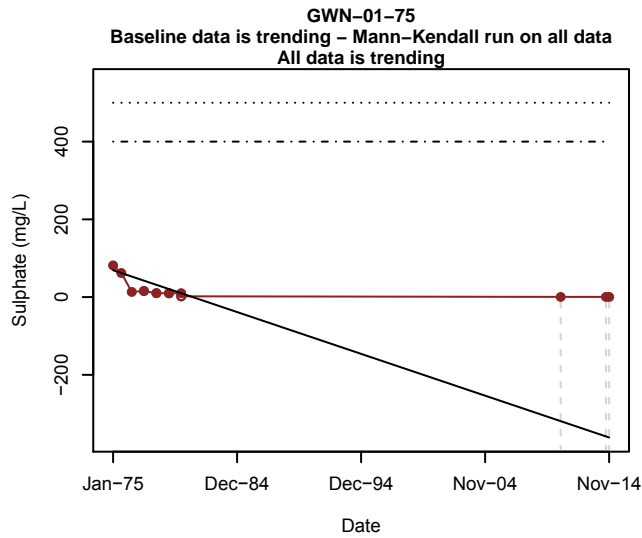
Appendix C45b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Historical Dissolved Sulphate Concentrations



Appendix C46a

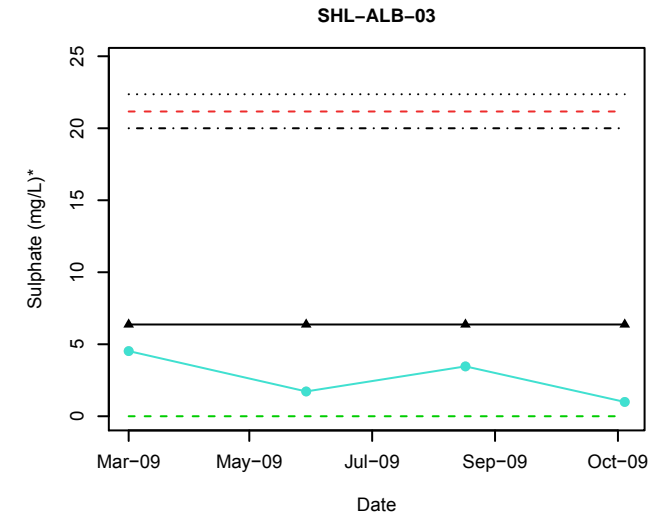
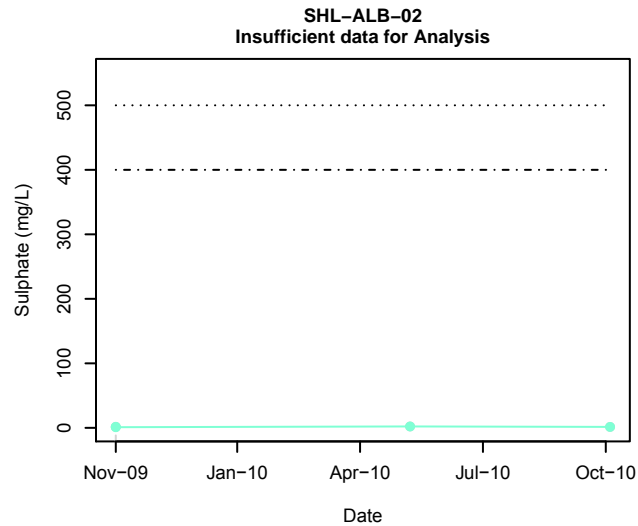
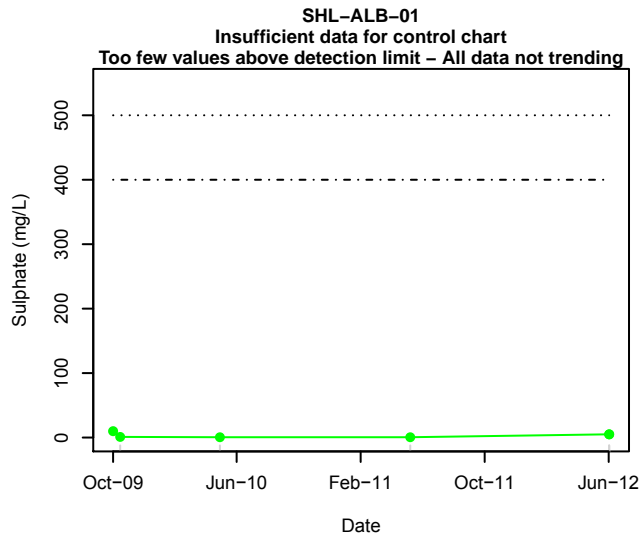
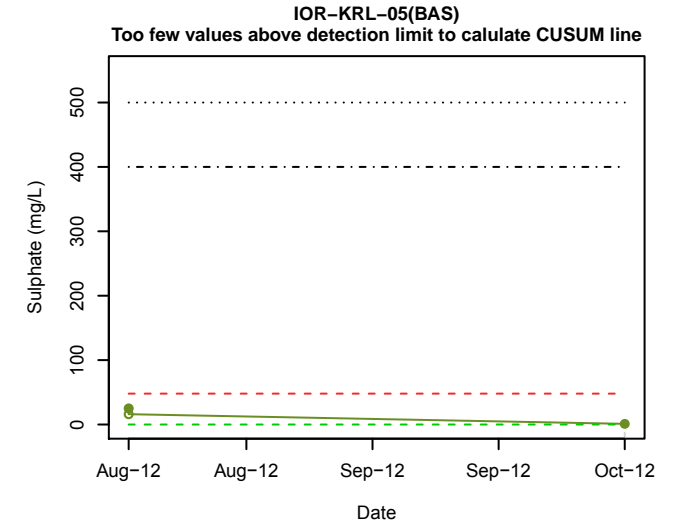
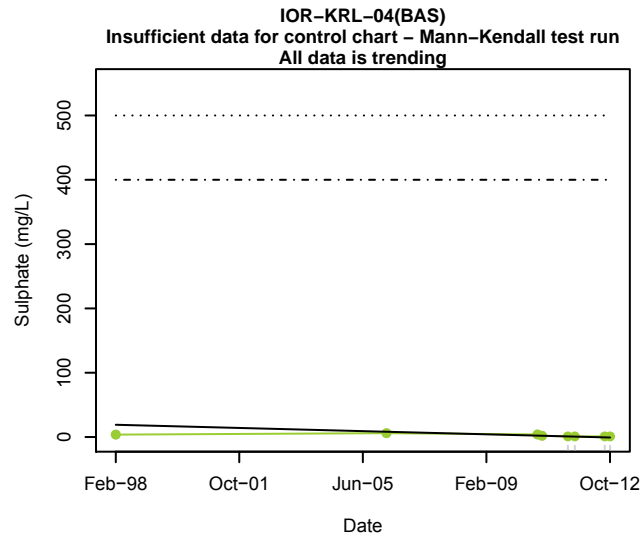
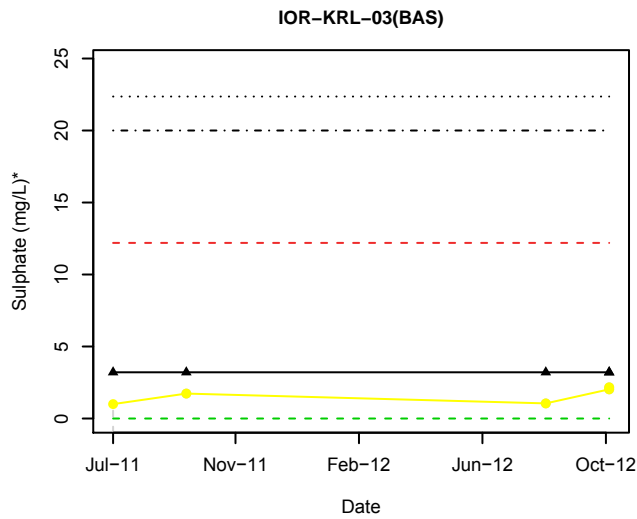
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Shewhart-CUSUM Control Charts- Dissolved Sulphate



- Sulphate
- Values below detection limit
- Sen slope
- Data point not used in analysis
- Alberta Tier 1-Natural Areas ~2010 = 500 mg/L
- Interim Quality Triggers for NAOS- AMU2 = 400 mg/L
- Well upper control limit
- Well lower control limit

Appendix C46b

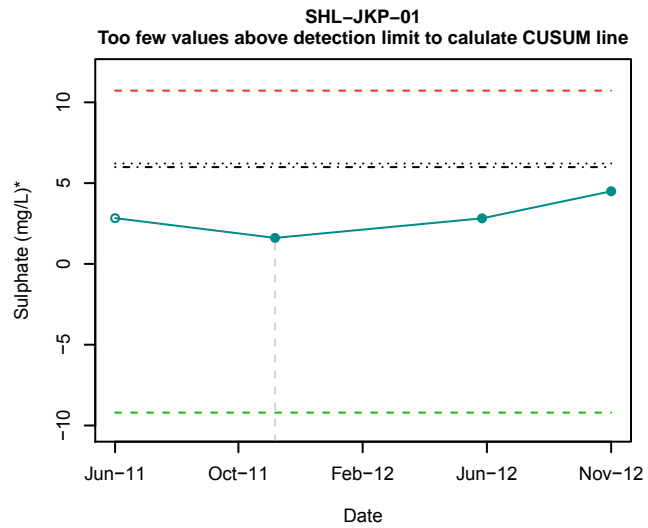
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Shewhart-CUSUM Control Charts- Dissolved Sulphate



- Sulphate
- Values below detection limit
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 500 mg/L
- ⋯ Interim Quality Triggers for NAOS- AMU2 = 400 mg/L
- ▲ CUSUM
- * Data transformed for normality
- Well upper control limit
- Well lower control limit

Appendix C46b

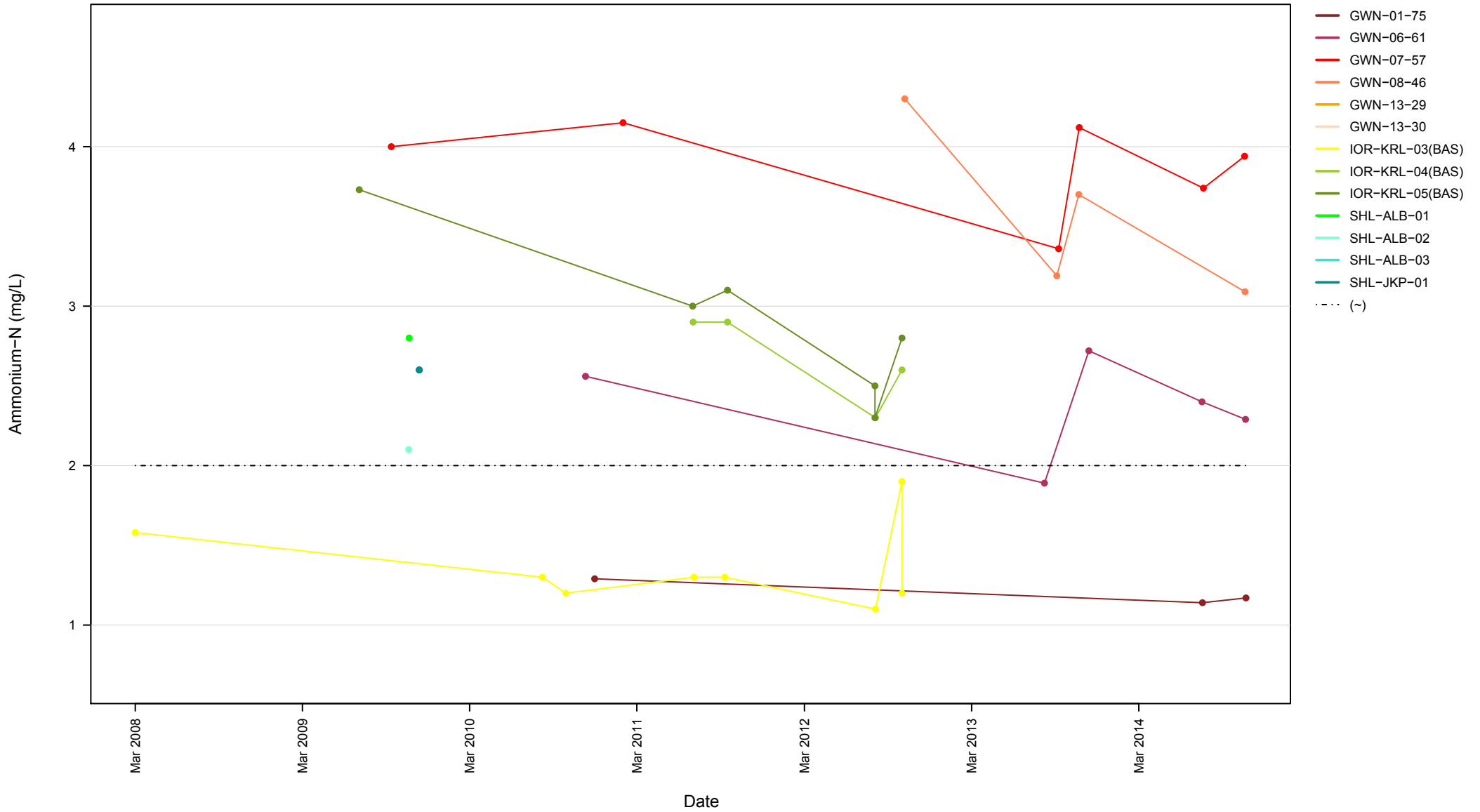
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Shewhart-CUSUM Control Charts- Dissolved Sulphate



- Sulphate
- - - Values below detection limit
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 500 mg/L
- ⋯ Interim Quality Triggers for NAOS- AMU2 = 400 mg/L
- ▲ CUSUM
- * Data transformed for normality
- - - Well upper control limit
- - - Well lower control limit

Appendix C46b

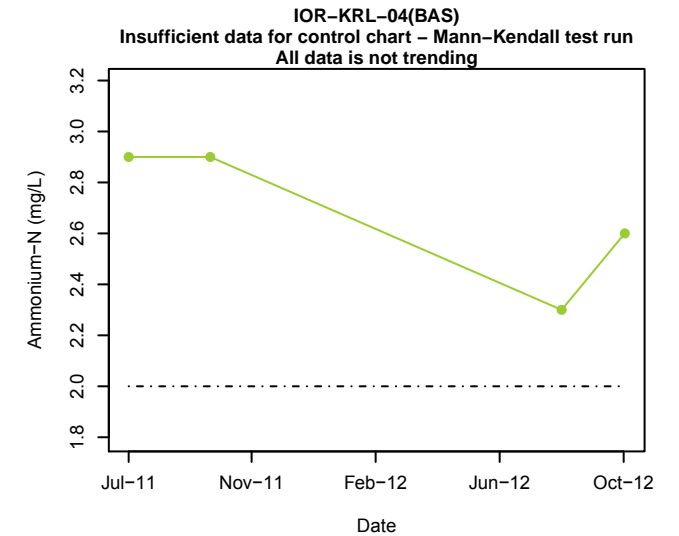
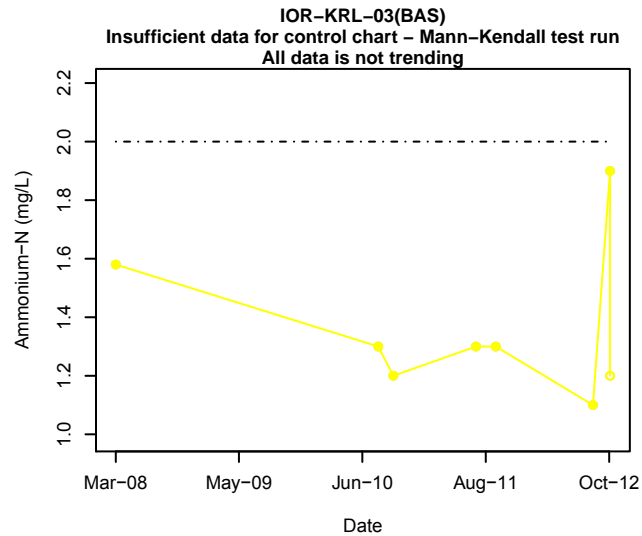
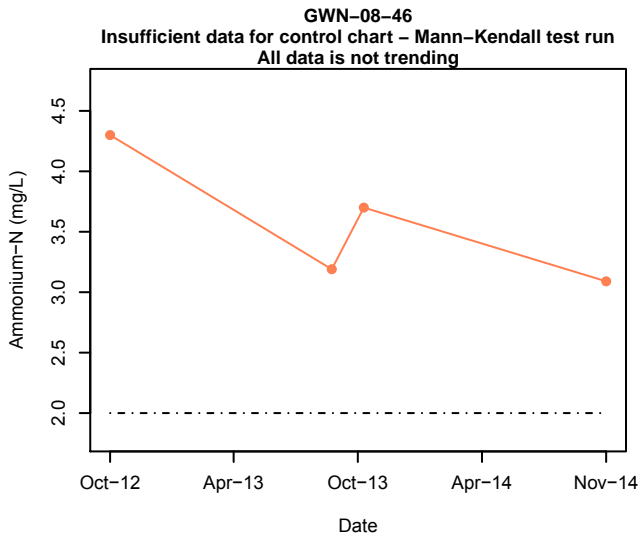
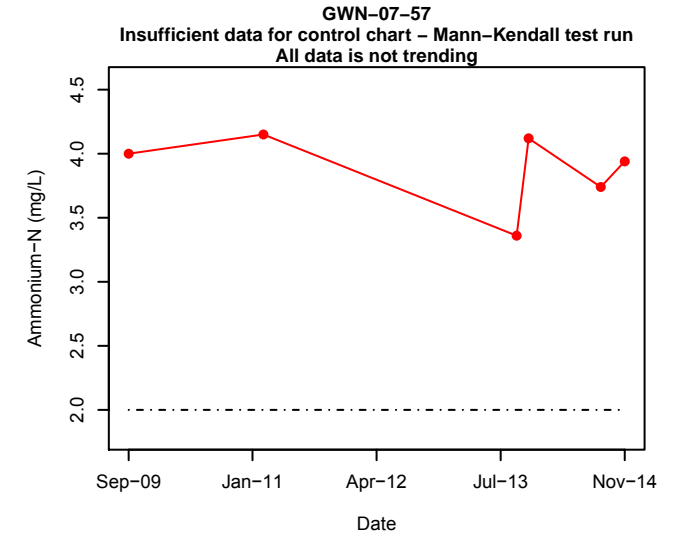
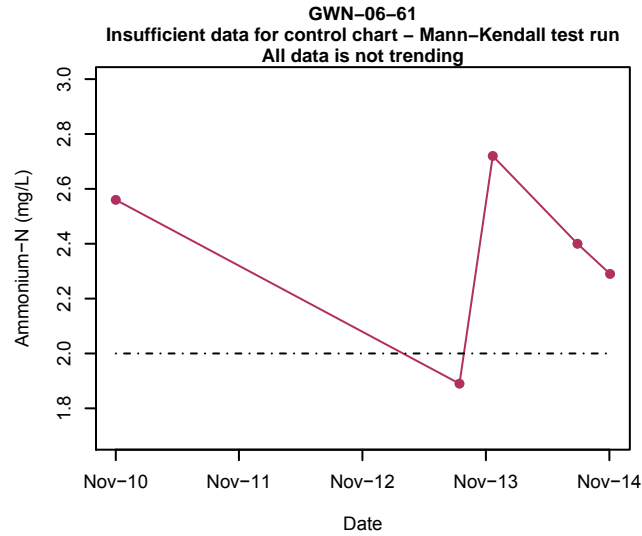
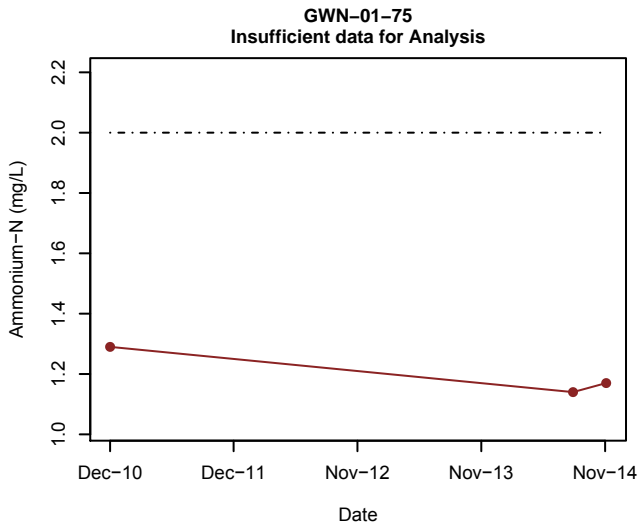
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Historical Ammonium-N Concentrations



(-) Interim Quality Triggers for NAOS- AMU2 = 2 mg/L

Appendix C47a

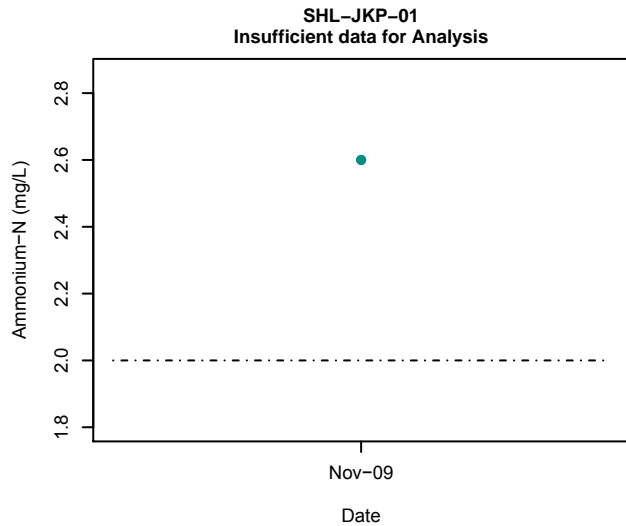
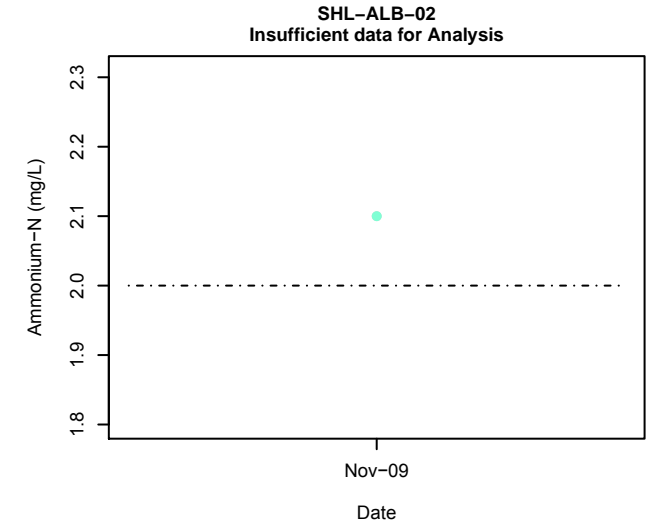
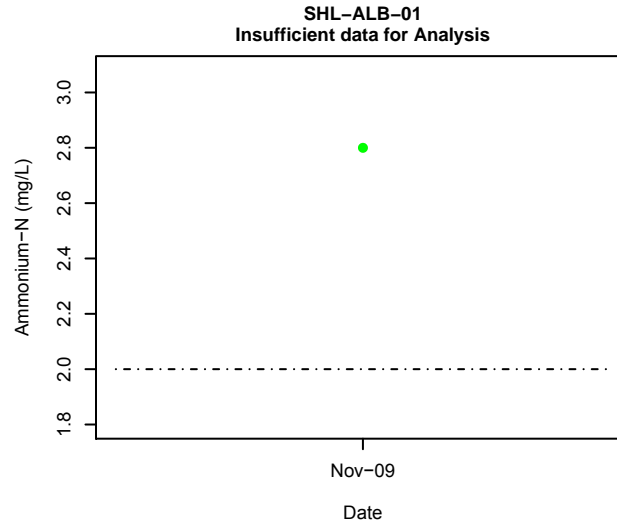
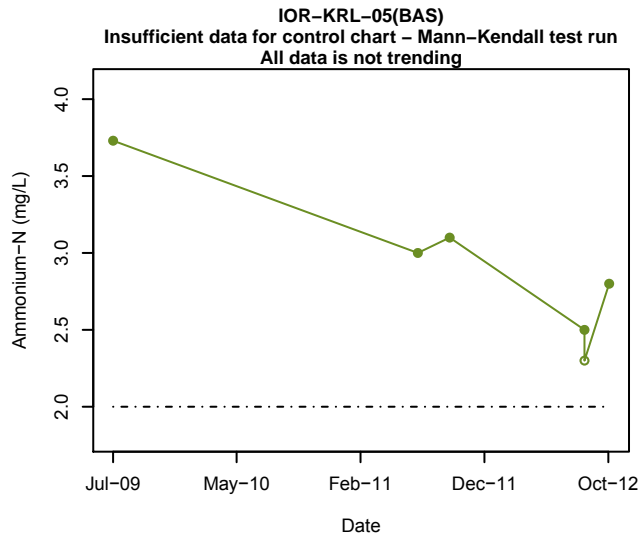
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Shewhart-CUSUM Control Charts- Ammonium-N



- Ammonium-N
- Data point not used in analysis
- Interim Quality Triggers for NAOS- AMU2 = 2 mg/L

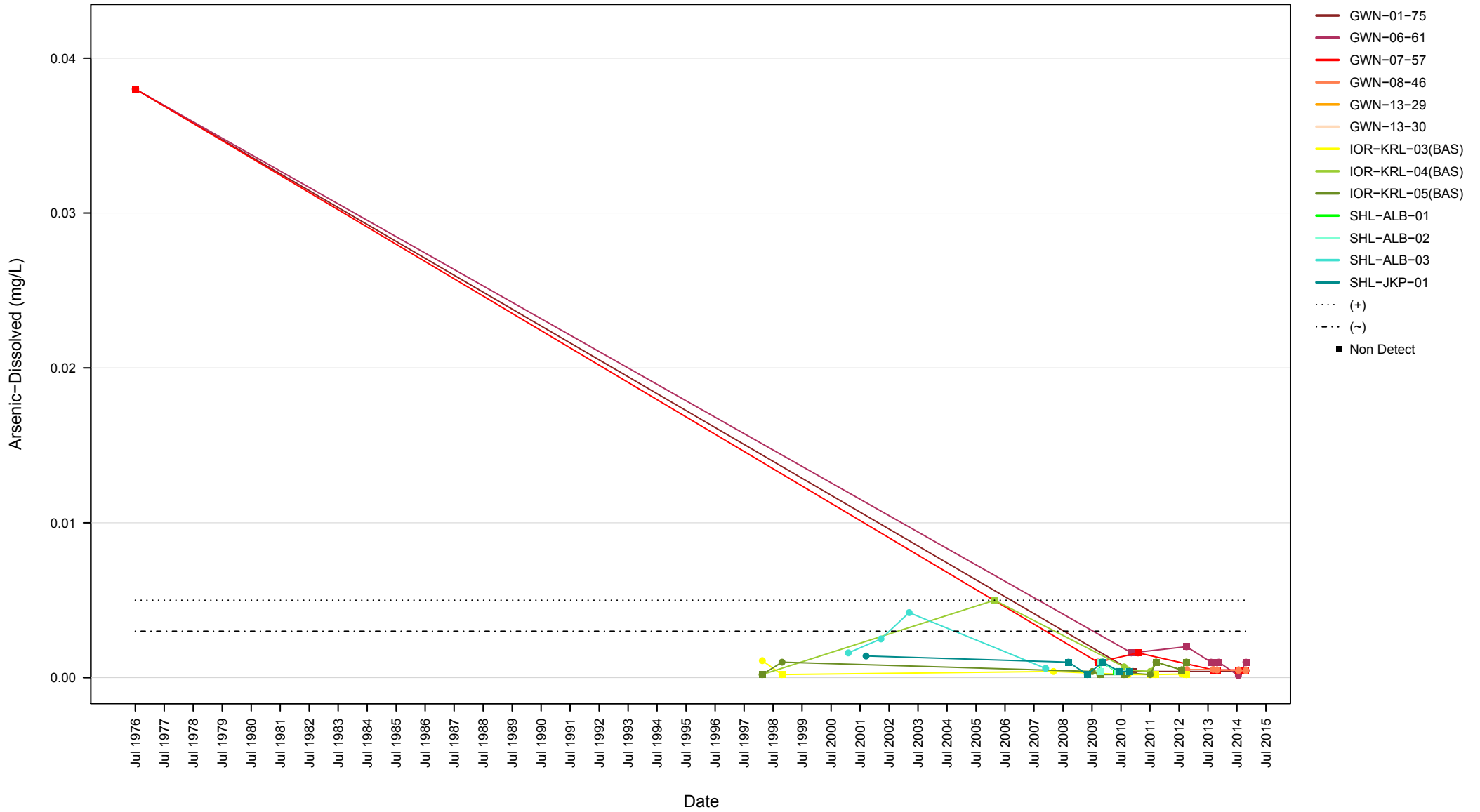
Appendix C47b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Shewhart-CUSUM Control Charts- Ammonium-N



- Ammonium-N
- Data point not used in analysis
- Interim Quality Triggers for NAOS- AMU2 = 2 mg/L

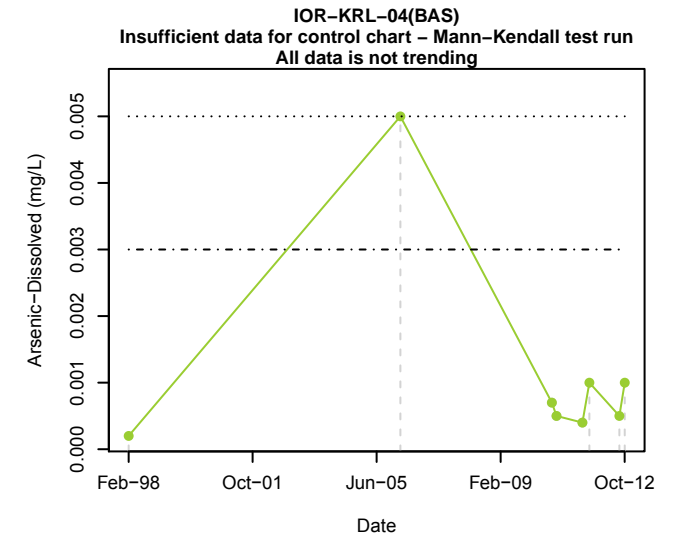
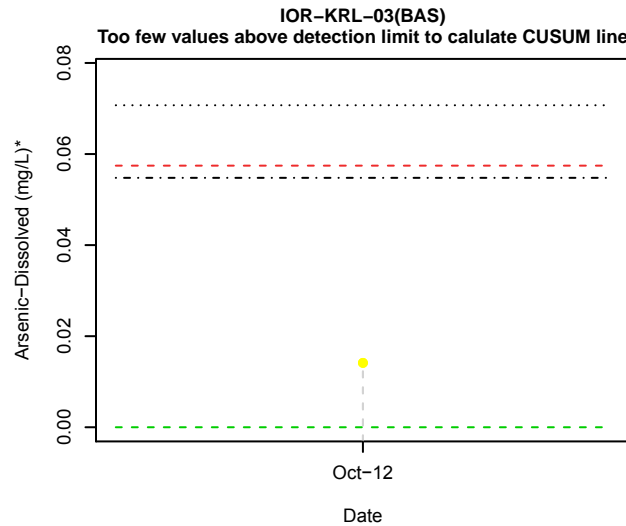
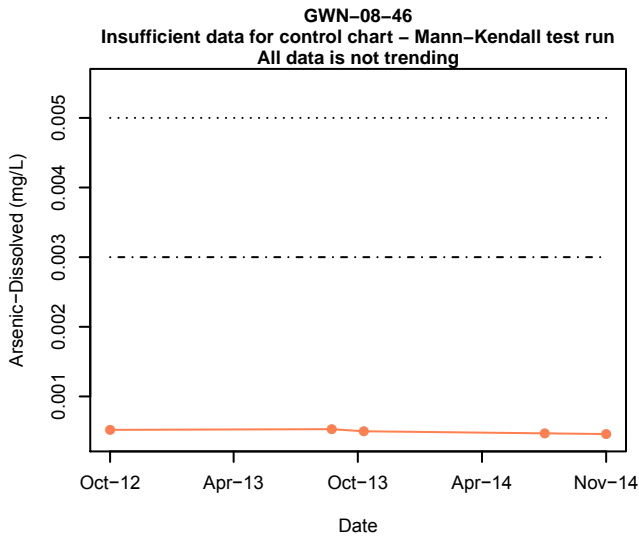
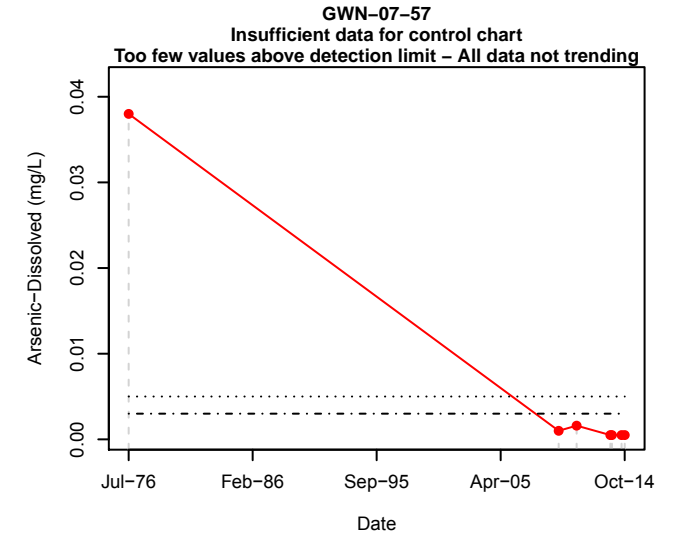
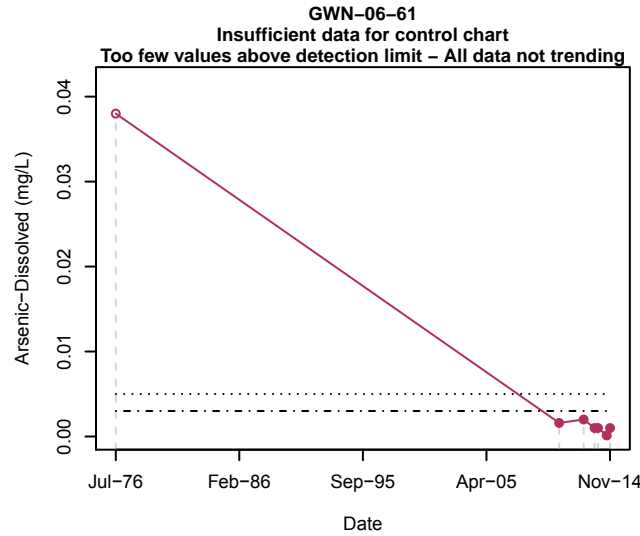
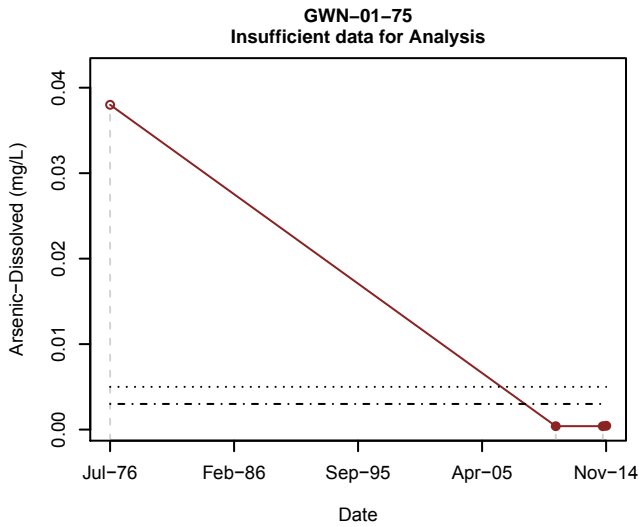
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Historical Dissolved Arsenic Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 0.005 mg/L
 (-) Interim Quality Triggers for NAOS- AMU2 = 0.003 mg/L

Appendix C48a

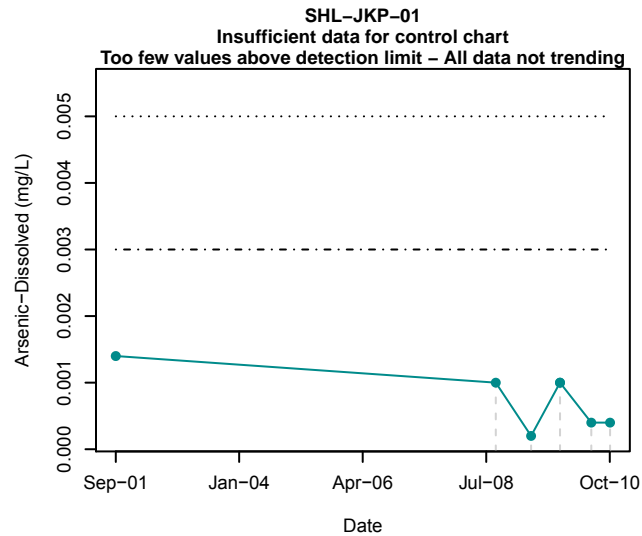
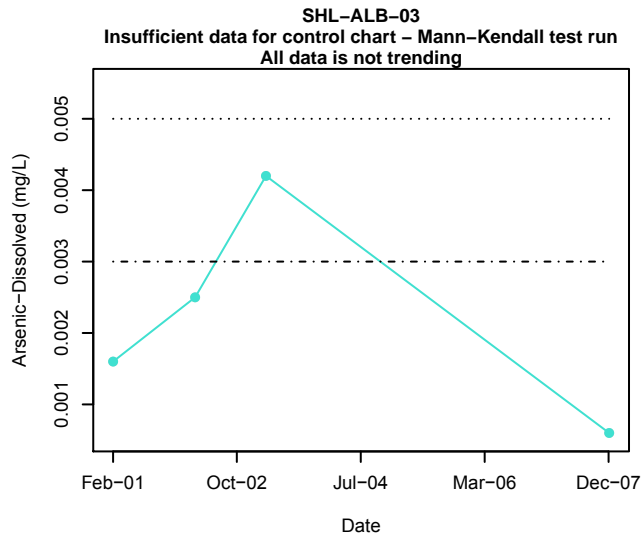
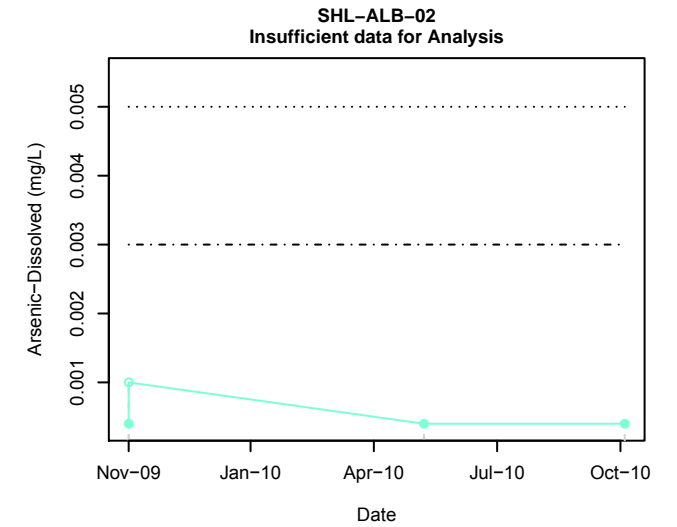
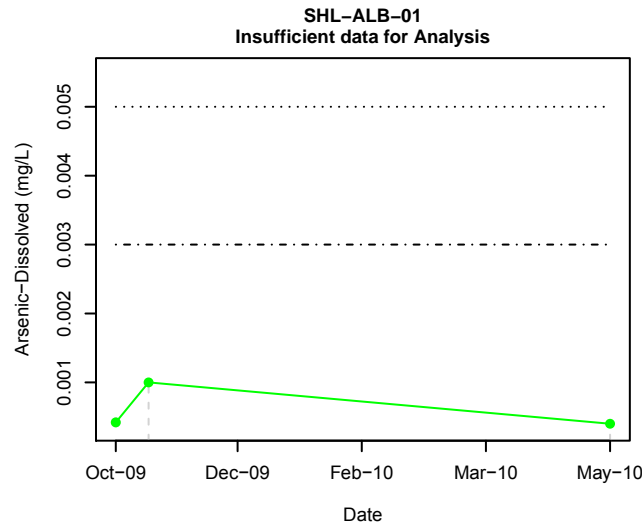
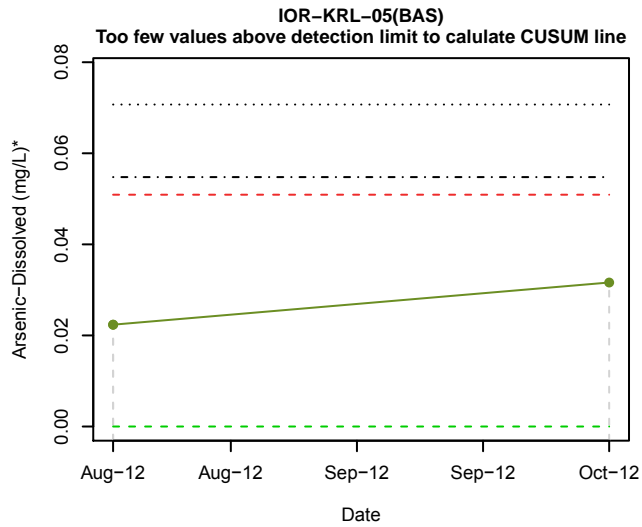
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Shewhart-CUSUM Control Charts- Dissolved Arsenic



- Arsenic-Dissolved
- - - Values below detection limit
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 0.005 mg/L
- * Interim Quality Triggers for NAOS- AMU2 = 0.003 mg/L
- * Data transformed for normality
- - - Well upper control limit
- - - Well lower control limit

Appendix C48b

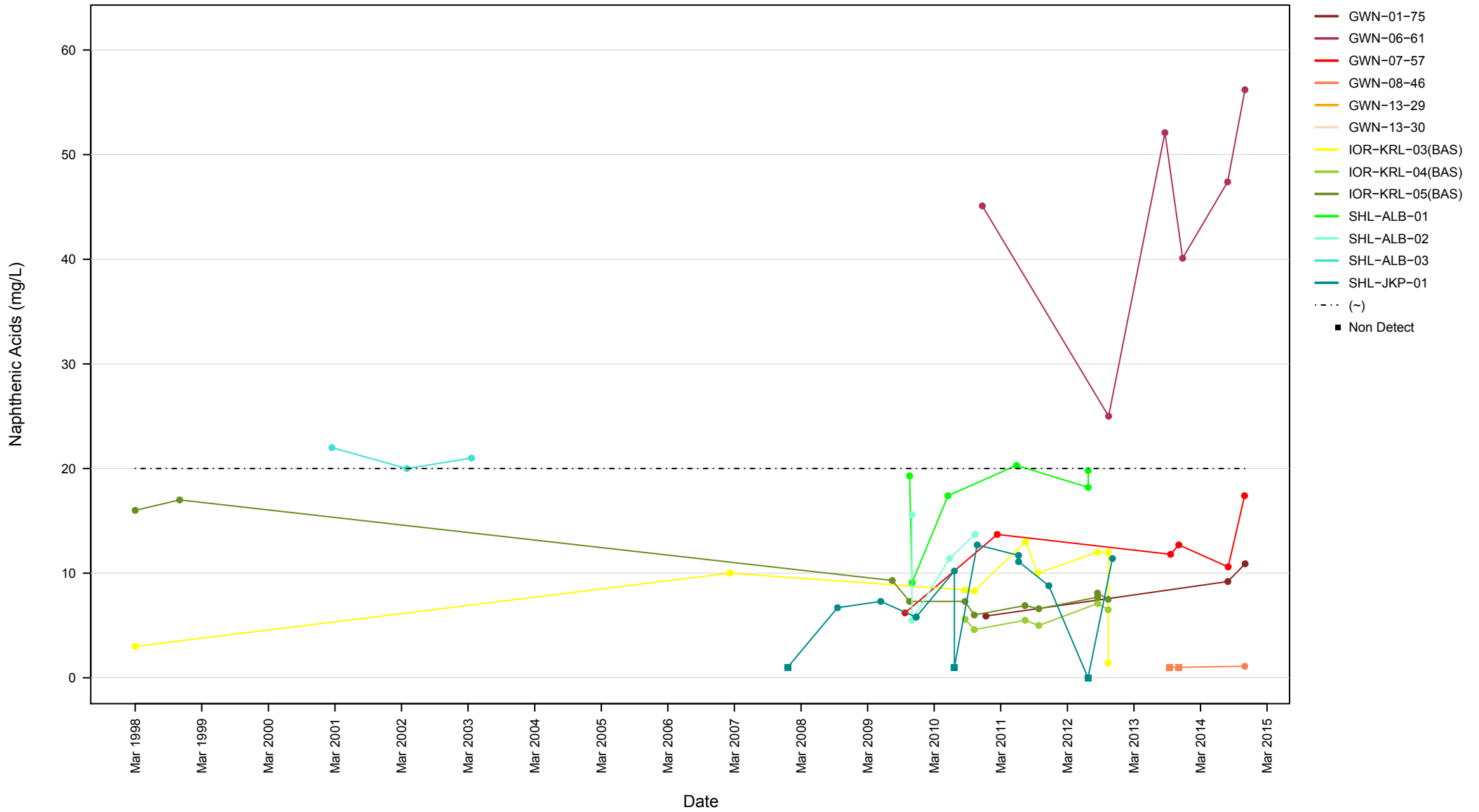
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Shewhart-CUSUM Control Charts- Dissolved Arsenic



- Arsenic-Dissolved
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 0.005 mg/L
- ⋯ Interim Quality Triggers for NAOS- AMU2 = 0.003 mg/L
- * Data transformed for normality
- Well upper control limit
- Well lower control limit

Appendix C48b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Historical Naphthenic Acids Concentrations

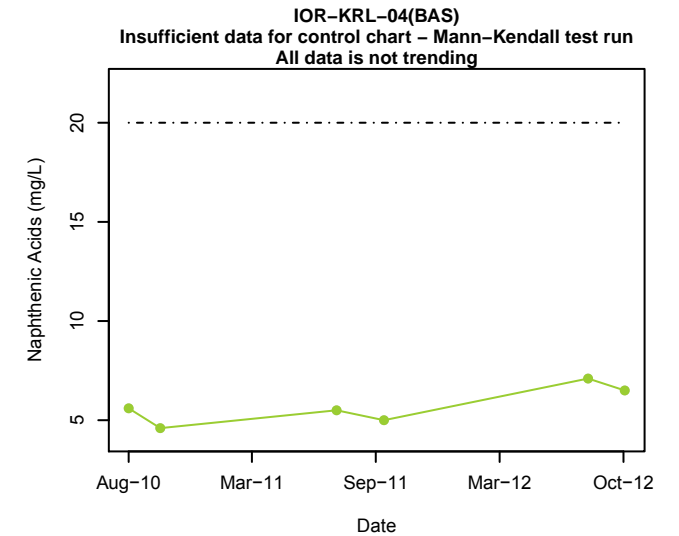
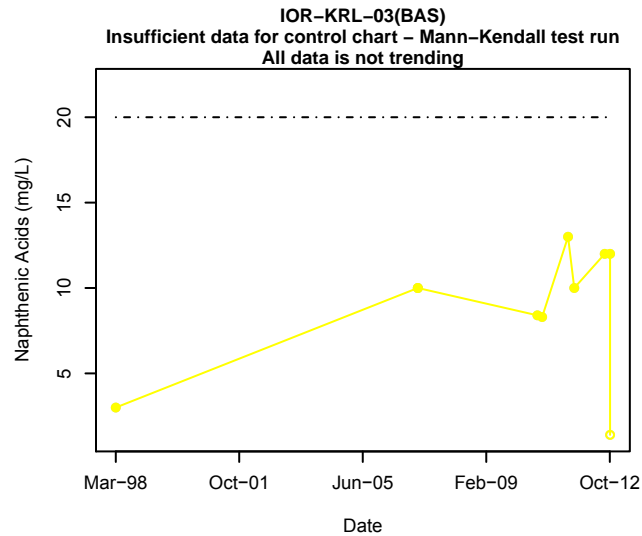
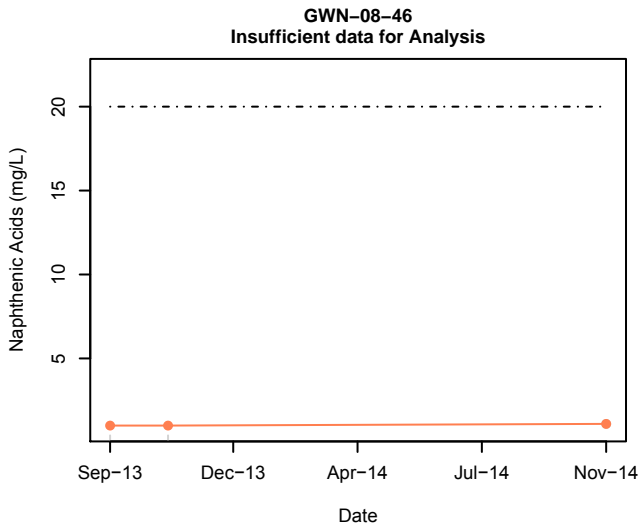
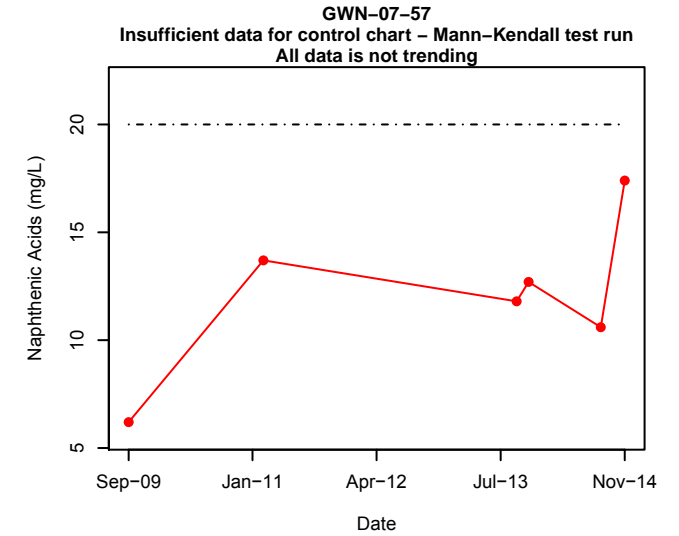
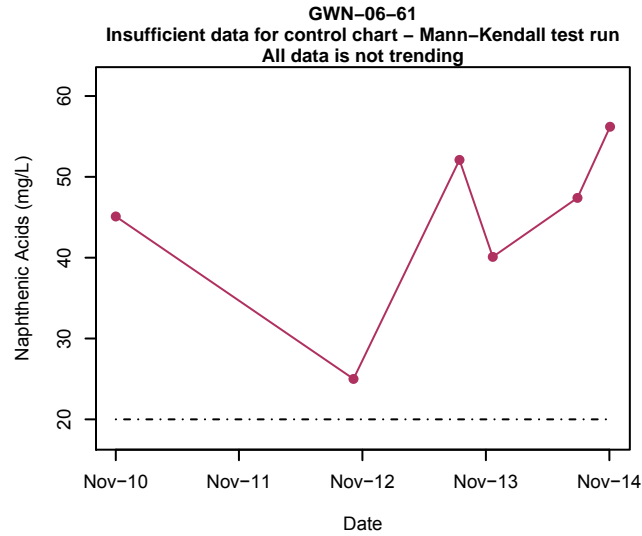
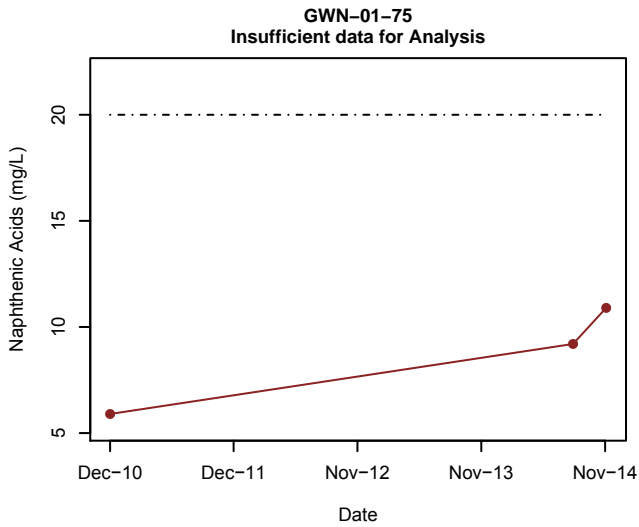


(-) Interim Quality Triggers for NAOS- AMU2 = 20 mg/L

Appendix C49a

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2)

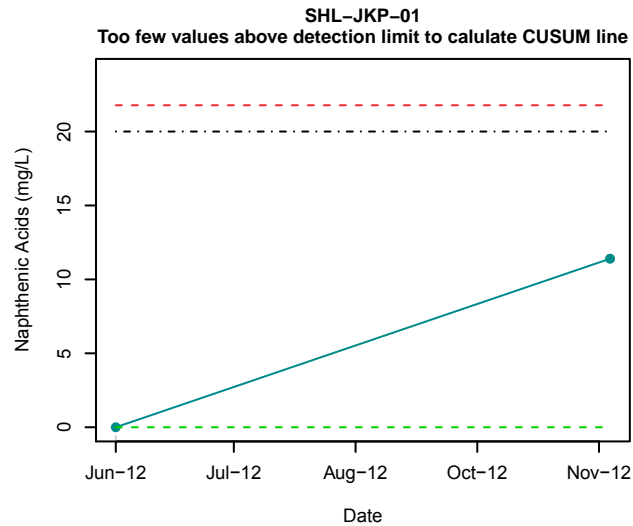
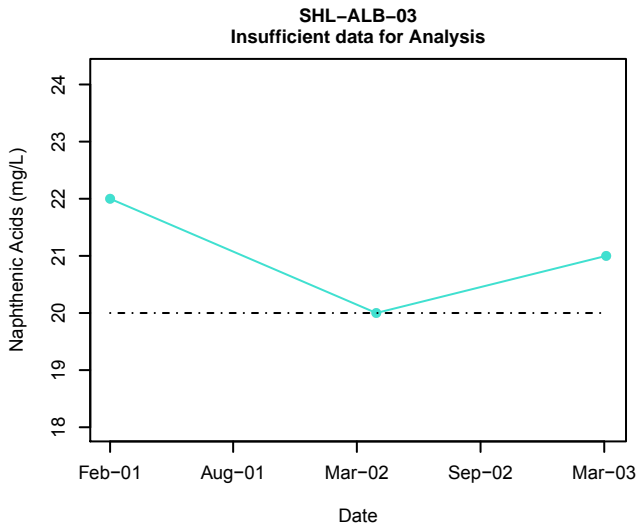
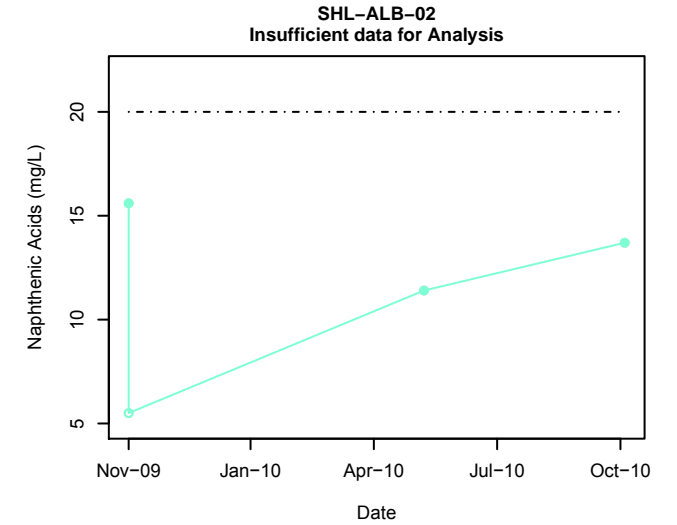
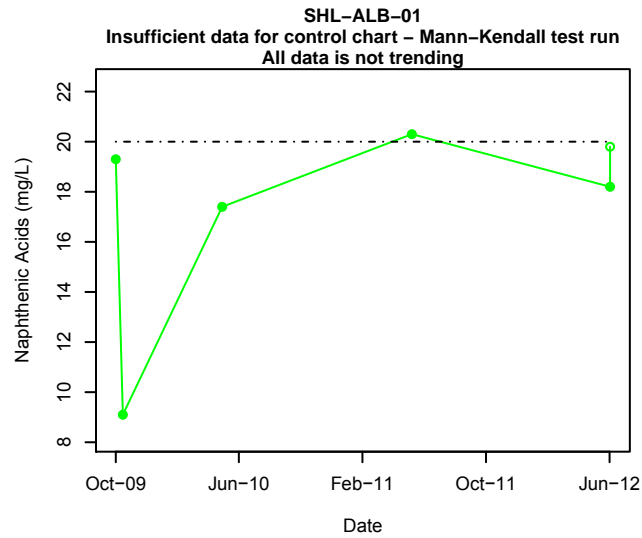
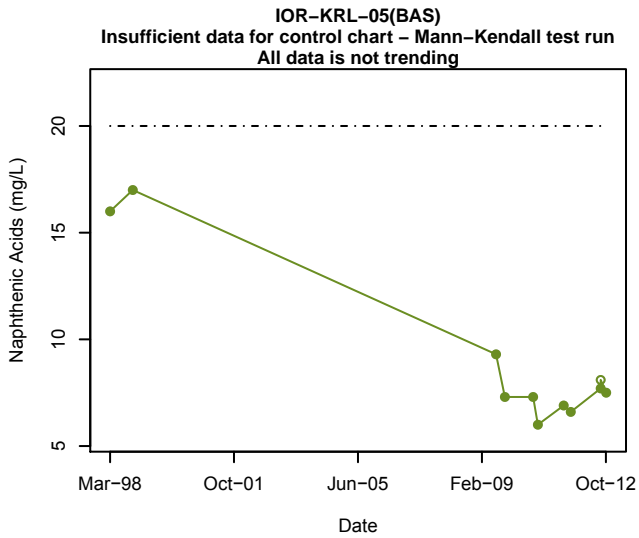
Shewhart-CUSUM Control Charts- Naphthenic Acids



- Naphthenic Acids
- - - Values below detection limit
- Data point not used in analysis
- · · Interim Quality Triggers for NAOS- AMU2 = 20 mg/L

Appendix C49b

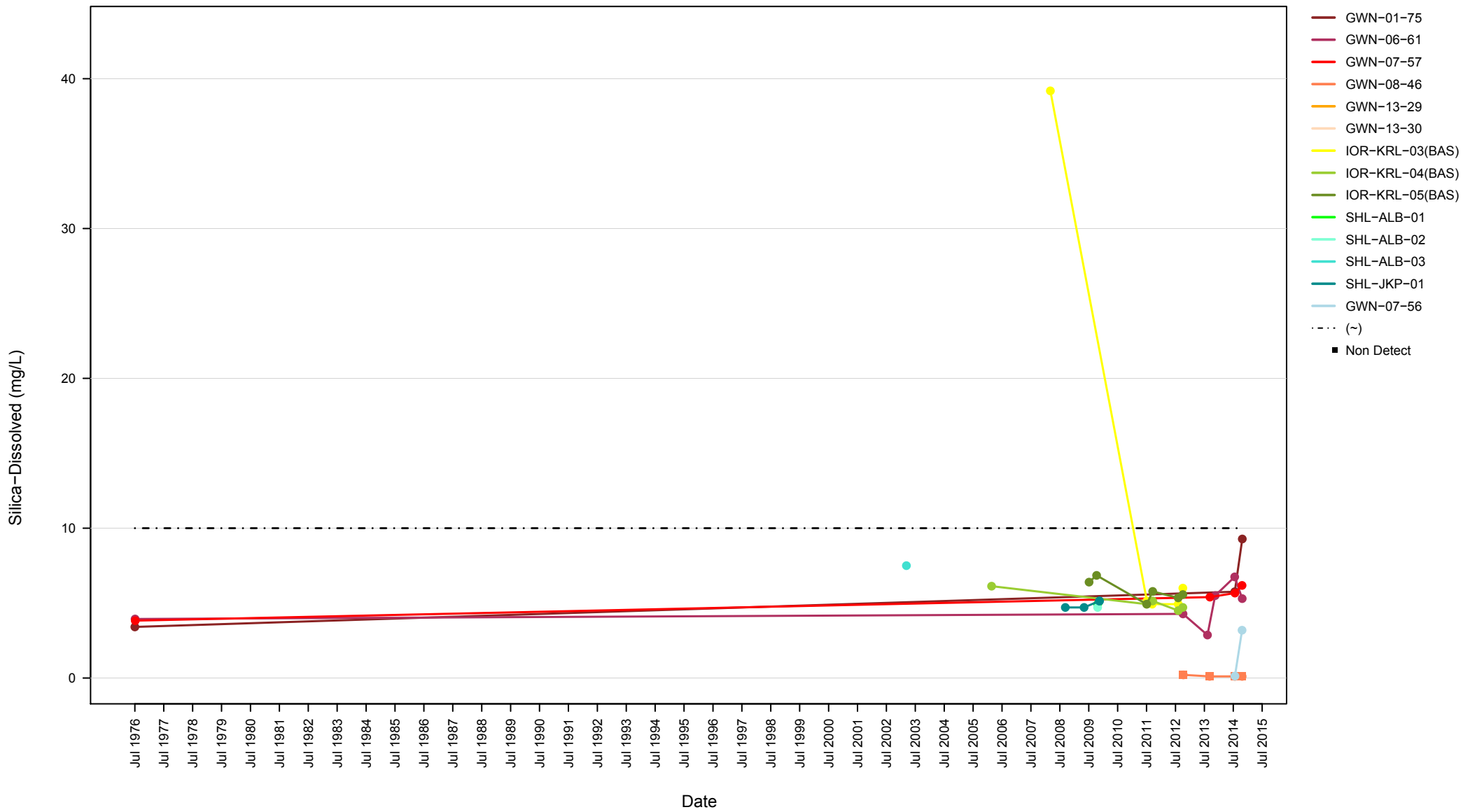
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Shewhart-CUSUM Control Charts- Naphthenic Acids



- Naphthenic Acids
- Values below detection limit
- Data point not used in analysis
- ⋯ Interim Quality Triggers for NAOS- AMU2 = 20 mg/L
- - - Well upper control limit
- - - Well lower control limit

Appendix C49b

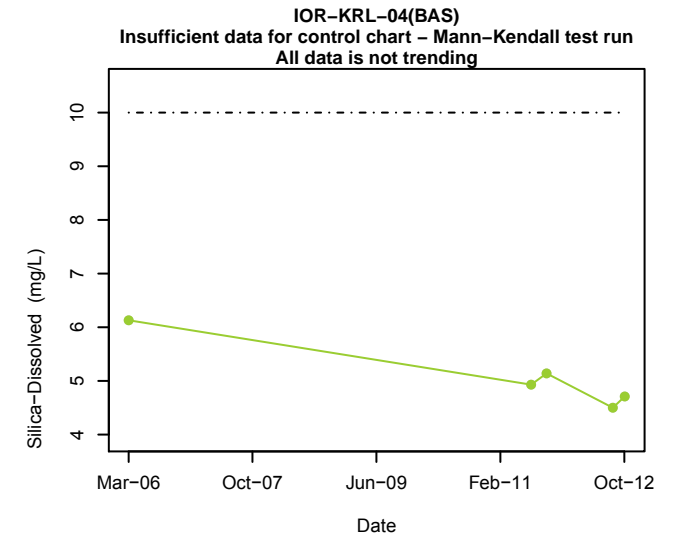
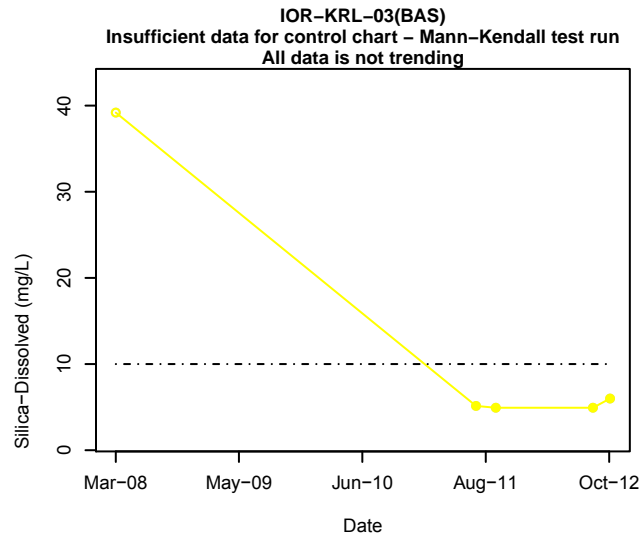
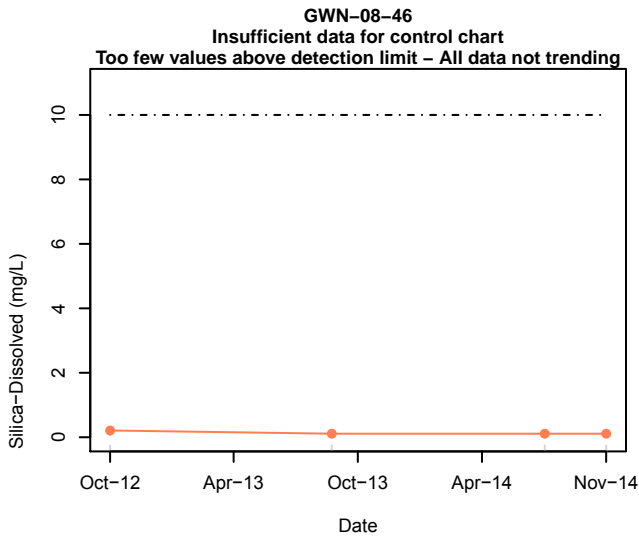
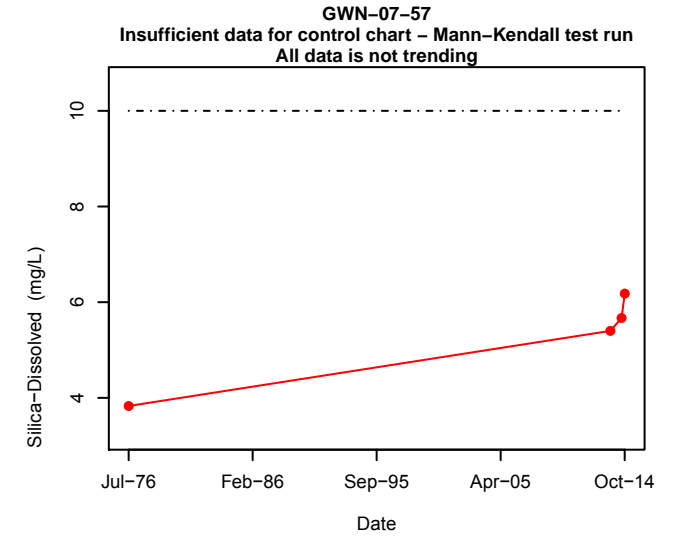
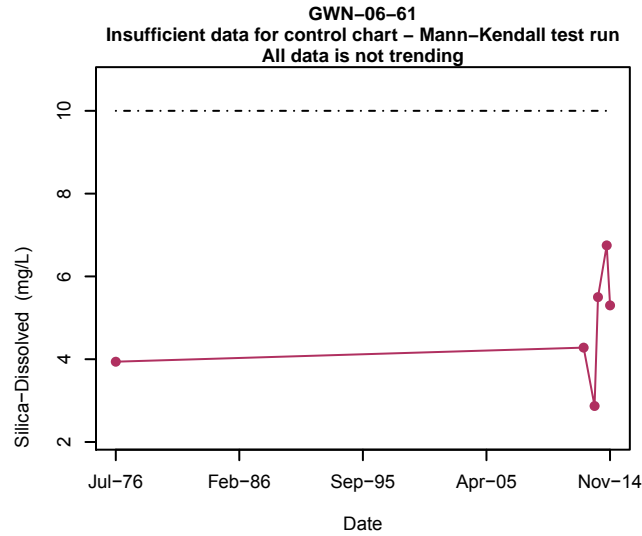
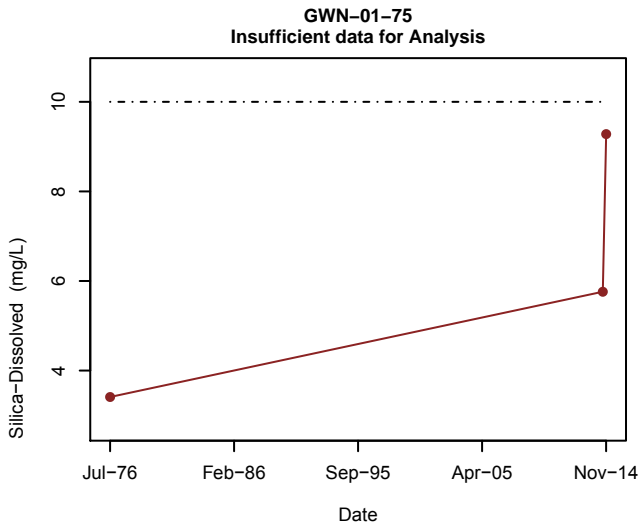
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Historical Dissolved Silica Concentrations



(~) Interim Quality Triggers for NAOS- AMU2 = 10 mg/L

Appendix C50a

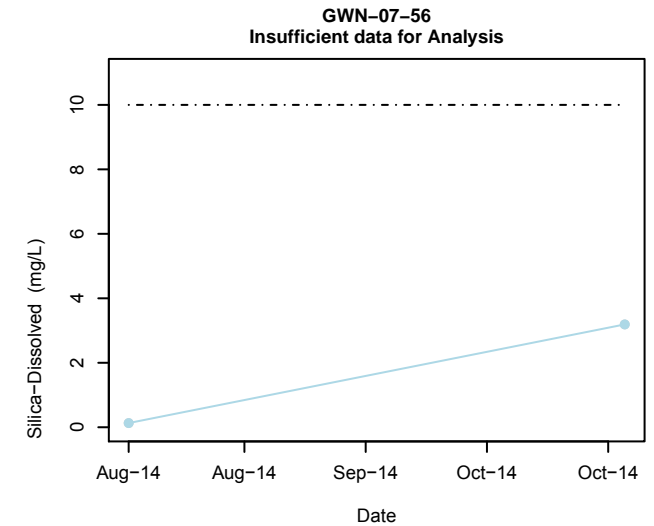
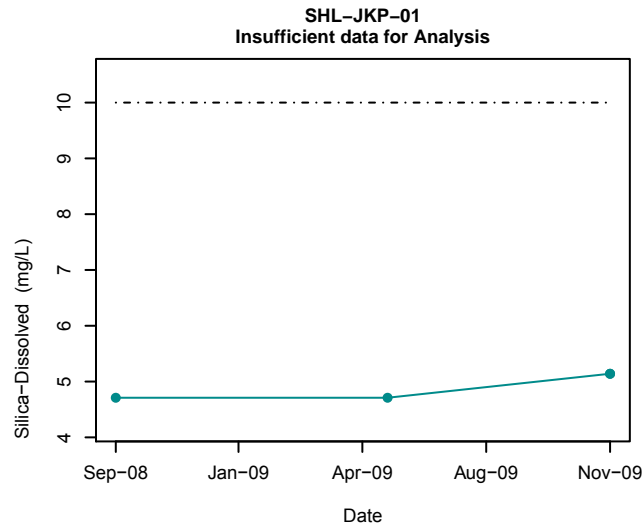
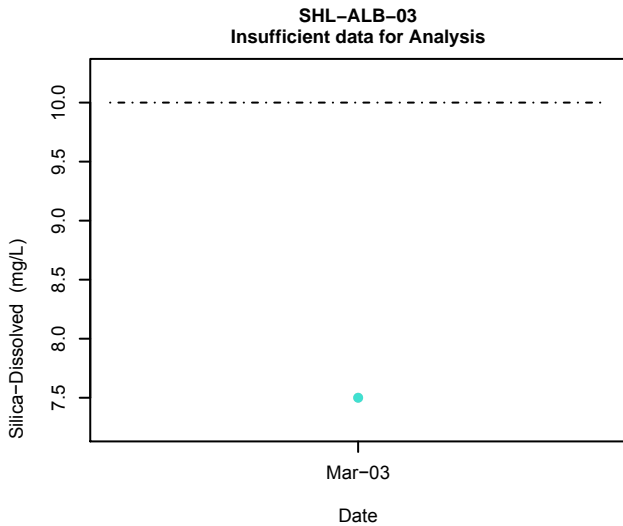
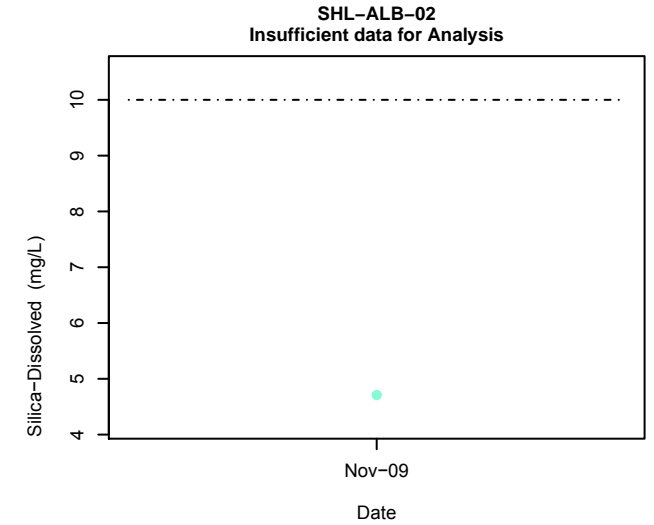
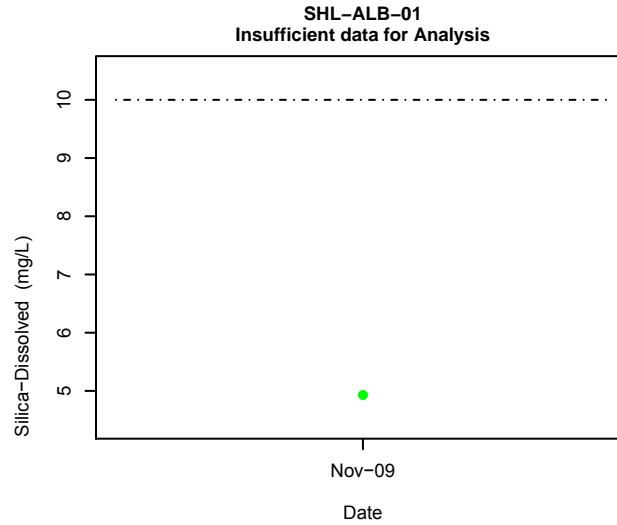
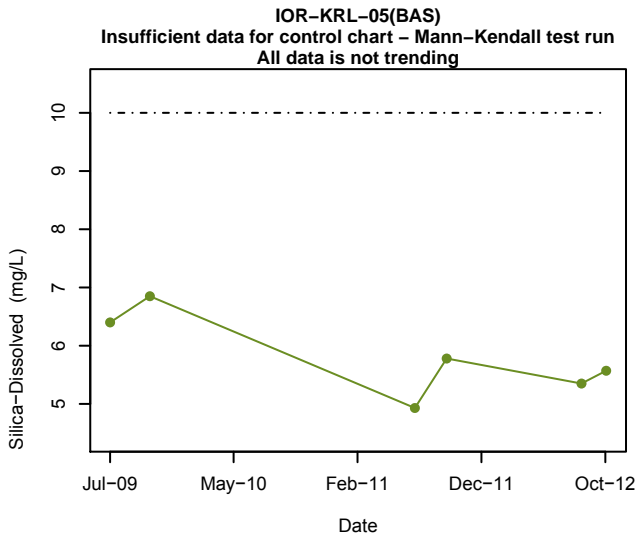
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Shewhart-CUSUM Control Charts- Dissolved Silica



- Silica-Dissolved
- - - Values below detection limit
- Data point not used in analysis
- · · Interim Quality Triggers for NAOS- AMU2 = 10 mg/L

Appendix C50b

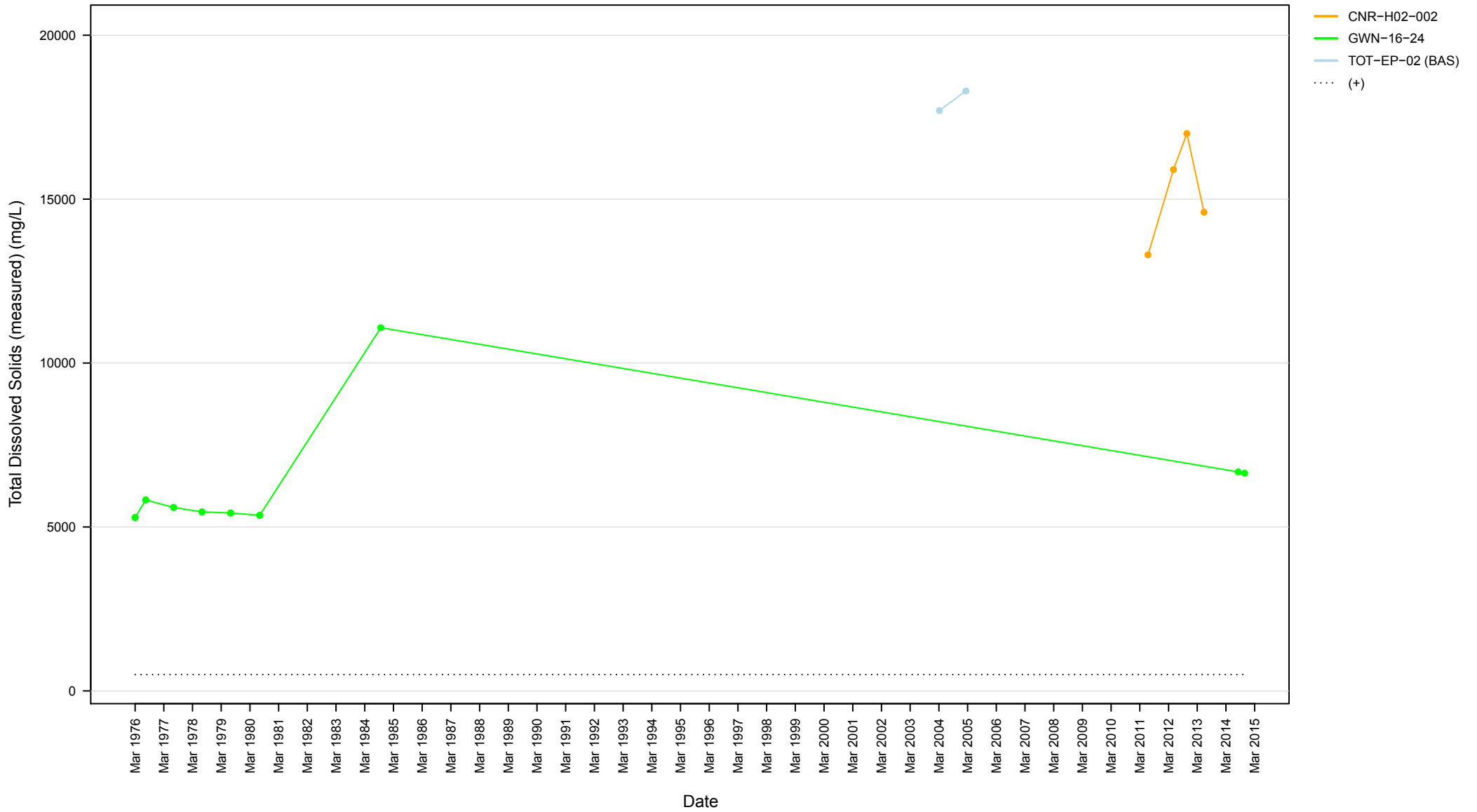
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU2) Shewhart-CUSUM Control Charts- Dissolved Silica



- Silica-Dissolved
- - - Values below detection limit
- Data point not used in analysis
- ⋯ Interim Quality Triggers for NAOS- AMU2 = 10 mg/L

Appendix C50b

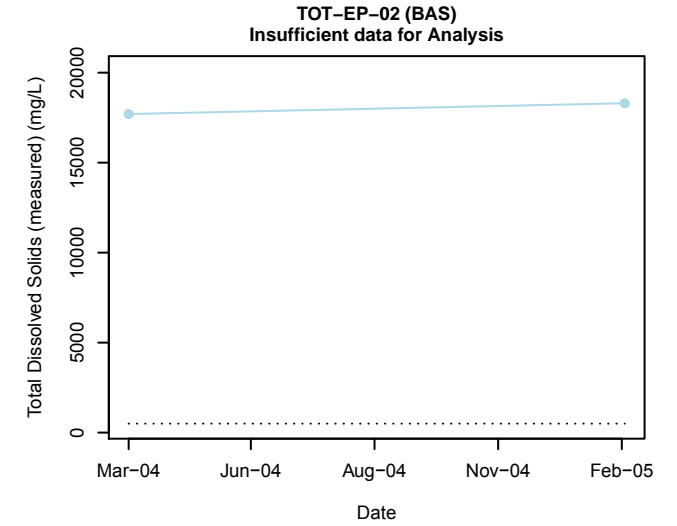
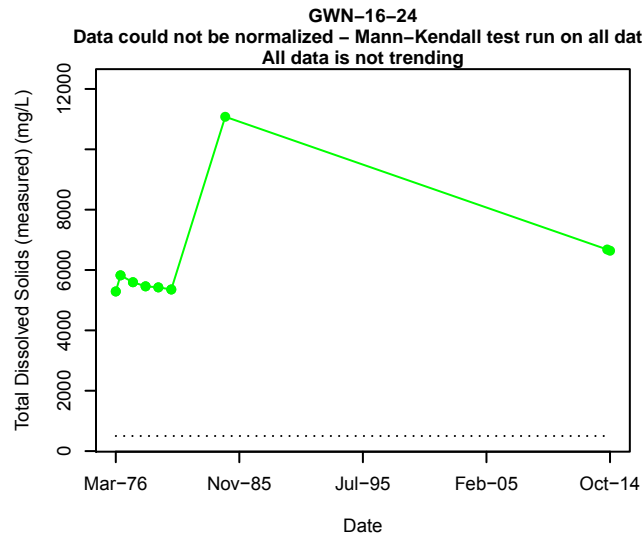
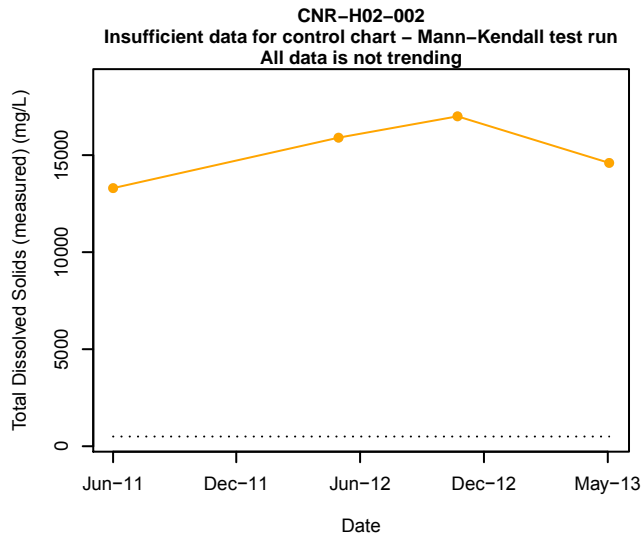
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU3) Historical Total Dissolved Solid Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 500 mg/L

Appendix C51a

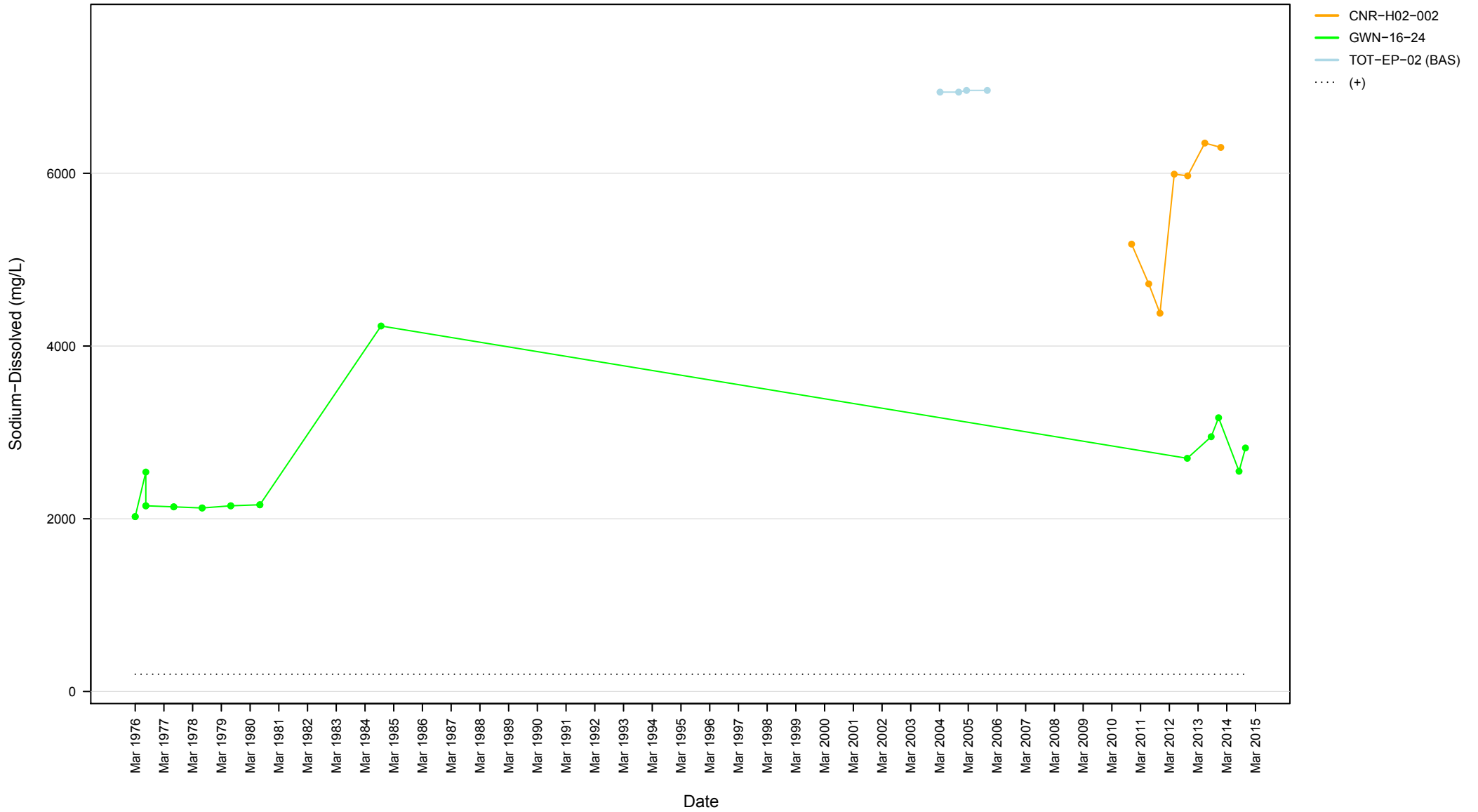
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU3) Shewhart-CUSUM Control Charts- Total Dissolved Solids



- Total Dissolved Solids (measured)
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 500 mg/L

Appendix C51b

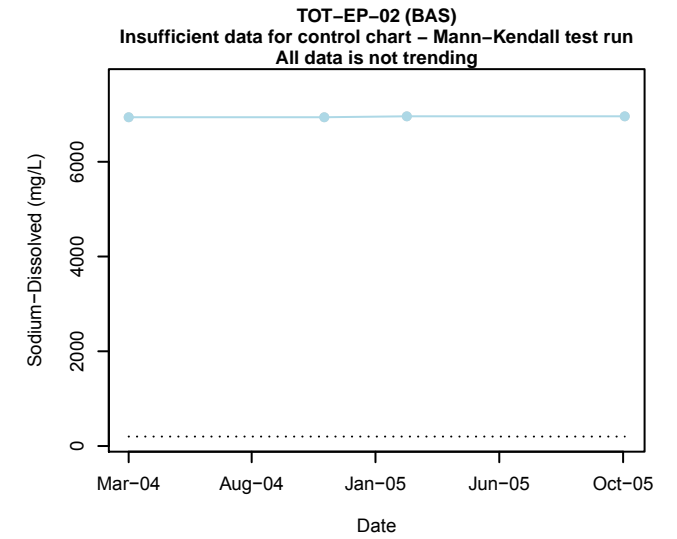
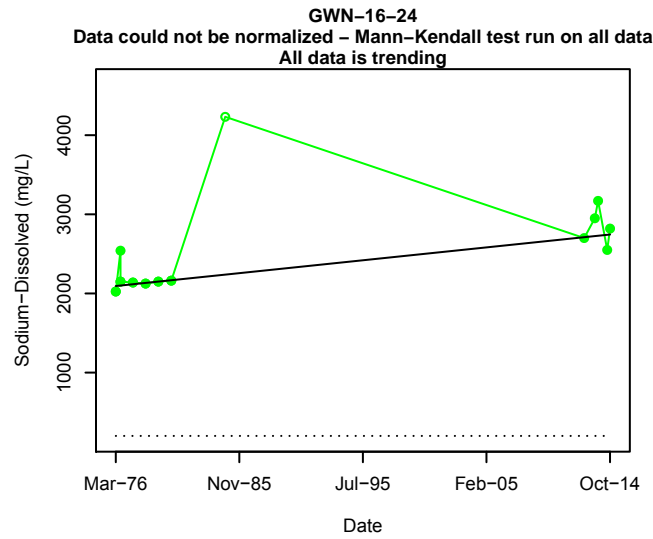
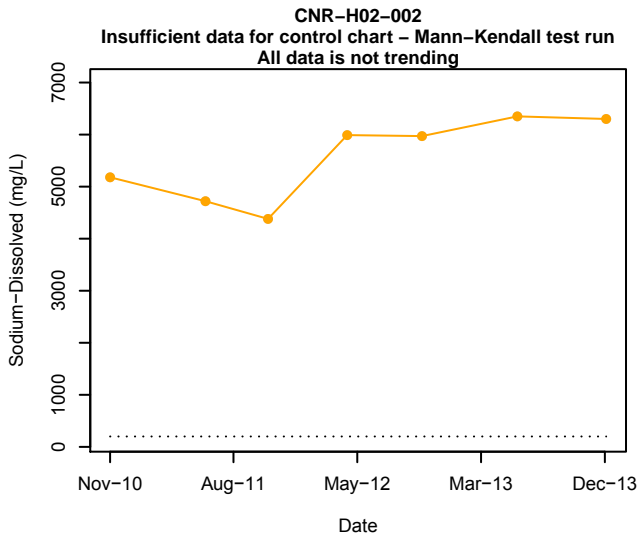
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU3) Historical Dissolved Sodium Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 200 mg/L

Appendix C52a

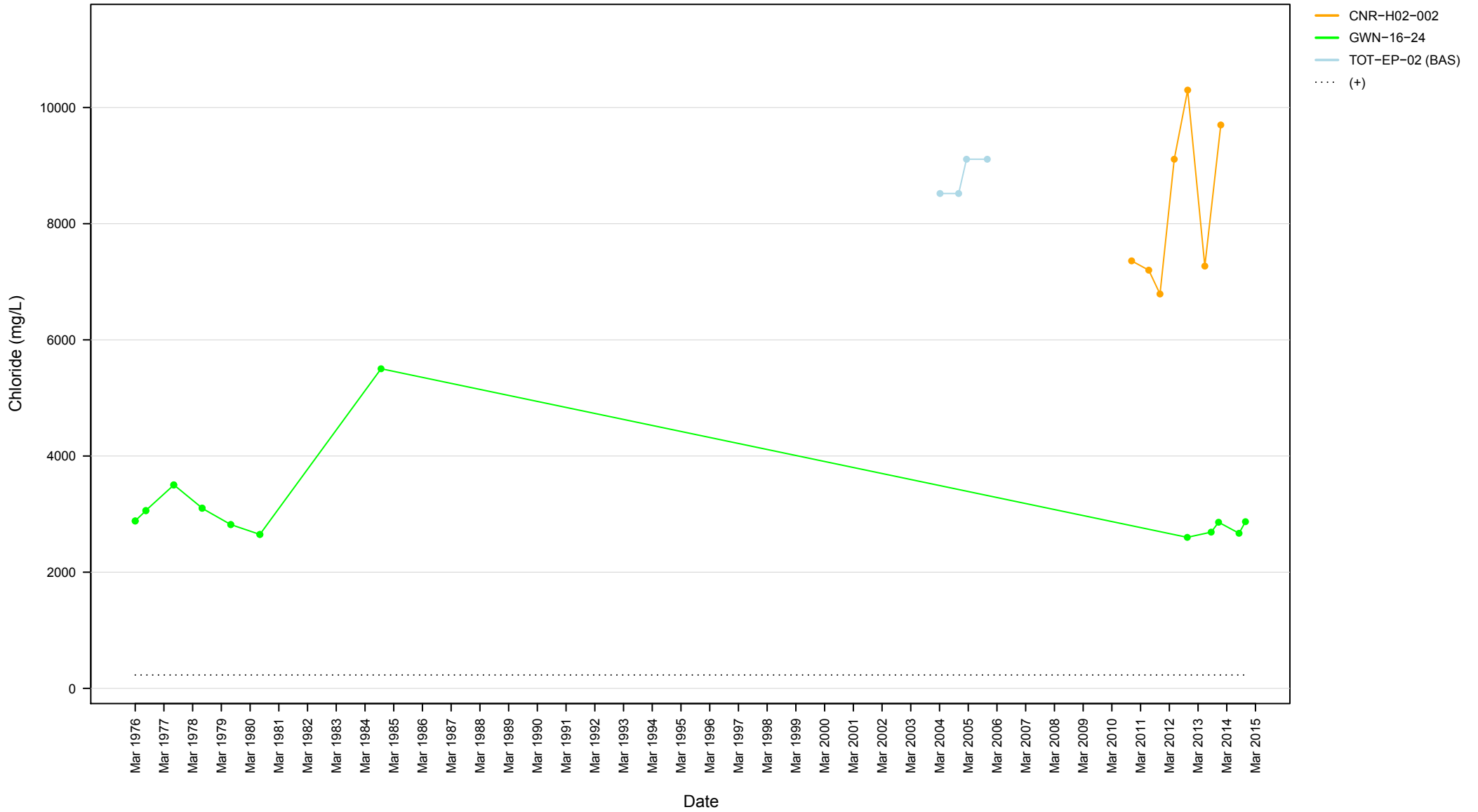
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU3) Shewhart-CUSUM Control Charts- Dissolved Sodium



- Sodium-Dissolved
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 200 mg/L

Appendix C52b

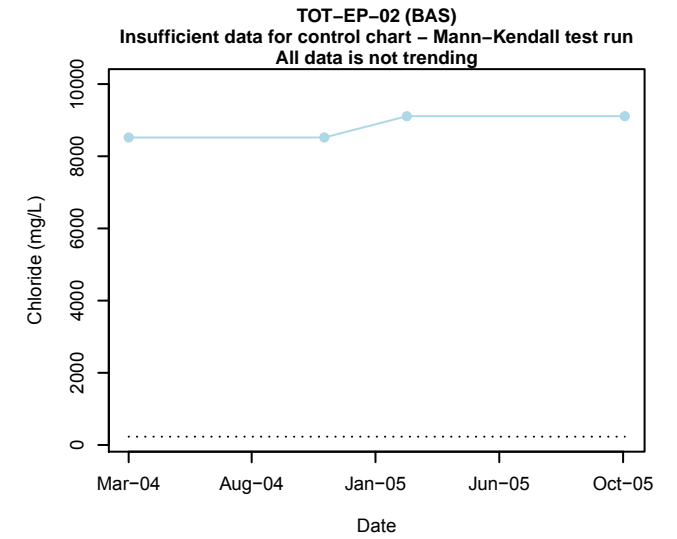
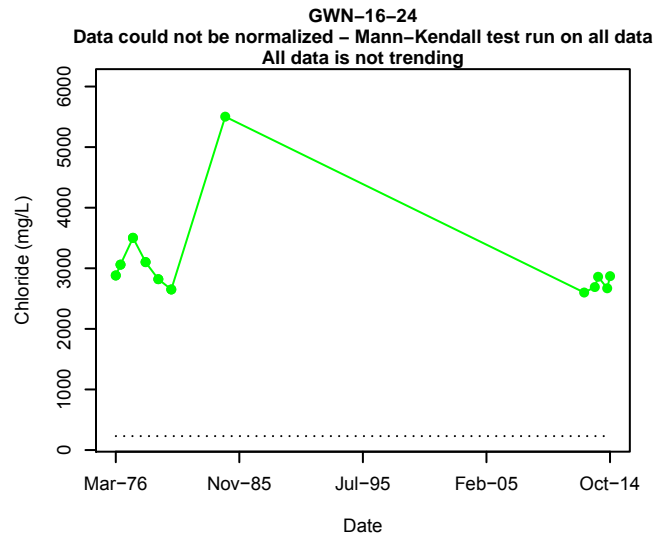
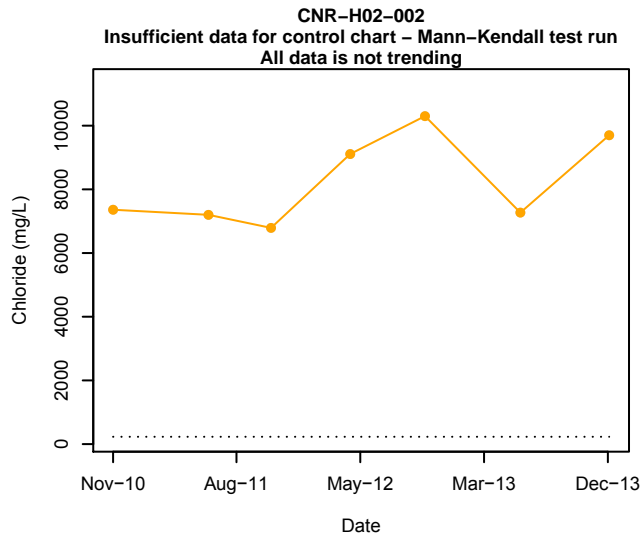
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU3) Historical Dissolved Chloride Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 230 mg/L

Appendix C53a

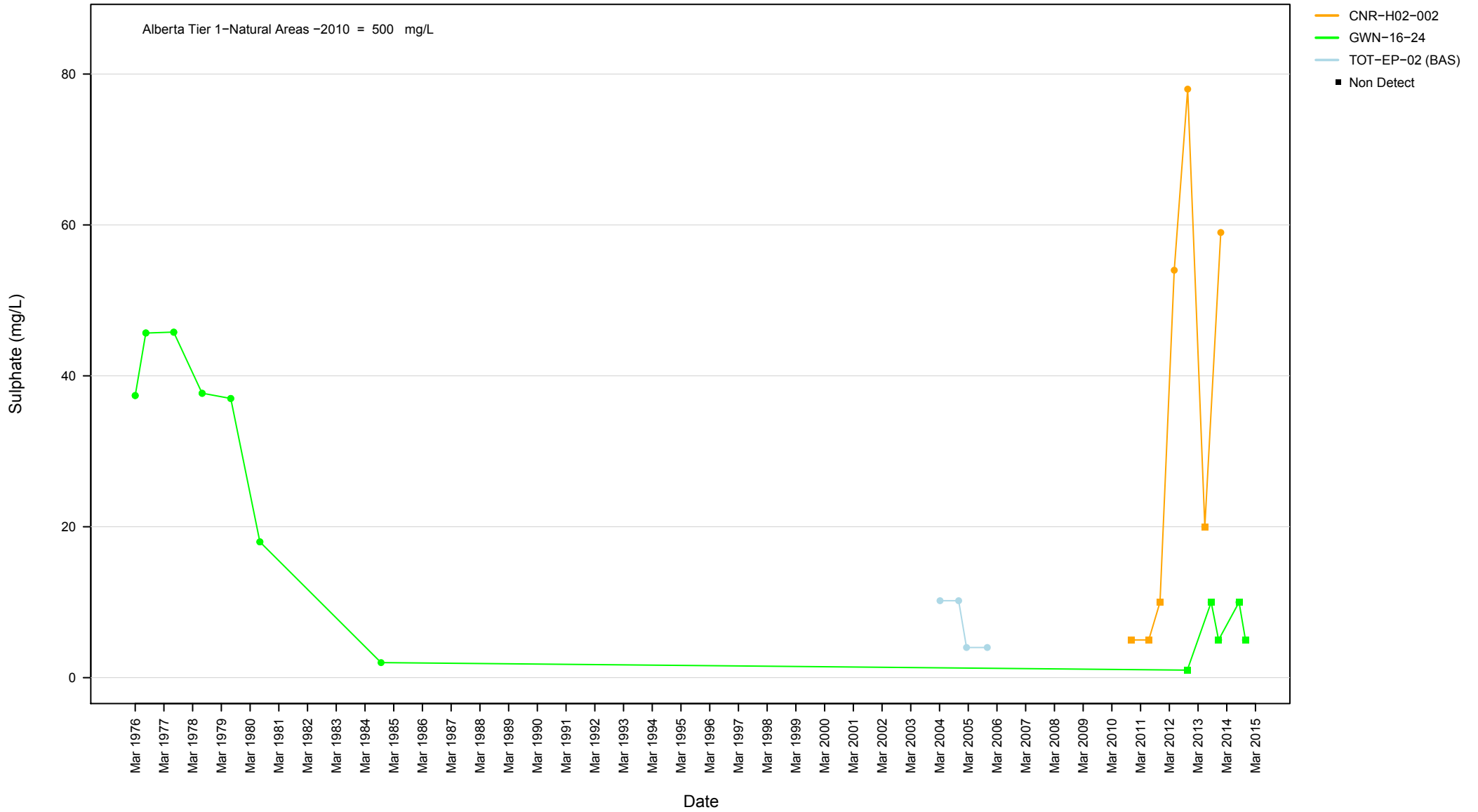
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU3) Shewhart-CUSUM Control Charts- Dissolved Chloride



- Chloride
- Data point not used in analysis
- Alberta Tier 1-Natural Areas -2010 = 230 mg/L

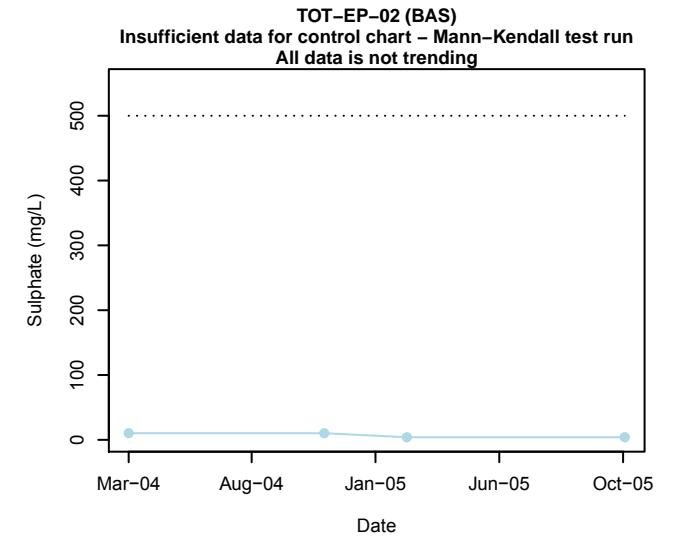
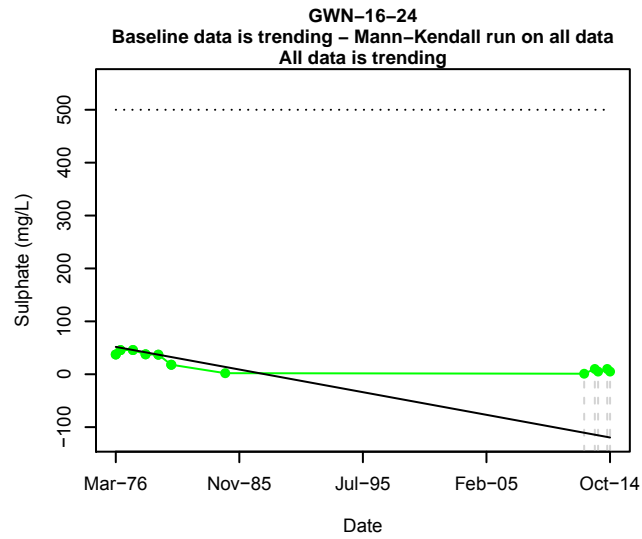
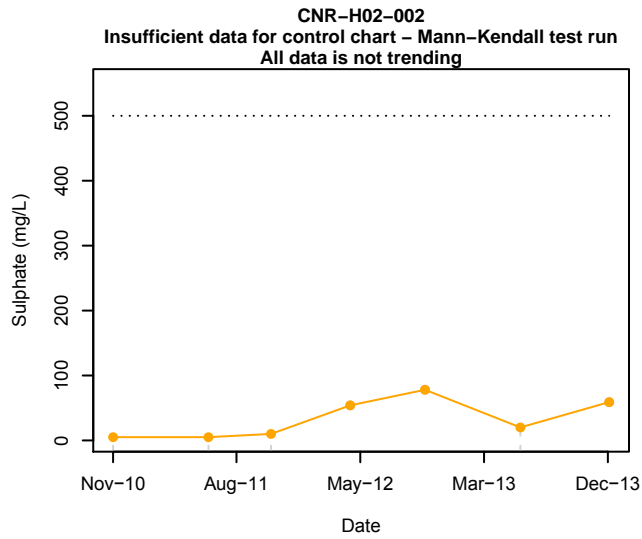
Appendix C53b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU3) Historical Dissolved Sulphate Concentrations



Appendix C54a

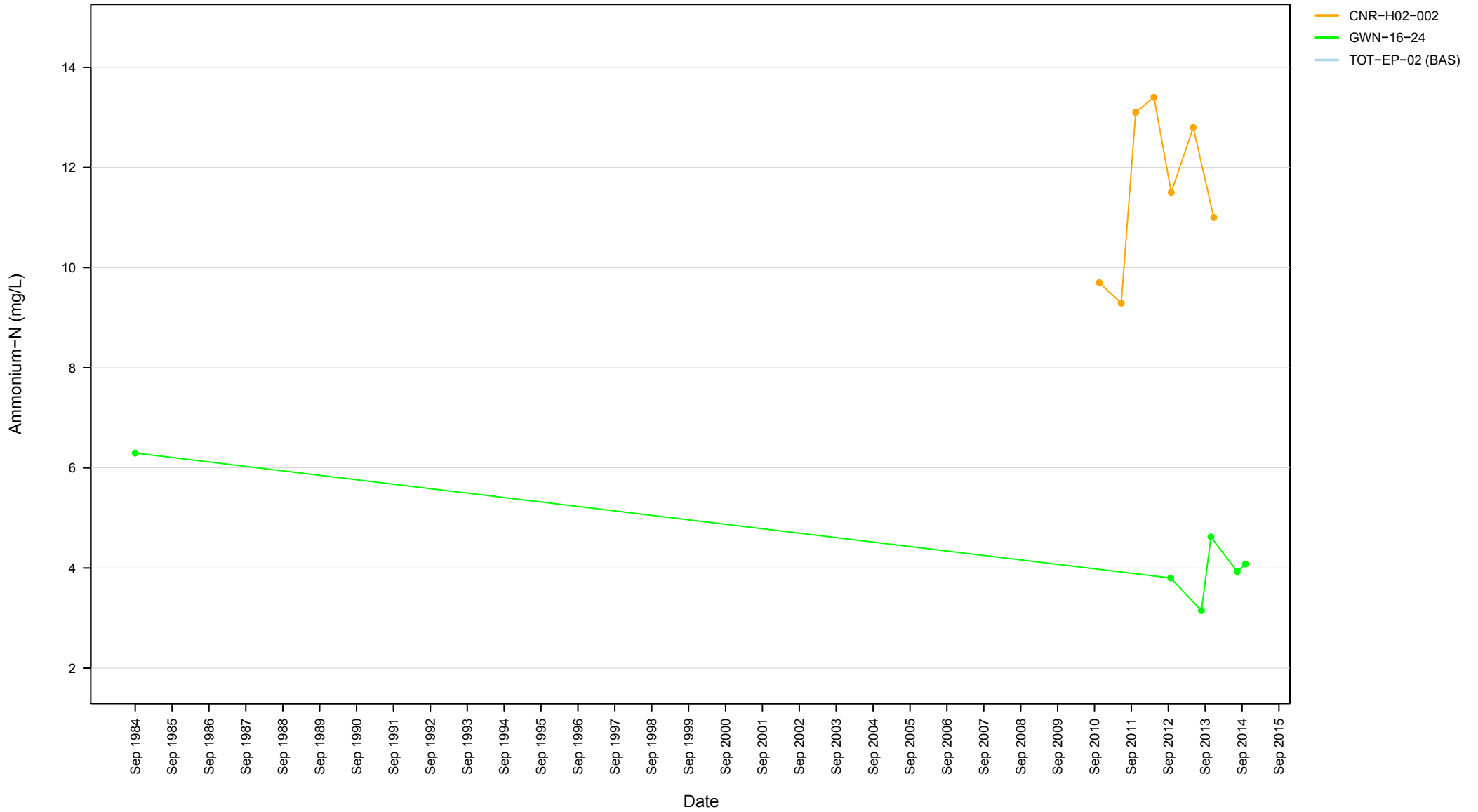
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU3) Shewhart-CUSUM Control Charts- Dissolved Sulphate



- Sulphate
- - - Values below detection limit
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 500 mg/L

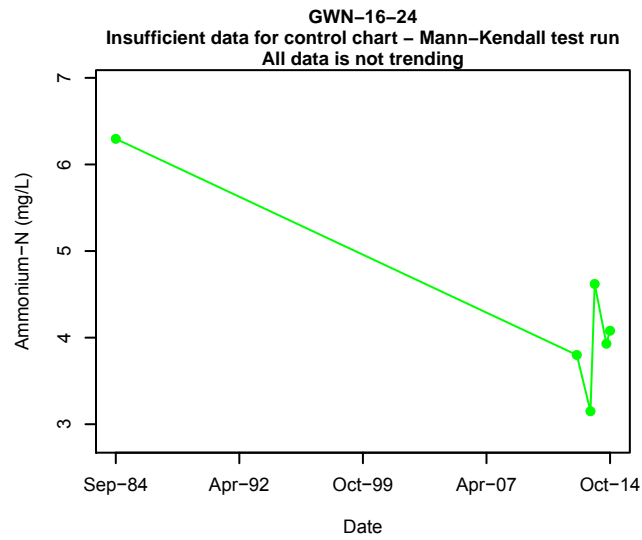
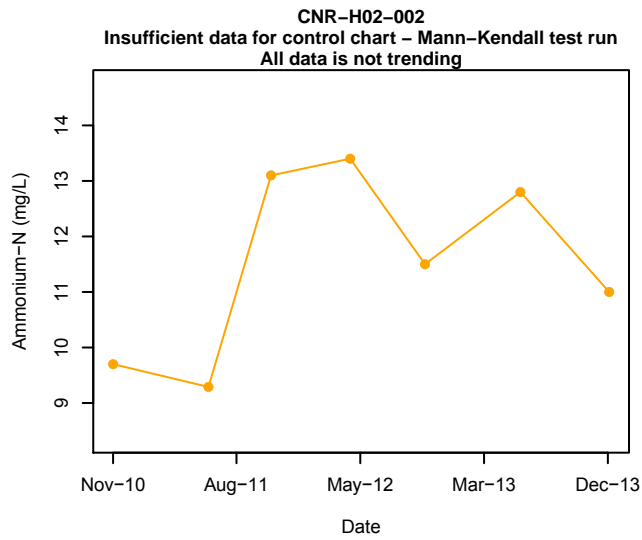
Appendix C54b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU3) Historical Ammonium-N Concentrations



Appendix C55a

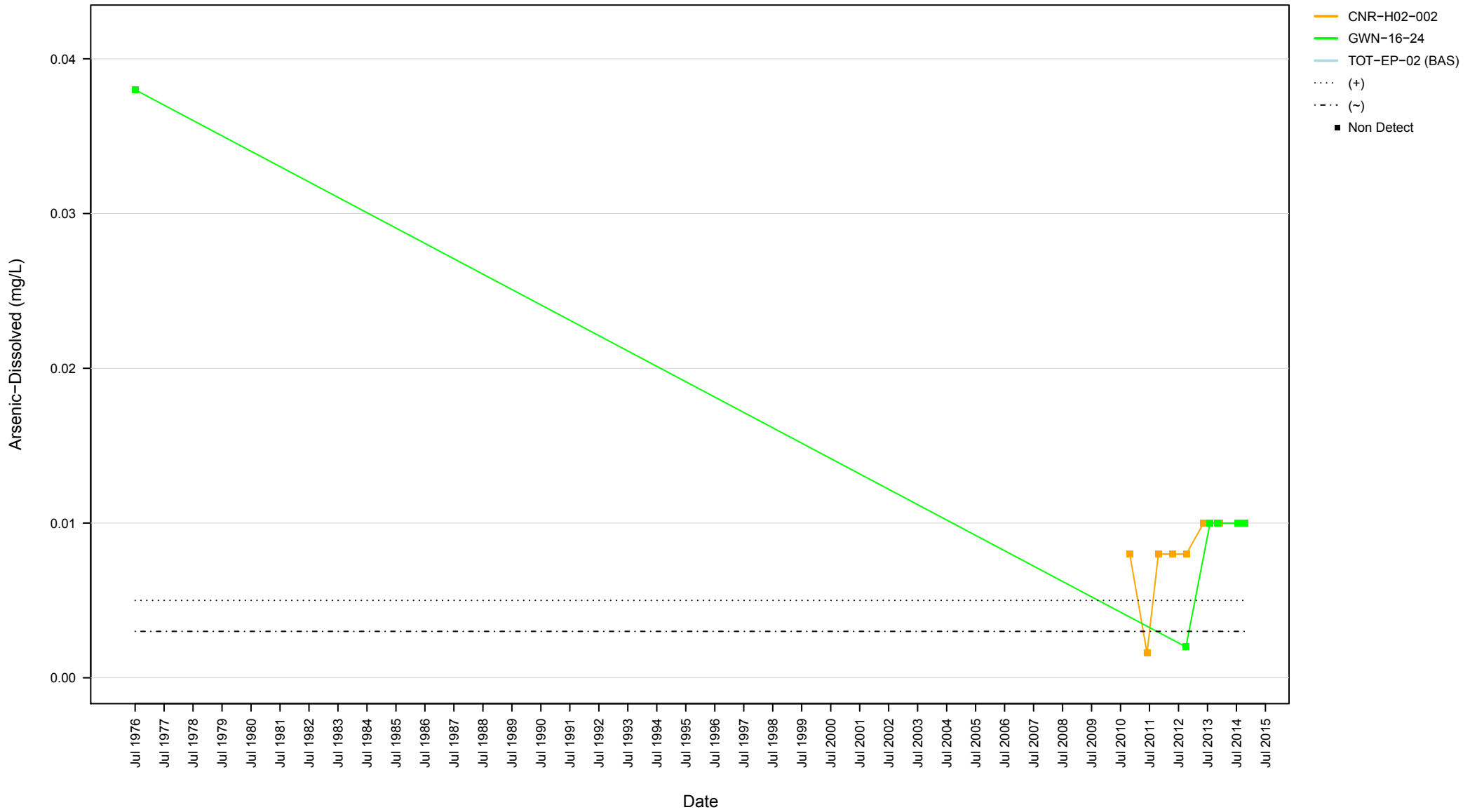
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU3) Shewhart-CUSUM Control Charts- Ammonium-N



—●— Ammonium-N

Appendix C55b

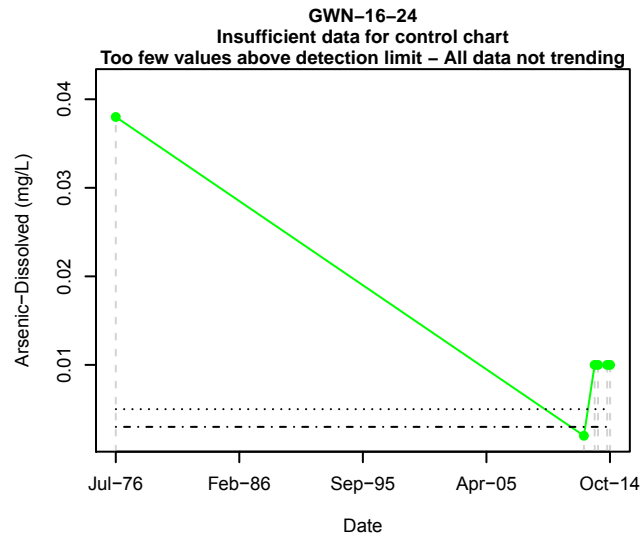
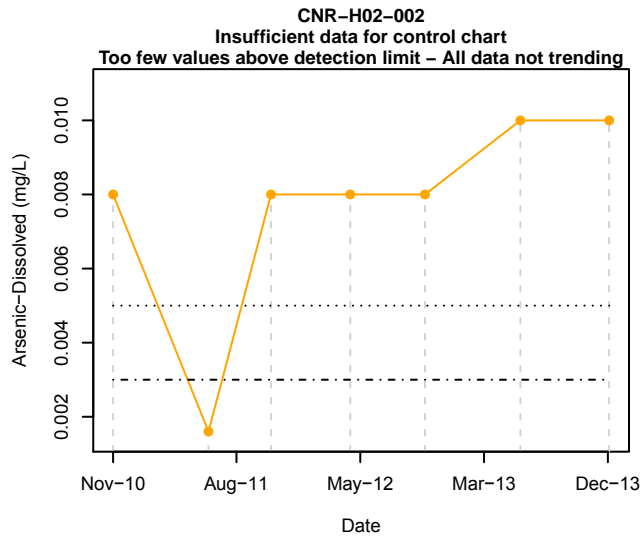
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU3) Historical Dissolved Arsenic Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 0.005 mg/L
 (-) Interim Quality Triggers for NAOS = 0.003 mg/L

Appendix C56a

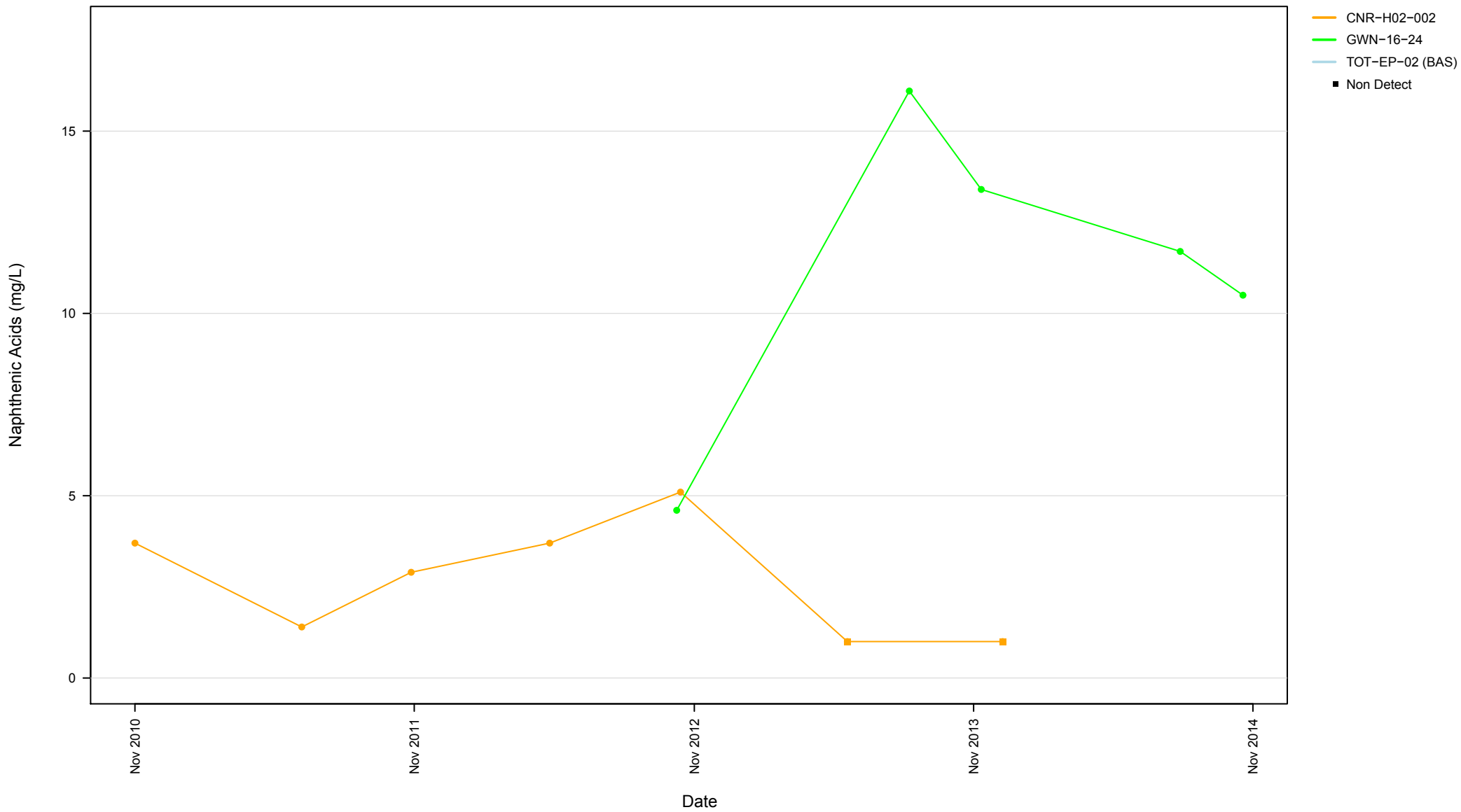
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU3) Shewhart-CUSUM Control Charts- Dissolved Arsenic



- Arsenic-Dissolved
- - Values below detection limit
- Alberta Tier 1-Natural Areas -2010 = 0.005 mg/L
- - - Interim Quality Triggers for NAOS = 0.003 mg/L

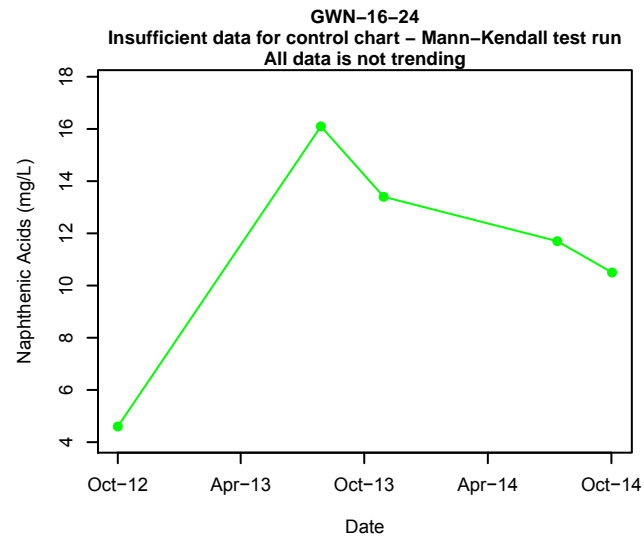
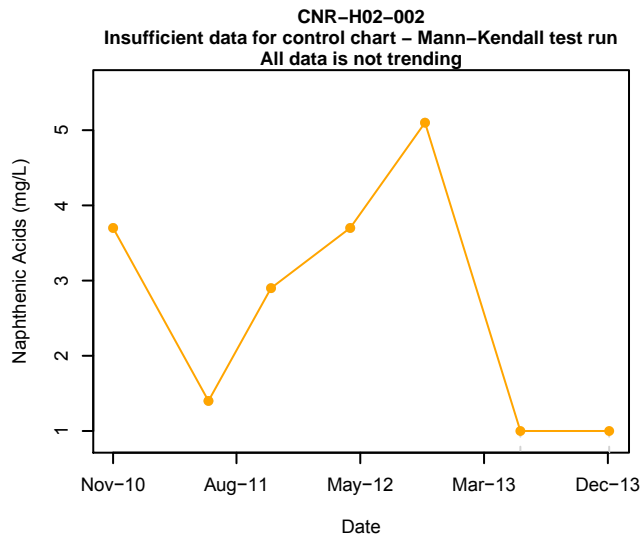
Appendix C56b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU3) Historical Naphthenic Acids Concentrations



Appendix C57a

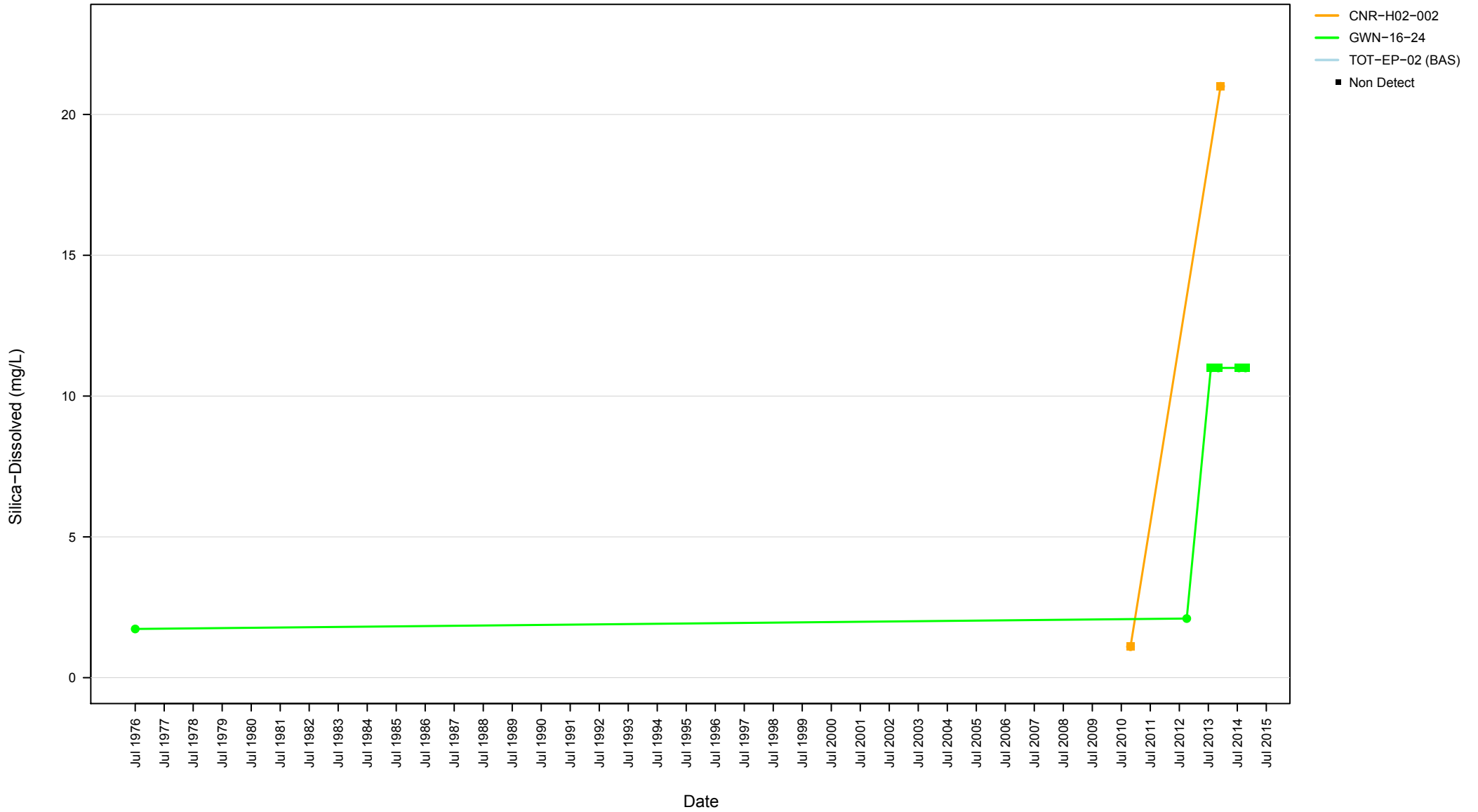
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU3) Shewhart-CUSUM Control Charts- Naphthenic Acids



● Naphthenic Acids
- - Values below detection limit

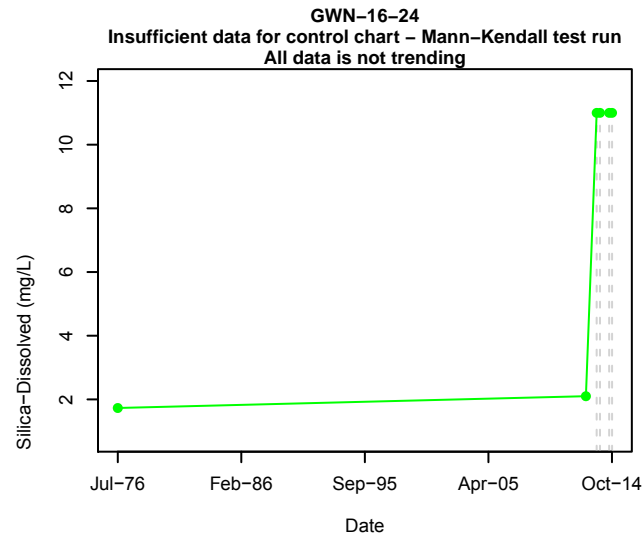
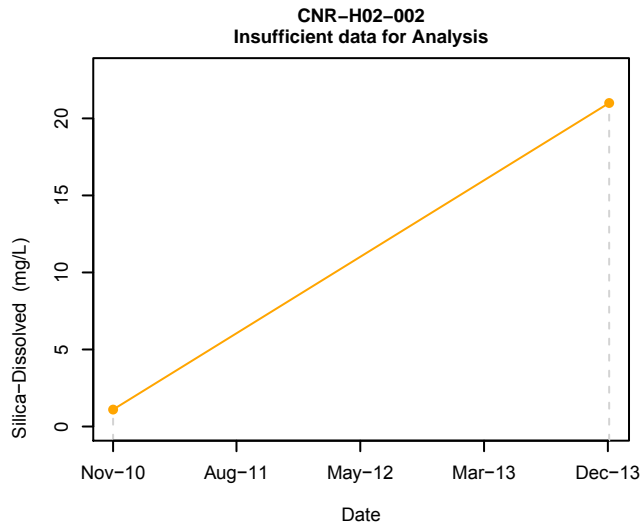
Appendix C57b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU3) Historical Dissolved Silica Concentrations



Appendix C58a

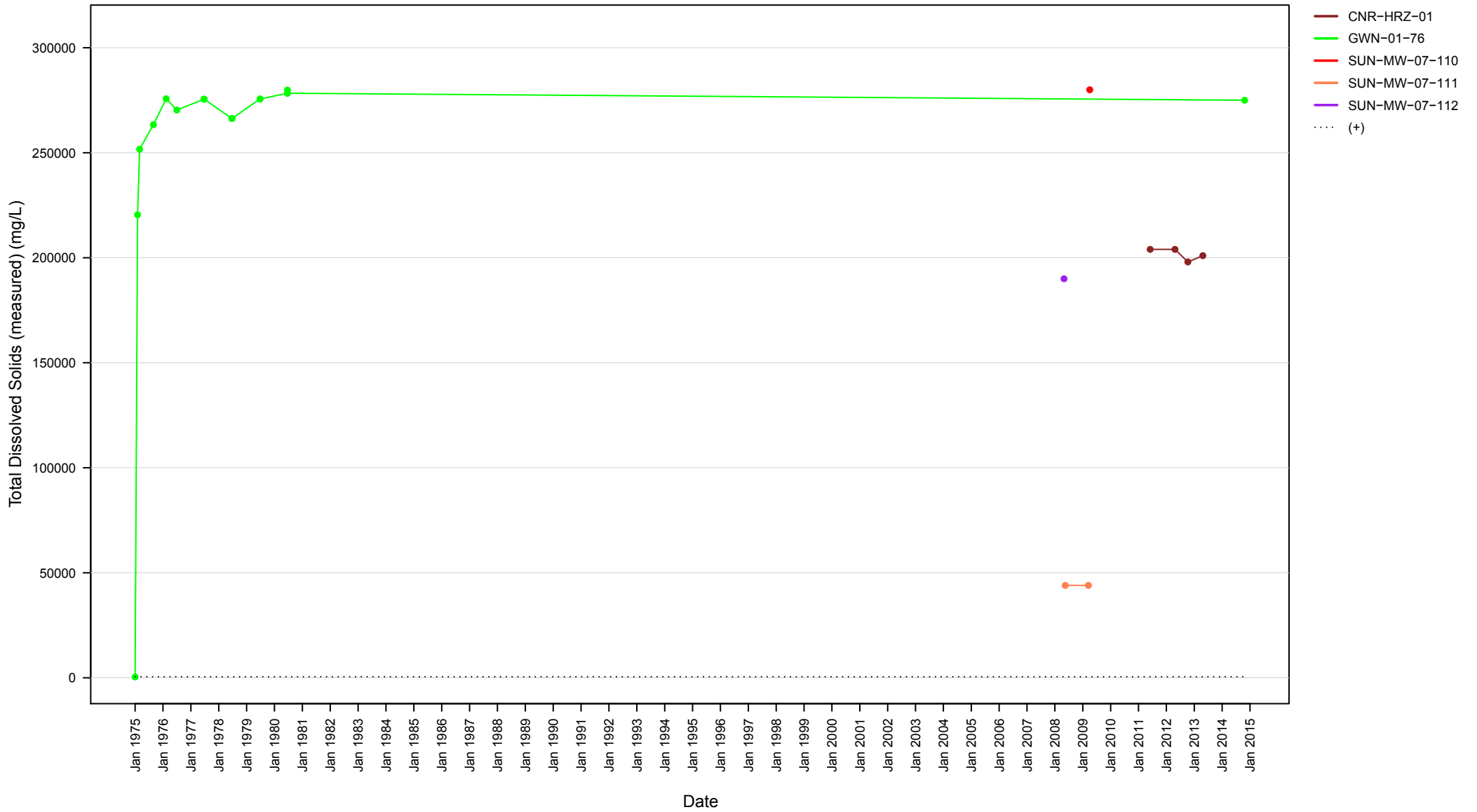
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU3) Shewhart-CUSUM Control Charts- Dissolved Silica



● Silica-Dissolved
- - Values below detection limit

Appendix C58b

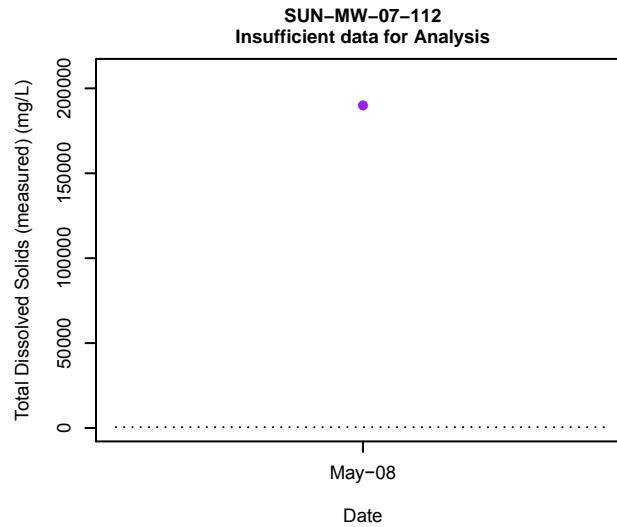
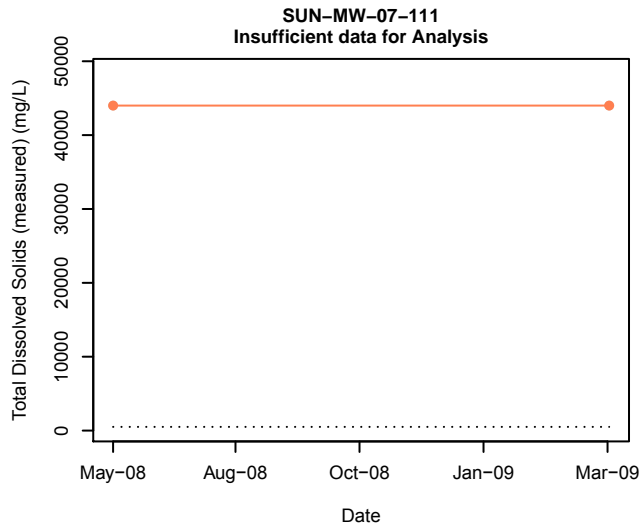
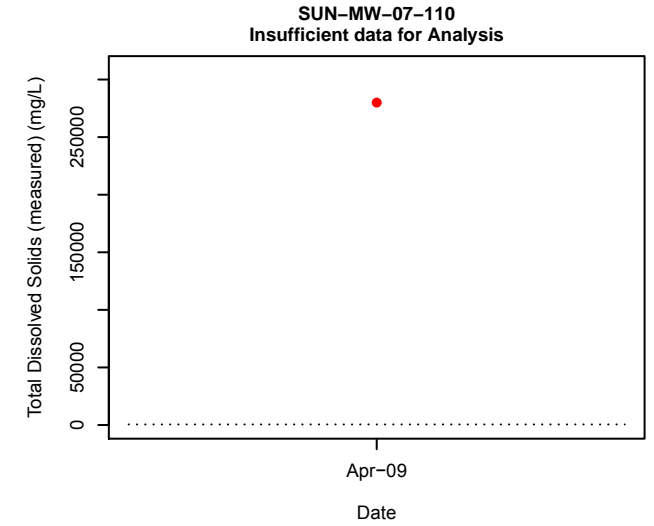
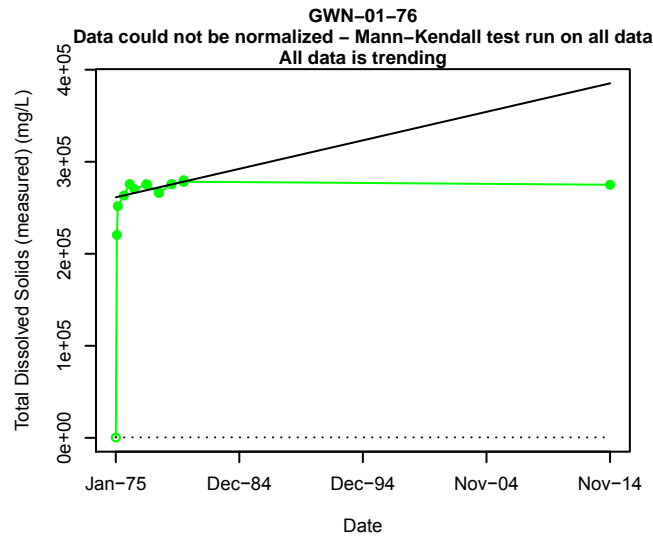
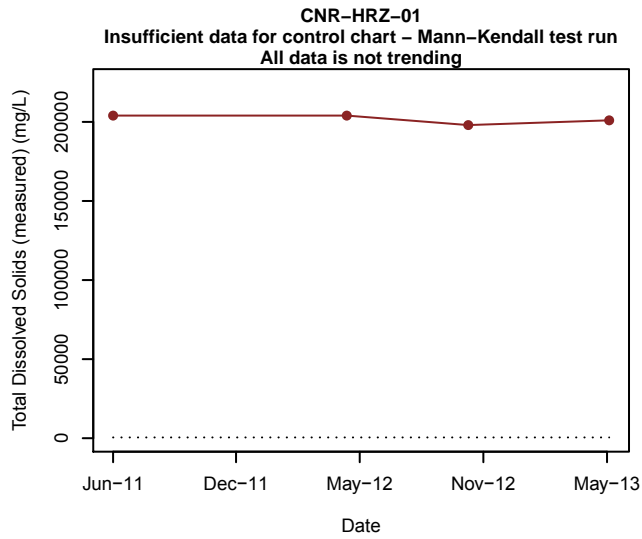
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU4) Historical Total Dissolved Solid Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 500 mg/L

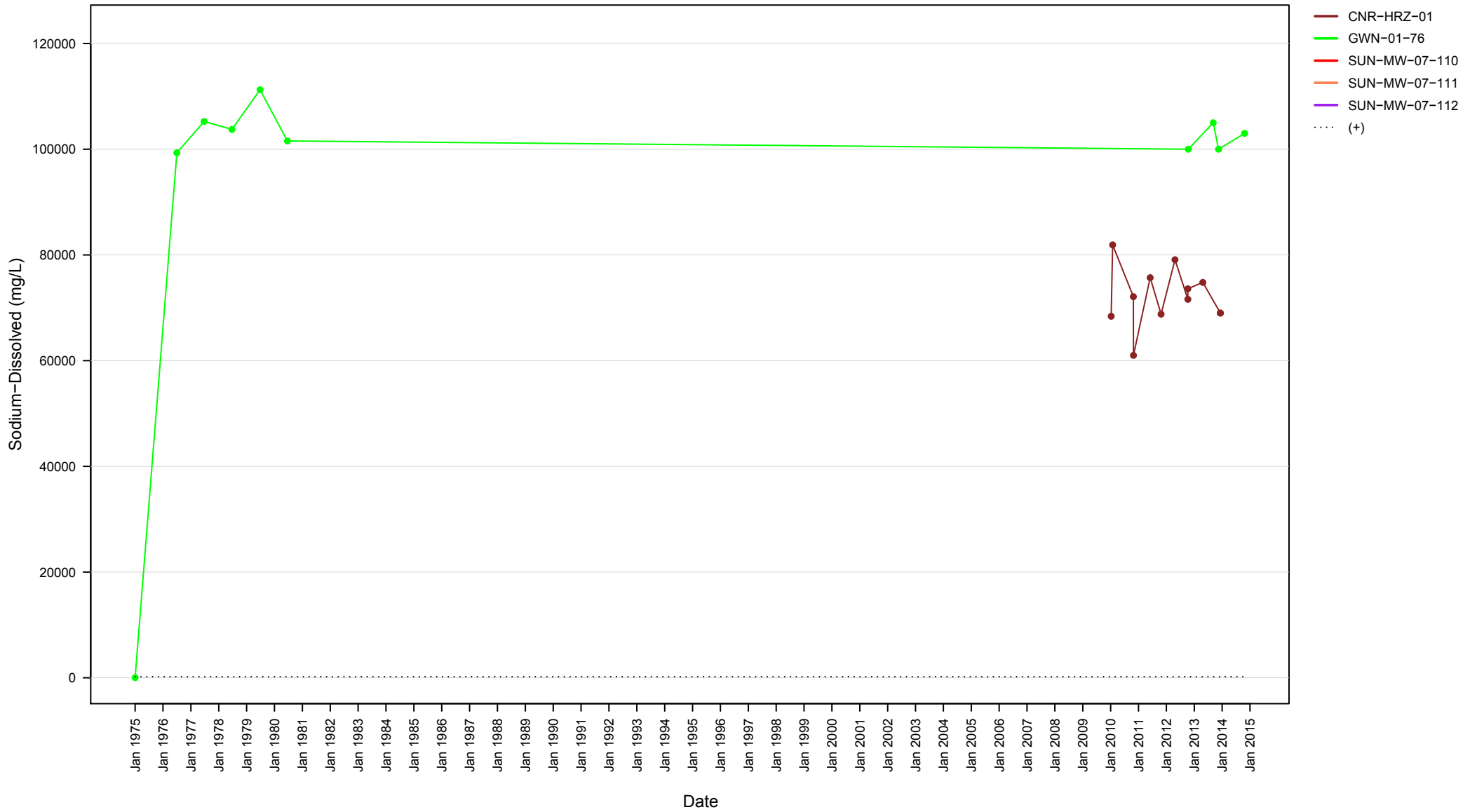
Appendix C59a

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU4) Shewhart-CUSUM Control Charts- Total Dissolved Solids



- Total Dissolved Solids (measured)
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 500 mg/L

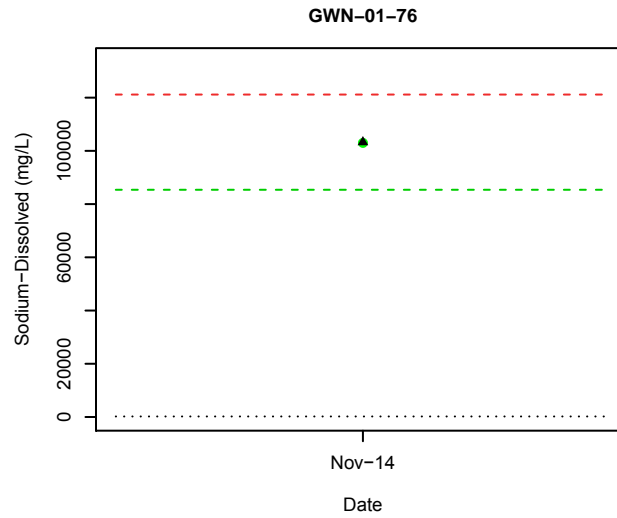
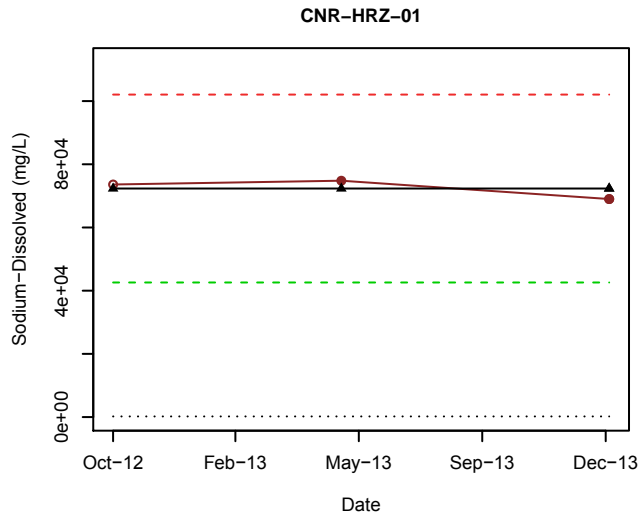
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU4) Historical Dissolved Sodium Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 200 mg/L

Appendix C60a

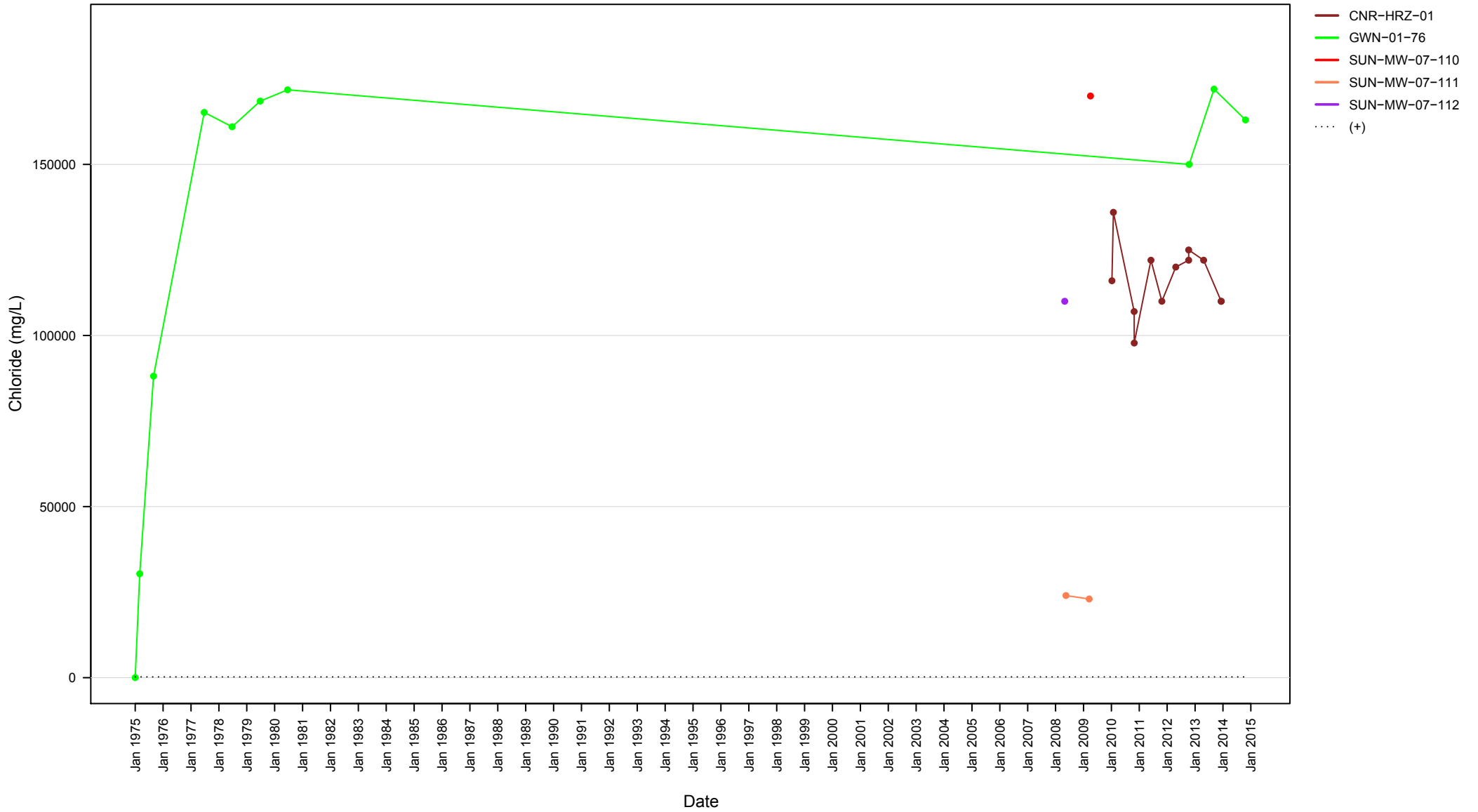
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU4) Shewhart-CUSUM Control Charts- Dissolved Sodium



- Sodium-Dissolved
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 200 mg/L
- ▲ CUSUM
- - - Well upper control limit
- - - Well lower control limit

Appendix C60b

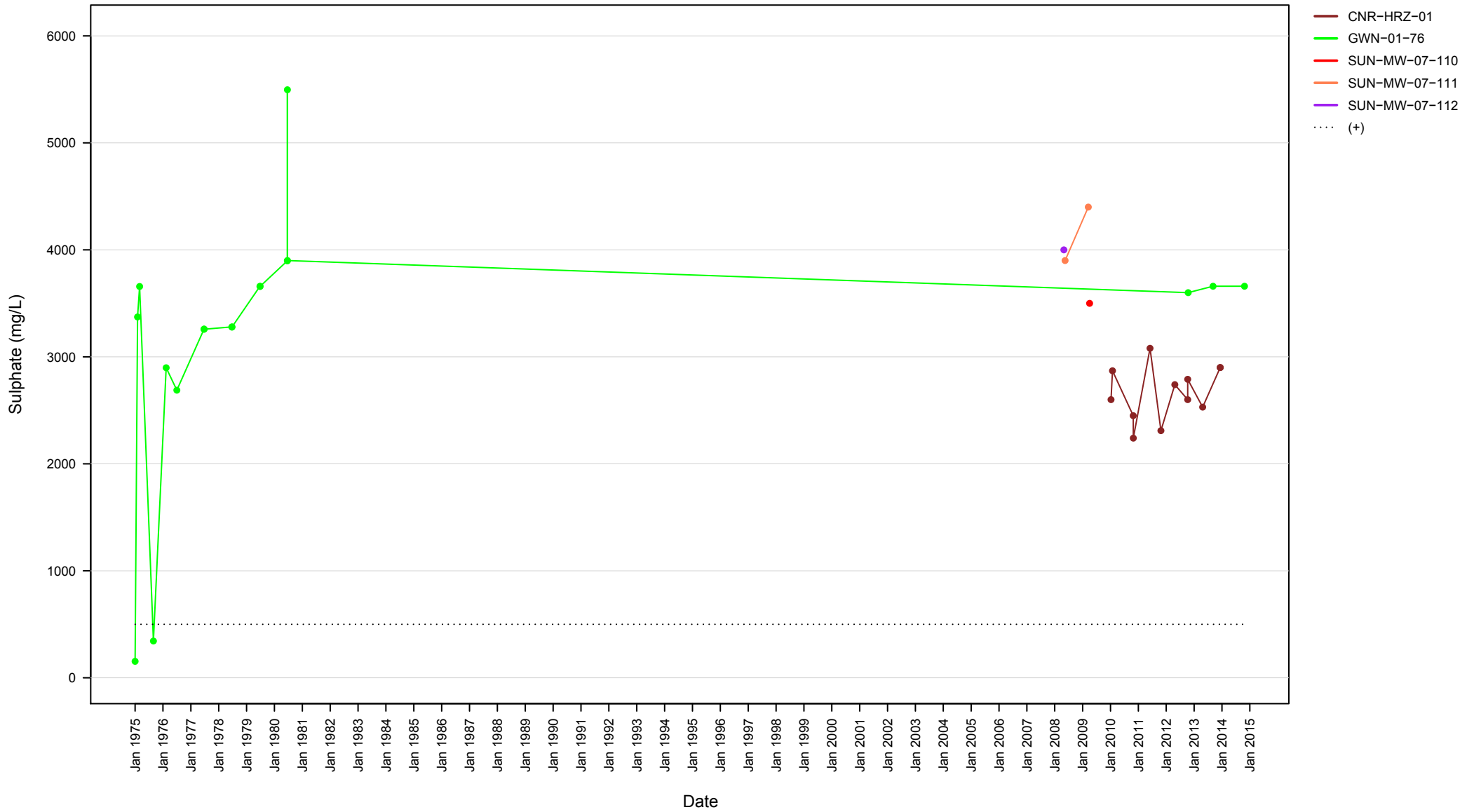
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU4) Historical Dissolved Chloride Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 230 mg/L

Appendix C61a

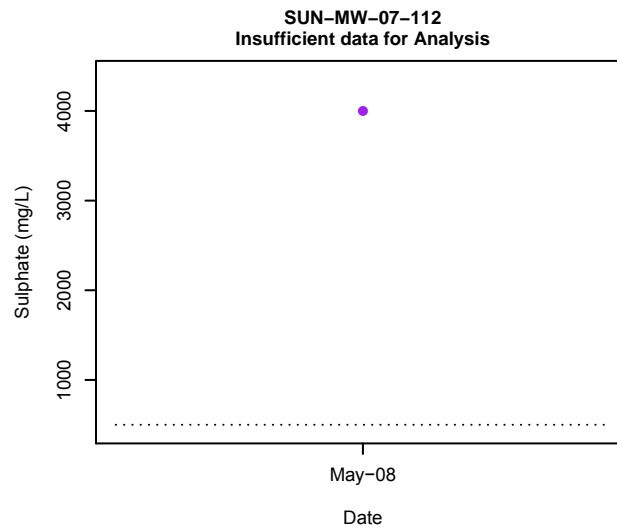
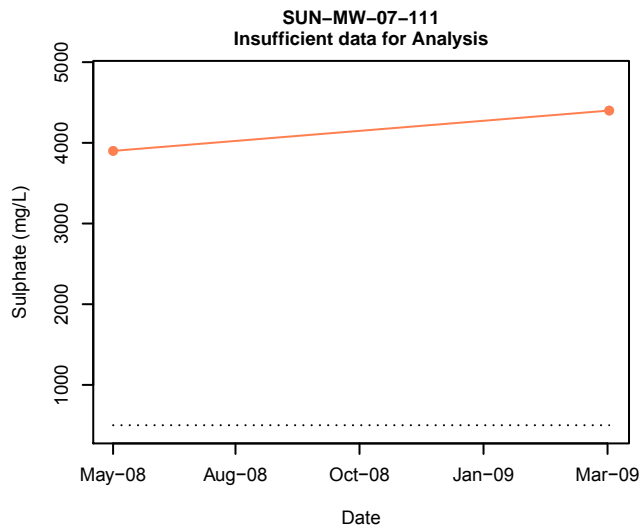
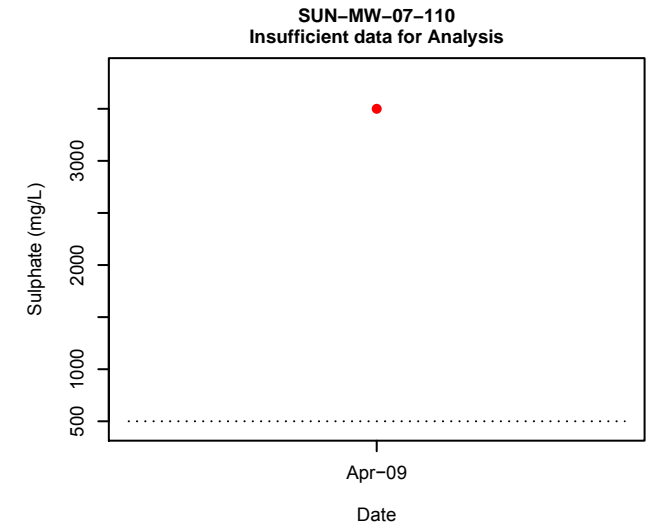
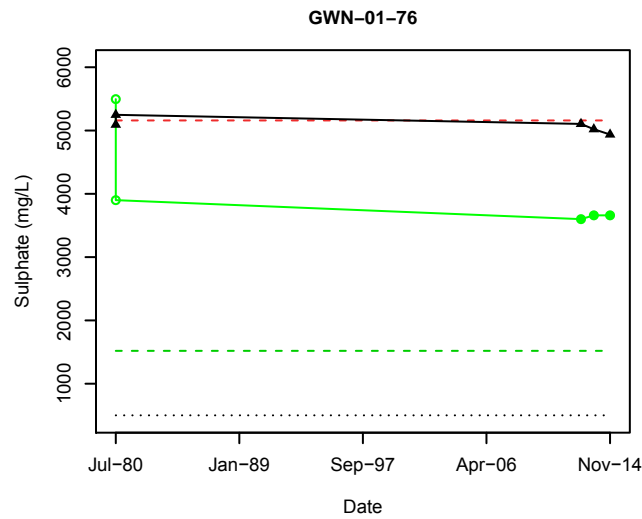
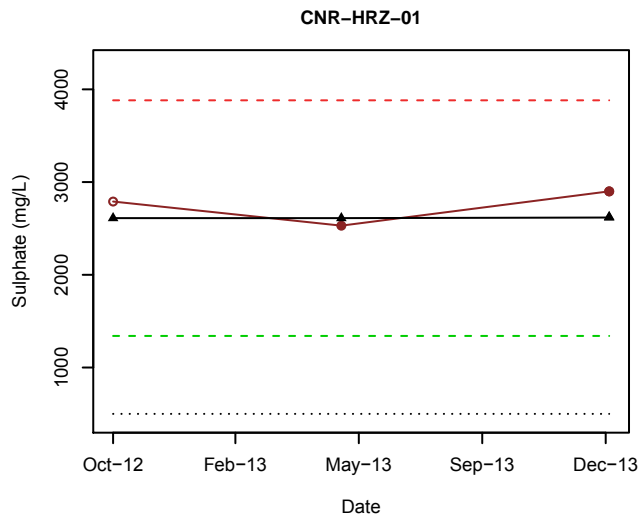
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU4) Historical Dissolved Sulphate Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 500 mg/L

Appendix C62a

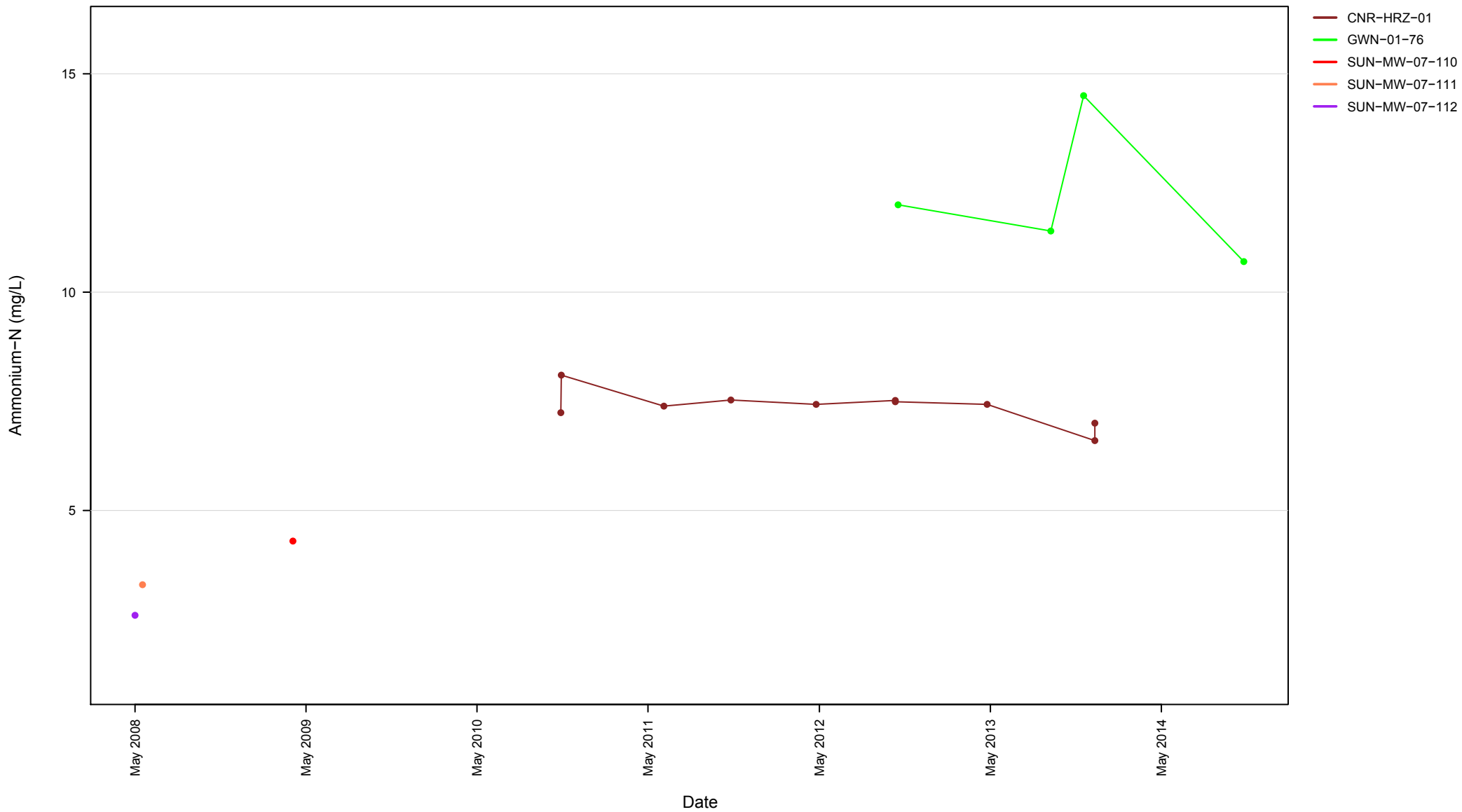
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU4) Shewhart-CUSUM Control Charts- Dissolved Sulphate



- Sulphate
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 500 mg/L
- ▲ CUSUM
- - - Well upper control limit
- - - Well lower control limit

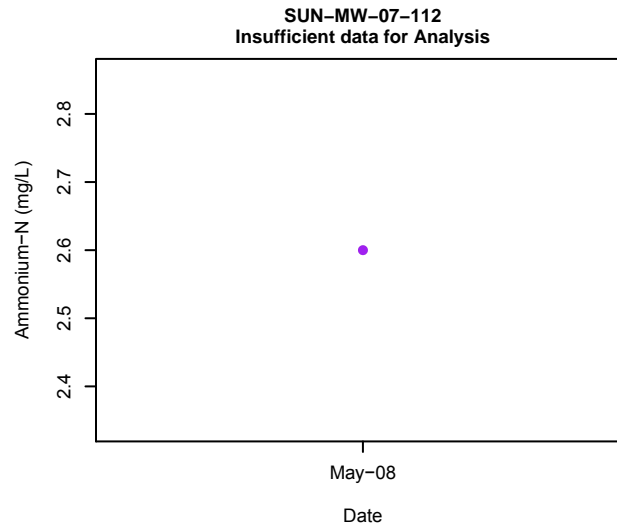
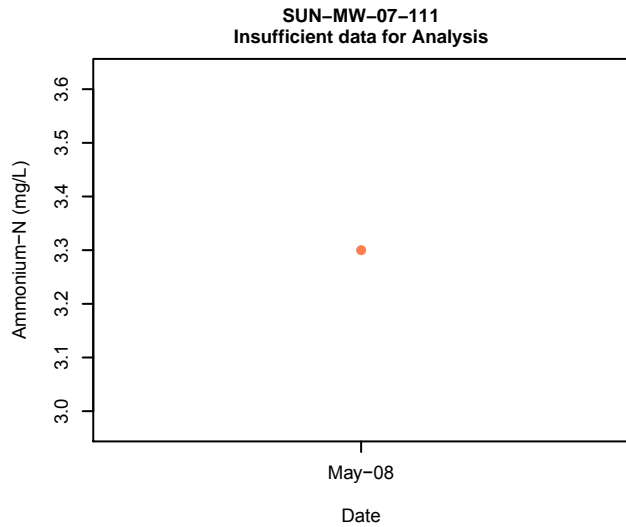
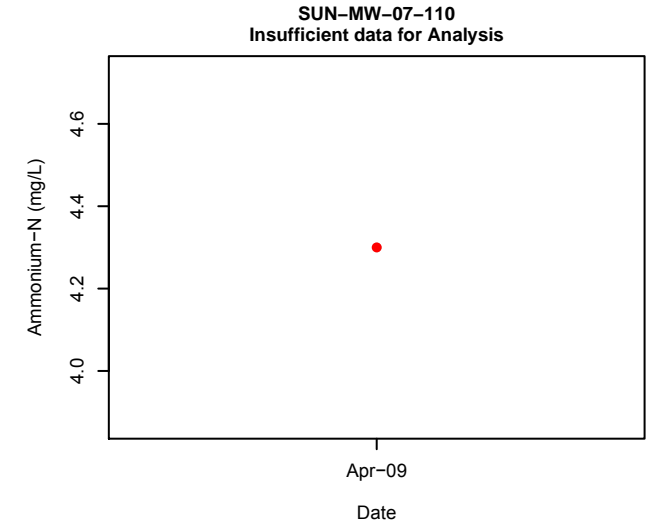
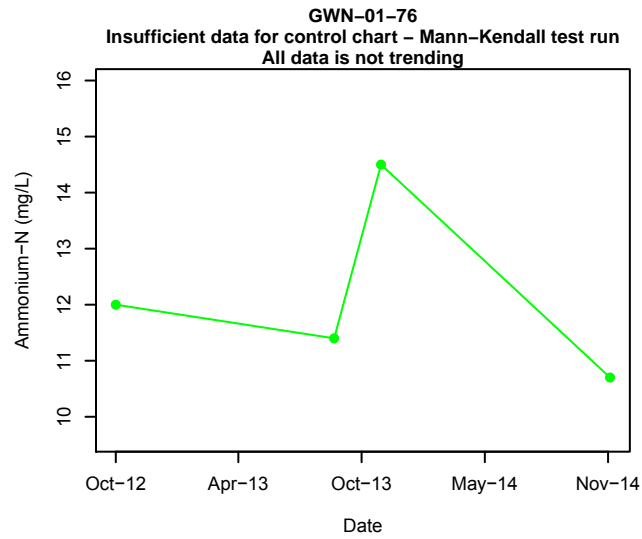
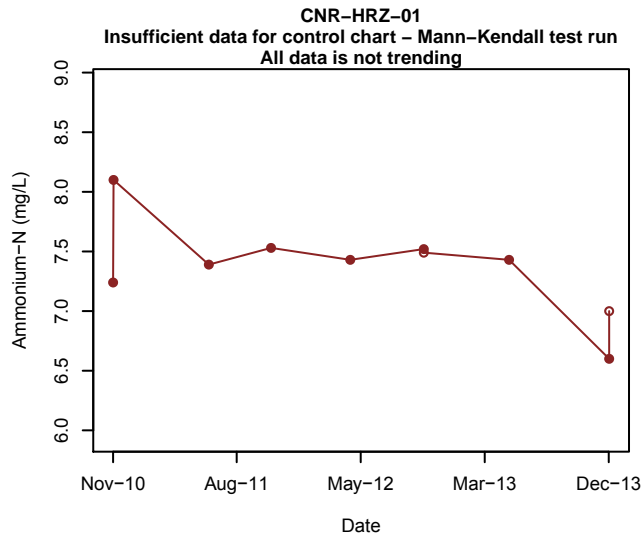
Appendix C62b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU4) Historical Ammonium-N Concentrations



Appendix C63a

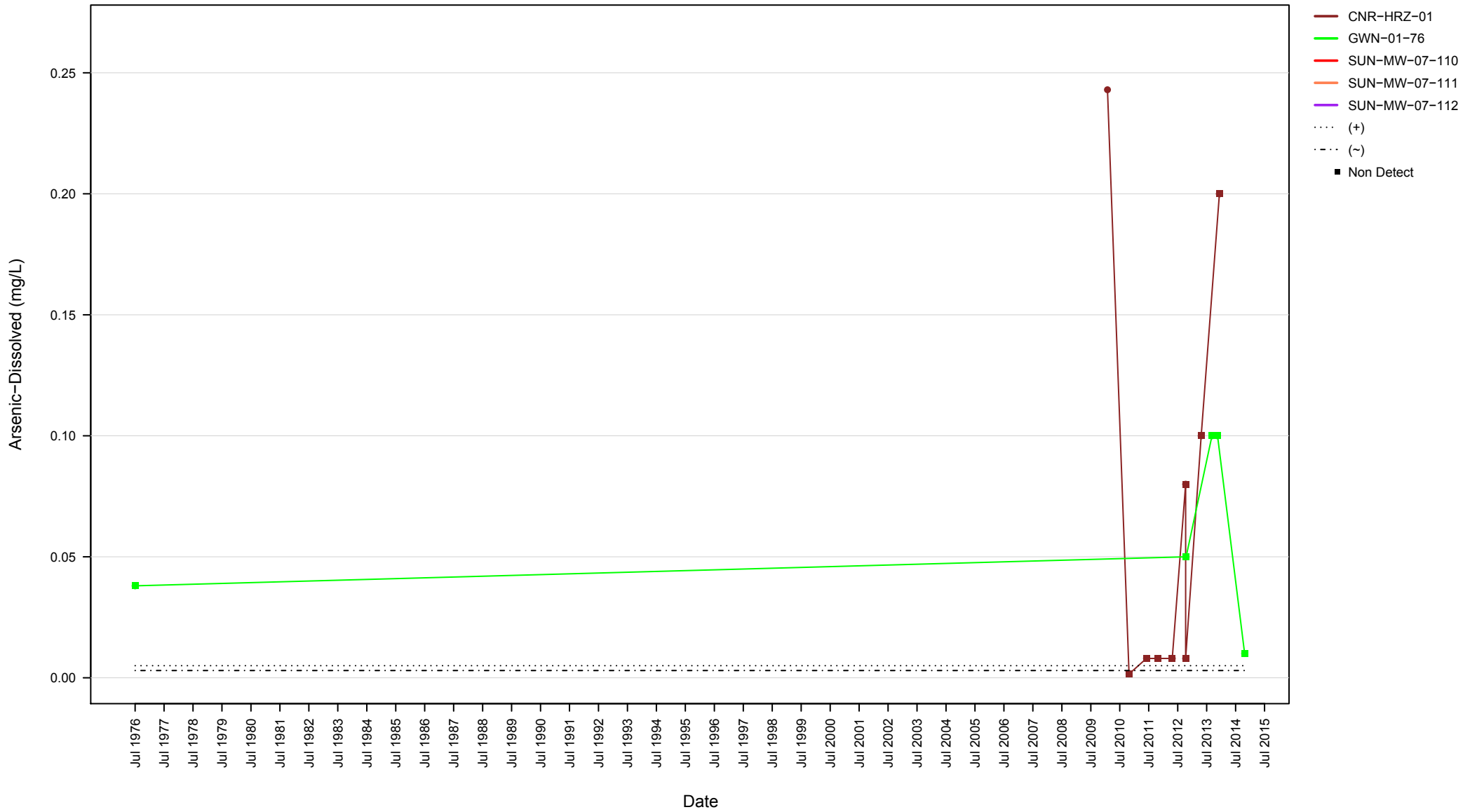
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU4) Shewhart-CUSUM Control Charts- Ammonium-N



● Ammonium-N
○ Data point not used in analysis

Appendix C63b

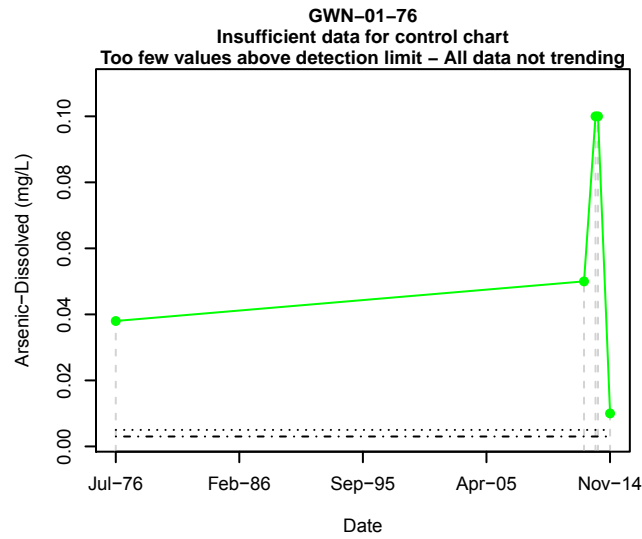
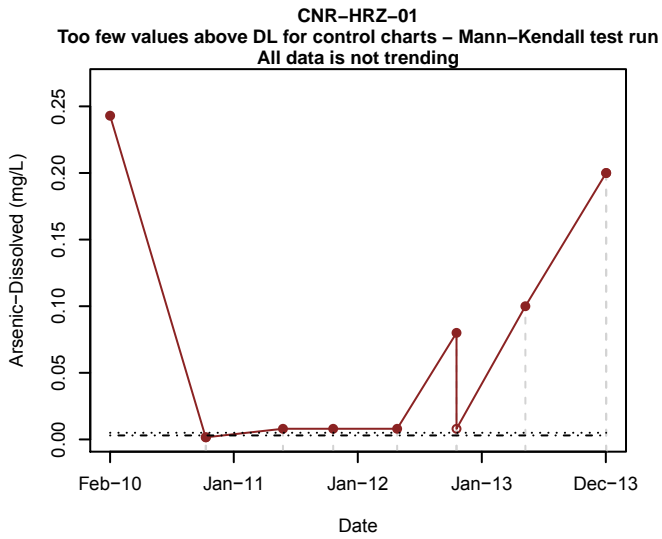
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU4) Historical Dissolved Arsenic Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 0.005 mg/L
 (-) Interim Quality Triggers for NAOS = 0.003 mg/L

Appendix C64a

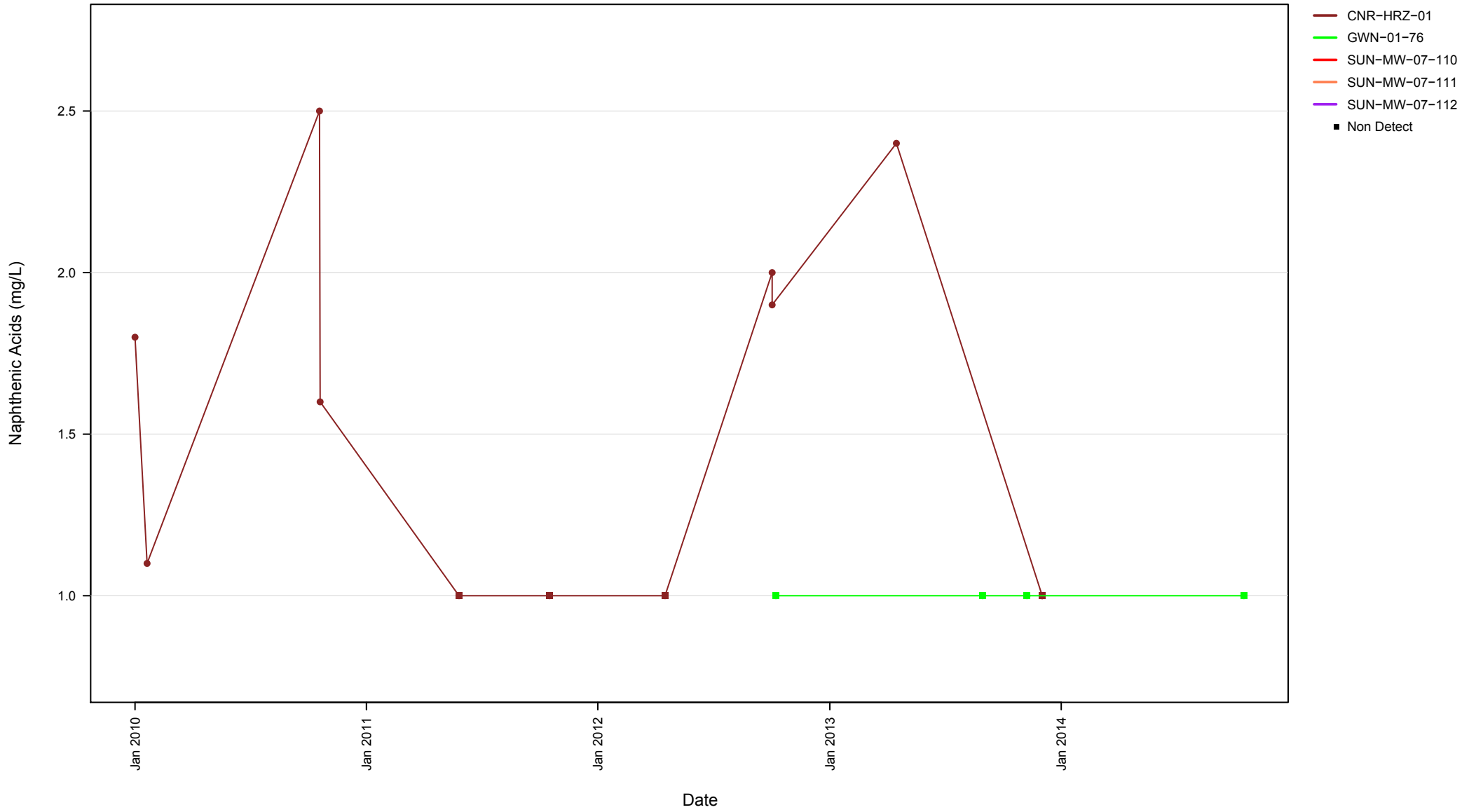
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU4) Shewhart-CUSUM Control Charts- Dissolved Arsenic



- Arsenic-Dissolved
- - - Values below detection limit
- Data point not used in analysis
- Alberta Tier 1-Natural Areas -2010 = 0.005 mg/L
- Interim Quality Triggers for NAOS = 0.003 mg/L

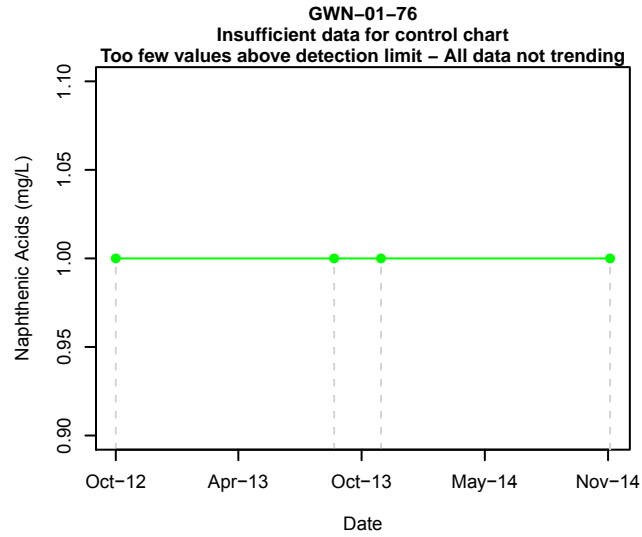
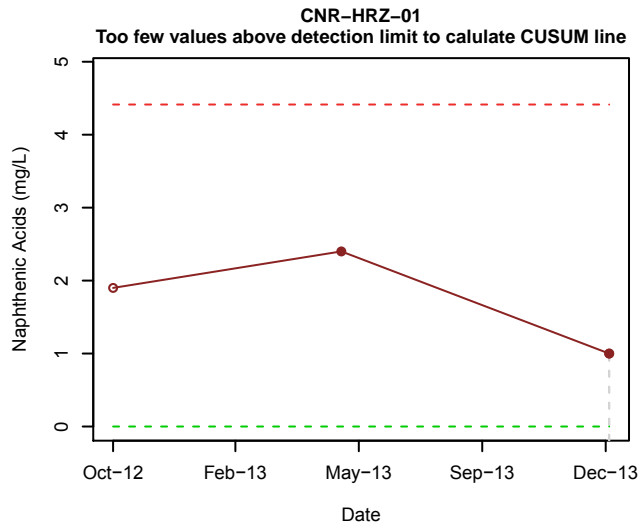
Appendix C64b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU4) Historical Naphthenic Acids Concentrations



Appendix C65a

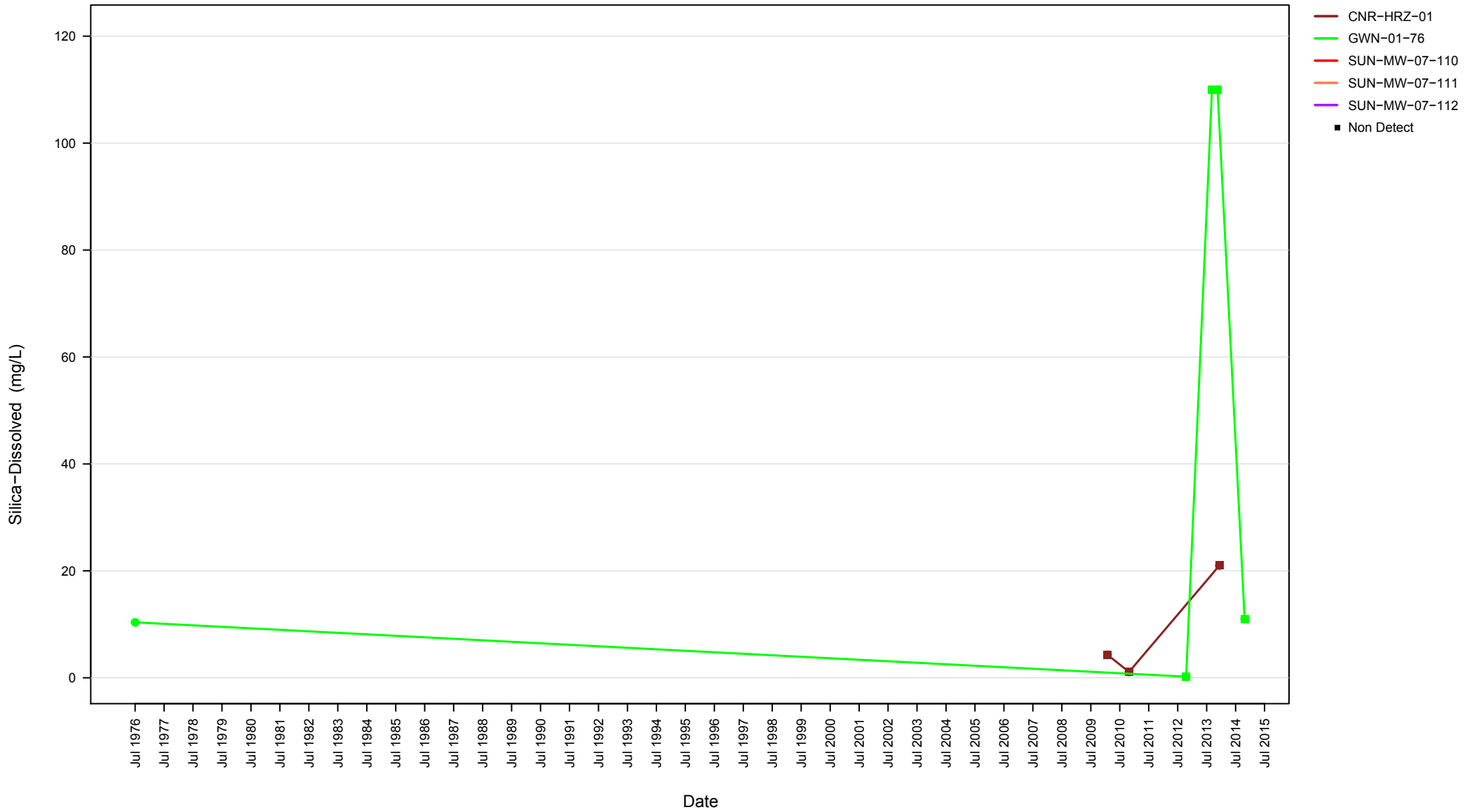
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU4) Shewhart-CUSUM Control Charts- Naphthenic Acids



- Naphthenic Acids
- - Values below detection limit
- Data point not used in analysis
- - Well upper control limit
- - Well lower control limit

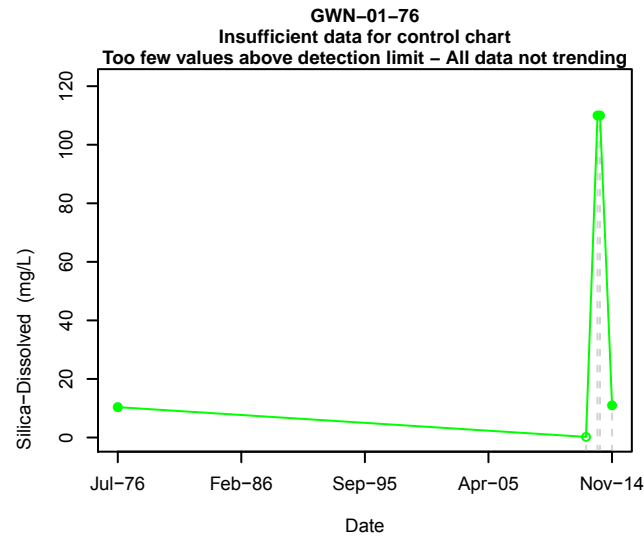
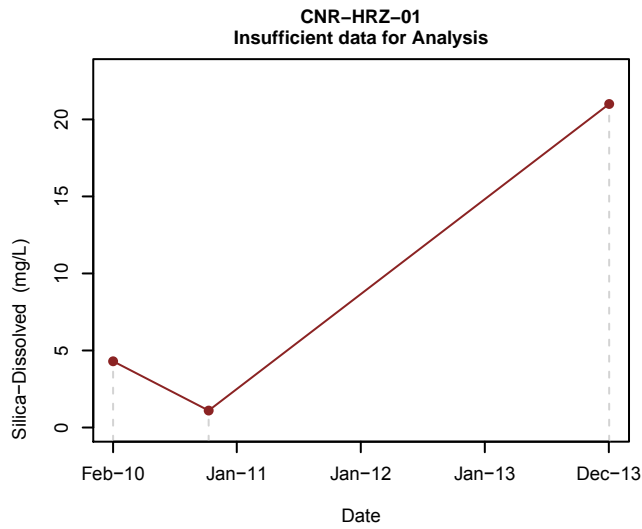
Appendix C65b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU4) Historical Dissolved Silica Concentrations



Appendix C66a

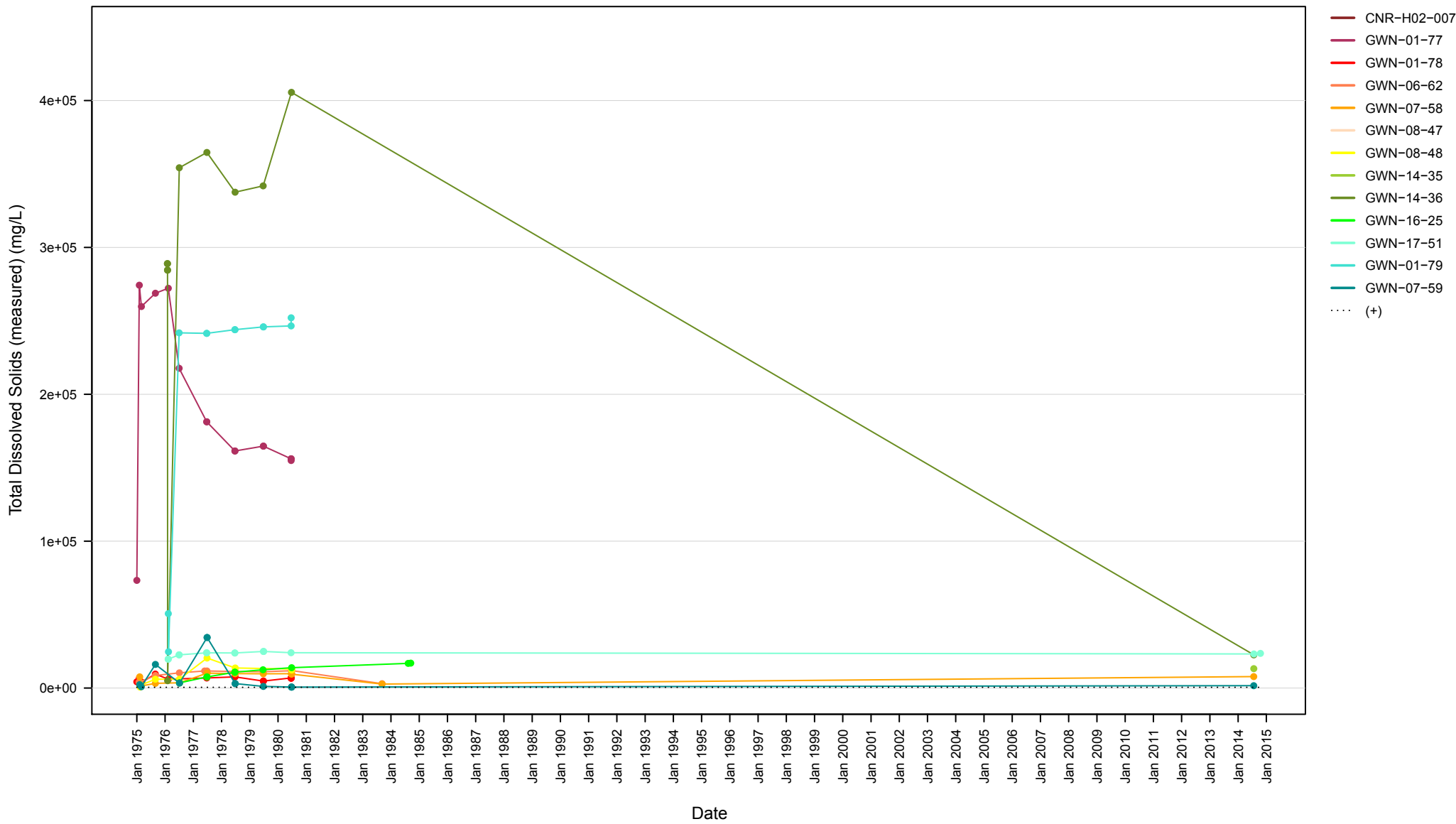
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (McMurray Formation AMU4) Shewhart-CUSUM Control Charts- Dissolved Silica



- Silica-Dissolved
- - Values below detection limit
- Data point not used in analysis

Appendix C66b

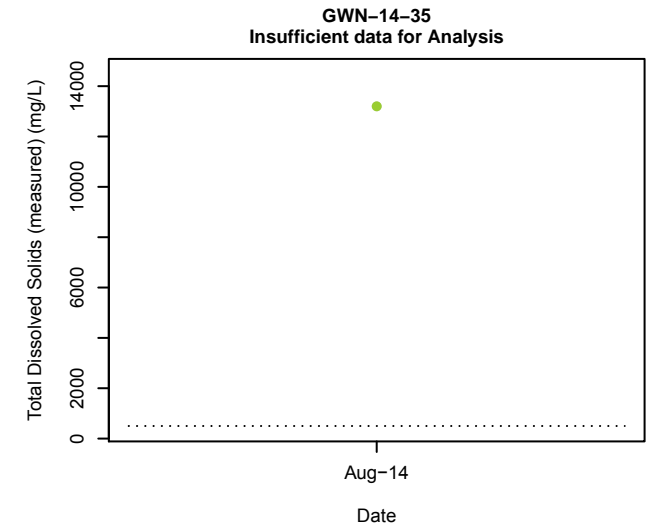
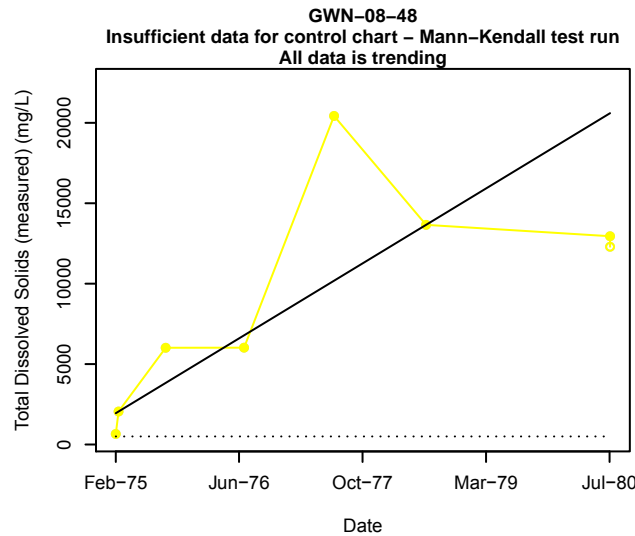
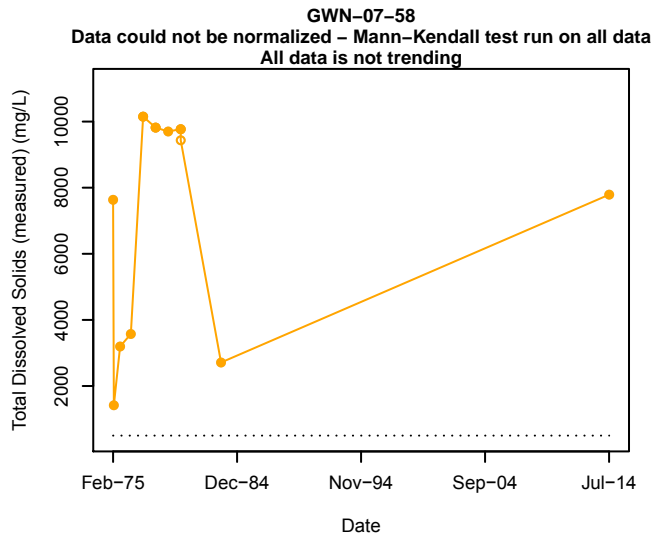
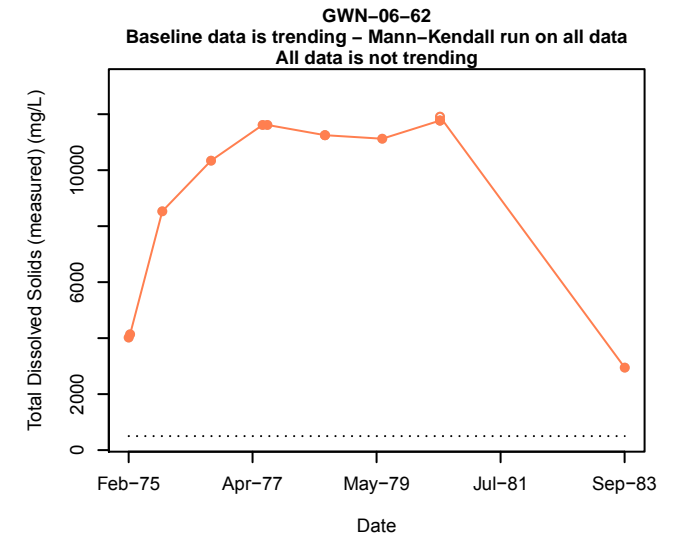
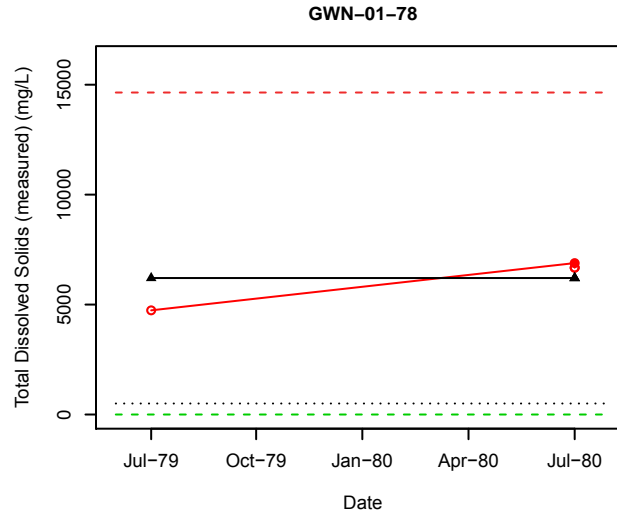
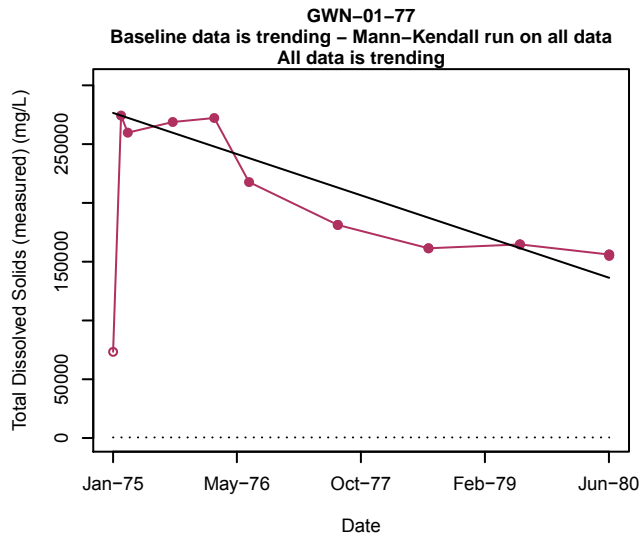
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Historical Total Dissolved Solid Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 500 mg/L

Appendix C67a

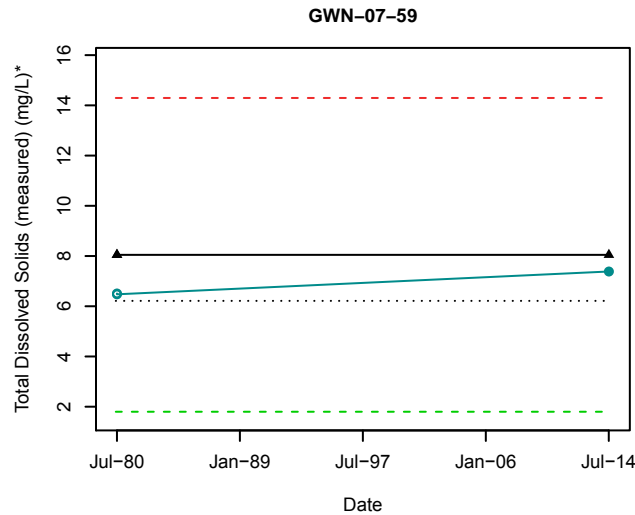
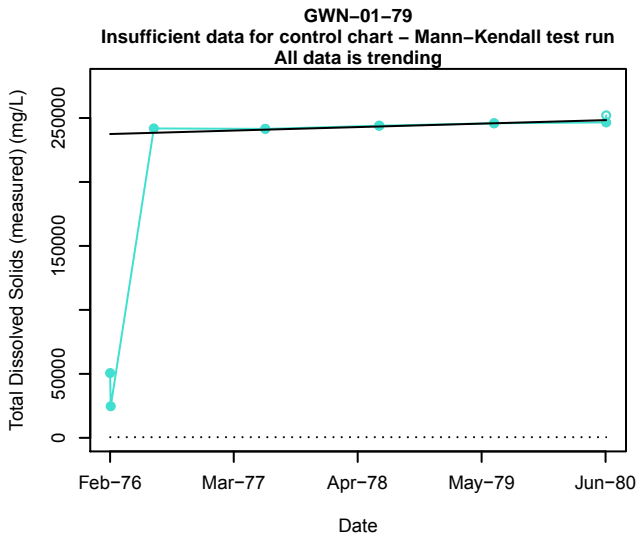
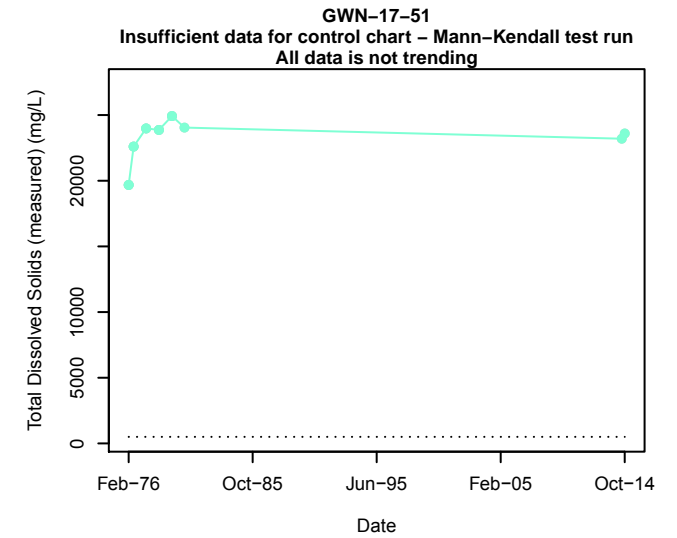
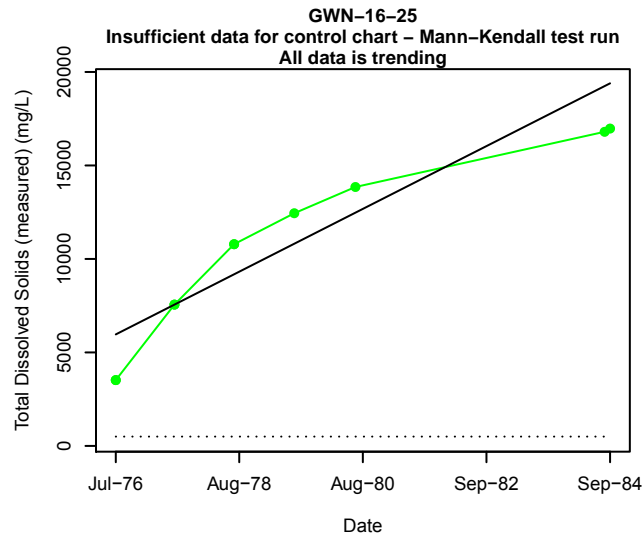
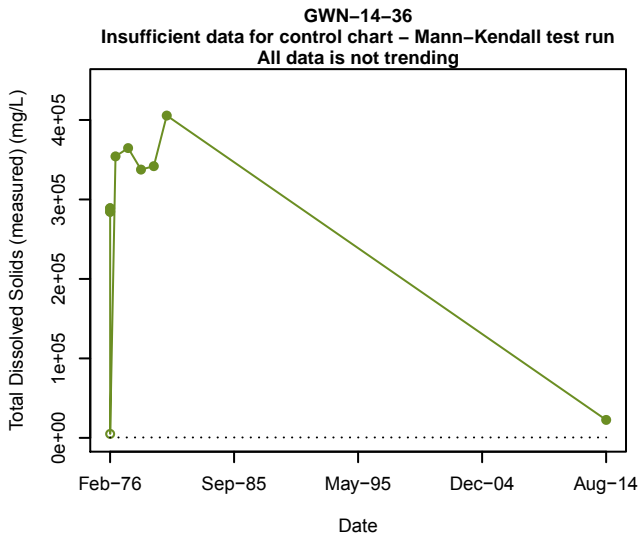
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Shewhart-CUSUM Control Charts- Total Dissolved Solids



- Total Dissolved Solids (measured)
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 500 mg/L
- ▲ CUSUM
- - - Well upper control limit
- - - Well lower control limit

Appendix C67b

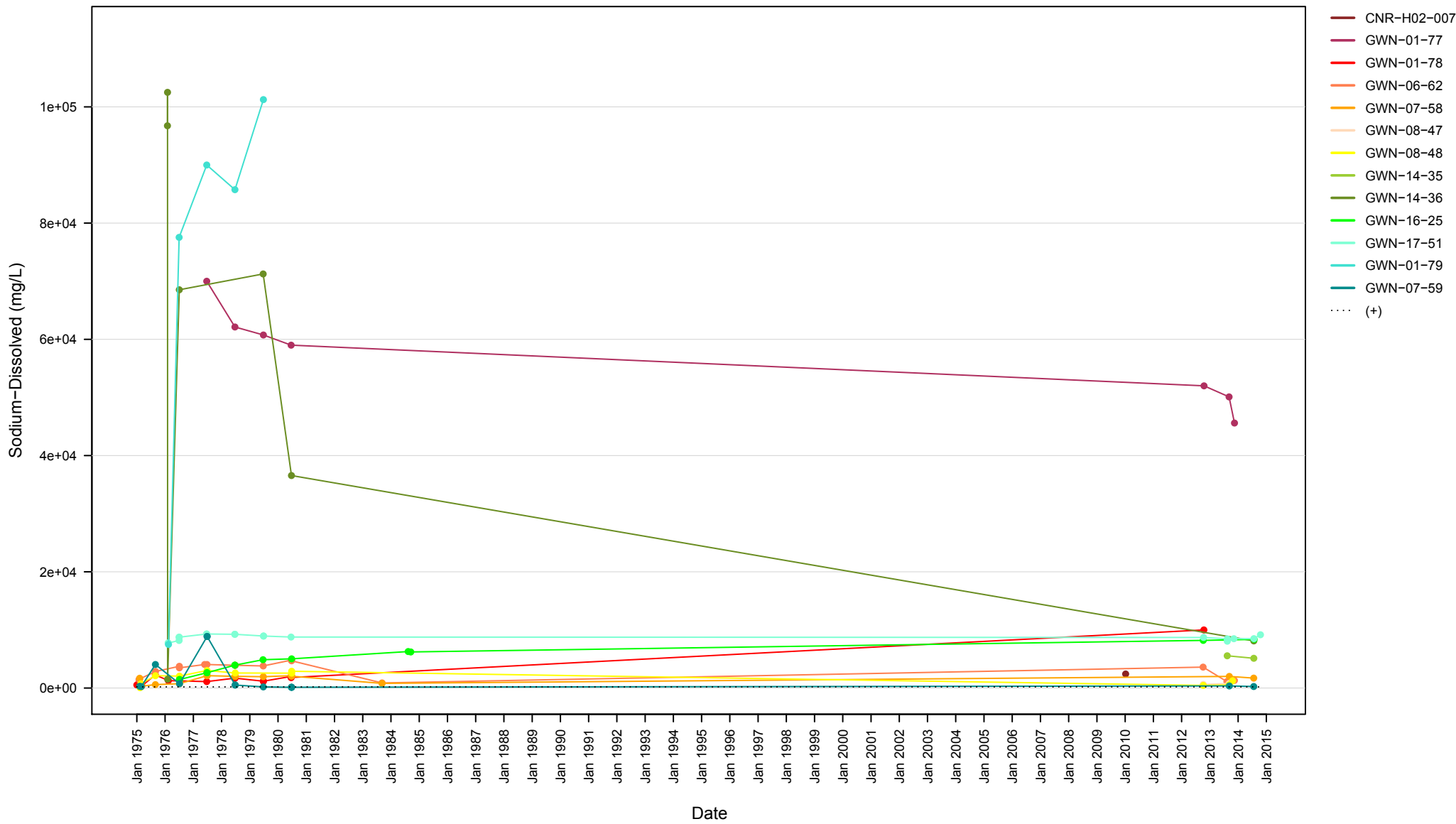
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Shewhart-CUSUM Control Charts- Total Dissolved Solids



- Total Dissolved Solids (measured)
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 500 mg/L
- ▲ CUSUM
- * Data transformed for normality
- - - Well upper control limit
- - - Well lower control limit

Appendix C67b

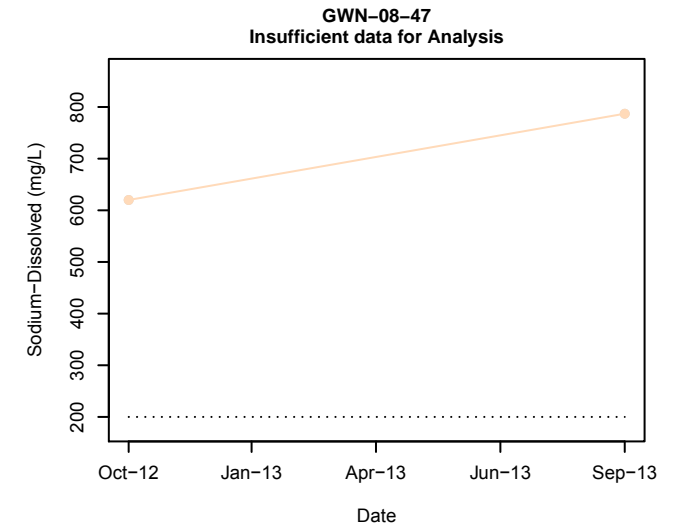
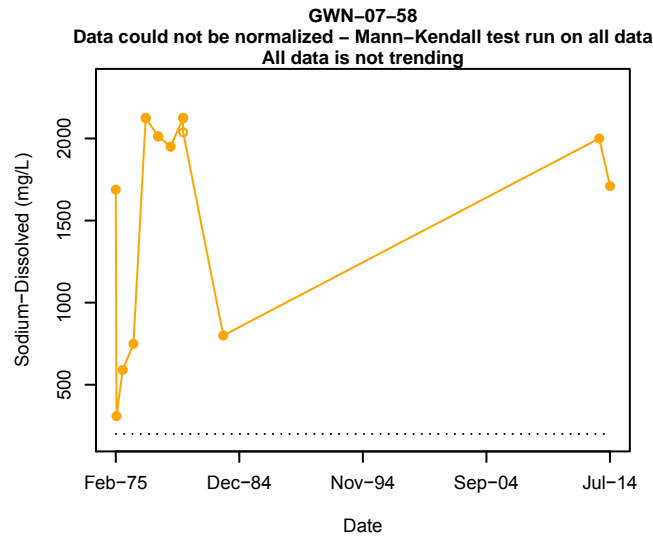
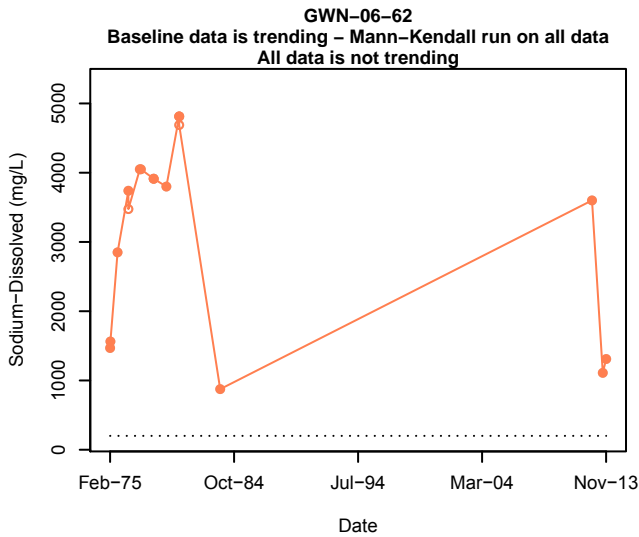
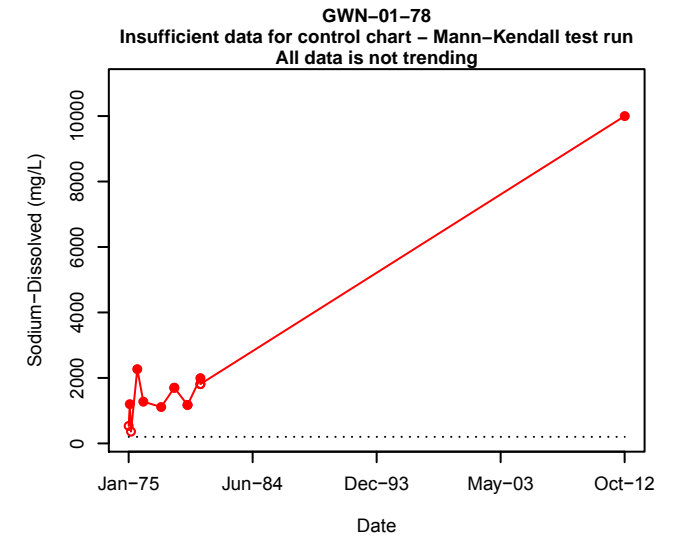
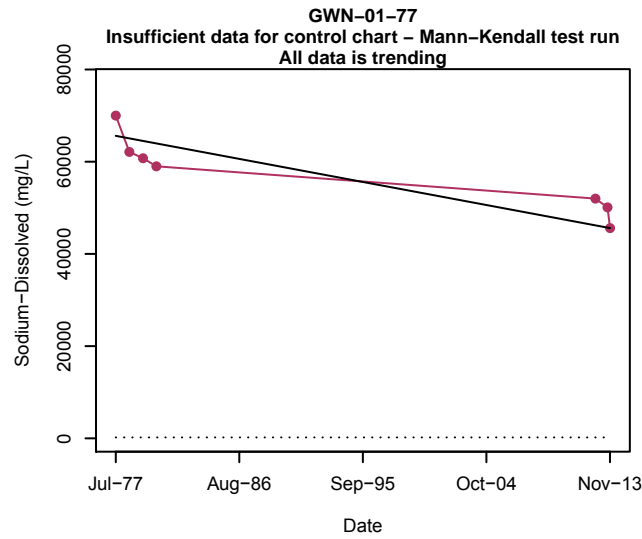
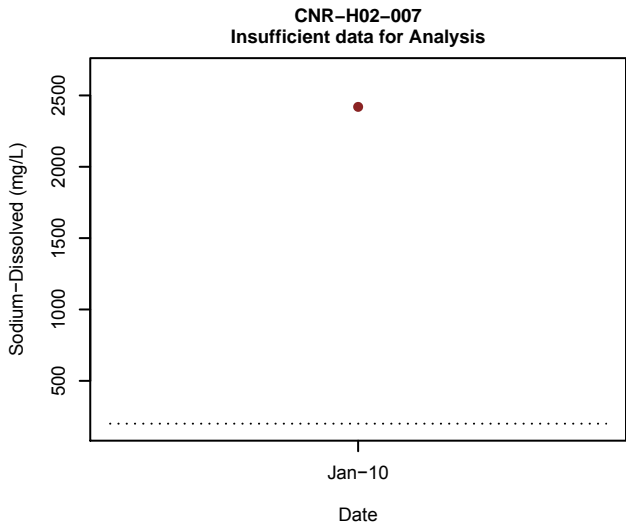
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Historical Dissolved Sodium Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 200 mg/L

Appendix C68a

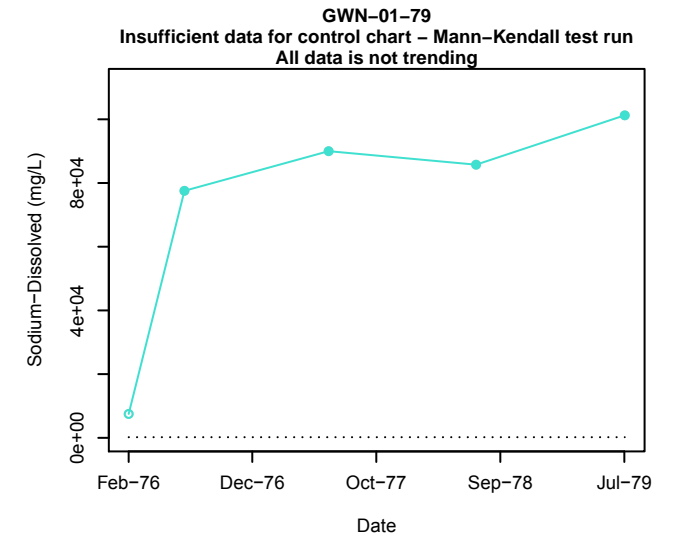
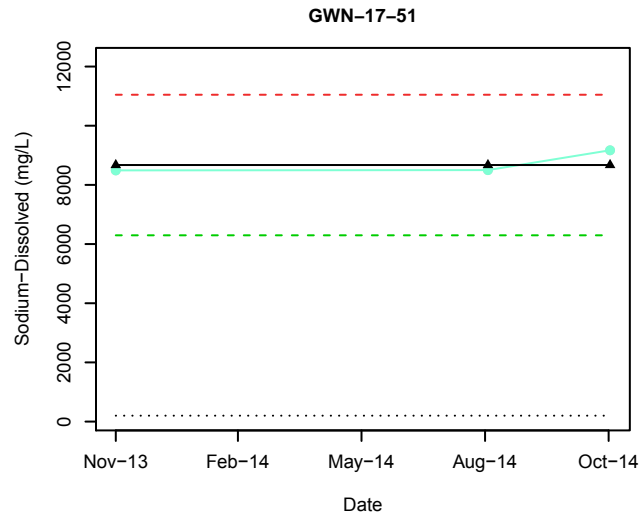
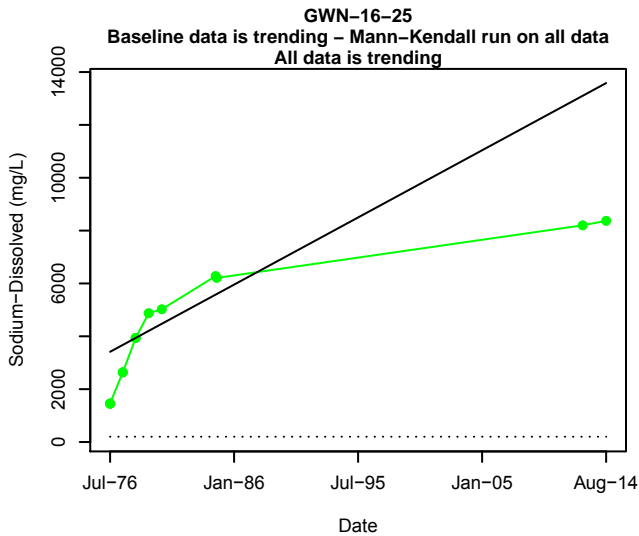
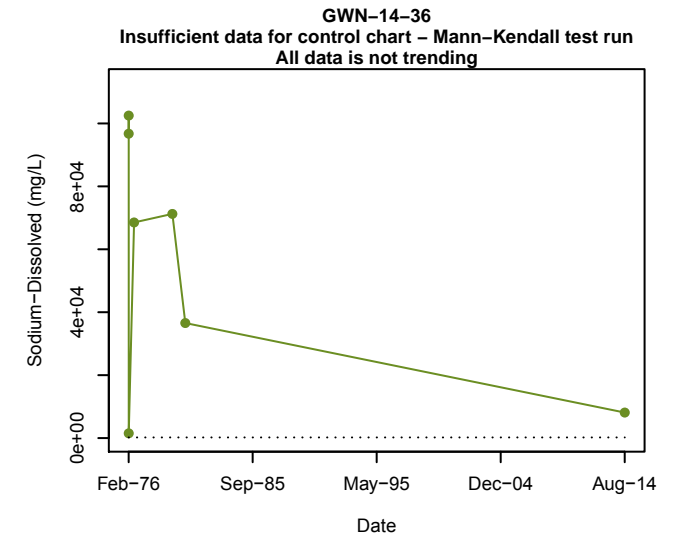
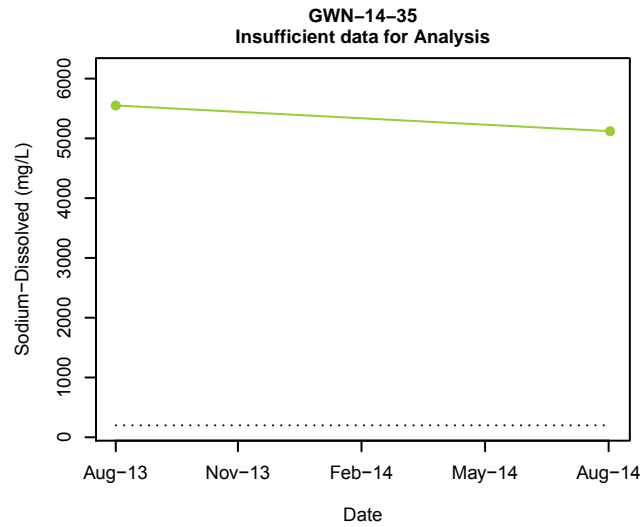
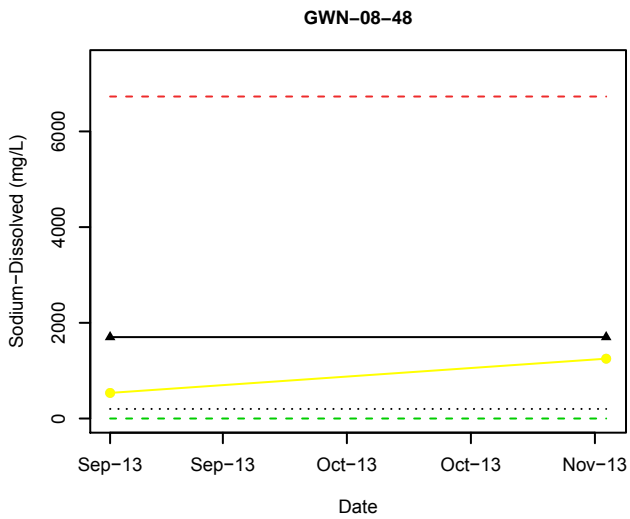
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Shewhart-CUSUM Control Charts- Dissolved Sodium



- Sodium-Dissolved
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 200 mg/L

Appendix C68b

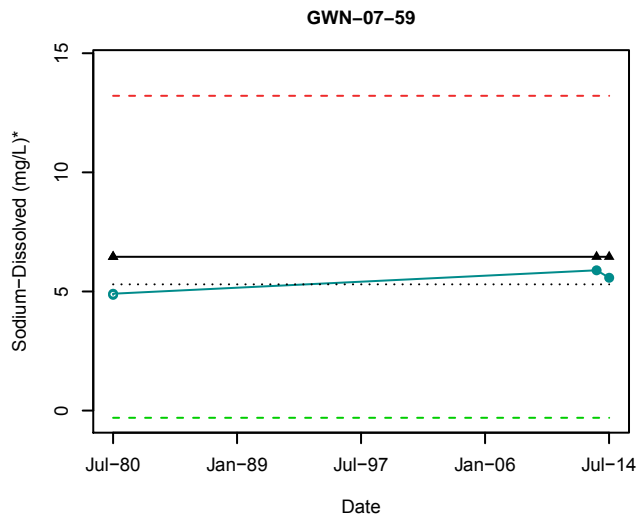
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Shewhart-CUSUM Control Charts- Dissolved Sodium



- Sodium-Dissolved
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 200 mg/L
- ▲ CUSUM
- - - Well upper control limit
- - - Well lower control limit

Appendix C68b

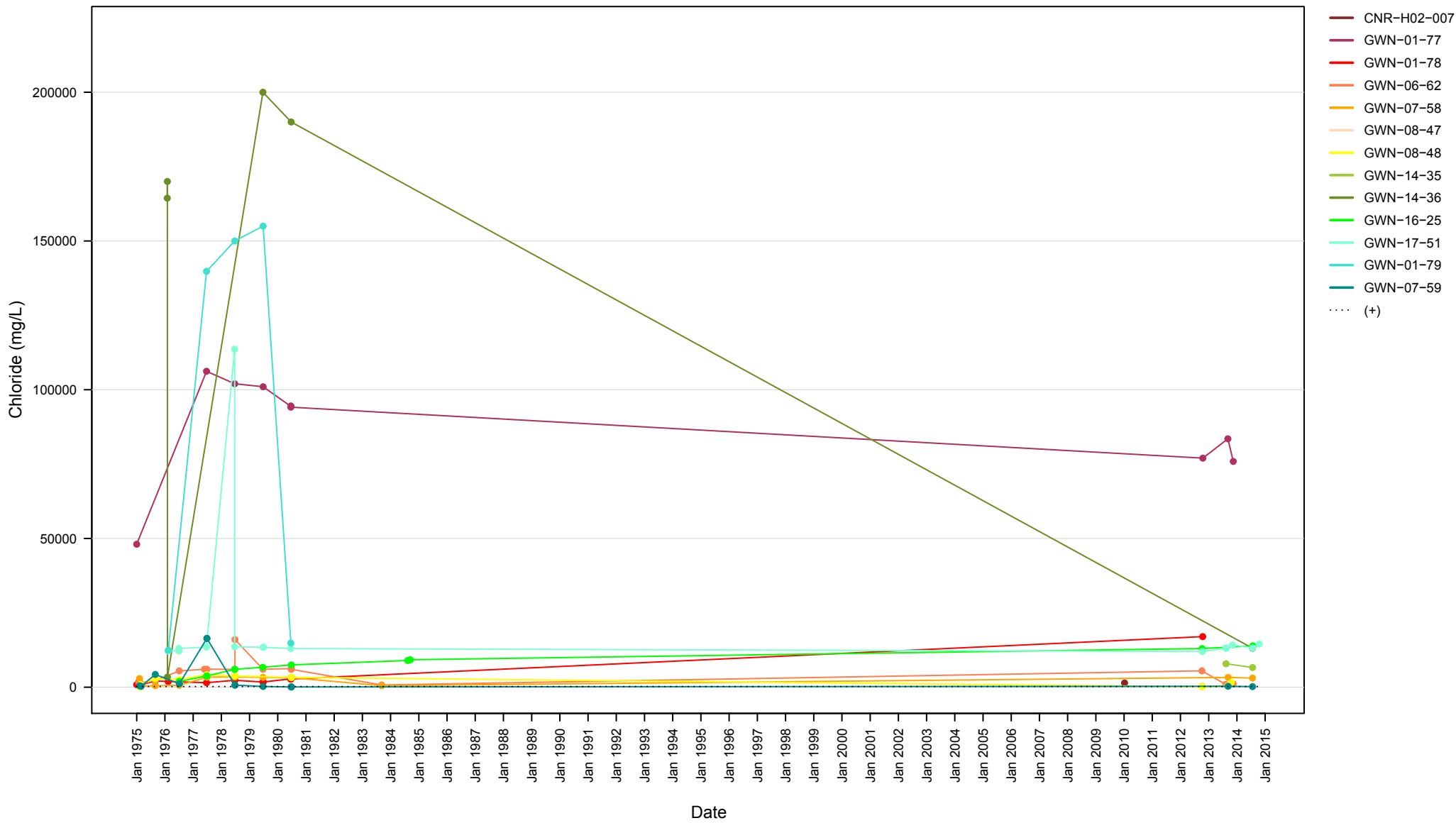
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Shewhart-CUSUM Control Charts- Dissolved Sodium



- Sodium-Dissolved
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 200 mg/L
- ▲ CUSUM
- * Data transformed for normality
- - Well upper control limit
- - Well lower control limit

Appendix C68b

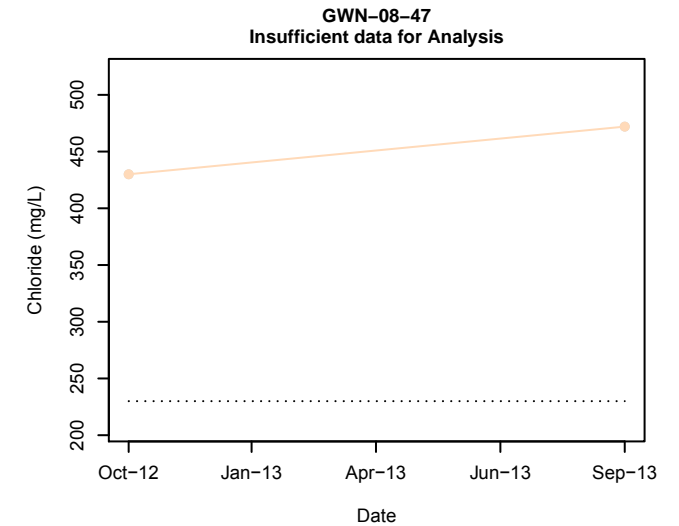
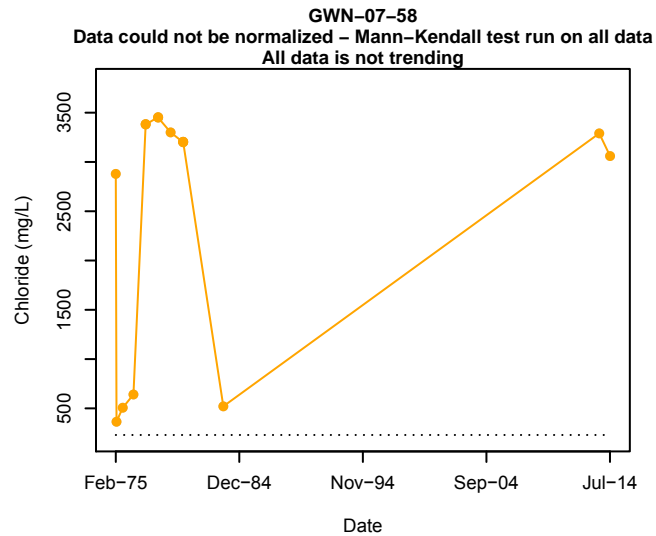
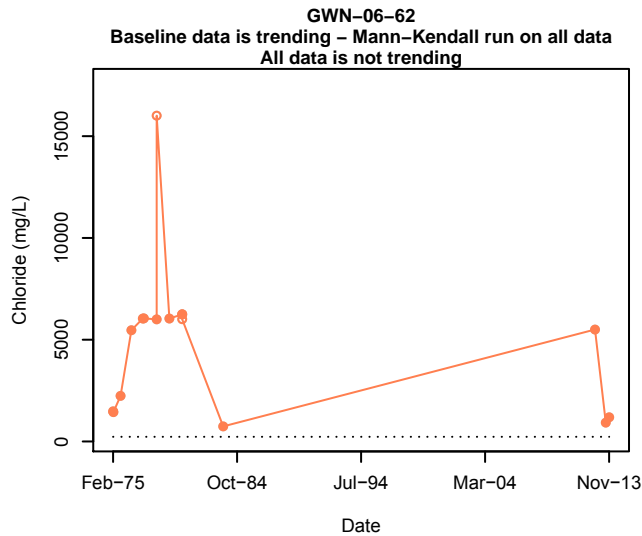
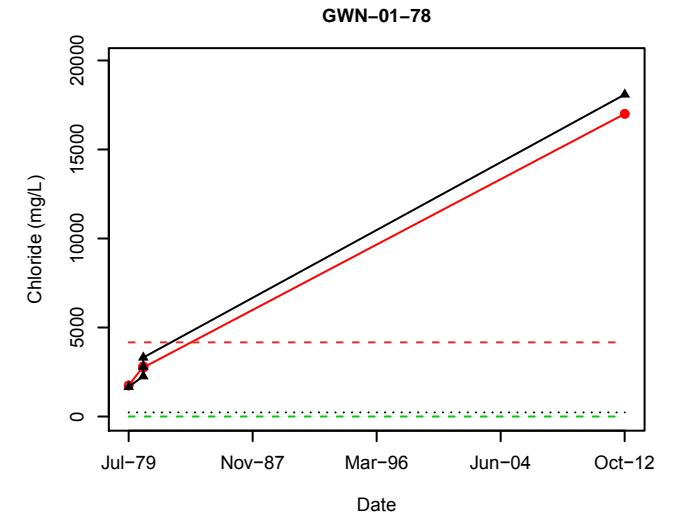
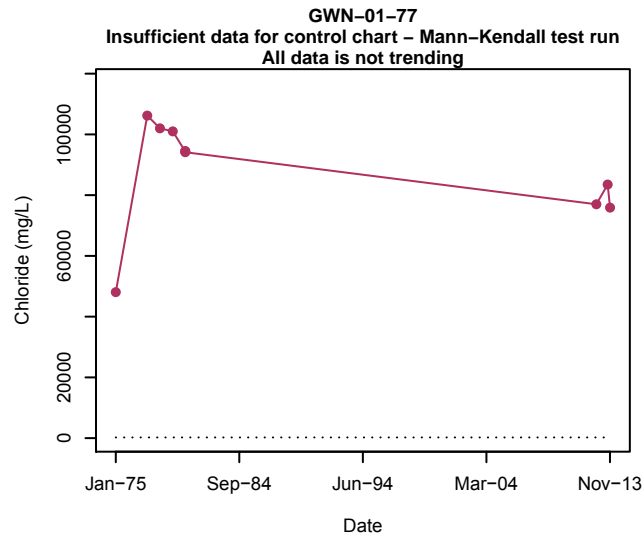
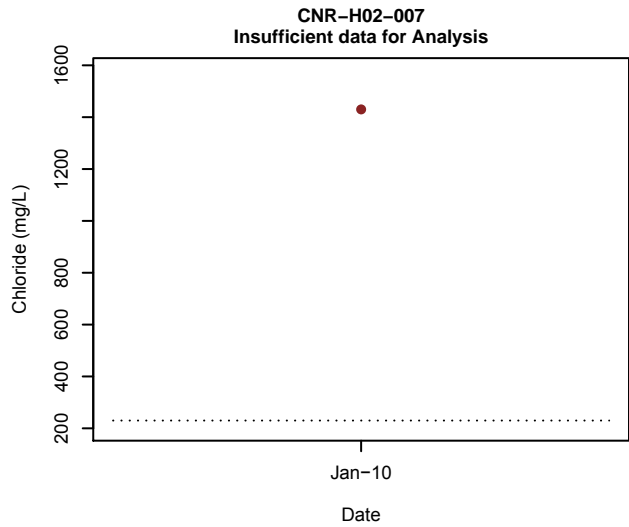
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Historical Dissolved Chloride Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 230 mg/L

Appendix C69a

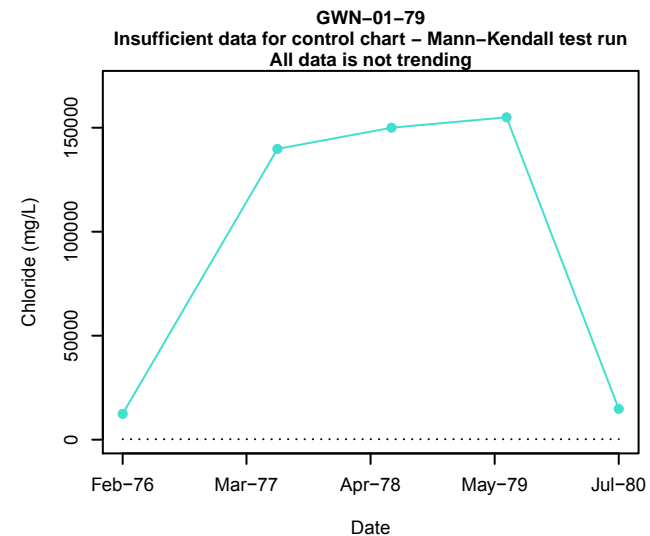
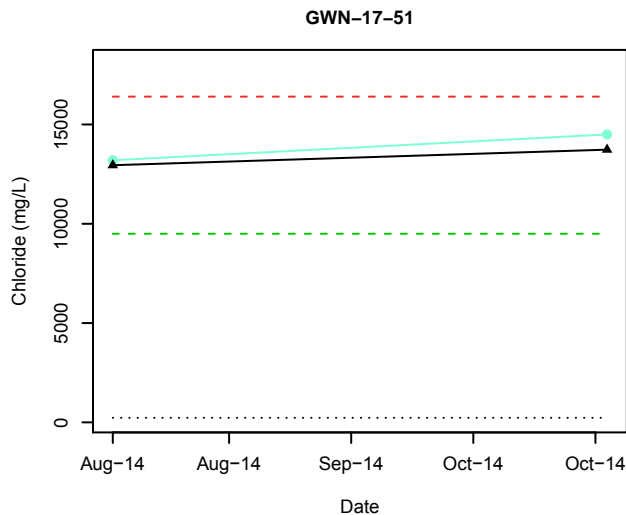
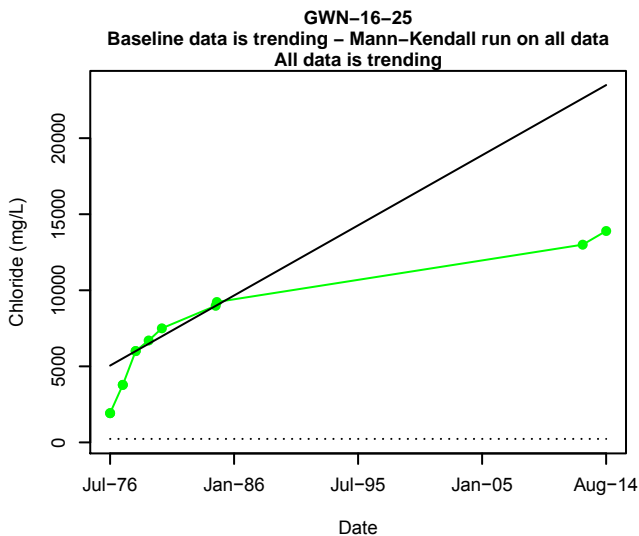
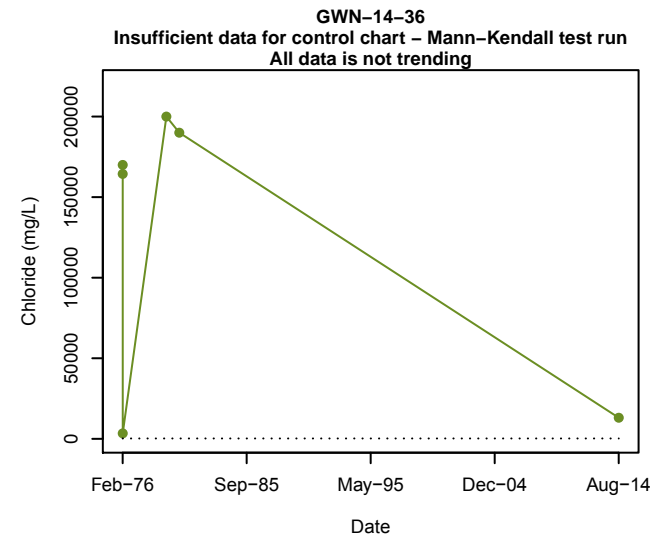
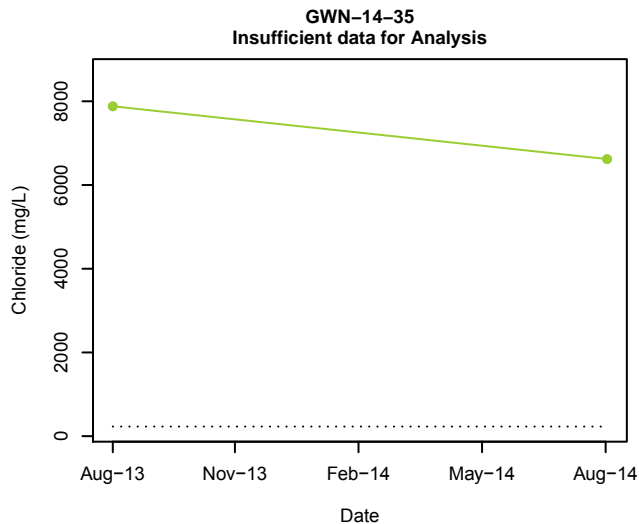
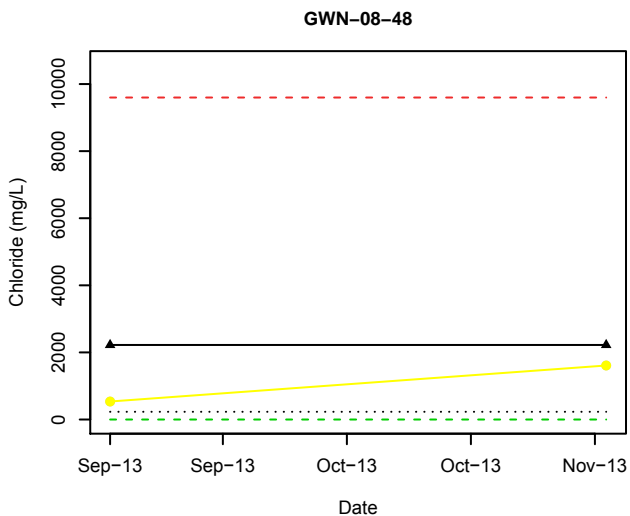
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Shewhart-CUSUM Control Charts- Dissolved Chloride



Chloride
 Data point not used in analysis
 Alberta Tier 1-Natural Areas -2010 = 230 mg/L
 CUSUM
 Well upper control limit
 Well lower control limit

Appendix C69b

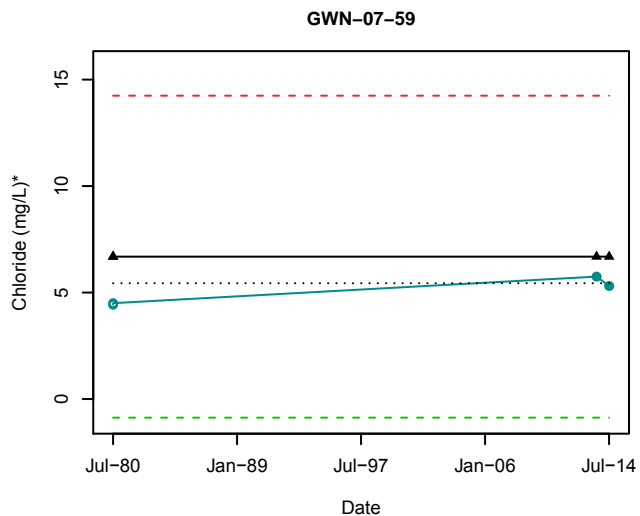
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Shewhart-CUSUM Control Charts- Dissolved Chloride



- Chloride
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 230 mg/L
- ▲ CUSUM
- - - Well upper control limit
- - - Well lower control limit

Appendix C69b

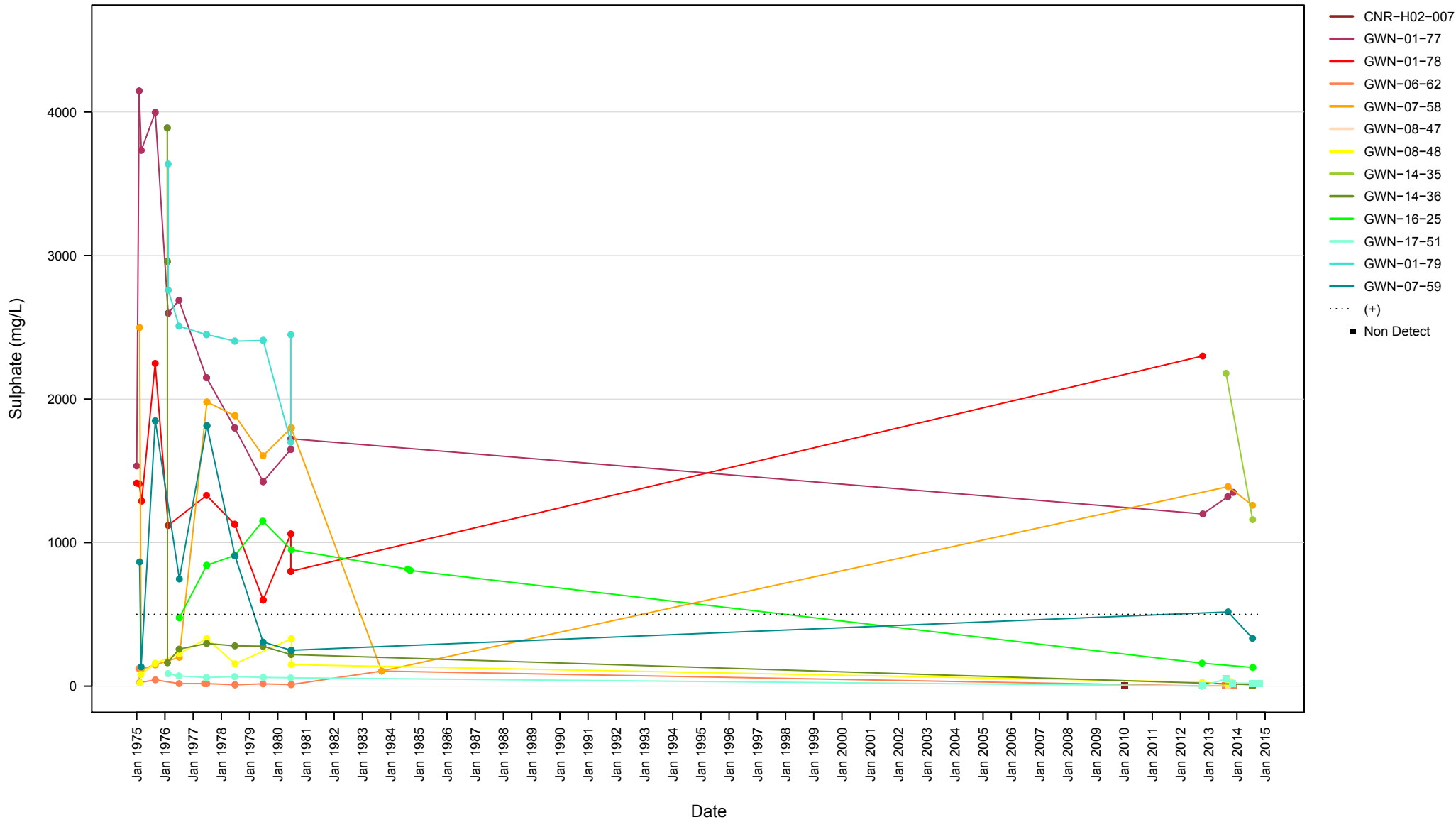
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Shewhart-CUSUM Control Charts- Dissolved Chloride



- Chloride
- Sen slope
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 230 mg/L
- ▲ CUSUM
- * Data transformed for normality
- - - Well upper control limit
- - - Well lower control limit

Appendix C69b

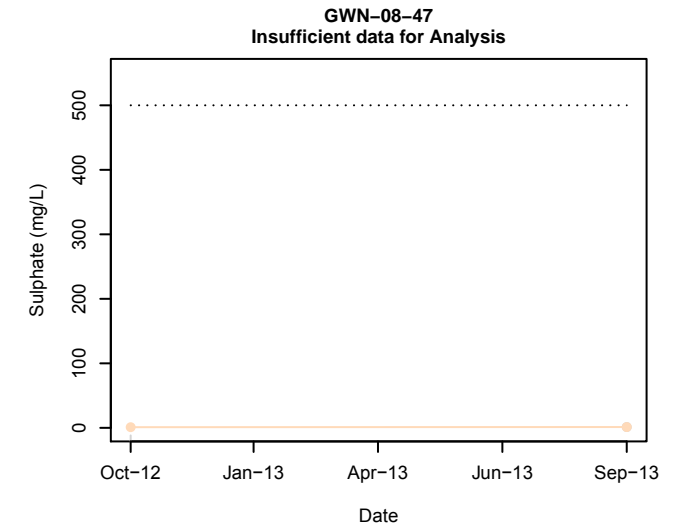
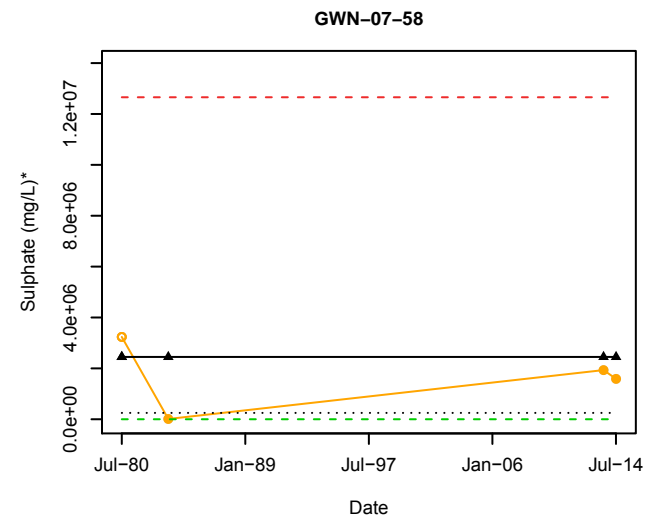
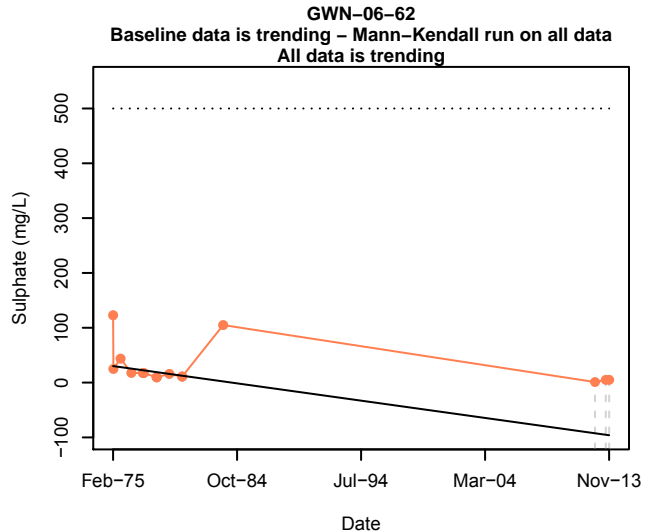
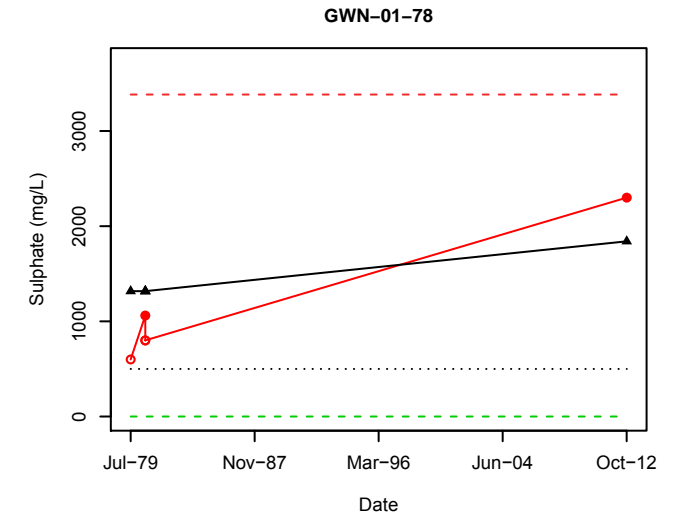
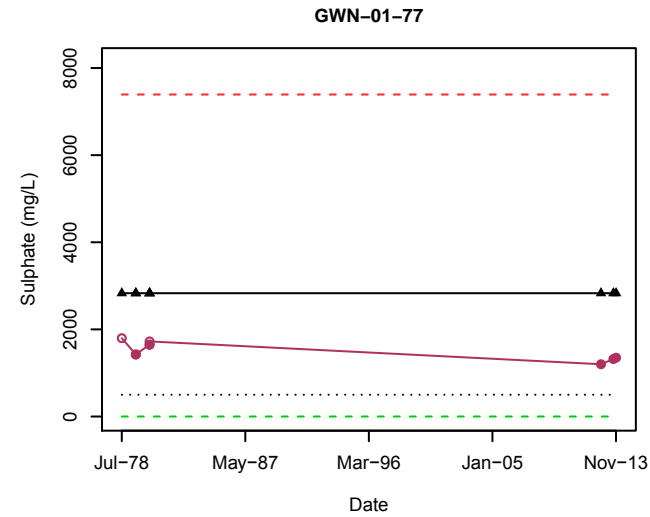
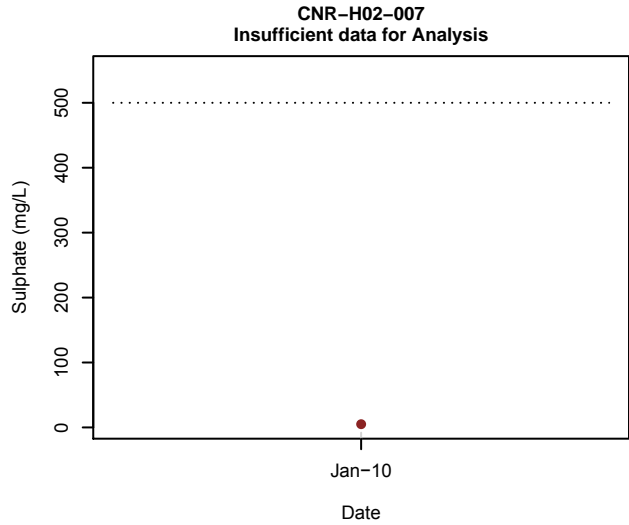
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Historical Dissolved Sulphate Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 500 mg/L

Appendix C70a

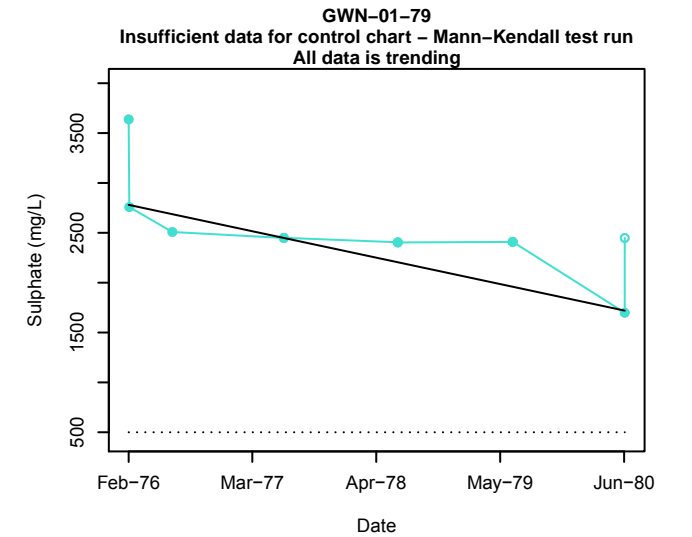
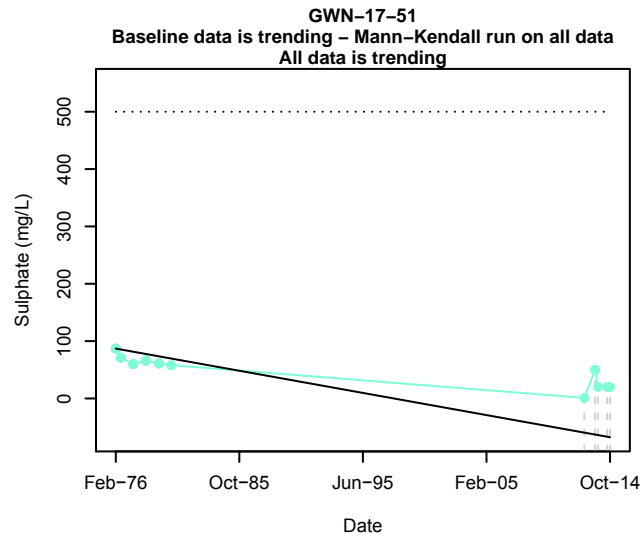
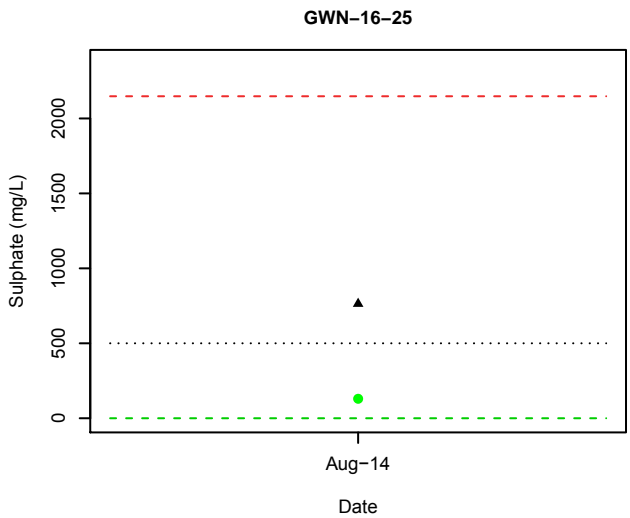
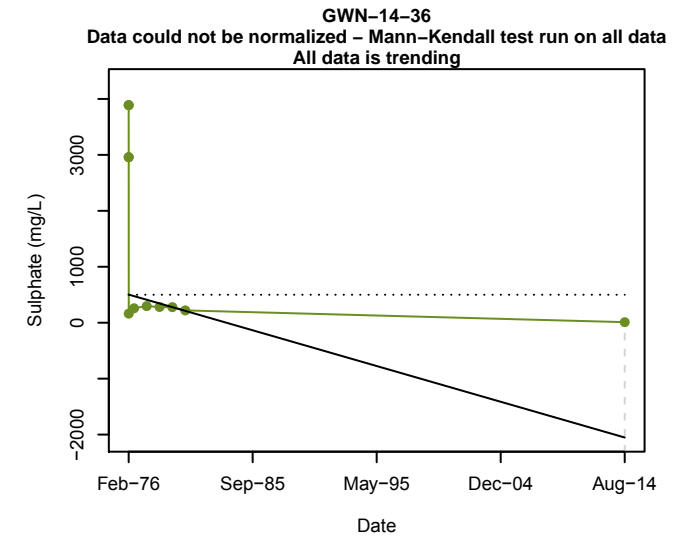
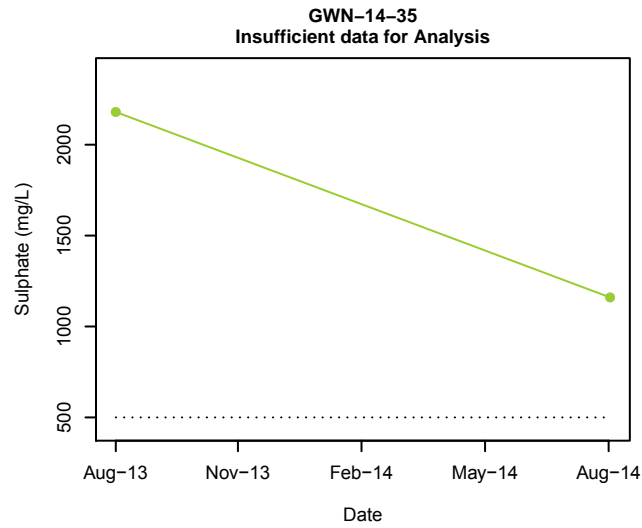
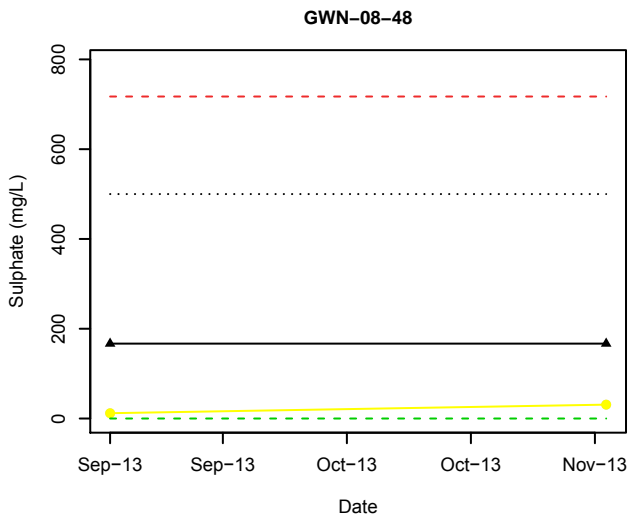
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Shewhart-CUSUM Control Charts- Dissolved Sulphate



- Sulphate
- Data point not used in analysis
- Values below detection limit
- Sen slope
- ▲ CUSUM
- * Data transformed for normality
- Well upper control limit
- Well lower control limit
- ⋯ Alberta Tier 1-Natural Areas -2010 = 500 mg/L

Appendix C70b

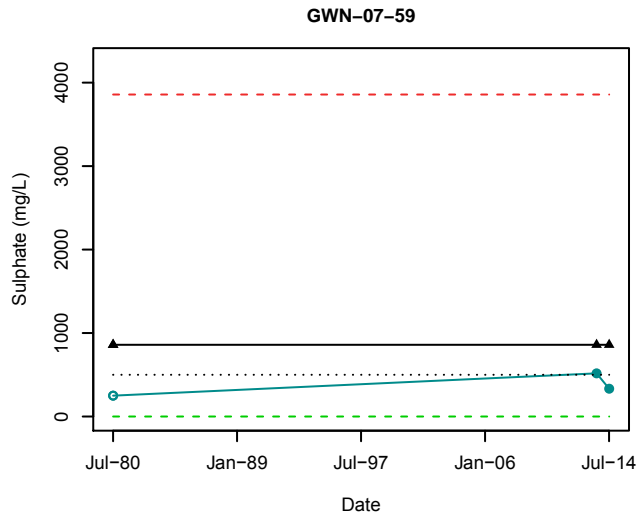
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Shewhart-CUSUM Control Charts- Dissolved Sulphate



- Sulphate
- Data point not used in analysis
- ▲ CUSUM
- * Data transformed for normality
- Values below detection limit
- Sen slope
- Well upper control limit
- Well lower control limit
- ⋯ Alberta Tier 1-Natural Areas -2010 = 500 mg/L

Appendix C70b

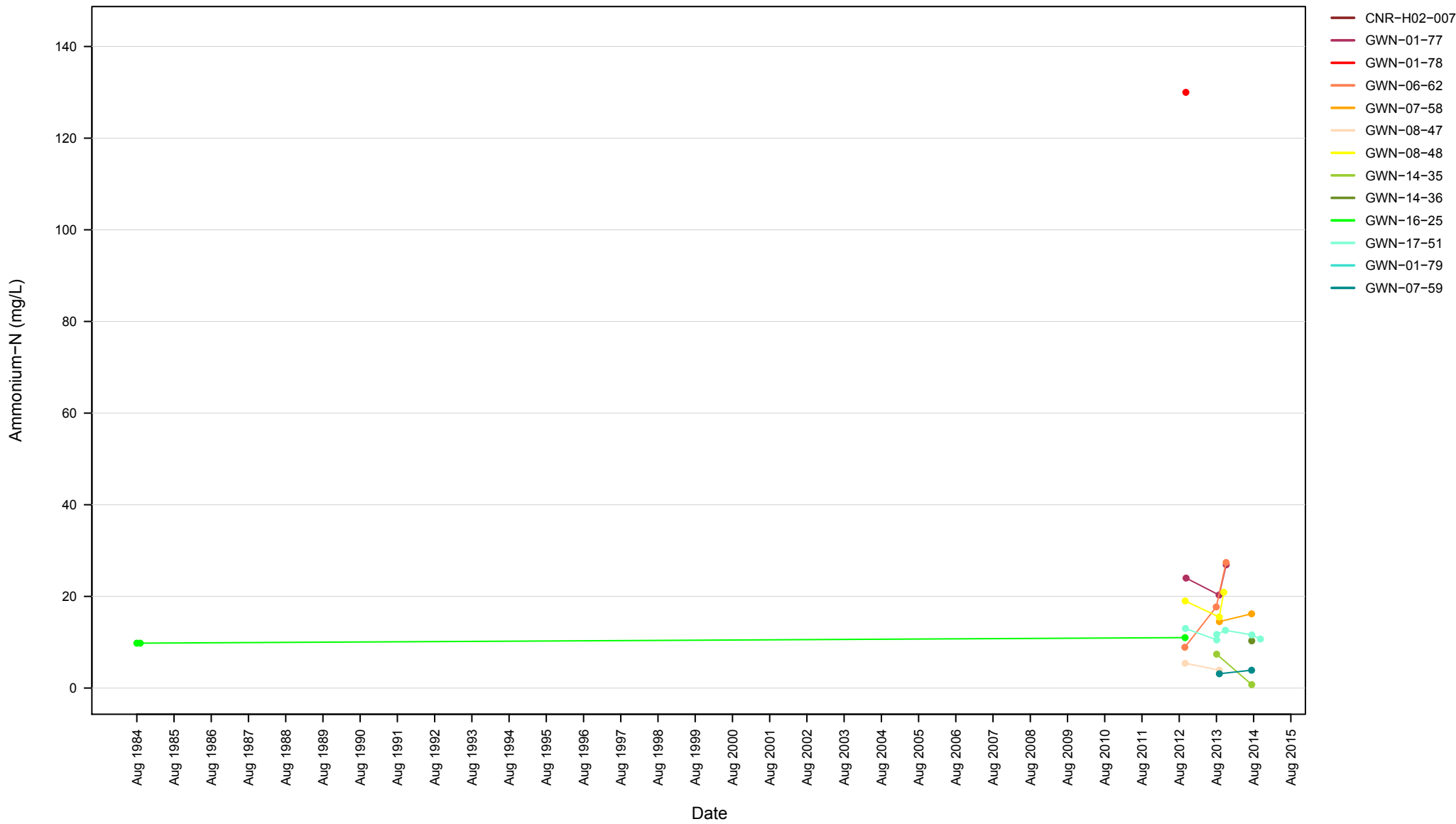
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Shewhart-CUSUM Control Charts- Dissolved Sulphate



- Sulphate
- Values below detection limit
- Sen slope
- Data point not used in analysis
- Alberta Tier 1-Natural Areas -2010 = 500 mg/L
- ▲ CUSUM
- * Data transformed for normality
- - - Well upper control limit
- - - Well lower control limit

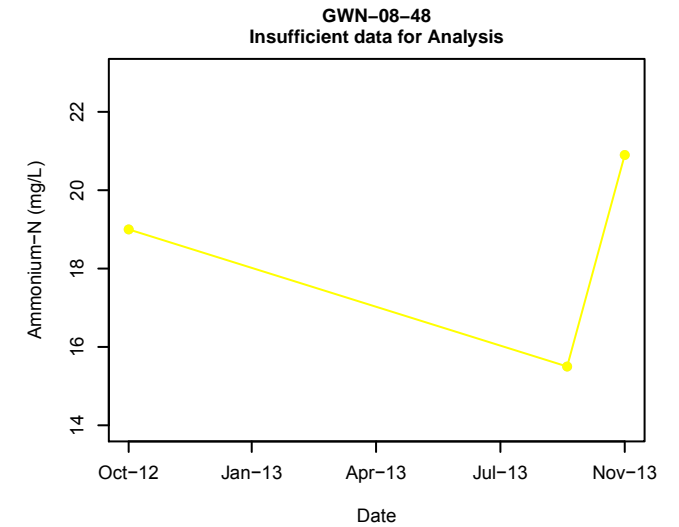
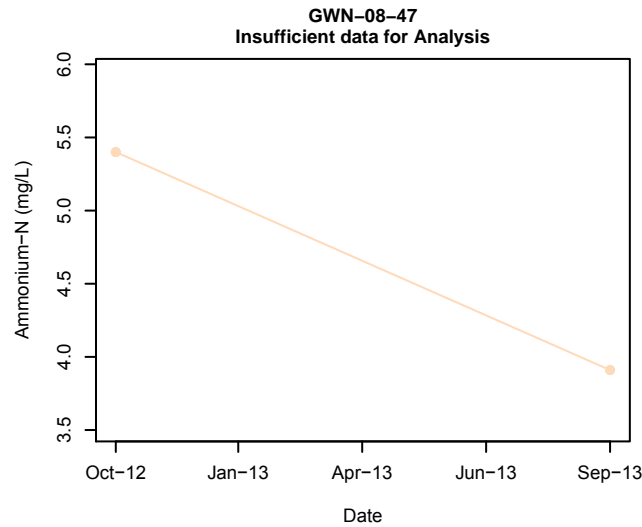
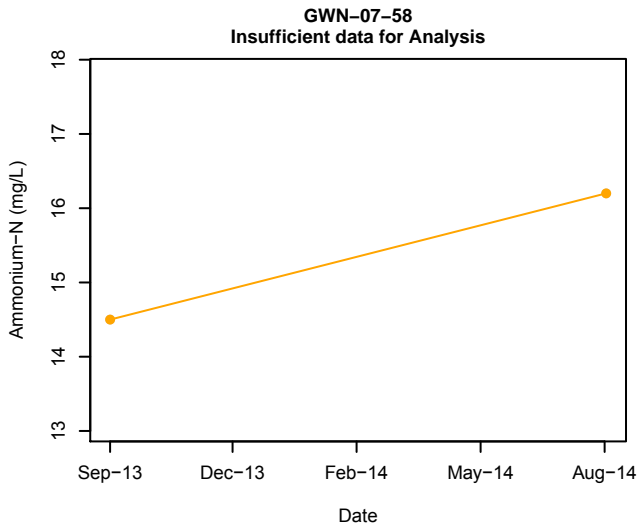
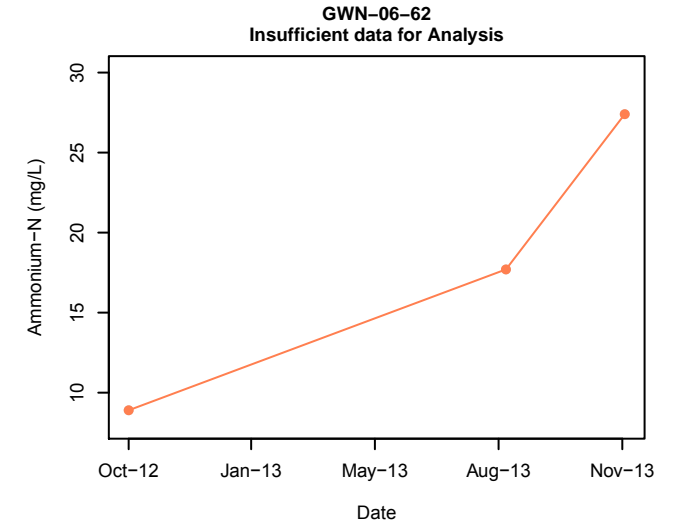
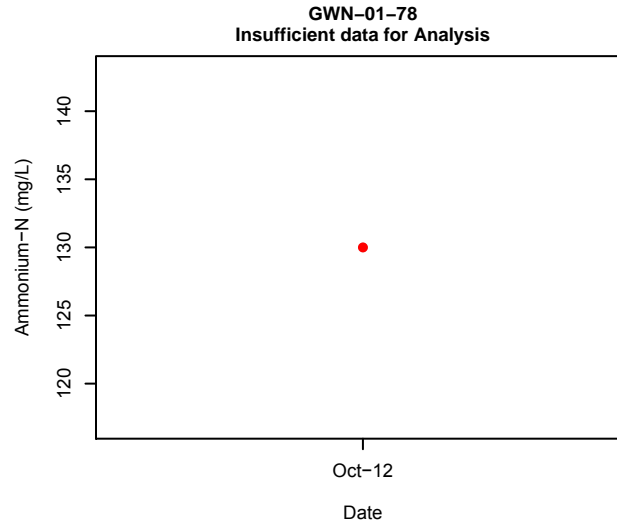
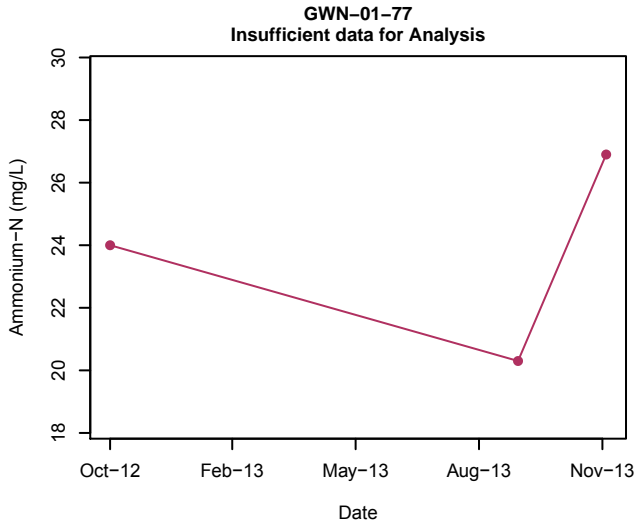
Appendix C70b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Historical Ammonium-N Concentrations



Appendix C71a

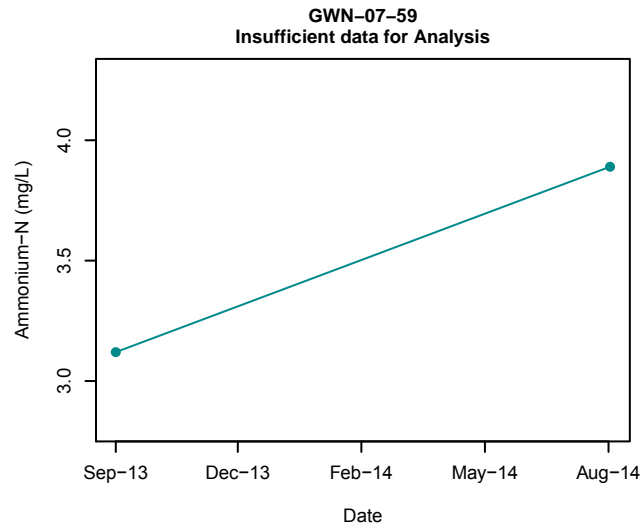
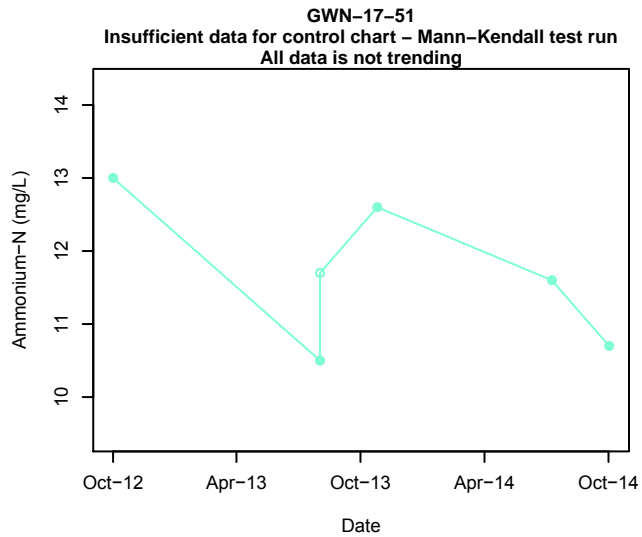
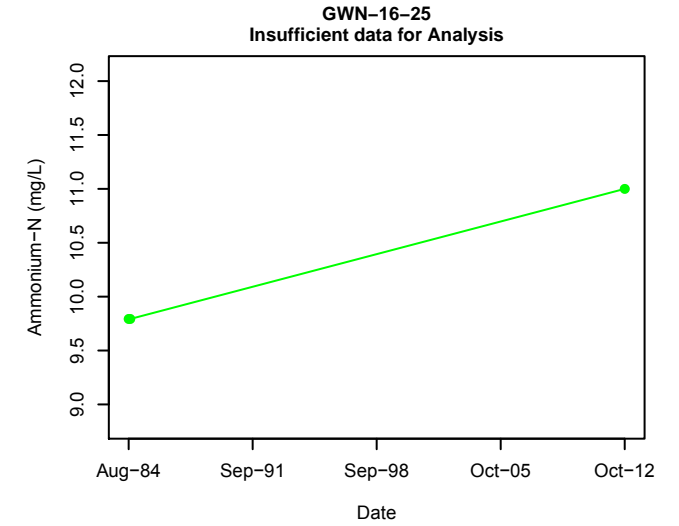
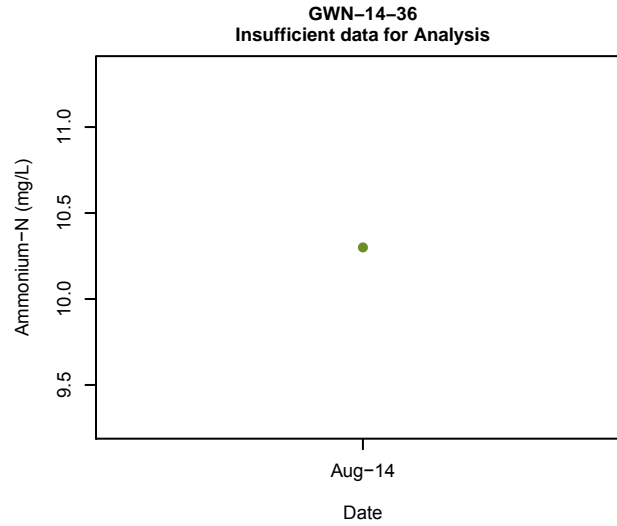
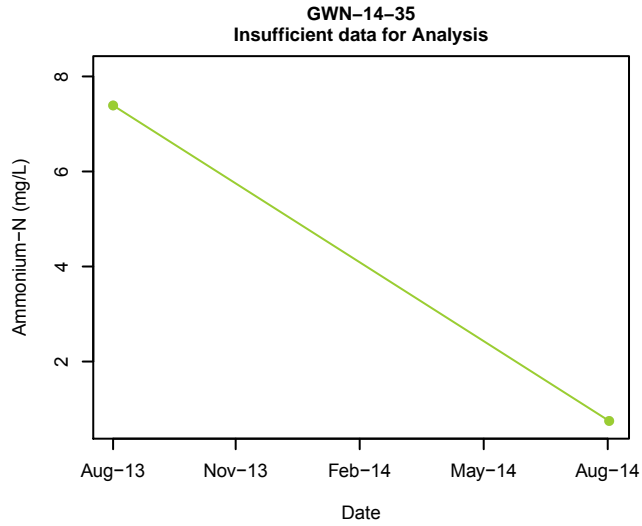
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Shewhart-CUSUM Control Charts- Ammonium-N



● Ammonium-N

Appendix C71b

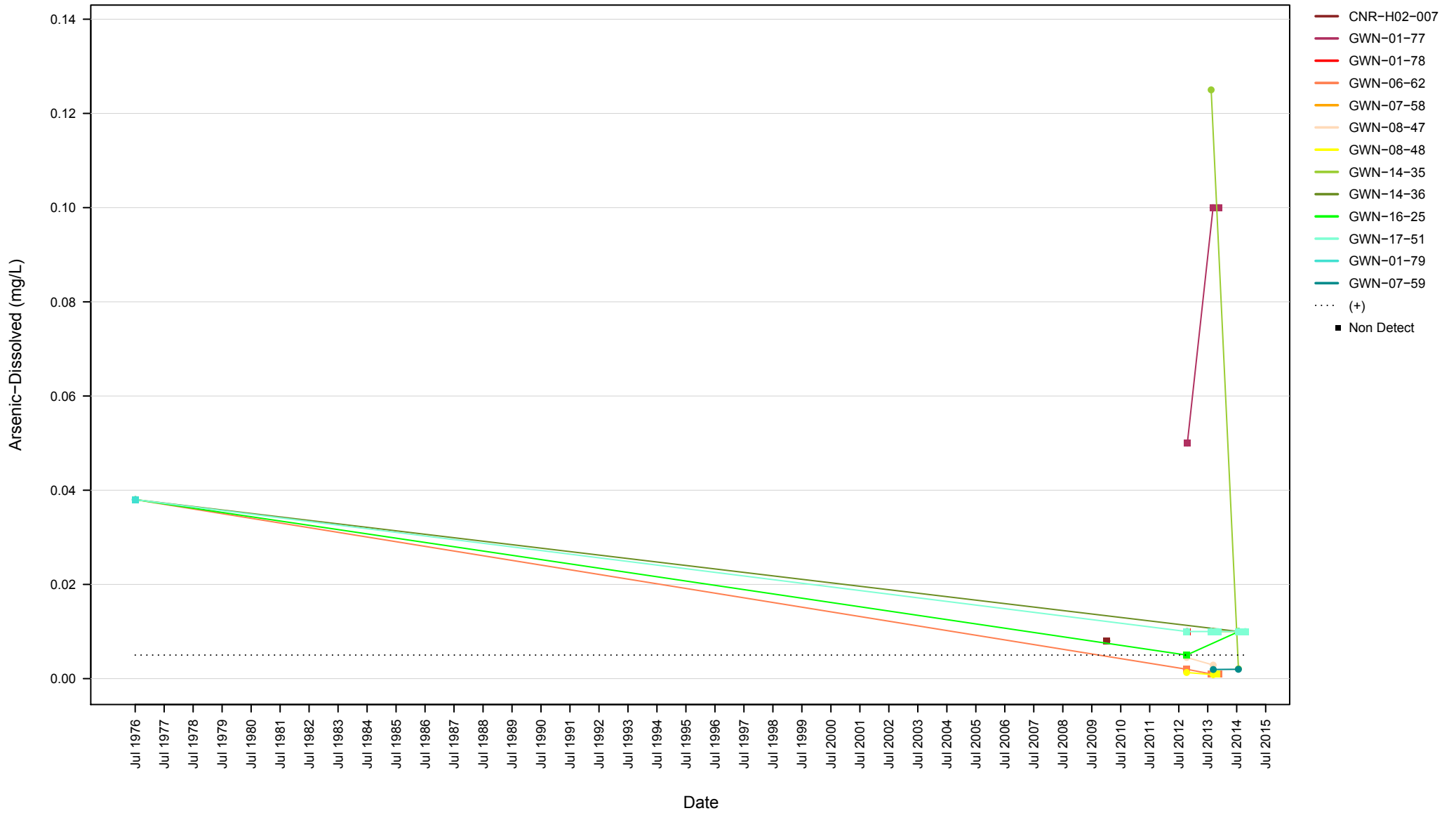
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Shewhart-CUSUM Control Charts- Ammonium-N



● Ammonium-N
○ Data point not used in analysis

Appendix C71b

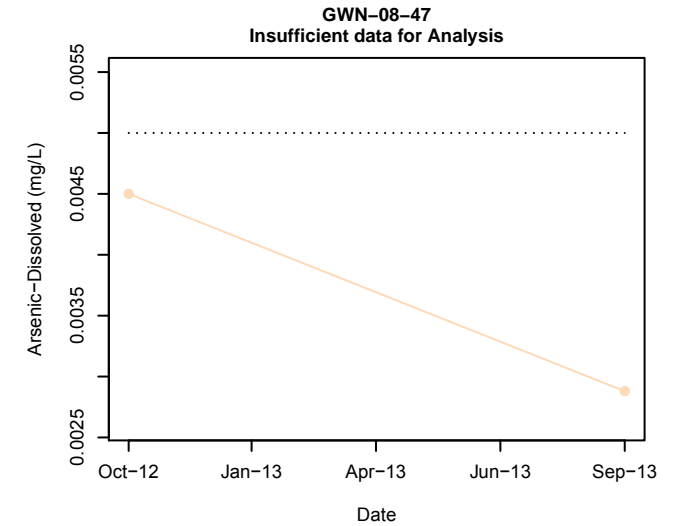
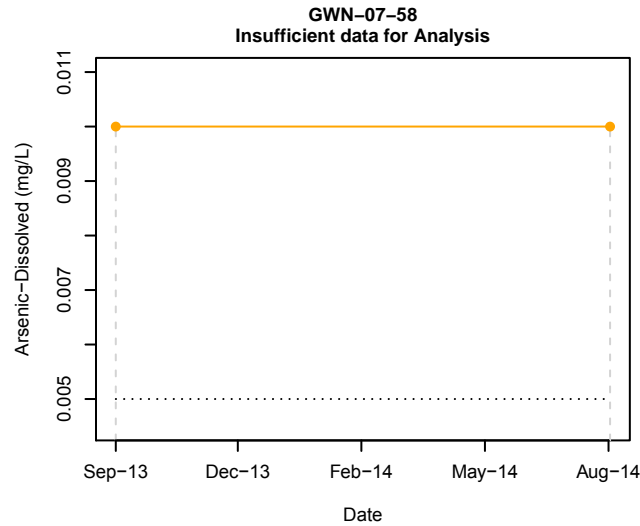
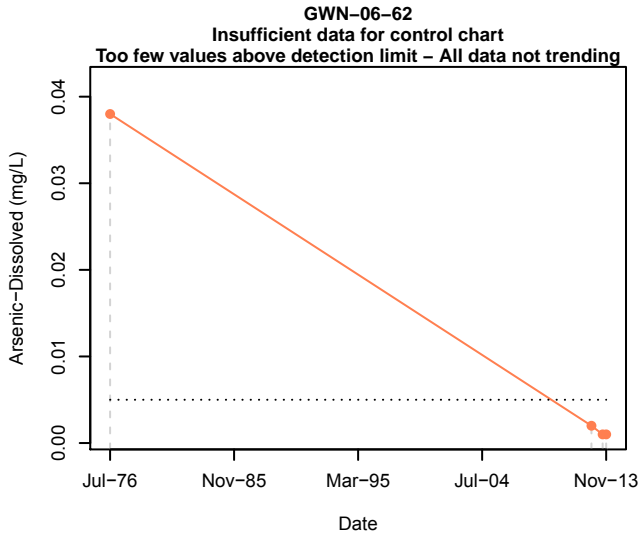
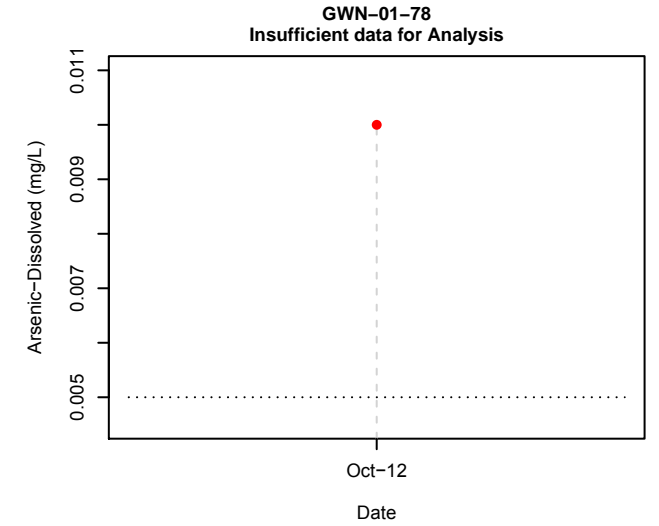
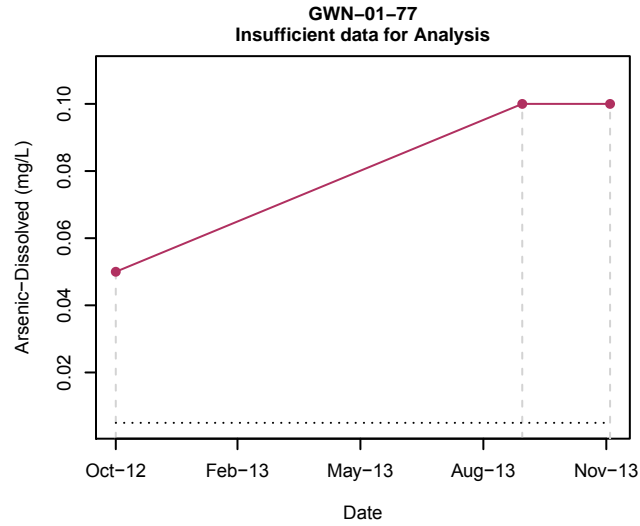
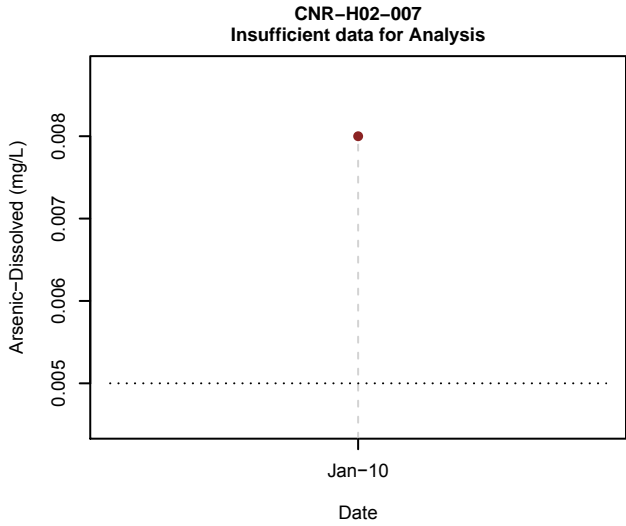
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Historical Dissolved Arsenic Concentrations



(+) Alberta Tier 1-Natural Areas -2010 = 0.005 mg/L

Appendix C72a

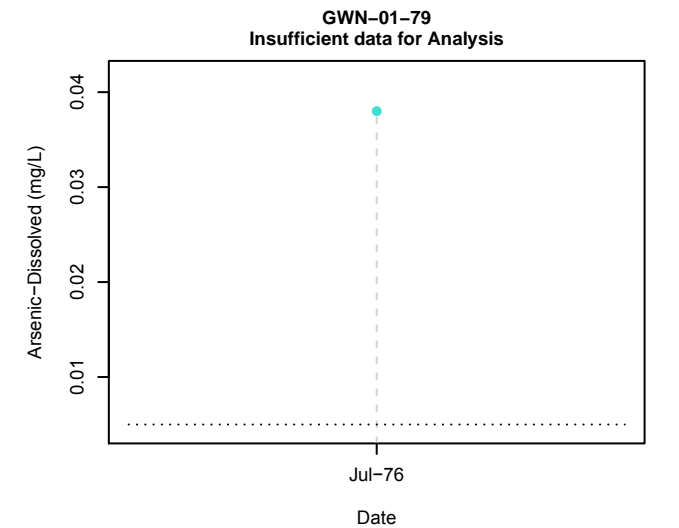
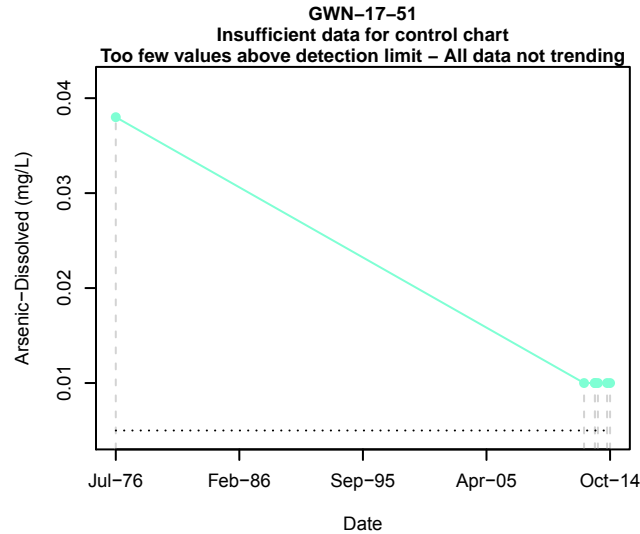
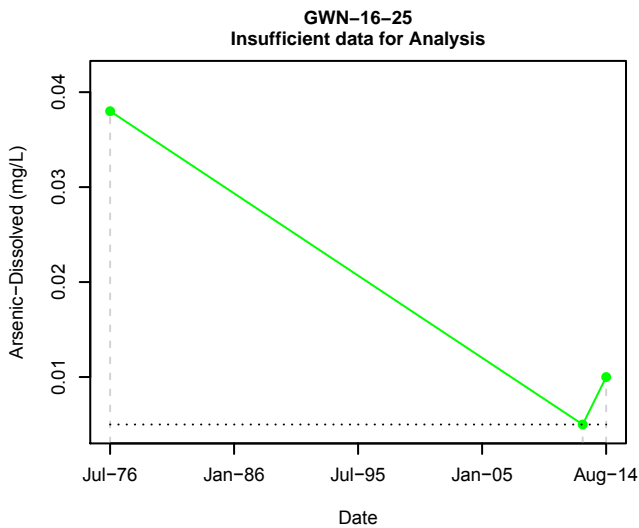
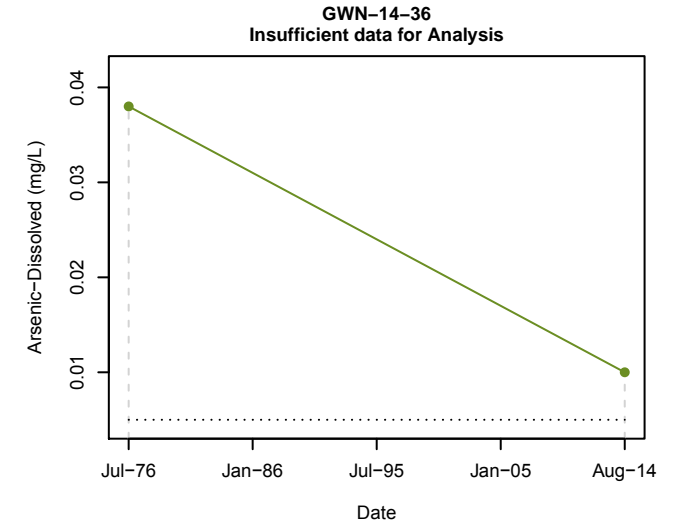
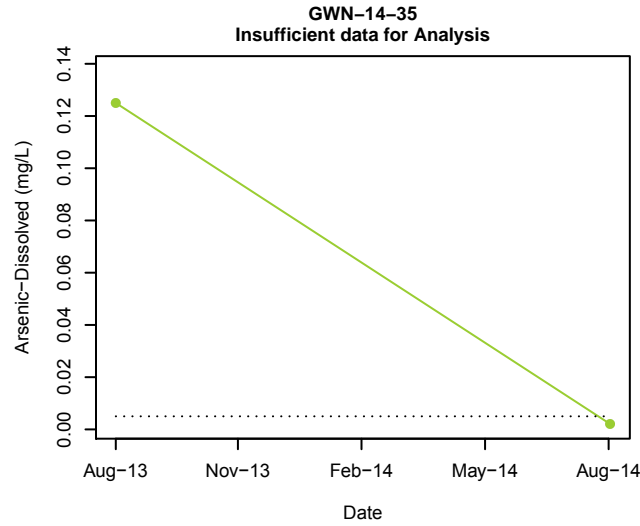
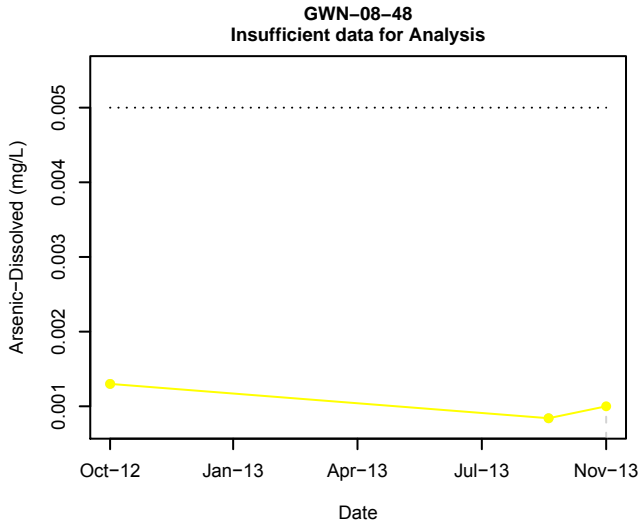
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Shewhart-CUSUM Control Charts- Dissolved Arsenic



- Arsenic-Dissolved
- - - Values below detection limit
- ⋯ Alberta Tier 1-Natural Areas -2010 = 0.005 mg/L

Appendix C72b

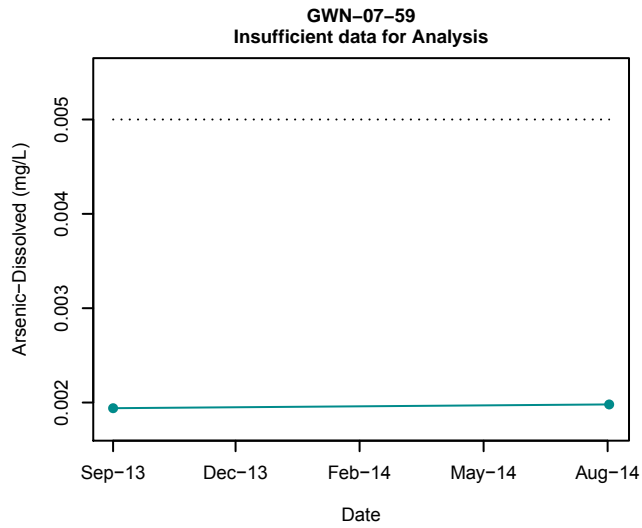
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Shewhart-CUSUM Control Charts- Dissolved Arsenic



- Arsenic-Dissolved
- - - Values below detection limit
- Data point not used in analysis
- ⋯ Alberta Tier 1-Natural Areas -2010 = 0.005 mg/L

Appendix C72b

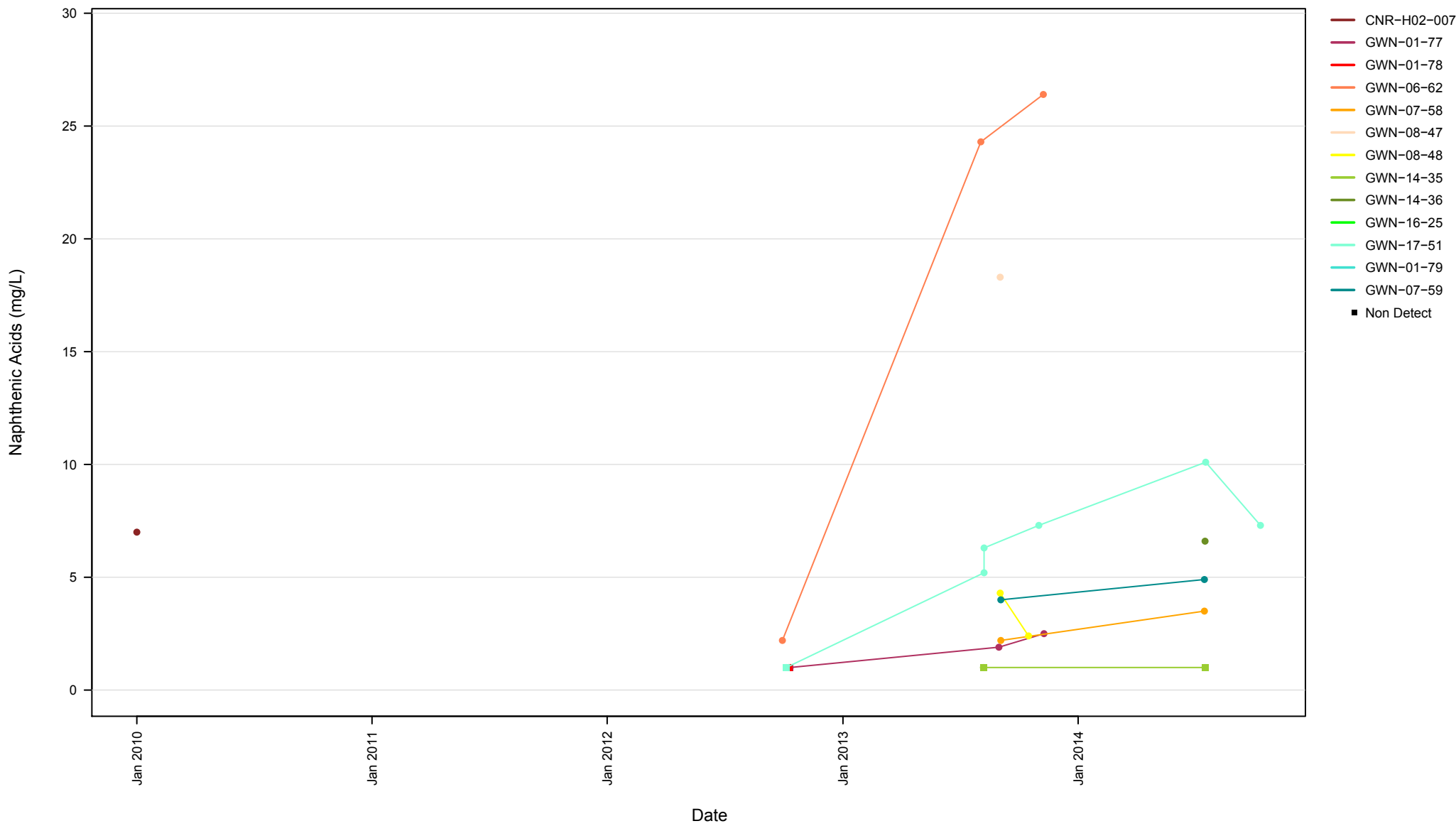
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Shewhart-CUSUM Control Charts- Dissolved Arsenic



- Arsenic-Dissolved
- - Values below detection limit
- Data point not used in analysis
- Alberta Tier 1-Natural Areas -2010 = 0.005 mg/L

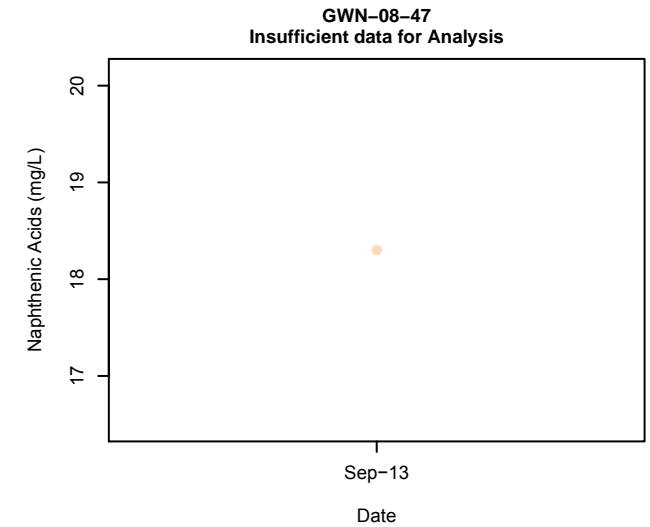
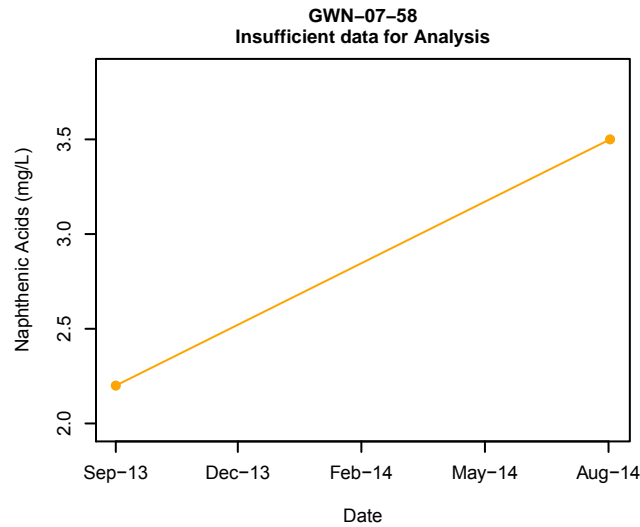
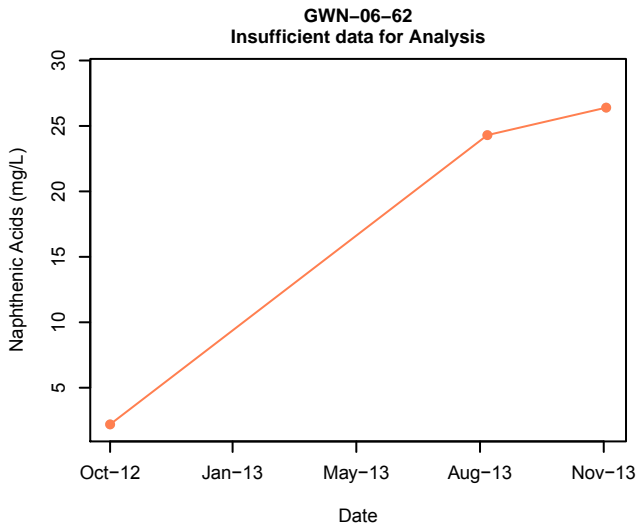
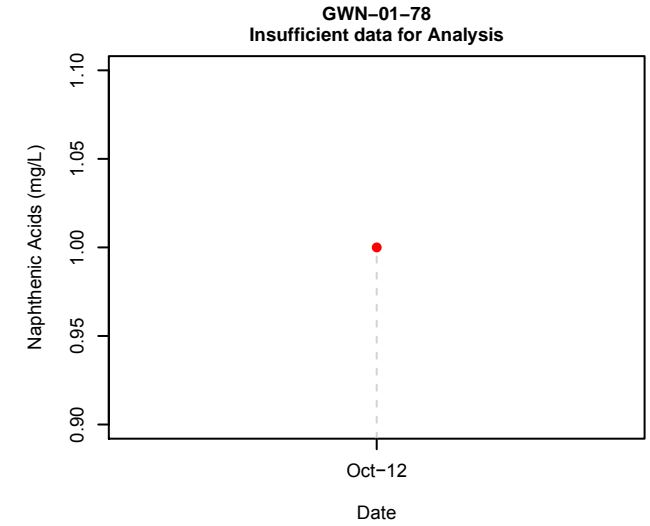
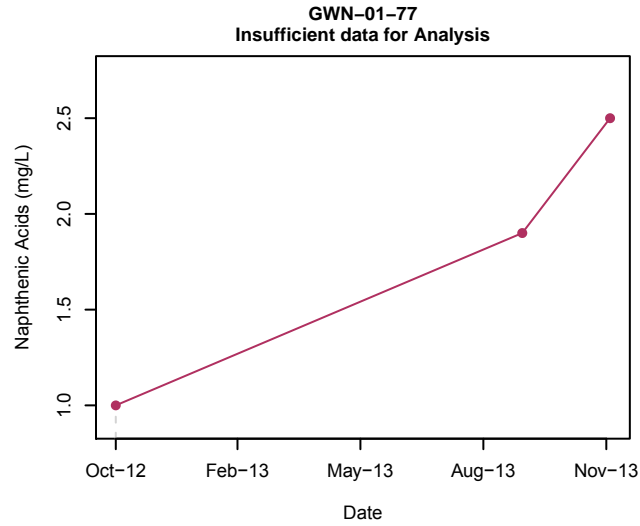
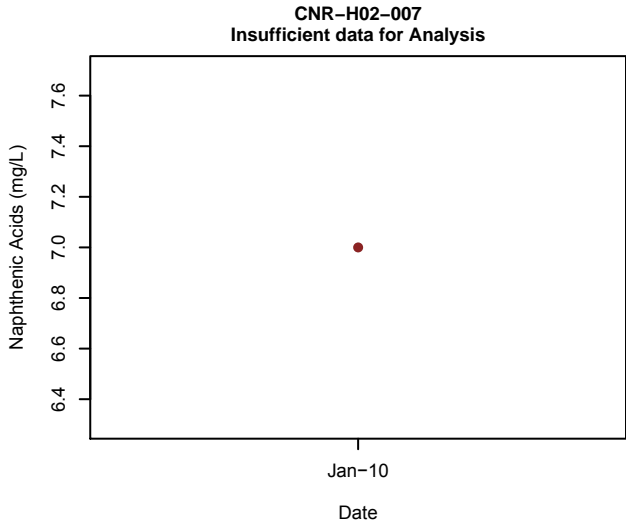
Appendix C72b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Historical Naphthenic Acids Concentrations



Appendix C73a

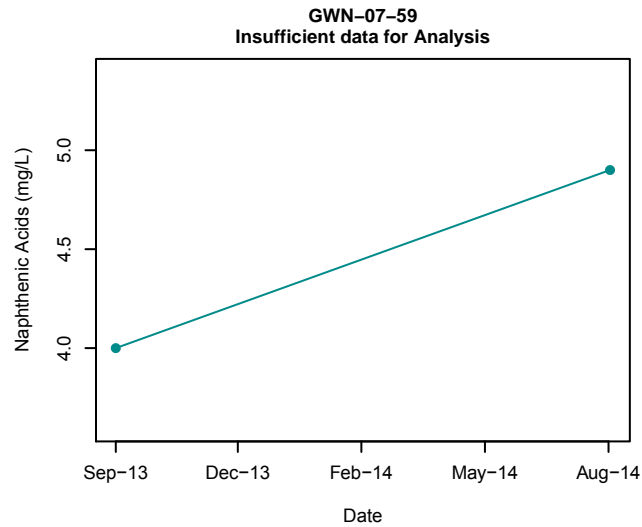
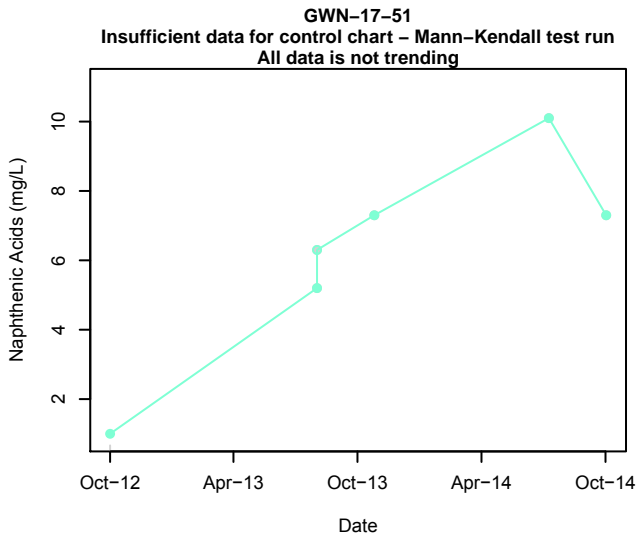
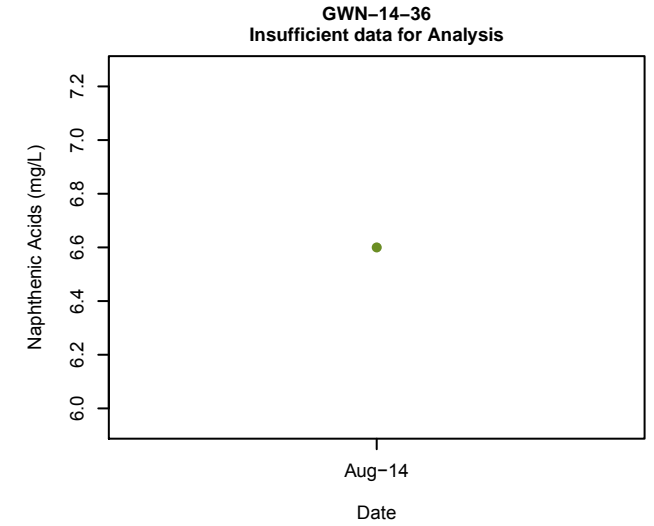
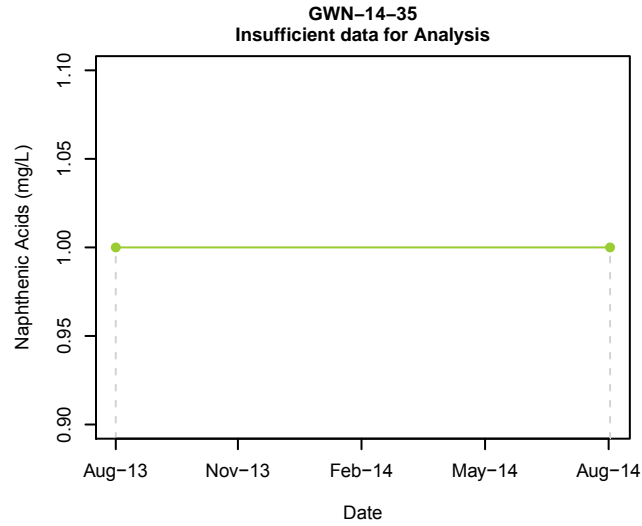
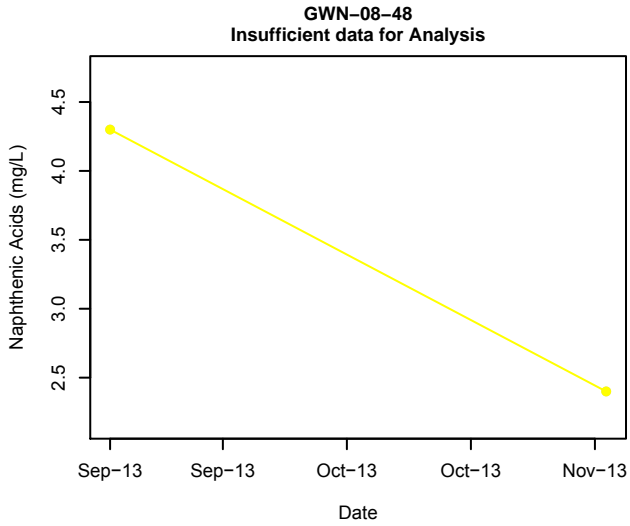
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Shewhart-CUSUM Control Charts- Naphthenic Acids



● Naphthenic Acids
- - Values below detection limit

Appendix C73b

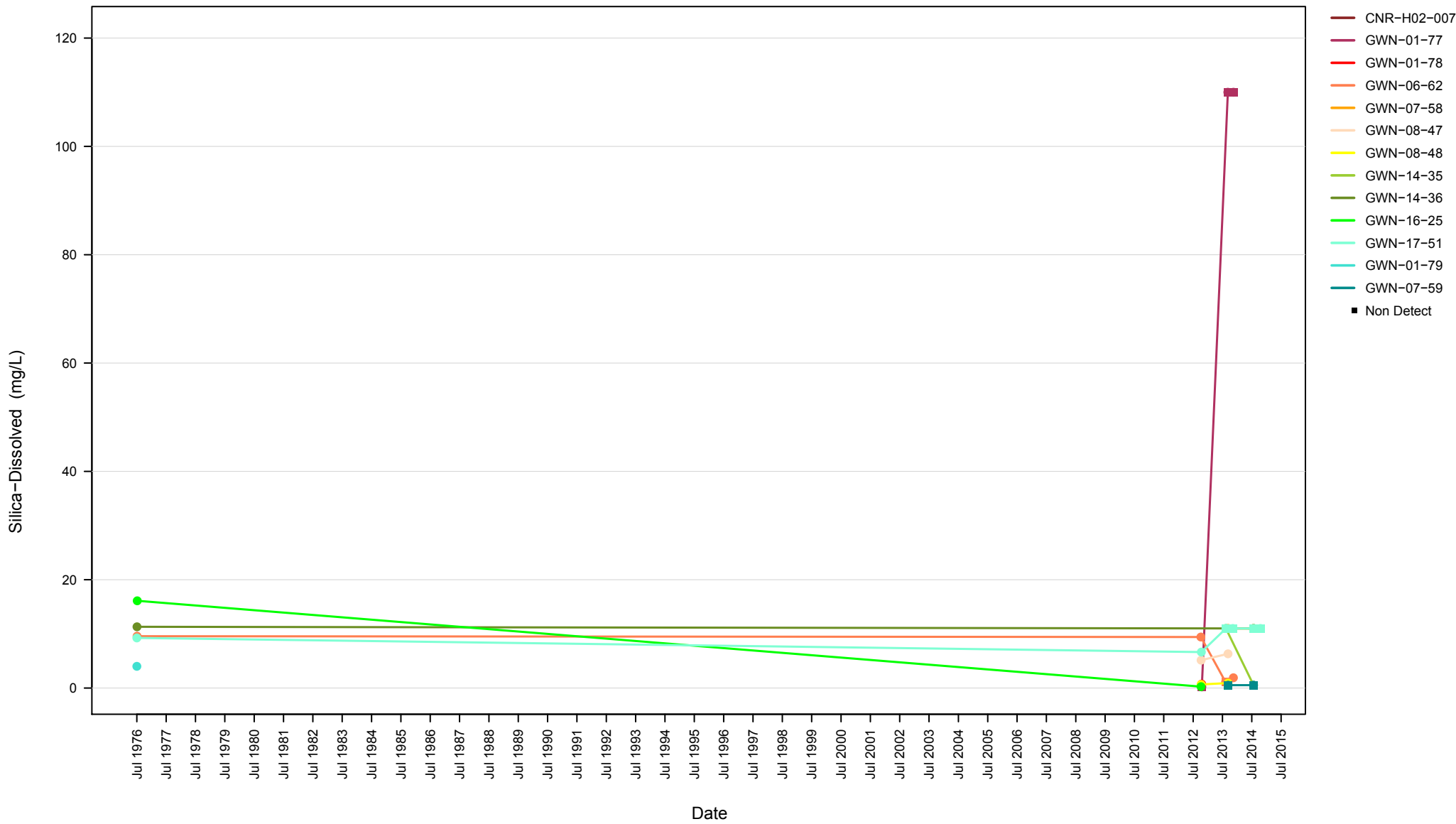
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Shewhart-CUSUM Control Charts- Naphthenic Acids



- Naphthenic Acids
- - Values below detection limit
- Data point not used in analysis

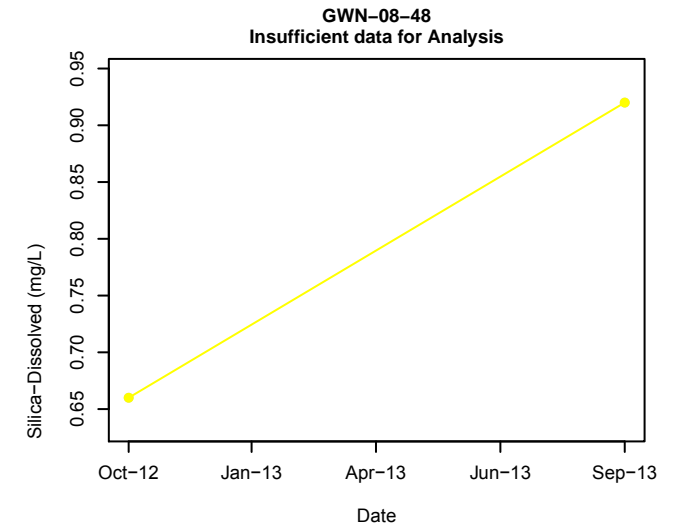
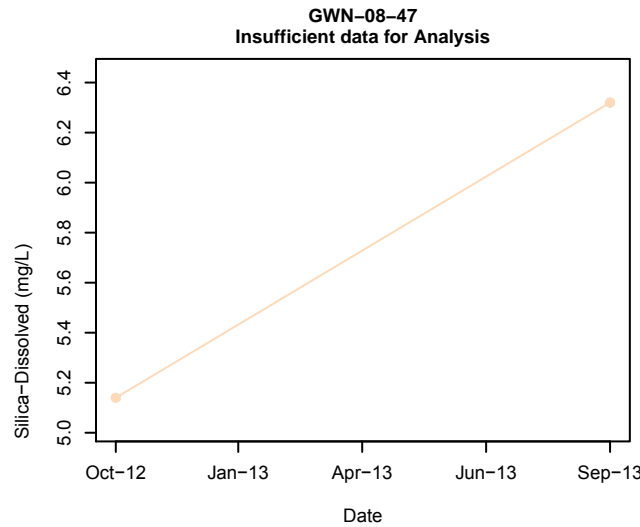
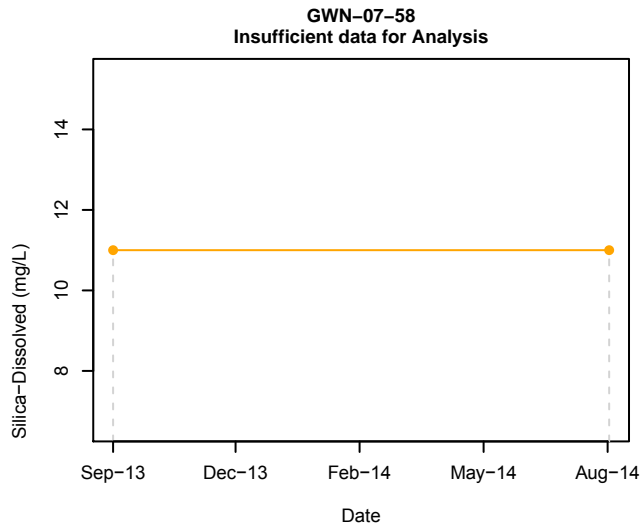
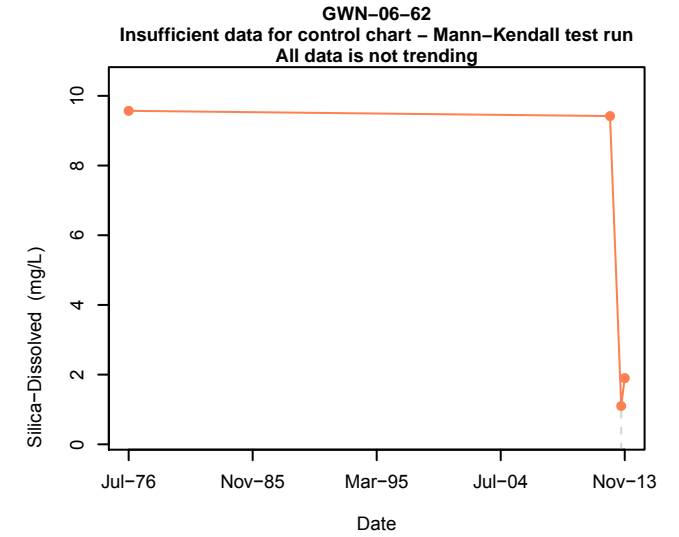
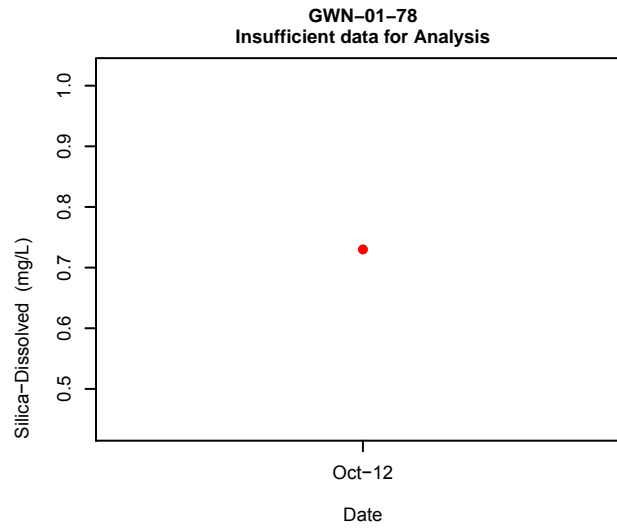
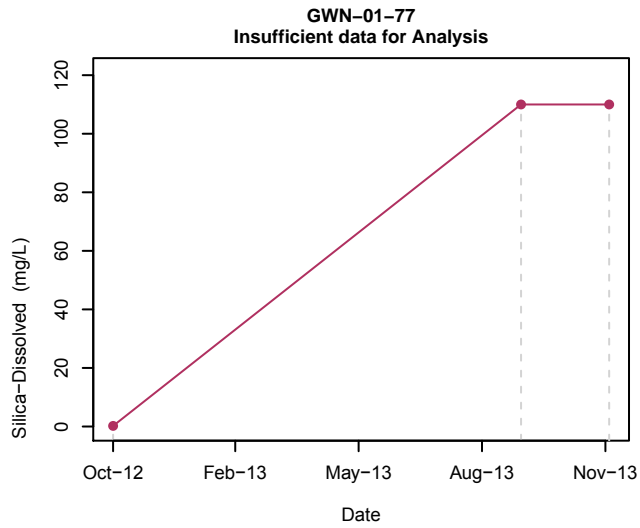
Appendix C73b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Historical Dissolved Silica Concentrations



Appendix C74a

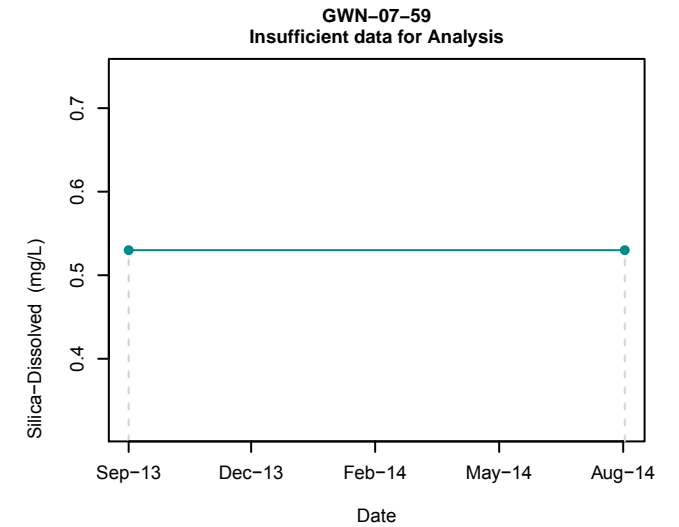
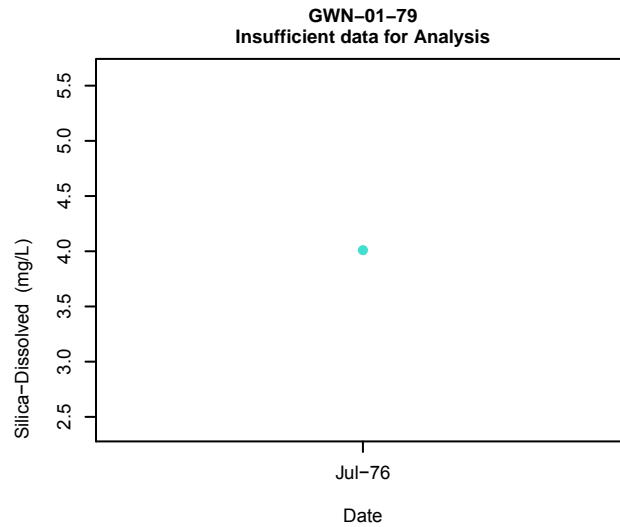
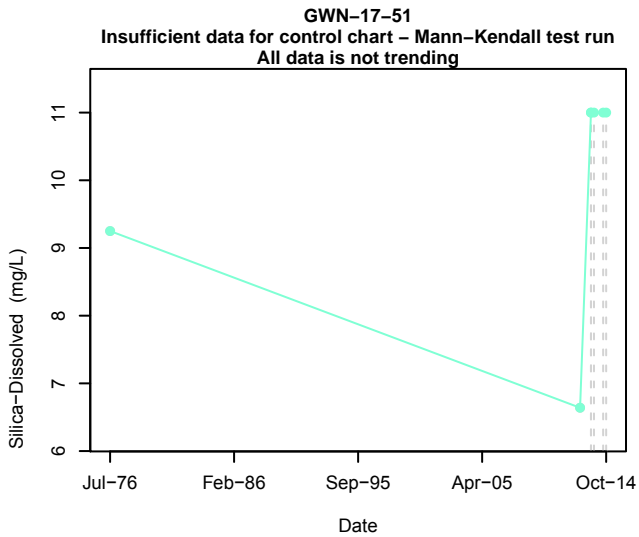
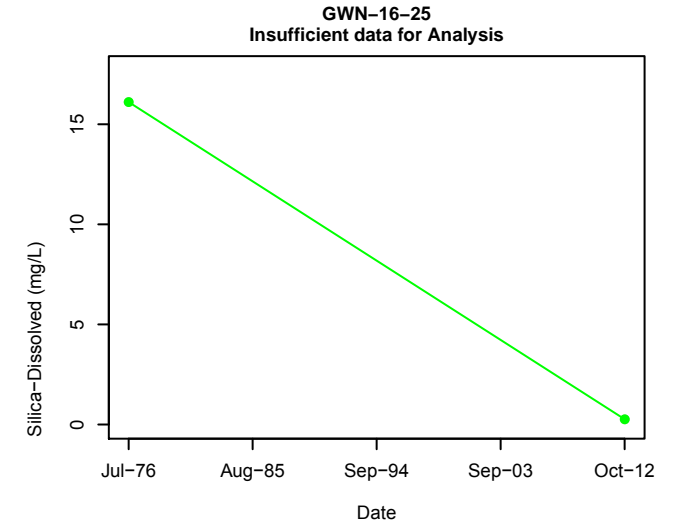
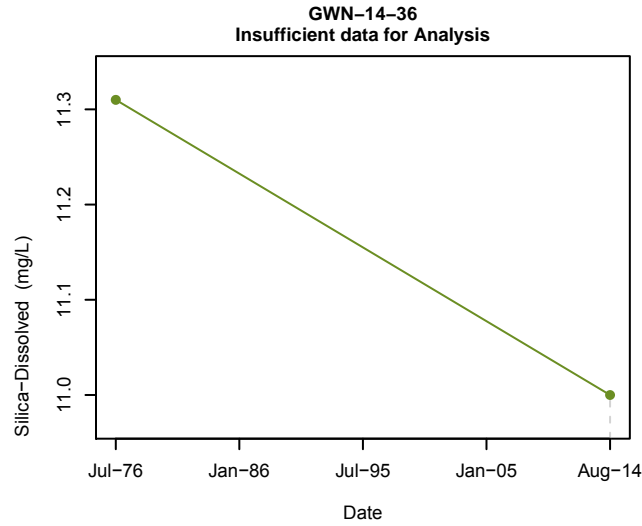
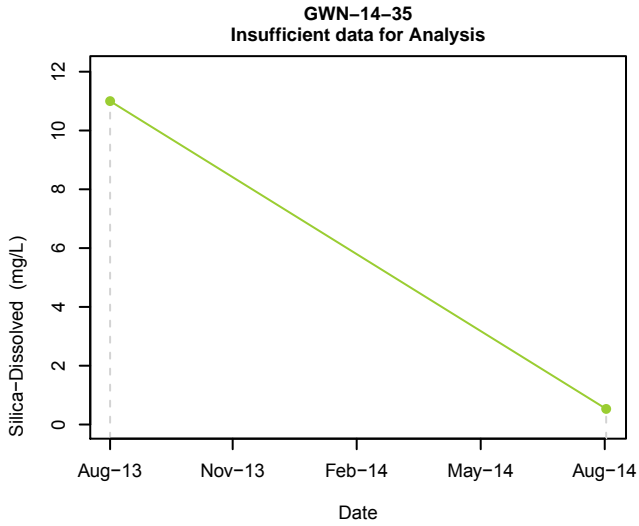
North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Shewhart-CUSUM Control Charts- Dissolved Silica



● Silica-Dissolved
- - Values below detection limit

Appendix C74b

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network (Prairie Evaporite/Beaverhill Lake/Methy) Shewhart-CUSUM Control Charts- Dissolved Silica



- Silica-Dissolved
- - Values below detection limit
- Data point not used in analysis

Appendix C74b

APPENDIX C75.

GROUNDWATER MONITORING DIRECTIVE STATISTICAL SUMMARY FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Shewhart-CUSUM Control Chart Data				Trend Analysis on All Data		
		Statistical Trend Detected on Baseline ($\alpha=0.05$)	Statistical Lower Control Limit	Statistical Upper Control Limit	Transformation	Statistical Trend ($\alpha=0.05$)	Mann-Kendall p-value	Sen Slope
Surficial Sands								
AGS-02-20	Total Dissolved Solids (measured)	---	---	---	---	no	0.462	---
AGS-02-WT	Total Dissolved Solids (measured)	---	---	---	---	no	0.806	---
AGS-03-WT	Total Dissolved Solids (measured)	---	---	---	---	no	0.130	---
CVE-BOR-01	Total Dissolved Solids (measured)	---	---	---	---	no	0.452	---
CVE-BOR-02	Total Dissolved Solids (measured)	---	---	---	---	no	0.452	---
GWN-01-74	Total Dissolved Solids (measured)	no	1196	3262	---	---	---	---
GWN-08-43	Total Dissolved Solids (measured)	yes	---	---	---	no	0.806	---
GWN-13-26	Total Dissolved Solids (measured)	no	0.000	484.8	---	---	---	---
GWN-14-32	Total Dissolved Solids (measured)	no	236.7	2133	---	---	---	---
GWN-16-22	Total Dissolved Solids (measured)	no	191.6	733.9	---	---	---	---
IOR-KRL-01	Total Dissolved Solids (measured)	---	---	---	---	no	0.176	---
IOR-KRL-03 (SS)	Total Dissolved Solids (measured)	---	---	---	---	no	0.452	---
IOR-KRL-04 (SS)	Total Dissolved Solids (measured)	---	---	---	---	no	0.773	---
IOR-KRL-05 (SS)	Total Dissolved Solids (measured)	---	---	---	---	no	0.221	---
IOR-KRL-06 (SS)	Total Dissolved Solids (measured)	---	---	---	---	no	0.133	---
IOR-KRL-07	Total Dissolved Solids (measured)	---	---	---	---	no	0.172	---
IOR-KRL-08	Total Dissolved Solids (measured)	---	---	---	---	no	0.879	---
IOR-KRL-09	Total Dissolved Solids (measured)	---	---	---	---	no	0.503	---
IOR-KRL-10	Total Dissolved Solids (measured)	---	---	---	---	no	0.192	---
AGS-02-20	Sodium	no	---	---	---	no	0.602	---
AGS-02-WT	Sodium	---	---	---	---	no	0.386	---
AGS-03-WT	Sodium	---	---	---	---	yes	0.035	-0.005
CVE-BOR-01	Sodium	---	---	---	---	no	0.697	---
CVE-BOR-02	Sodium	---	---	---	---	yes	0.009	-0.002
GWN-01-74	Sodium	no	---	---	---	no	0.701	---
GWN-08-43	Sodium	no	109.6	173.3	---	---	---	---
GWN-13-26	Sodium	no	0.000	3299	Data Squared	---	---	---
GWN-14-32	Sodium	yes	---	---	---	no	0.064	---
GWN-16-22	Sodium	no	0.000	102.9	---	---	---	---
IOR-KRL-01	Sodium	no	---	---	---	no	0.915	---
IOR-KRL-03 (SS)	Sodium	no	---	---	---	no	0.454	---
IOR-KRL-04 (SS)	Sodium	no	140.0	257.5	---	---	---	---
IOR-KRL-05 (SS)	Sodium	---	---	---	---	no	0.462	---
IOR-KRL-06 (SS)	Sodium	---	---	---	---	yes	0.024	-0.002
IOR-KRL-07	Sodium	---	---	---	---	no	0.181	---
IOR-KRL-08	Sodium	---	---	---	---	yes	0.016	-0.010
IOR-KRL-09	Sodium	---	---	---	---	yes	0.017	-0.001
IOR-KRL-10	Sodium	---	---	---	---	no	0.462	---
AGS-02-20	Chloride	---	---	---	---	yes	0.019	-0.0005
AGS-02-WT	Chloride	---	---	---	---	no	0.548	---
AGS-03-WT	Chloride	---	---	---	---	no	0.072	---
CVE-BOR-01	Chloride	---	---	---	---	no	0.327	---
CVE-BOR-02	Chloride	---	---	---	---	no	0.685	---
GWN-01-74	Chloride	no	---	---	---	yes	0.033	-0.002
GWN-08-43	Chloride	no	0.000	111.8	---	---	---	---
GWN-13-26	Chloride	no	0.000	46.57	---	---	---	---
GWN-14-32	Chloride	no	-1.038	9.876	Log	---	---	---
GWN-16-22	Chloride	no	0.000	14.69	Square Root	---	---	---
IOR-KRL-01	Chloride	no	---	---	---	no	1.000	---
IOR-KRL-03 (SS)	Chloride	no	---	---	---	no	0.081	---
IOR-KRL-04 (SS)	Chloride	no	0.000	3.043	---	---	---	---
IOR-KRL-05 (SS)	Chloride	---	---	---	---	no	0.312	---
IOR-KRL-06 (SS)	Chloride	---	---	---	---	no	0.288	---
IOR-KRL-07	Chloride	---	---	---	---	no	0.548	---
IOR-KRL-08	Chloride	---	---	---	---	no	0.356	---
IOR-KRL-09	Chloride	---	---	---	---	no ^{DL}	---	---
IOR-KRL-10	Chloride	---	---	---	---	no	1.000	---

APPENDIX C75.

GROUNDWATER MONITORING DIRECTIVE STATISTICAL SUMMARY FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Shewhart-CUSUM Control Chart Data				Trend Analysis on All Data		
		Statistical Trend Detected on Baseline ($\alpha=0.05$)	Statistical Lower Control Limit	Statistical Upper Control Limit	Transformation	Statistical Trend ($\alpha=0.05$)	Mann-Kendall p-value	Sen Slope
Surficial Sands								
AGS-02-20	Sulphate	---	---	---	---	no	0.319	---
AGS-02-WT	Sulphate	---	---	---	---	no	0.711	---
AGS-03-WT	Sulphate	---	---	---	---	no	0.108	---
CVE-BOR-01	Sulphate	---	---	---	---	no	1.000	---
CVE-BOR-02	Sulphate	---	---	---	---	no ^{DL}	---	---
GWN-01-74	Sulphate	no	32.69	404.5	---	---	---	---
GWN-08-43	Sulphate	no	---	---	---	no	0.068	---
GWN-13-26	Sulphate	no	0.000	35.60	---	---	---	---
GWN-14-32	Sulphate	no	0.000	923.0	---	---	---	---
GWN-16-22	Sulphate	yes	---	---	---	yes	0.042	-0.002
IOR-KRL-01	Sulphate	yes	---	---	---	yes	0.025	0.003
IOR-KRL-03 (SS)	Sulphate	no	5.591	12.13	---	---	---	---
IOR-KRL-04 (SS)	Sulphate	no	375.9	836.6	---	---	---	---
IOR-KRL-05 (SS)	Sulphate	---	---	---	---	no	0.613	---
IOR-KRL-06 (SS)	Sulphate	---	---	---	---	no ^{DL}	---	---
IOR-KRL-07	Sulphate	---	---	---	---	no ^{DL}	---	---
IOR-KRL-08	Sulphate	---	---	---	---	no	0.764	---
IOR-KRL-09	Sulphate	---	---	---	---	no	0.095	---
IOR-KRL-10	Sulphate	---	---	---	---	no ^{DL}	---	---
AGS-02-20	Ammonium-N	---	---	---	---	no	0.536	---
AGS-02-WT	Ammonium-N	---	---	---	---	no	0.230	---
AGS-03-WT	Ammonium-N	---	---	---	---	no	0.484	---
CVE-BOR-01	Ammonium-N	---	---	---	---	---	---	---
CVE-BOR-02	Ammonium-N	---	---	---	---	---	---	---
GWN-01-74	Ammonium-N	---	---	---	---	no	1.000	---
GWN-08-43	Ammonium-N	---	---	---	---	no	0.221	---
GWN-13-26	Ammonium-N	---	---	---	---	no	0.879	---
GWN-14-32	Ammonium-N	---	---	---	---	no	1.000	---
GWN-16-22	Ammonium-N	---	---	---	---	yes	0.035	-0.001
IOR-KRL-01	Ammonium-N	---	---	---	---	no	1.000	---
IOR-KRL-03 (SS)	Ammonium-N	---	---	---	---	no ^{DL}	---	---
IOR-KRL-04 (SS)	Ammonium-N	---	---	---	---	no	0.806	---
IOR-KRL-05 (SS)	Ammonium-N	---	---	---	---	no	0.089	---
IOR-KRL-06 (SS)	Ammonium-N	---	---	---	---	no	1.000	---
IOR-KRL-07	Ammonium-N	---	---	---	---	no	0.806	---
IOR-KRL-08	Ammonium-N	---	---	---	---	no	0.734	---
IOR-KRL-09	Ammonium-N	---	---	---	---	no	0.245	---
IOR-KRL-10	Ammonium-N	---	---	---	---	no	0.436	---
AGS-02-20	Arsenic-Dissolved	---	---	---	---	no	0.368	---
AGS-02-WT	Arsenic-Dissolved	---	---	---	---	no	0.566	---
AGS-03-WT	Arsenic-Dissolved	---	---	---	---	no	0.124	---
CVE-BOR-01	Arsenic-Dissolved	---	---	---	---	no	0.221	---
CVE-BOR-02	Arsenic-Dissolved	---	---	---	---	no	0.613	---
GWN-01-74	Arsenic-Dissolved	---	---	---	---	no	0.866	---
GWN-08-43	Arsenic-Dissolved	---	---	---	---	no	0.707	---
GWN-13-26	Arsenic-Dissolved	---	---	---	---	no	0.072	---
GWN-14-32	Arsenic-Dissolved	---	---	---	---	no	1.000	---
GWN-16-22	Arsenic-Dissolved	---	---	---	---	no	0.536	---
IOR-KRL-01	Arsenic-Dissolved	no	---	---	---	no	1.000	---
IOR-KRL-03 (SS)	Arsenic-Dissolved	no	---	---	---	no	0.565	---
IOR-KRL-04 (SS)	Arsenic-Dissolved	no	---	---	---	no	0.699	---
IOR-KRL-05 (SS)	Arsenic-Dissolved	---	---	---	---	no	1.000	---
IOR-KRL-06 (SS)	Arsenic-Dissolved	---	---	---	---	no	0.095	---
IOR-KRL-07	Arsenic-Dissolved	---	---	---	---	no	0.219	---
IOR-KRL-08	Arsenic-Dissolved	---	---	---	---	no	0.764	---
IOR-KRL-09	Arsenic-Dissolved	---	---	---	---	no ^{DL}	---	---
IOR-KRL-10	Arsenic-Dissolved	---	---	---	---	no	0.558	---

APPENDIX C75.

GROUNDWATER MONITORING DIRECTIVE STATISTICAL SUMMARY FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Shewhart-CUSUM Control Chart Data				Trend Analysis on All Data		
		Statistical Trend Detected on Baseline ($\alpha=0.05$)	Statistical Lower Control Limit	Statistical Upper Control Limit	Transformation	Statistical Trend ($\alpha=0.05$)	Mann-Kendall p-value	Sen Slope
Surficial Sands								
AGS-02-20	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
AGS-02-WT	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
AGS-03-WT	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
CVE-BOR-01	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
CVE-BOR-02	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
GWN-01-74	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
GWN-08-43	Naphthenic Acids	---	---	---	---	no	1.000	---
GWN-13-26	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
GWN-14-32	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
GWN-16-22	Naphthenic Acids	---	---	---	---	no	0.897	---
IOR-KRL-01	Naphthenic Acids	no	---	---	---	no	1.000	---
IOR-KRL-03 (SS)	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
IOR-KRL-04 (SS)	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
IOR-KRL-05 (SS)	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
IOR-KRL-06 (SS)	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
IOR-KRL-07	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
IOR-KRL-08	Naphthenic Acids	---	---	---	---	no	1.000	---
IOR-KRL-09	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
IOR-KRL-10	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
AGS-02-20	Dissolved Silica	---	---	---	---	no	0.221	---
AGS-02-WT	Dissolved Silica	---	---	---	---	no	0.462	---
AGS-03-WT	Dissolved Silica	---	---	---	---	no	0.806	---
CVE-BOR-01	Dissolved Silica	---	---	---	---	no	0.462	---
CVE-BOR-02	Dissolved Silica	---	---	---	---	no	0.308	---
GWN-01-74	Dissolved Silica	---	---	---	---	no	0.339	---
GWN-08-43	Dissolved Silica	---	---	---	---	yes	0.027	0.001
GWN-13-26	Dissolved Silica	---	---	---	---	no	0.707	---
GWN-14-32	Dissolved Silica	---	---	---	---	no	0.836	---
GWN-16-22	Dissolved Silica	---	---	---	---	no	1.000	---
IOR-KRL-01	Dissolved Silica	---	---	---	---	no	0.445	---
IOR-KRL-03 (SS)	Dissolved Silica	---	---	---	---	no	0.707	---
IOR-KRL-04 (SS)	Dissolved Silica	---	---	---	---	no	0.379	---
IOR-KRL-05 (SS)	Dissolved Silica	---	---	---	---	no	1.000	---
IOR-KRL-06 (SS)	Dissolved Silica	---	---	---	---	no	0.221	---
IOR-KRL-07	Dissolved Silica	---	---	---	---	no	1.000	---
IOR-KRL-08	Dissolved Silica	---	---	---	---	no	0.130	---
IOR-KRL-09	Dissolved Silica	---	---	---	---	no	0.433	---
IOR-KRL-10	Dissolved Silica	---	---	---	---	no	0.130	---

APPENDIX C75.

GROUNDWATER MONITORING DIRECTIVE STATISTICAL SUMMARY FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Shewhart-CUSUM Control Chart Data				Trend Analysis on All Data		
		Statistical Trend Detected on Baseline ($\alpha=0.05$)	Statistical Lower Control Limit	Statistical Upper Control Limit	Transformation	Statistical Trend ($\alpha=0.05$)	Mann-Kendall p-value	Sen Slope
Buried Channels and Valleys								
<i>Kearl Channel</i>								
GWN-08-44	Total Dissolved Solids (measured)	no	101.0	1267.0	---	---	---	---
GWN-Shell-PW2-63	Total Dissolved Solids (measured)	---	---	---	---	---	---	---
IOR-KRL-02	Total Dissolved Solids (measured)	---	---	---	---	no	1.000	---
GWN-08-44	Sodium	yes	---	---	---	yes	0.0001	-0.005
GWN-Shell-PW2-63	Sodium	---	---	---	---	no	0.095	---
IOR-KRL-02	Sodium	---	---	---	---	no	1.000	---
GWN-08-44	Chloride	yes	---	---	---	yes	0.0001	-0.004
GWN-Shell-PW2-63	Chloride	---	---	---	---	no	0.484	---
IOR-KRL-02	Chloride	---	---	---	---	no	0.110	---
GWN-08-44	Sulphate	no	0.000	16.28	---	---	---	---
GWN-Shell-PW2-63	Sulphate	---	---	---	---	no ^{DL}	---	---
IOR-KRL-02	Sulphate	---	---	---	---	no	0.112	---
GWN-08-44	Ammonium-N	---	---	---	---	no	1.000	---
GWN-Shell-PW2-63	Ammonium-N	---	---	---	---	no	0.452	---
IOR-KRL-02	Ammonium-N	---	---	---	---	no ^{DL}	---	---
GWN-08-44	Arsenic-Dissolved	---	---	---	---	no	0.358	---
GWN-Shell-PW2-63	Arsenic-Dissolved	---	---	---	---	no	0.879	---
IOR-KRL-02	Arsenic-Dissolved	---	---	---	---	no ^{DL}	---	---
GWN-08-44	Naphthenic Acids	---	---	---	---	no	0.149	---
GWN-Shell-PW2-63	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
IOR-KRL-02	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
GWN-08-44	Dissolved Silica	---	---	---	---	no	0.734	---
GWN-Shell-PW2-63	Dissolved Silica	---	---	---	---	no	0.260	---
IOR-KRL-02	Dissolved Silica	---	---	---	---	no	0.734	---
Buried Channels and Valleys								
<i>Birch Channel</i>								
AGS-02-97	Total Dissolved Solids (measured)	---	---	---	---	no	1.000	---
AGS-03-17	Total Dissolved Solids (measured)	---	---	---	---	no	0.086	---
AGS-02-97	Sodium	---	---	---	---	no	0.610	---
AGS-03-17	Sodium	---	---	---	---	no	0.764	---
AGS-02-97	Chloride	---	---	---	---	no	0.711	---
AGS-03-17	Chloride	---	---	---	---	no	1.000	---
AGS-02-97	Sulphate	---	---	---	---	no	1.000	---
AGS-03-17	Sulphate	---	---	---	---	no	0.266	---
AGS-02-97	Ammonium-N	---	---	---	---	no	0.368	---
AGS-03-17	Ammonium-N	---	---	---	---	no	0.133	---
AGS-02-97	Arsenic-Dissolved	---	---	---	---	no	0.401	---
AGS-03-17	Arsenic-Dissolved	---	---	---	---	no ^{DL}	---	---
AGS-02-97	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
AGS-03-17	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
AGS-02-97	Dissolved Silica	---	---	---	---	no	0.806	---
AGS-03-17	Dissolved Silica	---	---	---	---	no	0.462	---

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		Statistical Trend Detected on Baseline ($\alpha=0.05$)	Statistical Lower Control Limit	Statistical Upper Control Limit	Transformation	Statistical Trend ($\alpha=0.05$)	Mann-Kendall p-value	Sen Slope
<i>Thickwood Channel</i>								
GWN-13-27	Total Dissolved Solids (measured)	no	0.000	10223	---	---	---	---
GWN-13-27	Sodium	no	0.000	698.6	---	---	---	---
GWN-13-27	Chloride	yes	---	---	---	yes	0.000	-0.011
GWN-13-27	Sulphate	no	0.000	134.9	---	---	---	---
GWN-13-27	Ammonium-N	---	---	---	---	yes	0.016	-0.001
GWN-13-27	Arsenic-Dissolved	---	---	---	---	no	1.000	---
GWN-13-27	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
GWN-13-27	Dissolved Silica	---	---	---	---	no	0.462	---
<i>Grand Rapids Formation</i>								
CVE-BOR-03	Total Dissolved Solids (measured)	---	---	---	---	no	0.462	---
CVE-BOR-04	Total Dissolved Solids (measured)	---	---	---	---	---	---	---
CVE-WW10-13	Total Dissolved Solids (measured)	---	---	---	---	---	---	---
GWN-13-28	Total Dissolved Solids (measured)	no	---	---	---	no	0.585	---
CVE-BOR-03	Sodium-Dissolved	---	---	---	---	no	0.806	---
CVE-BOR-04	Sodium-Dissolved	---	---	---	---	---	---	---
CVE-WW10-13	Sodium-Dissolved	---	---	---	---	---	---	---
GWN-13-28	Sodium-Dissolved	no	275.7	506.0	---	---	---	---
CVE-BOR-03	Chloride	---	---	---	---	no	0.462	---
CVE-BOR-04	Chloride	---	---	---	---	---	---	---
CVE-WW10-13	Chloride	---	---	---	---	---	---	---
GWN-13-28	Chloride	no	0.000	51.02	---	---	---	---
CVE-BOR-03	Sulphate	---	---	---	---	no	0.462	---
CVE-BOR-04	Sulphate	---	---	---	---	---	---	---
CVE-WW10-13	Sulphate	---	---	---	---	---	---	---
GWN-13-28	Sulphate	no	0.000	235.7	---	---	---	---
GWN-13-28	Ammonium-N	---	---	---	---	no	1.000	---
CVE-BOR-03	Arsenic-Dissolved	---	---	---	---	no	1.000	---
CVE-WW10-13	Arsenic-Dissolved	---	---	---	---	---	---	---
GWN-13-28	Arsenic-Dissolved	---	---	---	---	no	0.089	---
CVE-BOR-03	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
GWN-13-28	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
CVE-BOR-03	Dissolved Silica	---	---	---	---	no	1.000	---
CVE-WW10-13	Dissolved Silica	---	---	---	---	---	---	---
GWN-13-28	Dissolved Silica	---	---	---	---	no	1.000	---

APPENDIX C75.

GROUNDWATER MONITORING DIRECTIVE STATISTICAL SUMMARY FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Shewhart-CUSUM Control Chart Data				Trend Analysis on All Data		
		Statistical Trend Detected on Baseline ($\alpha=0.05$)	Statistical Lower Control Limit	Statistical Upper Control Limit	Transformation	Statistical Trend ($\alpha=0.05$)	Mann-Kendall p-value	Sen Slope
Clearwater Formation								
AGS-02-108	Total Dissolved Solids (measured)	---	---	---	---	---	---	---
AGS-03-30	Total Dissolved Solids (measured)	---	---	---	---	no	0.462	---
GWN-08-45	Total Dissolved Solids (measured)	---	---	---	---	no	0.548	---
GWN-14-33	Total Dissolved Solids (measured)	---	---	---	---	no	0.174	---
AGS-02-108	Sodium-Dissolved	---	---	---	---	no	0.086	---
AGS-03-30	Sodium-Dissolved	---	---	---	---	no	1.000	---
GWN-08-45	Sodium-Dissolved	no	0.000	6.49E+08	Data Cubed	---	---	---
GWN-14-33	Sodium-Dissolved	no	0.000	2910	---	---	---	---
AGS-02-108	Chloride	---	---	---	---	no	0.734	---
AGS-03-30	Chloride	---	---	---	---	no	0.794	---
GWN-08-45	Chloride	no	---	---	---	no	0.184	---
GWN-14-33	Chloride	no	0.000	3027	---	---	---	---
AGS-02-108	Sulphate	---	---	---	---	no	0.462	---
AGS-03-30	Sulphate	---	---	---	---	no	0.260	---
GWN-08-45	Sulphate	no	0.000	9.97	Square Root	---	---	---
GWN-14-33	Sulphate	no	0.000	55.76	---	---	---	---
AGS-02-108	Ammonium-N	---	---	---	---	no	1.000	---
AGS-03-30	Ammonium-N	---	---	---	---	yes	0.027	-0.0002
GWN-08-45	Ammonium-N	---	---	---	---	no	0.848	---
GWN-14-33	Ammonium-N	---	---	---	---	no	0.734	---
AGS-02-108	Arsenic-Dissolved	---	---	---	---	no	0.308	---
AGS-03-30	Arsenic-Dissolved	---	---	---	---	no	0.806	---
GWN-08-45	Arsenic-Dissolved	---	---	---	---	no ^{DL}	---	---
GWN-14-33	Arsenic-Dissolved	---	---	---	---	no ^{DL}	---	---
AGS-02-108	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
AGS-03-30	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
GWN-08-45	Naphthenic Acids	---	---	---	---	no	0.763	---
GWN-14-33	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
AGS-02-108	Dissolved Silica	---	---	---	---	---	---	---
AGS-03-30	Dissolved Silica	---	---	---	---	---	---	---
GWN-08-45	Dissolved Silica	---	---	---	---	no	0.734	---
GWN-14-33	Dissolved Silica	---	---	---	---	no	0.806	---

APPENDIX C75.

GROUNDWATER MONITORING DIRECTIVE STATISTICAL SUMMARY FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Shewhart-CUSUM Control Chart Data				Trend Analysis on All Data		
		Statistical Trend Detected on Baseline ($\alpha=0.05$)	Statistical Lower Control Limit	Statistical Upper Control Limit	Transformation	Statistical Trend ($\alpha=0.05$)	Mann-Kendall p-value	Sen Slope
McMurray Formation Basal Aquifer								
<i>Aquifer Management Unit (AMU) 1</i>								
CVE-02-04-LM	Total Dissolved Solids (measured)	---	---	---	---	---	---	---
GWN-06-60	Total Dissolved Solids (measured)	no	0.000	1830	---	---	---	---
GWN-17-50	Total Dissolved Solids (measured)	no	55.8	989.4	---	---	---	---
CVE-02-04-LM	Sodium	---	---	---	---	---	---	---
GWN-06-60	Sodium	no	0.000	116.5	---	---	---	---
GWN-17-50	Sodium	no	0.000	327.5	---	---	---	---
CVE-02-04-LM	Chloride	---	---	---	---	---	---	---
GWN-06-60	Chloride	no	0.000	157.5	---	---	---	---
GWN-17-50	Chloride	no	0.000	285.2	---	---	---	---
CVE-02-04-LM	Sulphate	---	---	---	---	---	---	---
GWN-06-60	Sulphate	no	0.000	61.40	---	---	---	---
GWN-17-50	Sulphate	yes	---	---	---	yes	0.001	-0.002
GWN-06-60	Ammonium-N	---	---	---	---	no	0.548	---
GWN-17-50	Ammonium-N	---	---	---	---	yes	0.024	-0.0001
CVE-02-04-LM	Arsenic-Dissolved	---	---	---	---	---	---	---
GWN-06-60	Arsenic-Dissolved	---	---	---	---	no	0.711	---
GWN-17-50	Arsenic-Dissolved	---	---	---	---	no	0.260	---
GWN-06-60	Naphthenic Acids	---	---	---	---	no	0.441	---
GWN-17-50	Naphthenic Acids	---	---	---	---	yes	0.024	0.003
CVE-02-04-LM	Dissolved Silica	---	---	---	---	---	---	---
GWN-06-60	Dissolved Silica	---	---	---	---	no	0.548	---
GWN-17-50	Dissolved Silica	---	---	---	---	no	0.368	---

APPENDIX C75.

GROUNDWATER MONITORING DIRECTIVE STATISTICAL SUMMARY FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Shewhart-CUSUM Control Chart Data				Trend Analysis on All Data		
		Statistical Trend Detected on Baseline ($\alpha=0.05$)	Statistical Lower Control Limit	Statistical Upper Control Limit	Transformation	Statistical Trend ($\alpha=0.05$)	Mann-Kendall p-value	Sen Slope
McMurray Formation Basal Aquifer								
<i>Aquifer Management Unit (AMU) 2</i>								
GWN-01-75	Total Dissolved Solids (measured)	yes	---	---	---	yes	0.049	-0.029
GWN-06-61	Total Dissolved Solids (measured)	no	3545	4190	---	---	---	---
GWN-07-57	Total Dissolved Solids (measured)	no	1447	1761	---	---	---	---
GWN-08-46	Total Dissolved Solids (measured)	---	---	---	---	no	0.368	---
GWN-13-29	Total Dissolved Solids (measured)	---	---	---	---	yes	0.027	0.2107
GWN-13-30	Total Dissolved Solids (measured)	---	---	---	---	no	0.734	---
IOR-KRL-03(BAS)	Total Dissolved Solids (measured)	no	---	---	---	no	0.246	---
IOR-KRL-04(BAS)	Total Dissolved Solids (measured)	---	---	---	---	no	0.681	---
IOR-KRL-05(BAS)	Total Dissolved Solids (measured)	---	---	---	---	no	0.071	---
SHL-ALB-01	Total Dissolved Solids (measured)	---	---	---	---	---	---	---
SHL-ALB-02	Total Dissolved Solids (measured)	---	---	---	---	---	---	---
SHL-JKP-01	Total Dissolved Solids (measured)	yes	---	---	---	yes	0.004	0.1061
GWN-01-75	Sodium-Dissolved	no	0.000	368.8	---	---	---	---
GWN-06-61	Sodium-Dissolved	no	1068	1830	---	---	---	---
GWN-07-57	Sodium-Dissolved	no	545.7	633.8	---	---	---	---
GWN-08-46	Sodium-Dissolved	no	0.000	2112	---	---	---	---
GWN-13-29	Sodium-Dissolved	---	---	---	---	yes	0.027	0.0974
GWN-13-30	Sodium-Dissolved	---	---	---	---	no	0.734	---
IOR-KRL-03(BAS)	Sodium-Dissolved	no	---	---	---	no	0.266	---
IOR-KRL-04(BAS)	Sodium-Dissolved	---	---	---	---	no	0.319	---
IOR-KRL-05(BAS)	Sodium-Dissolved	no	259.1	841.4	---	---	---	---
SHL-ALB-01	Sodium-Dissolved	---	---	---	---	no	0.462	---
SHL-ALB-02	Sodium-Dissolved	---	---	---	---	---	---	---
SHL-ALB-03	Sodium-Dissolved	no	260.0	1887	---	---	---	---
SHL-JKP-01	Sodium-Dissolved	no	686.1	987.6	---	---	---	---
GWN-01-75	Chloride	---	---	---	---	no	0.174	---
GWN-06-61	Chloride	no	592.0	1733	---	---	---	---
GWN-07-57	Chloride	no	---	---	---	no	0.083	---
GWN-08-46	Chloride	no	---	---	---	yes	0.016	-0.002
GWN-13-29	Chloride	---	---	---	---	yes	0.027	0.125
GWN-13-30	Chloride	---	---	---	---	no	1.000	---
IOR-KRL-03(BAS)	Chloride	yes	---	---	---	yes	0.013	0.007
IOR-KRL-04(BAS)	Chloride	---	---	---	---	no	0.448	---
IOR-KRL-05(BAS)	Chloride	no	195.2	424.8	---	---	---	---
SHL-ALB-01	Chloride	---	---	---	---	no	0.221	---
SHL-ALB-02	Chloride	---	---	---	---	---	---	---
SHL-ALB-03	Chloride	no	16.44	36.22	Square Root	---	---	---
SHL-JKP-01	Chloride	no	672.4	837.4	---	---	---	---
GWN-01-75	Sulphate	yes	---	---	---	yes	0.001	-0.030
GWN-06-61	Sulphate	no	0.000	34.99	---	---	---	---
GWN-07-57	Sulphate	no	0.000	26.90	---	---	---	---
GWN-08-46	Sulphate	yes	---	---	---	yes	0.009	-0.0006
GWN-13-29	Sulphate	---	---	---	---	no	1.000	---
GWN-13-30	Sulphate	---	---	---	---	no	0.308	---
IOR-KRL-03(BAS)	Sulphate	no	0.000	12.19	Square Root	---	---	---
IOR-KRL-04(BAS)	Sulphate	---	---	---	---	yes	0.020	-0.0037
IOR-KRL-05(BAS)	Sulphate	no	0.000	47.95	---	---	---	---
SHL-ALB-01	Sulphate	---	---	---	---	no ^{DL}	---	---
SHL-ALB-02	Sulphate	---	---	---	---	---	---	---
SHL-ALB-03	Sulphate	no	0.000	21.16	Square Root	---	---	---
SHL-JKP-01	Sulphate	no	-9.204	10.72	Log	---	---	---

APPENDIX C75.

GROUNDWATER MONITORING DIRECTIVE STATISTICAL SUMMARY FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Shewhart-CUSUM Control Chart Data				Trend Analysis on All Data		
		Statistical Trend Detected on Baseline ($\alpha=0.05$)	Statistical Lower Control Limit	Statistical Upper Control Limit	Transformation	Statistical Trend ($\alpha=0.05$)	Mann-Kendall p-value	Sen Slope
McMurray Formation Basal Aquifer								
<i>Aquifer Management Unit (AMU) 2</i>								
GWN-01-75	Ammonium-N	---	---	---	---	---	---	---
GWN-06-61	Ammonium-N	---	---	---	---	no	0.806	---
GWN-07-57	Ammonium-N	---	---	---	---	no	0.707	---
GWN-08-46	Ammonium-N	---	---	---	---	no	0.308	---
IOR-KRL-03(BAS)	Ammonium-N	---	---	---	---	no	0.875	---
IOR-KRL-04(BAS)	Ammonium-N	---	---	---	---	no	0.470	---
IOR-KRL-05(BAS)	Ammonium-N	---	---	---	---	no	0.221	---
SHL-ALB-01	Ammonium-N	---	---	---	---	---	---	---
SHL-ALB-02	Ammonium-N	---	---	---	---	---	---	---
SHL-JKP-01	Ammonium-N	---	---	---	---	---	---	---
GWN-01-75	Arsenic-Dissolved	---	---	---	---	---	---	---
GWN-06-61	Arsenic-Dissolved	---	---	---	---	no ^{DL}	---	---
GWN-07-57	Arsenic-Dissolved	---	---	---	---	no ^{DL}	---	---
GWN-08-46	Arsenic-Dissolved	---	---	---	---	no	0.086	---
IOR-KRL-03(BAS)	Arsenic-Dissolved	no	0.000	0.057	Square Root	---	---	---
IOR-KRL-04(BAS)	Arsenic-Dissolved	---	---	---	---	no	0.882	---
IOR-KRL-05(BAS)	Arsenic-Dissolved	no	0.000	0.051	Square Root	---	---	---
SHL-ALB-01	Arsenic-Dissolved	---	---	---	---	---	---	---
SHL-ALB-02	Arsenic-Dissolved	---	---	---	---	---	---	---
SHL-ALB-03	Arsenic-Dissolved	---	---	---	---	no	1.000	---
SHL-JKP-01	Arsenic-Dissolved	---	---	---	---	no ^{DL}	---	---
GWN-01-75	Naphthenic Acids	---	---	---	---	---	---	---
GWN-06-61	Naphthenic Acids	---	---	---	---	no	0.260	---
GWN-07-57	Naphthenic Acids	---	---	---	---	no	0.452	---
GWN-08-46	Naphthenic Acids	---	---	---	---	---	---	---
IOR-KRL-03 (BAS)	Naphthenic Acids	---	---	---	---	no	0.102	---
IOR-KRL-04 (BAS)	Naphthenic Acids	---	---	---	---	no	0.452	---
IOR-KRL-05 (BAS)	Naphthenic Acids	---	---	---	---	no	0.127	---
SHL-ALB-01	Naphthenic Acids	---	---	---	---	no	0.806	---
SHL-ALB-02	Naphthenic Acids	---	---	---	---	---	---	---
SHL-ALB-03	Naphthenic Acids	---	---	---	---	---	---	---
SHL-JKP-01	Naphthenic Acids	no	0.000	21.78	---	---	---	---
GWN-01-75	Dissolved Silica	---	---	---	---	---	---	---
GWN-06-61	Dissolved Silica	---	---	---	---	no	0.260	---
GWN-07-57	Dissolved Silica	---	---	---	---	no	0.089	---
GWN-08-46	Dissolved Silica	---	---	---	---	no ^{DL}	---	---
IOR-KRL-03(BAS)	Dissolved Silica	---	---	---	---	no	1.000	---
IOR-KRL-04(BAS)	Dissolved Silica	---	---	---	---	no	0.221	---
IOR-KRL-05(BAS)	Dissolved Silica	---	---	---	---	no	0.452	---
SHL-ALB-01	Dissolved Silica	---	---	---	---	---	---	---
SHL-ALB-02	Dissolved Silica	---	---	---	---	---	---	---
SHL-ALB-03	Dissolved Silica	---	---	---	---	---	---	---
SHL-JKP-01	Dissolved Silica	---	---	---	---	---	---	---
GWN-07-56	Dissolved Silica	---	---	---	---	---	---	---

APPENDIX C75.

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Alberta Environment and Sustainable Resource Development

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Shewhart-CUSUM Control Chart Data				Trend Analysis on All Data		
		Statistical Trend Detected on Baseline ($\alpha=0.05$)	Statistical Lower Control Limit	Statistical Upper Control Limit	Transformation	Statistical Trend ($\alpha=0.05$)	Mann-Kendall p-value	Sen Slope
<i>Aquifer Management Unit (AMU) 3</i>								
CNR-H02-002	Total Dissolved Solids (measured)	---	---	---	---	no	0.734	---
GWN-16-24	Total Dissolved Solids (measured)	no	---	---	---	no	0.348	---
TOT-EP-02 (BAS)	Total Dissolved Solids (measured)	---	---	---	---	---	---	---
CNR-H02-002	Sodium	---	---	---	---	no	0.133	---
GWN-16-24	Sodium	no	---	---	---	yes	0.007	0.046
TOT-EP-02 (BAS)	Sodium	---	---	---	---	no	0.245	---
CNR-H02-002	Chloride	---	---	---	---	no	0.368	---
GWN-16-24	Chloride	no	---	---	---	no	0.304	---
TOT-EP-02 (BAS)	Chloride	---	---	---	---	no	0.245	---
CNR-H02-002	Sulphate	---	---	---	---	no	0.196	---
GWN-16-24	Sulphate	yes	---	---	---	yes	0.002	-0.012
TOT-EP-02 (BAS)	Sulphate	---	---	---	---	no	0.245	---
CNR-H02-002	Ammonium-N	---	---	---	---	no	0.764	---
GWN-16-24	Ammonium-N	---	---	---	---	no	1.000	---
CNR-H02-002	Arsenic-Dissolved	---	---	---	---	no ^{DL}	---	---
GWN-16-24	Arsenic-Dissolved	---	---	---	---	no ^{DL}	---	---
CNR-H02-002	Naphthenic Acids	---	---	---	---	no	0.539	---
GWN-16-24	Naphthenic Acids	---	---	---	---	no	0.806	---
CNR-H02-002	Dissolved Silica	---	---	---	---	---	---	---
GWN-16-24	Dissolved Silica	---	---	---	---	no	1.000	---

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		Statistical Trend Detected on Baseline ($\alpha=0.05$)	Statistical Lower Control Limit	Statistical Upper Control Limit	Transformation	Statistical Trend ($\alpha=0.05$)	Mann-Kendall p-value	Sen Slope
McMurray Formation Basal Aquifer								
<i>Aquifer Management Unit (AMU) 4</i>								
CNR-HRZ-01	Total Dissolved Solids (measured)	---	---	---	---	no	0.470	---
GWN-01-76	Total Dissolved Solids (measured)	no	---	---	---	yes	0.032	8.519
SUN-MW-07-110	Total Dissolved Solids (measured)	---	---	---	---	---	---	---
SUN-MW-07-111	Total Dissolved Solids (measured)	---	---	---	---	---	---	---
SUN-MW-07-112	Total Dissolved Solids (measured)	---	---	---	---	---	---	---
CNR-HRZ-01	Sodium-Dissolved	no	42590	102060	---	---	---	---
GWN-01-76	Sodium-Dissolved	no	85377	121159	---	---	---	---
CNR-HRZ-01	Chloride	no	64335	168365	---	---	---	---
GWN-01-76	Chloride	yes	---	---	---	no	0.076	---
SUN-MW-07-110	Chloride	---	---	---	---	---	---	---
SUN-MW-07-111	Chloride	---	---	---	---	---	---	---
SUN-MW-07-112	Chloride	---	---	---	---	---	---	---
CNR-HRZ-01	Sulphate	no	1341	3882	---	---	---	---
GWN-01-76	Sulphate	no	1519	5159	---	---	---	---
SUN-MW-07-110	Sulphate	---	---	---	---	---	---	---
SUN-MW-07-111	Sulphate	---	---	---	---	---	---	---
SUN-MW-07-112	Sulphate	---	---	---	---	---	---	---
CNR-HRZ-01	Ammonium-N	---	---	---	---	no	0.618	---
GWN-01-76	Ammonium-N	---	---	---	---	no	0.734	---
SUN-MW-07-110	Ammonium-N	---	---	---	---	---	---	---
SUN-MW-07-111	Ammonium-N	---	---	---	---	---	---	---
SUN-MW-07-112	Ammonium-N	---	---	---	---	---	---	---
CNR-HRZ-01	Arsenic-Dissolved	no	---	---	---	no	0.375	---
GWN-01-76	Arsenic-Dissolved	---	---	---	---	no ^{DL}	---	---
CNR-HRZ-01	Naphthenic Acids	no	0.000	4.414	---	---	---	---
GWN-01-76	Naphthenic Acids	---	---	---	---	no ^{DL}	---	---
CNR-HRZ-01	Dissolved Silica	---	---	---	---	---	---	---
GWN-01-76	Dissolved Silica	---	---	---	---	no ^{DL}	---	---

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GROUNDWATER MONITORING DIRECTIVE STATISTICAL SUMMARY FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development

North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Shewhart-CUSUM Control Chart Data				Trend Analysis on All Data		
		Statistical Trend Detected on Baseline ($\alpha=0.05$)	Statistical Lower Control Limit	Statistical Upper Control Limit	Transformation	Statistical Trend ($\alpha=0.05$)	Mann-Kendall p-value	Sen Slope
Prairie Evaporite/Beaverhill Lake/Methy (Keg River) Formations								
GWN-01-77	Total Dissolved Solids (measured)	yes	---	---	---	yes	0.005	-70.253
GWN-01-78	Total Dissolved Solids (measured)	no	0.000	14645	---	---	---	---
GWN-06-62	Total Dissolved Solids (measured)	yes	---	---	---	no	0.178	---
GWN-07-58	Total Dissolved Solids (measured)	no	---	---	---	no	0.592	---
GWN-08-48	Total Dissolved Solids (measured)	---	---	---	---	yes	0.035	9.513
GWN-14-35	Total Dissolved Solids (measured)	---	---	---	---	---	---	---
GWN-14-36	Total Dissolved Solids (measured)	---	---	---	---	no	0.711	---
GWN-16-25	Total Dissolved Solids (measured)	---	---	---	---	yes	0.003	4.490
GWN-17-51	Total Dissolved Solids (measured)	---	---	---	---	no	0.386	---
GWN-01-79	Total Dissolved Solids (measured)	---	---	---	---	yes	0.016	6.849
GWN-07-59	Total Dissolved Solids (measured)	no	1.800	14.29	Log	---	---	---
CNR-H02-007	Sodium	---	---	---	---	---	---	---
GWN-01-77	Sodium	---	---	---	---	yes	0.003	-1.505
GWN-01-78	Sodium	---	---	---	---	no	0.386	---
GWN-06-62	Sodium	yes	---	---	---	no	0.951	---
GWN-07-58	Sodium	no	---	---	---	no	0.213	---
GWN-08-47	Sodium	---	---	---	---	---	---	---
GWN-08-48	Sodium	no	0.000	6729	---	---	---	---
GWN-14-35	Sodium	---	---	---	---	---	---	---
GWN-14-36	Sodium	---	---	---	---	no	0.230	---
GWN-16-25	Sodium	yes	---	---	---	yes	0.001	0.732
GWN-17-51	Sodium	no	6296	11046	---	---	---	---
GWN-01-79	Sodium	---	---	---	---	no	0.308	---
GWN-07-59	Sodium	no	-0.302	13.21	Log	---	---	---
CNR-H02-007	Chloride	---	---	---	---	---	---	---
GWN-01-77	Chloride	---	---	---	---	no	0.174	---
GWN-01-78	Chloride	no	0.000	4165	---	---	---	---
GWN-06-62	Chloride	yes	---	---	---	no	1.000	---
GWN-07-58	Chloride	no	---	---	---	no	0.436	---
GWN-08-47	Chloride	---	---	---	---	---	---	---
GWN-08-48	Chloride	no	0.000	9598	---	---	---	---
GWN-14-35	Chloride	---	---	---	---	---	---	---
GWN-14-36	Chloride	---	---	---	---	no	1.000	---
GWN-16-25	Chloride	yes	---	---	---	yes	0.000	1.327
GWN-17-51	Chloride	no	9498	16402	---	---	---	---
GWN-01-79	Chloride	---	---	---	---	no	0.462	---
GWN-07-59	Chloride	no	-0.874	14.25	Log	---	---	---
CNR-H02-007	Sulphate	---	---	---	---	---	---	---
GWN-01-77	Sulphate	no	0.000	7392	---	---	---	---
GWN-01-78	Sulphate	no	0.000	3383	---	---	---	---
GWN-06-62	Sulphate	yes	---	---	---	yes	0.001	-0.009
GWN-07-58	Sulphate	no	0.000	1.27E+07	Data Squared	---	---	---
GWN-08-47	Sulphate	---	---	---	---	---	---	---
GWN-08-48	Sulphate	no	0.000	717.3	---	---	---	---
GWN-14-35	Sulphate	---	---	---	---	---	---	---
GWN-14-36	Sulphate	no	---	---	---	yes	0.048	-0.182
GWN-16-25	Sulphate	no	0.000	2148	---	---	---	---
GWN-17-51	Sulphate	yes	---	---	---	yes	0.001	-0.011
GWN-01-79	Sulphate	---	---	---	---	yes	0.007	-0.668
GWN-07-59	Sulphate	no	0.000	3858	---	---	---	---

APPENDIX C75.

GROUNDWATER MONITORING DIRECTIVE STATISTICAL SUMMARY FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Shewhart-CUSUM Control Chart Data				Trend Analysis on All Data		
		Statistical Trend Detected on Baseline ($\alpha=0.05$)	Statistical Lower Control Limit	Statistical Upper Control Limit	Transformation	Statistical Trend ($\alpha=0.05$)	Mann-Kendall p-value	Sen Slope
Prairie Evaporite/Beaverhill Lake/Methy (Keg River) Formations								
GWN-01-77	Ammonium-N	---	---	---	---	---	---	---
GWN-01-78	Ammonium-N	---	---	---	---	---	---	---
GWN-06-62	Ammonium-N	---	---	---	---	---	---	---
GWN-07-58	Ammonium-N	---	---	---	---	---	---	---
GWN-08-47	Ammonium-N	---	---	---	---	---	---	---
GWN-08-48	Ammonium-N	---	---	---	---	---	---	---
GWN-14-35	Ammonium-N	---	---	---	---	---	---	---
GWN-14-36	Ammonium-N	---	---	---	---	---	---	---
GWN-16-25	Ammonium-N	---	---	---	---	---	---	---
GWN-17-51	Ammonium-N	---	---	---	---	no	0.462	---
GWN-07-59	Ammonium-N	---	---	---	---	---	---	---
CNR-H02-007	Arsenic-Dissolved	---	---	---	---	---	---	---
GWN-01-77	Arsenic-Dissolved	---	---	---	---	---	---	---
GWN-01-78	Arsenic-Dissolved	---	---	---	---	---	---	---
GWN-06-62	Arsenic-Dissolved	---	---	---	---	no ^{DL}	---	---
GWN-07-58	Arsenic-Dissolved	---	---	---	---	---	---	---
GWN-08-47	Arsenic-Dissolved	---	---	---	---	---	---	---
GWN-08-48	Arsenic-Dissolved	---	---	---	---	---	---	---
GWN-14-35	Arsenic-Dissolved	---	---	---	---	---	---	---
GWN-14-36	Arsenic-Dissolved	---	---	---	---	---	---	---
GWN-16-25	Arsenic-Dissolved	---	---	---	---	---	---	---
GWN-17-51	Arsenic-Dissolved	---	---	---	---	no ^{DL}	---	---
GWN-01-79	Arsenic-Dissolved	---	---	---	---	---	---	---
GWN-07-59	Arsenic-Dissolved	---	---	---	---	---	---	---
CNR-H02-007	Naphthenic Acids	---	---	---	---	---	---	---
GWN-01-77	Naphthenic Acids	---	---	---	---	---	---	---
GWN-01-78	Naphthenic Acids	---	---	---	---	---	---	---
GWN-06-62	Naphthenic Acids	---	---	---	---	---	---	---
GWN-07-58	Naphthenic Acids	---	---	---	---	---	---	---
GWN-08-47	Naphthenic Acids	---	---	---	---	---	---	---
GWN-08-48	Naphthenic Acids	---	---	---	---	---	---	---
GWN-14-35	Naphthenic Acids	---	---	---	---	---	---	---
GWN-14-36	Naphthenic Acids	---	---	---	---	---	---	---
GWN-17-51	Naphthenic Acids	---	---	---	---	no	0.130	---
GWN-07-59	Naphthenic Acids	---	---	---	---	---	---	---
GWN-01-77	Dissolved Silica	---	---	---	---	---	---	---
GWN-01-78	Dissolved Silica	---	---	---	---	---	---	---
GWN-06-62	Dissolved Silica	---	---	---	---	no	0.308	---
GWN-07-58	Dissolved Silica	---	---	---	---	---	---	---
GWN-08-47	Dissolved Silica	---	---	---	---	---	---	---
GWN-08-48	Dissolved Silica	---	---	---	---	---	---	---
GWN-14-35	Dissolved Silica	---	---	---	---	---	---	---
GWN-14-36	Dissolved Silica	---	---	---	---	---	---	---
GWN-16-25	Dissolved Silica	---	---	---	---	---	---	---
GWN-17-51	Dissolved Silica	---	---	---	---	no	1.000	---
GWN-01-79	Dissolved Silica	---	---	---	---	---	---	---
GWN-07-59	Dissolved Silica	---	---	---	---	---	---	---

Notes:

- - not applicable
- ^{DL} - Too few values above detection limit to conduct Mann-Kendall analysis
- ^A - Groundwater Management Framework Interim Quality Triggers for the North Athabasca Oil Sands Area

APPENDIX C76.

GROUNDWATER MONITORING DIRECTIVE STATISTICAL SUMMARY FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Baseline Data Removed from Analysis (by date)	
		Statistical Outlier	Statistically Dependent*
Surficial Sands			
AGS-02-20	Total Dissolved Solids (measured)	9-Oct-96	---
AGS-02-WT	Total Dissolved Solids (measured)	---	---
AGS-03-WT	Total Dissolved Solids (measured)	---	---
CVE-BOR-01	Total Dissolved Solids (measured)	---	---
CVE-BOR-02	Total Dissolved Solids (measured)	---	---
GWN-01-74	Total Dissolved Solids (measured)	---	---
GWN-08-43	Total Dissolved Solids (measured)	---	---
GWN-13-26	Total Dissolved Solids (measured)	---	---
GWN-14-32	Total Dissolved Solids (measured)	---	---
GWN-16-22	Total Dissolved Solids (measured)	18-Jul-76	---
IOR-KRL-01	Total Dissolved Solids (measured)	1-Mar-08	---
IOR-KRL-03 (SS)	Total Dissolved Solids (measured)	---	---
IOR-KRL-04 (SS)	Total Dissolved Solids (measured)	---	---
IOR-KRL-05 (SS)	Total Dissolved Solids (measured)	---	---
IOR-KRL-06 (SS)	Total Dissolved Solids (measured)	---	---
IOR-KRL-07	Total Dissolved Solids (measured)	---	---
IOR-KRL-08	Total Dissolved Solids (measured)	---	---
IOR-KRL-09	Total Dissolved Solids (measured)	---	---
IOR-KRL-10	Total Dissolved Solids (measured)	---	---
AGS-02-20	Sodium	---	---
AGS-02-WT	Sodium	---	---
AGS-03-WT	Sodium	---	---
CVE-BOR-01	Sodium	---	---
CVE-BOR-02	Sodium	---	---
GWN-01-74	Sodium	---	---
GWN-08-43	Sodium	---	---
GWN-13-26	Sodium	19-Jul-76	---
GWN-14-32	Sodium	---	---
GWN-16-22	Sodium	---	---
IOR-KRL-01	Sodium	3-Mar-05	---
IOR-KRL-03 (SS)	Sodium	---	---
IOR-KRL-04 (SS)	Sodium	---	---
IOR-KRL-05 (SS)	Sodium	---	---
IOR-KRL-06 (SS)	Sodium	24-Jan-09	---
IOR-KRL-07	Sodium	27-Jan-09	---
IOR-KRL-08	Sodium	---	---
IOR-KRL-09	Sodium	---	---
IOR-KRL-10	Sodium	---	---
AGS-02-20	Chloride	9-Oct-96	---
AGS-02-WT	Chloride	9-Oct-96	---
AGS-03-WT	Chloride	---	---
CVE-BOR-01	Chloride	---	---
CVE-BOR-02	Chloride	---	---
GWN-01-74	Chloride	---	---
GWN-08-43	Chloride	---	---
GWN-13-26	Chloride	10-Jul-79	---
GWN-14-32	Chloride	---	---
GWN-16-22	Chloride	---	---
IOR-KRL-01	Chloride	3-Mar-05	---
IOR-KRL-03 (SS)	Chloride	---	---
IOR-KRL-04 (SS)	Chloride	---	---
IOR-KRL-05 (SS)	Chloride	---	---
IOR-KRL-06 (SS)	Chloride	---	---
IOR-KRL-07	Chloride	---	---
IOR-KRL-08	Chloride	---	---
IOR-KRL-09	Chloride	---	---
IOR-KRL-10	Chloride	---	---

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 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Baseline Data Removed from Analysis (by date)	
		Statistical Outlier	Statistically Dependent*
Surficial Sands			
AGS-02-20	Sulphate	---	---
AGS-02-WT	Sulphate	---	---
AGS-03-WT	Sulphate	---	---
CVE-BOR-01	Sulphate	---	---
CVE-BOR-02	Sulphate	---	---
GWN-01-74	Sulphate	---	---
GWN-08-43	Sulphate	27-Aug-80	---
GWN-13-26	Sulphate	---	---
GWN-14-32	Sulphate	16-Feb-11, 24-Aug-13, 28-Nov-13	---
GWN-16-22	Sulphate	---	---
IOR-KRL-01	Sulphate	3-Mar-05	---
IOR-KRL-03 (SS)	Sulphate	---	---
IOR-KRL-04 (SS)	Sulphate	---	---
IOR-KRL-05 (SS)	Sulphate	---	---
IOR-KRL-06 (SS)	Sulphate	24-Jan-09	---
IOR-KRL-07	Sulphate	27-Jan-09	---
IOR-KRL-08	Sulphate	---	---
IOR-KRL-09	Sulphate	---	---
IOR-KRL-10	Sulphate	---	---
AGS-02-20	Ammonium-N	---	---
AGS-02-WT	Ammonium-N	---	---
AGS-03-WT	Ammonium-N	---	---
CVE-BOR-01	Ammonium-N	---	---
CVE-BOR-02	Ammonium-N	---	---
GWN-01-74	Ammonium-N	---	---
GWN-08-43	Ammonium-N	2-Aug-14	---
GWN-13-26	Ammonium-N	---	---
GWN-14-32	Ammonium-N	4-Aug-14	---
GWN-16-22	Ammonium-N	---	---
IOR-KRL-01	Ammonium-N	---	---
IOR-KRL-03 (SS)	Ammonium-N	---	---
IOR-KRL-04 (SS)	Ammonium-N	---	---
IOR-KRL-05 (SS)	Ammonium-N	---	---
IOR-KRL-06 (SS)	Ammonium-N	---	---
IOR-KRL-07	Ammonium-N	---	---
IOR-KRL-08	Ammonium-N	---	---
IOR-KRL-09	Ammonium-N	---	---
IOR-KRL-10	Ammonium-N	---	---
AGS-02-20	Arsenic-Dissolved	---	---
AGS-02-WT	Arsenic-Dissolved	---	---
AGS-03-WT	Arsenic-Dissolved	---	---
CVE-BOR-01	Arsenic-Dissolved	---	---
CVE-BOR-02	Arsenic-Dissolved	---	---
GWN-01-74	Arsenic-Dissolved	---	---
GWN-08-43	Arsenic-Dissolved	---	---
GWN-13-26	Arsenic-Dissolved	19-Jul-76	---
GWN-14-32	Arsenic-Dissolved	---	---
GWN-16-22	Arsenic-Dissolved	18-Jul-76	---
IOR-KRL-01	Arsenic-Dissolved	---	---
IOR-KRL-03 (SS)	Arsenic-Dissolved	---	---
IOR-KRL-04 (SS)	Arsenic-Dissolved	---	---
IOR-KRL-05 (SS)	Arsenic-Dissolved	---	---
IOR-KRL-06 (SS)	Arsenic-Dissolved	---	---
IOR-KRL-07	Arsenic-Dissolved	---	---
IOR-KRL-08	Arsenic-Dissolved	---	---
IOR-KRL-09	Arsenic-Dissolved	---	---
IOR-KRL-10	Arsenic-Dissolved	---	---

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Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Baseline Data Removed from Analysis (by date)	
		Statistical Outlier	Statistically Dependent*
Surficial Sands			
AGS-02-20	Naphthenic Acids	---	---
AGS-02-WT	Naphthenic Acids	---	---
AGS-03-WT	Naphthenic Acids	---	---
CVE-BOR-01	Naphthenic Acids	---	---
CVE-BOR-02	Naphthenic Acids	---	---
GWN-01-74	Naphthenic Acids	---	---
GWN-08-43	Naphthenic Acids	---	---
GWN-13-26	Naphthenic Acids	---	---
GWN-14-32	Naphthenic Acids	4-Aug-14	---
GWN-16-22	Naphthenic Acids	---	---
IOR-KRL-01	Naphthenic Acids	---	---
IOR-KRL-03 (SS)	Naphthenic Acids	---	---
IOR-KRL-04 (SS)	Naphthenic Acids	---	---
IOR-KRL-05 (SS)	Naphthenic Acids	---	---
IOR-KRL-06 (SS)	Naphthenic Acids	---	---
IOR-KRL-07	Naphthenic Acids	---	---
IOR-KRL-08	Naphthenic Acids	---	---
IOR-KRL-09	Naphthenic Acids	---	---
IOR-KRL-10	Naphthenic Acids	---	---
AGS-02-20	Dissolved Silica	---	---
AGS-02-WT	Dissolved Silica	---	---
AGS-03-WT	Dissolved Silica	---	---
CVE-BOR-01	Dissolved Silica	---	---
CVE-BOR-02	Dissolved Silica	23-Jan-08	---
GWN-01-74	Dissolved Silica	---	---
GWN-08-43	Dissolved Silica	---	---
GWN-13-26	Dissolved Silica	---	---
GWN-14-32	Dissolved Silica	---	---
GWN-16-22	Dissolved Silica	---	---
IOR-KRL-01	Dissolved Silica	---	---
IOR-KRL-03 (SS)	Dissolved Silica	---	---
IOR-KRL-04 (SS)	Dissolved Silica	---	---
IOR-KRL-05 (SS)	Dissolved Silica	---	---
IOR-KRL-06 (SS)	Dissolved Silica	---	---
IOR-KRL-07	Dissolved Silica	---	---
IOR-KRL-08	Dissolved Silica	---	---
IOR-KRL-09	Dissolved Silica	---	---
IOR-KRL-10	Dissolved Silica	---	---

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Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Baseline Data Removed from Analysis (by date)	
		Statistical Outlier	Statistically Dependent*
Buried Channels and Valleys			
<i>Kearl Channel</i>			
GWN-08-44	Total Dissolved Solids (measured)	---	---
GWN-Shell-PW2-63	Total Dissolved Solids (measured)	---	---
IOR-KRL-02	Total Dissolved Solids (measured)	---	---
GWN-08-44	Sodium	---	---
GWN-Shell-PW2-63	Sodium	---	---
IOR-KRL-02	Sodium	---	---
GWN-08-44	Chloride	---	---
GWN-Shell-PW2-63	Chloride	---	---
IOR-KRL-02	Chloride	---	---
GWN-08-44	Sulphate	22-Feb-75	---
GWN-Shell-PW2-63	Sulphate	---	---
IOR-KRL-02	Sulphate	---	---
GWN-08-44	Ammonium-N	---	---
GWN-Shell-PW2-63	Ammonium-N	---	---
IOR-KRL-02	Ammonium-N	---	---
GWN-08-44	Arsenic-Dissolved	---	---
GWN-Shell-PW2-63	Arsenic-Dissolved	---	---
IOR-KRL-02	Arsenic-Dissolved	---	---
GWN-08-44	Naphthenic Acids	---	---
GWN-Shell-PW2-63	Naphthenic Acids	---	---
IOR-KRL-02	Naphthenic Acids	---	---
GWN-08-44	Dissolved Silica	---	---
GWN-Shell-PW2-63	Dissolved Silica	---	---
IOR-KRL-02	Dissolved Silica	---	---
Buried Channels and Valleys			
<i>Birch Channel</i>			
AGS-02-97	Total Dissolved Solids (measured)	---	---
AGS-03-17	Total Dissolved Solids (measured)	---	---
AGS-02-97	Sodium	---	---
AGS-03-17	Sodium	---	---
AGS-02-97	Chloride	---	---
AGS-03-17	Chloride	---	---
AGS-02-97	Sulphate	---	---
AGS-03-17	Sulphate	---	---
AGS-02-97	Ammonium-N	---	---
AGS-03-17	Ammonium-N	22-Aug-13	---
AGS-02-97	Arsenic-Dissolved	---	---
AGS-03-17	Arsenic-Dissolved	---	---
AGS-02-97	Naphthenic Acids	---	---
AGS-03-17	Naphthenic Acids	---	---
AGS-02-97	Dissolved Silica	---	---
AGS-03-17	Dissolved Silica	---	---

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Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Baseline Data Removed from Analysis (by date)	
		Statistical Outlier	Statistically Dependent*
<i>Thickwood Channel</i>			
GWN-13-27	Total Dissolved Solids (measured)	---	---
GWN-13-27	Sodium	---	---
GWN-13-27	Chloride	11-Jul-77	---
GWN-13-27	Sulphate	8-Sep-09	---
GWN-13-27	Ammonium-N	---	---
GWN-13-27	Arsenic-Dissolved	---	---
GWN-13-27	Naphthenic Acids	---	---
GWN-13-27	Dissolved Silica	---	---
Grand Rapids Formation			
CVE-BOR-03	Total Dissolved Solids (measured)	---	---
CVE-BOR-04	Total Dissolved Solids (measured)	---	---
CVE-WW10-13	Total Dissolved Solids (measured)	---	---
GWN-13-28	Total Dissolved Solids (measured)	---	---
CVE-BOR-03	Sodium	---	---
CVE-BOR-04	Sodium	---	---
CVE-WW10-13	Sodium	---	---
GWN-13-28	Sodium	---	---
CVE-BOR-03	Chloride	---	---
CVE-BOR-04	Chloride	---	---
CVE-WW10-13	Chloride	---	---
GWN-13-28	Chloride	---	---
CVE-BOR-03	Sulphate	---	---
CVE-BOR-04	Sulphate	---	---
CVE-WW10-13	Sulphate	---	---
GWN-13-28	Sulphate	---	---
GWN-13-28	Ammonium-N	---	---
CVE-BOR-03	Arsenic-Dissolved	---	---
CVE-WW10-13	Arsenic-Dissolved	---	---
GWN-13-28	Arsenic-Dissolved	11-Nov-76	---
CVE-BOR-03	Naphthenic Acids	---	---
GWN-13-28	Naphthenic Acids	---	---
CVE-BOR-03	Dissolved Silica	---	---
CVE-WW10-13	Dissolved Silica	---	---
GWN-13-28	Dissolved Silica	---	---

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GROUNDWATER MONITORING DIRECTIVE STATISTICAL SUMMARY FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Baseline Data Removed from Analysis (by date)	
		Statistical Outlier	Statistically Dependent*
Clearwater Formation			
AGS-02-108	Total Dissolved Solids (measured)	---	---
AGS-03-30	Total Dissolved Solids (measured)	---	---
GWN-08-45	Total Dissolved Solids (measured)	6-Mar-75, 17-Jul-76	---
GWN-14-33	Total Dissolved Solids (measured)	---	---
AGS-02-108	Sodium	---	---
AGS-03-30	Sodium	---	---
GWN-08-45	Sodium	---	---
GWN-14-33	Sodium	---	---
AGS-02-108	Chloride	6-Aug-14	---
AGS-03-30	Chloride	---	---
GWN-08-45	Chloride	6-Mar-75	---
GWN-14-33	Chloride	---	---
AGS-02-108	Sulphate	---	---
AGS-03-30	Sulphate	---	---
GWN-08-45	Sulphate	23-Feb-75	---
GWN-14-33	Sulphate	---	---
AGS-02-108	Ammonium-N	---	---
AGS-03-30	Ammonium-N	---	---
GWN-08-45	Ammonium-N	---	---
GWN-14-33	Ammonium-N	---	---
AGS-02-108	Arsenic-Dissolved	---	---
AGS-03-30	Arsenic-Dissolved	---	---
GWN-08-45	Arsenic-Dissolved	---	---
GWN-14-33	Arsenic-Dissolved	---	---
AGS-02-108	Naphthenic Acids	---	---
AGS-03-30	Naphthenic Acids	---	---
GWN-08-45	Naphthenic Acids	---	---
GWN-14-33	Naphthenic Acids	---	---
AGS-02-108	Dissolved Silica	---	---
AGS-03-30	Dissolved Silica	---	---
GWN-08-45	Dissolved Silica	30-Sep-09	---
GWN-14-33	Dissolved Silica	---	---

APPENDIX C76.

GROUNDWATER MONITORING DIRECTIVE STATISTICAL SUMMARY FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Baseline Data Removed from Analysis (by date)	
		Statistical Outlier	Statistically Dependent*
McMurray Formation Basal Aquifer			
<i>Aquifer Management Unit (AMU) 1</i>			
CVE-02-04-LM	Total Dissolved Solids (measured)	---	---
GWN-06-60	Total Dissolved Solids (measured)	---	---
GWN-17-50	Total Dissolved Solids (measured)	---	---
CVE-02-04-LM	Sodium	---	---
GWN-06-60	Sodium	26-Aug-81	---
GWN-17-50	Sodium	---	---
CVE-02-04-LM	Chloride	---	---
GWN-06-60	Chloride	16-Jul-76	---
GWN-17-50	Chloride	---	---
CVE-02-04-LM	Sulphate	---	---
GWN-06-60	Sulphate	3-Aug-77, 15-Mar-78	---
GWN-17-50	Sulphate	---	---
GWN-06-60	Ammonium-N	---	---
GWN-17-50	Ammonium-N	---	---
CVE-02-04-LM	Arsenic-Dissolved	---	---
GWN-06-60	Arsenic-Dissolved	16-Jul-76	---
GWN-17-50	Arsenic-Dissolved	13-Jul-76	---
GWN-06-60	Naphthenic Acids	---	---
GWN-17-50	Naphthenic Acids	---	---
CVE-02-04-LM	Dissolved Silica	---	---
GWN-06-60	Dissolved Silica	---	---
GWN-17-50	Dissolved Silica	---	---

APPENDIX C76.

GROUNDWATER MONITORING DIRECTIVE STATISTICAL SUMMARY FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Baseline Data Removed from Analysis (by date)	
		Statistical Outlier	Statistically Dependent*
McMurray Formation Basal Aquifer			
<i>Aquifer Management Unit (AMU) 2</i>			
GWN-01-75	Total Dissolved Solids (measured)	---	---
GWN-06-61	Total Dissolved Solids (measured)	---	---
GWN-07-57	Total Dissolved Solids (measured)	---	---
GWN-08-46	Total Dissolved Solids (measured)	---	---
GWN-13-29	Total Dissolved Solids (measured)	19-Jul-76	---
GWN-13-30	Total Dissolved Solids (measured)	---	---
IOR-KRL-03 (BAS)	Total Dissolved Solids (measured)	---	---
IOR-KRL-04 (BAS)	Total Dissolved Solids (measured)	---	---
IOR-KRL-05 (BAS)	Total Dissolved Solids (measured)	---	---
SHL-ALB-01	Total Dissolved Solids (measured)	---	---
SHL-ALB-02	Total Dissolved Solids (measured)	---	---
SHL-JKP-01	Total Dissolved Solids (measured)	21-Dec-07	---
GWN-01-75	Sodium	10-Sep-75	---
GWN-06-61	Sodium	---	---
GWN-07-57	Sodium	---	---
GWN-08-46	Sodium	---	---
GWN-13-29	Sodium	19-Jul-76	---
GWN-13-30	Sodium	---	---
IOR-KRL-03 (BAS)	Sodium	28-Feb-98, 1-Mar-98	---
IOR-KRL-04 (BAS)	Sodium	---	---
IOR-KRL-05 (BAS)	Sodium	---	---
SHL-ALB-01	Sodium	---	---
SHL-ALB-02	Sodium	---	---
SHL-ALB-03	Sodium	---	---
SHL-JKP-01	Sodium	---	---
GWN-01-75	Chloride	---	---
GWN-06-61	Chloride	11-Sep-75	---
GWN-07-57	Chloride	9-Sep-75	---
GWN-08-46	Chloride	---	---
GWN-13-29	Chloride	19-Jul-76	---
GWN-13-30	Chloride	---	---
IOR-KRL-03 (BAS)	Chloride	---	---
IOR-KRL-04 (BAS)	Chloride	3-Mar-06	---
IOR-KRL-05 (BAS)	Chloride	---	---
SHL-ALB-01	Chloride	---	---
SHL-ALB-02	Chloride	---	---
SHL-ALB-03	Chloride	25-Aug-09	---
SHL-JKP-01	Chloride	21-Dec-07	---
GWN-01-75	Sulphate	---	---
GWN-06-61	Sulphate	18-Feb-75	---
GWN-07-57	Sulphate	---	---
GWN-08-46	Sulphate	23-Feb-75	---
GWN-13-29	Sulphate	---	---
GWN-13-30	Sulphate	---	---
IOR-KRL-03 (BAS)	Sulphate	---	---
IOR-KRL-04 (BAS)	Sulphate	---	---
IOR-KRL-05 (BAS)	Sulphate	---	---
SHL-ALB-01	Sulphate	---	---
SHL-ALB-02	Sulphate	---	---
SHL-ALB-03	Sulphate	---	---
SHL-JKP-01	Sulphate	---	---

APPENDIX C76.

GROUNDWATER MONITORING DIRECTIVE STATISTICAL SUMMARY FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Baseline Data Removed from Analysis (by date)	
		Statistical Outlier	Statistically Dependent*
McMurray Formation Basal Aquifer			
<i>Aquifer Management Unit (AMU) 2</i>			
GWN-01-75	Ammonium-N	---	---
GWN-06-61	Ammonium-N	---	---
GWN-07-57	Ammonium-N	---	---
GWN-08-46	Ammonium-N	---	---
IOR-KRL-03 (BAS)	Ammonium-N	---	---
IOR-KRL-04 (BAS)	Ammonium-N	---	---
IOR-KRL-05 (BAS)	Ammonium-N	---	---
SHL-ALB-01	Ammonium-N	---	---
SHL-ALB-02	Ammonium-N	---	---
SHL-JKP-01	Ammonium-N	---	---
GWN-01-75	Arsenic-Dissolved	13-Jul-76	---
GWN-06-61	Arsenic-Dissolved	16-Jul-76	---
GWN-07-57	Arsenic-Dissolved	---	---
GWN-08-46	Arsenic-Dissolved	---	---
IOR-KRL-03 (BAS)	Arsenic-Dissolved	---	---
IOR-KRL-04 (BAS)	Arsenic-Dissolved	---	---
IOR-KRL-05 (BAS)	Arsenic-Dissolved	---	---
SHL-ALB-01	Arsenic-Dissolved	---	---
SHL-ALB-02	Arsenic-Dissolved	---	---
SHL-ALB-03	Arsenic-Dissolved	---	---
SHL-JKP-01	Arsenic-Dissolved	---	---
GWN-01-75	Naphthenic Acids	---	---
GWN-06-61	Naphthenic Acids	---	---
GWN-07-57	Naphthenic Acids	---	---
GWN-08-46	Naphthenic Acids	---	---
IOR-KRL-03 (BAS)	Naphthenic Acids	---	---
IOR-KRL-04 (BAS)	Naphthenic Acids	---	---
IOR-KRL-05 (BAS)	Naphthenic Acids	---	---
SHL-ALB-01	Naphthenic Acids	---	---
SHL-ALB-02	Naphthenic Acids	---	---
SHL-ALB-03	Naphthenic Acids	---	---
SHL-JKP-01	Naphthenic Acids	---	---
GWN-01-75	Dissolved Silica	---	---
GWN-06-61	Dissolved Silica	---	---
GWN-07-57	Dissolved Silica	---	---
GWN-08-46	Dissolved Silica	---	---
IOR-KRL-03(BAS)	Dissolved Silica	15-Mar-08	---
IOR-KRL-04(BAS)	Dissolved Silica	---	---
IOR-KRL-05(BAS)	Dissolved Silica	---	---
SHL-ALB-01	Dissolved Silica	---	---
SHL-ALB-02	Dissolved Silica	---	---
SHL-ALB-03	Dissolved Silica	---	---
SHL-JKP-01	Dissolved Silica	---	---
GWN-07-56	Dissolved Silica	---	---

APPENDIX C76.

GROUNDWATER MONITORING DIRECTIVE STATISTICAL SUMMARY FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Baseline Data Removed from Analysis (by date)	
		Statistical Outlier	Statistically Dependent*
<i>Aquifer Management Unit (AMU) 3</i>			
CNR-H02-002	Total Dissolved Solids (measured)	---	---
GWN-16-24	Total Dissolved Solids (measured)	---	---
TOT-EP-02 (BAS)	Total Dissolved Solids (measured)	---	---
CNR-H02-002	Sodium	---	---
GWN-16-24	Sodium	---	---
TOT-EP-02 (BAS)	Sodium	---	---
CNR-H02-002	Chloride	---	---
GWN-16-24	Chloride	---	---
TOT-EP-02 (BAS)	Chloride	---	---
CNR-H02-002	Sulphate	---	---
GWN-16-24	Sulphate	---	---
TOT-EP-02 (BAS)	Sulphate	---	---
CNR-H02-002	Ammonium-N	---	---
GWN-16-24	Ammonium-N	---	---
CNR-H02-002	Arsenic-Dissolved	---	---
GWN-16-24	Arsenic-Dissolved	---	---
CNR-H02-002	Naphthenic Acids	---	---
GWN-16-24	Naphthenic Acids	---	---
CNR-H02-002	Dissolved Silica	---	---
GWN-16-24	Dissolved Silica	---	---

APPENDIX C76.

GROUNDWATER MONITORING DIRECTIVE STATISTICAL SUMMARY FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Baseline Data Removed from Analysis (by date)	
		Statistical Outlier	Statistically Dependent*
McMurray Formation Basal Aquifer			
<i>Aquifer Management Unit (AMU) 4</i>			
CNR-HRZ-01	Total Dissolved Solids (measured)	---	---
GWN-01-76	Total Dissolved Solids (measured)	13-Jan-75	---
SUN-MW-07-110	Total Dissolved Solids (measured)	---	---
SUN-MW-07-111	Total Dissolved Solids (measured)	---	---
SUN-MW-07-112	Total Dissolved Solids (measured)	---	---
CNR-HRZ-01	Sodium	---	---
GWN-01-76	Sodium	13-Jan-75	---
CNR-HRZ-01	Chloride	---	---
GWN-01-76	Chloride	13-Jan-75	---
SUN-MW-07-110	Chloride	---	---
SUN-MW-07-111	Chloride	---	---
SUN-MW-07-112	Chloride	---	---
CNR-HRZ-01	Sulphate	---	---
GWN-01-76	Sulphate	13-Jan-75, 10-Sep-75	---
SUN-MW-07-110	Sulphate	---	---
SUN-MW-07-111	Sulphate	---	---
SUN-MW-07-112	Sulphate	---	---
CNR-HRZ-01	Ammonium-N	---	---
GWN-01-76	Ammonium-N	---	---
SUN-MW-07-110	Ammonium-N	---	---
SUN-MW-07-111	Ammonium-N	---	---
SUN-MW-07-112	Ammonium-N	---	---
CNR-HRZ-01	Arsenic-Dissolved	---	---
GWN-01-76	Arsenic-Dissolved	---	---
CNR-HRZ-01	Naphthenic Acids	---	---
GWN-01-76	Naphthenic Acids	---	---
CNR-HRZ-01	Dissolved Silica	---	---
GWN-01-76	Dissolved Silica	27-Oct-12	---

APPENDIX C76.

GROUNDWATER MONITORING DIRECTIVE STATISTICAL SUMMARY FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Baseline Data Removed from Analysis (by date)	
		Statistical Outlier	Statistically Dependent*
Prairie Evaporite/Beaverhill Lake/Methy (Keg River) Formations			
GWN-01-77	Total Dissolved Solids (measured)	13-Jan-75	---
GWN-01-78	Total Dissolved Solids (measured)	---	---
GWN-06-62	Total Dissolved Solids (measured)	---	---
GWN-07-58	Total Dissolved Solids (measured)	---	---
GWN-08-48	Total Dissolved Solids (measured)	---	---
GWN-14-35	Total Dissolved Solids (measured)	---	---
GWN-14-36	Total Dissolved Solids (measured)	15-Feb-76	---
GWN-16-25	Total Dissolved Solids (measured)	---	---
GWN-17-51	Total Dissolved Solids (measured)	---	---
GWN-01-79	Total Dissolved Solids (measured)	---	---
GWN-07-59	Total Dissolved Solids (measured)	---	---
CNR-H02-007	Sodium	---	---
GWN-01-77	Sodium	---	---
GWN-01-78	Sodium	13-Jan-75, 18-Mar-75	---
GWN-06-62	Sodium	---	---
GWN-07-58	Sodium	---	---
GWN-08-47	Sodium	---	---
GWN-08-48	Sodium	---	---
GWN-14-35	Sodium	---	---
GWN-14-36	Sodium	---	---
GWN-16-25	Sodium	---	---
GWN-17-51	Sodium	---	---
GWN-01-79	Sodium	26-Feb-76	---
GWN-07-59	Sodium	---	---
CNR-H02-007	Chloride	---	---
GWN-01-77	Chloride	---	---
GWN-01-78	Chloride	---	---
GWN-06-62	Chloride	---	---
GWN-07-58	Chloride	---	---
GWN-08-47	Chloride	---	---
GWN-08-48	Chloride	---	---
GWN-14-35	Chloride	---	---
GWN-14-36	Chloride	---	---
GWN-16-25	Chloride	---	---
GWN-17-51	Chloride	4-Jul-78	---
GWN-01-79	Chloride	---	---
GWN-07-59	Chloride	---	---
CNR-H02-007	Sulphate	---	---
GWN-01-77	Sulphate	---	---
GWN-01-78	Sulphate	---	---
GWN-06-62	Sulphate	---	---
GWN-07-58	Sulphate	---	---
GWN-08-47	Sulphate	---	---
GWN-08-48	Sulphate	---	---
GWN-14-35	Sulphate	---	---
GWN-14-36	Sulphate	---	---
GWN-16-25	Sulphate	---	---
GWN-17-51	Sulphate	---	---
GWN-01-79	Sulphate	---	---
GWN-07-59	Sulphate	---	---

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GROUNDWATER MONITORING DIRECTIVE STATISTICAL SUMMARY FOR MONITORING WELLS

Alberta Environment and Sustainable Resource Development
 North Athabasca Oil Sands Area Regional Groundwater Monitoring Network

Well ID	Analyte	Baseline Data Removed from Analysis (by date)	
		Statistical Outlier	Statistically Dependent*
Prairie Evaporite/Beaverhill Lake/Methy (Keg River) Formations			
GWN-01-77	Ammonium-N	---	---
GWN-01-78	Ammonium-N	---	---
GWN-06-62	Ammonium-N	---	---
GWN-07-58	Ammonium-N	---	---
GWN-08-47	Ammonium-N	---	---
GWN-08-48	Ammonium-N	---	---
GWN-14-35	Ammonium-N	---	---
GWN-14-36	Ammonium-N	---	---
GWN-16-25	Ammonium-N	---	---
GWN-17-51	Ammonium-N	---	---
GWN-07-59	Ammonium-N	---	---
CNR-H02-007	Arsenic-Dissolved	---	---
GWN-01-77	Arsenic-Dissolved	---	---
GWN-01-78	Arsenic-Dissolved	---	---
GWN-06-62	Arsenic-Dissolved	---	---
GWN-07-58	Arsenic-Dissolved	---	---
GWN-08-47	Arsenic-Dissolved	---	---
GWN-08-48	Arsenic-Dissolved	---	---
GWN-14-35	Arsenic-Dissolved	---	---
GWN-14-36	Arsenic-Dissolved	---	---
GWN-16-25	Arsenic-Dissolved	---	---
GWN-17-51	Arsenic-Dissolved	---	---
GWN-01-79	Arsenic-Dissolved	---	---
GWN-07-59	Arsenic-Dissolved	---	---
CNR-H02-007	Naphthenic Acids	---	---
GWN-01-77	Naphthenic Acids	---	---
GWN-01-78	Naphthenic Acids	---	---
GWN-06-62	Naphthenic Acids	---	---
GWN-07-58	Naphthenic Acids	---	---
GWN-08-47	Naphthenic Acids	---	---
GWN-08-48	Naphthenic Acids	---	---
GWN-14-35	Naphthenic Acids	---	---
GWN-14-36	Naphthenic Acids	---	---
GWN-17-51	Naphthenic Acids	---	---
GWN-07-59	Naphthenic Acids	---	---
GWN-01-77	Dissolved Silica	---	---
GWN-01-78	Dissolved Silica	---	---
GWN-06-62	Dissolved Silica	---	---
GWN-07-58	Dissolved Silica	---	---
GWN-08-47	Dissolved Silica	---	---
GWN-08-48	Dissolved Silica	---	---
GWN-14-35	Dissolved Silica	---	---
GWN-14-36	Dissolved Silica	---	---
GWN-16-25	Dissolved Silica	---	---
GWN-17-51	Dissolved Silica	---	---
GWN-01-79	Dissolved Silica	---	---
GWN-07-59	Dissolved Silica	---	---

Notes:

- - not applicable
- * - All duplicate values (where locations had the same location name and date collected) were excluded from analysis

APPENDIX D
Laboratory Reports



Matrix Solutions Inc.
ATTN: AKIN OWOJORI
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Date Received: 01-AUG-14
Report Date: 03-SEP-14 13:27 (MT)
Version: FINAL

Client Phone: 403-513-2275

Certificate of Analysis

Lab Work Order #: L1495990
Project P.O. #: NOT SUBMITTED
Job Reference: 16053-502 NAOS
C of C Numbers: M076075
Legal Site Desc: SITE 9 & 11

Nicole Thibault
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 9936-67 Avenue, Edmonton, AB T6E 0P5 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1495990-1 16053140731001									
Sampled By: CLIENT on 31-JUL-14 @ 09:31									
Matrix: WATER									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
Toluene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
EthylBenzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
o-Xylene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
m+p-Xylene	0.00073	-		0.00050	mg/L	-		10-AUG-14	R2908774
Styrene	<0.0010	-		0.0010	mg/L	-		10-AUG-14	R2908774
F1(C6-C10)	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908774
F1-BTEX	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908774
Xylenes	0.00073	-		0.00071	mg/L	-		10-AUG-14	R2908774
Surr: 1,4-Difluorobenzene (SS)	95.7	-		N/A	%	-		10-AUG-14	R2908774
Surr: 4-Bromofluorobenzene (SS)	70.5	-		N/A	%	-		10-AUG-14	R2908774
Surr: 3,4-Dichlorotoluene (SS)	86.6	-		N/A	%	-		10-AUG-14	R2908774
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	06-AUG-14	06-AUG-14	R2910432
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	06-AUG-14	06-AUG-14	R2910432
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	06-AUG-14	06-AUG-14	R2910432
Surr: 2-Bromobenzotrifluoride	83.4	-		N/A	%	-	06-AUG-14	06-AUG-14	R2910432
Dissolved Metals - Matrix									
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		14-AUG-14	R2919287
				0					
Total Metals - Matrix									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		14-AUG-14	R2919287
				0					
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.0072	+/-0.0023		0.0030	mg/L	0		10-AUG-14	R2912618
Antimony (Sb)-Total	<0.00010	-		0.00010	mg/L	-		10-AUG-14	R2912618
Arsenic (As)-Total	0.00084	+/-0.00011		0.00010	mg/L	0		10-AUG-14	R2912618
Barium (Ba)-Total	0.466	+/-0.052		0.000050	mg/L	0		10-AUG-14	R2912618
Beryllium (Be)-Total	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2912618
Bismuth (Bi)-Total	<0.000050	-		0.000050	mg/L	-		10-AUG-14	R2912618
Boron (B)-Total	0.062	+/-0.010		0.010	mg/L	0		10-AUG-14	R2912618
Cadmium (Cd)-Total	<0.000010	-		0.000010	mg/L	-		10-AUG-14	R2912618
Calcium (Ca)-Total	95.6	+/-11		0.10	mg/L	0		10-AUG-14	R2912618
Chromium (Cr)-Total	0.00101	+/-0.00016		0.00010	mg/L	0		10-AUG-14	R2912618
Cobalt (Co)-Total	0.00017	+/-0.00002		0.00010	mg/L	0		10-AUG-14	R2912618
Copper (Cu)-Total	0.00038	+/-0.00011		0.00010	mg/L	0		10-AUG-14	R2912618
Iron (Fe)-Total	31.6	+/-5.0		0.030	mg/L	0		10-AUG-14	R2912618
Lead (Pb)-Total	0.000058	+/-0.000017		0.000050	mg/L	0		10-AUG-14	R2912618
Lithium (Li)-Total	0.0158	+/-0.0030		0.0050	mg/L	0		10-AUG-14	R2912618
Magnesium (Mg)-Total	15.3	+/-1.9		0.10	mg/L	0		10-AUG-14	R2912618
Manganese (Mn)-Total	0.571	+/-0.058		0.0050	mg/L	0		10-AUG-14	R2912618
Molybdenum (Mo)-Total	0.000112	+/-0.000021		0.000050	mg/L	0		10-AUG-14	R2912618
Nickel (Ni)-Total	0.00087	+/-0.00012		0.00010	mg/L	0		10-AUG-14	R2912618
Potassium (K)-Total	1.69	+/-0.21		0.50	mg/L	0		10-AUG-14	R2912618
Selenium (Se)-Total	<0.00010	-		0.00010	mg/L	-		10-AUG-14	R2912618
Silicon (Si)-Total	10.4	+/-2.1		0.050	mg/L	0		10-AUG-14	R2912618
Silver (Ag)-Total	<0.000010	-		0.000010	mg/L	-		10-AUG-14	R2912618
Sodium (Na)-Total	5.4	+/-0.7		1.0	mg/L	0		10-AUG-14	R2912618
Strontium (Sr)-Total	0.254	+/-0.036		0.00010	mg/L	0		10-AUG-14	R2912618

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1495990-1 16053140731001									
Sampled By: CLIENT on 31-JUL-14 @ 09:31									
Matrix: WATER									
Total Metals in Water by CRC ICPMS									
Thallium (Tl)-Total	<0.000050	-		0.000050	mg/L	-		10-AUG-14	R2912618
Tin (Sn)-Total	<0.00010	-		0.00010	mg/L	-		10-AUG-14	R2912618
Titanium (Ti)-Total	0.00138	+/-0.00047		0.00030	mg/L	0		10-AUG-14	R2912618
Uranium (U)-Total	0.000011	+/-0.000002		0.000010	mg/L	0		10-AUG-14	R2912618
Vanadium (V)-Total	0.00295	+/-0.00040		0.00010	mg/L	0		10-AUG-14	R2912618
Zinc (Zn)-Total	0.0496	+/-0.0083		0.0050	mg/L	0		10-AUG-14	R2912618
Miscellaneous Parameters									
Ammonia, Total (as N)	0.622	-		0.050	mg/L	-		13-AUG-14	R2916747
Dissolved Organic Carbon	30.4	+/-3.3		1.0	mg/L	0		13-AUG-14	R2915774
Iron Bacteria	See Attached	-				-		09-AUG-14	R2936168
Naphthenic Acids	<1.0	-		1.0	mg/L	-	13-AUG-14	25-AUG-14	R2927870
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		14-AUG-14	R2918451
Sulphate Reducing Bacteria	See Attached	-				-		09-AUG-14	R2936168
Total Dissolved Solids	430	+/-29		10	mg/L	0		08-JUL-14	R2911966
Silicon (as SiO2)-Total	22.2	-		0.11	mg/L	-		10-AUG-14	
Turbidity	220	+/-12		0.10	NTU	0		02-AUG-14	R2906614
CCME PAHs									
Naphthalene	<0.000050	-		0.000050	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Quinoline	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Acenaphthene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Fluorene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Phenanthrene	<0.000050	-		0.000050	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Anthracene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Acridine	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Fluoranthene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Pyrene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Chrysene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(a)pyrene	<0.000050	-		0.000005	mg/L	-	07-AUG-14	07-AUG-14	R2912646
				0					
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Dibenzo(a,h)anthracene	<0.000050	-		0.000005	mg/L	-	07-AUG-14	07-AUG-14	R2912646
				0					
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Surr: d10-Acenaphthene	85.8	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Surr: d10-Phenanthrene	88.8	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Surr: d12-Chrysene	87.0	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Routine Water Analysis									
Chloride by IC									
Chloride (Cl)	<0.50	-		0.50	mg/L	-		01-AUG-14	R2906695
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	0.0039	+/-0.0007		0.0010	mg/L	0		14-AUG-14	R2918380
Antimony (Sb)-Dissolved	<0.00010	-		0.00010	mg/L	-		14-AUG-14	R2918380
Arsenic (As)-Dissolved	0.00081	+/-0.00008		0.00010	mg/L	0		14-AUG-14	R2918380
Barium (Ba)-Dissolved	0.484	+/-0.042		0.000050	mg/L	0		14-AUG-14	R2918380
Beryllium (Be)-Dissolved	<0.00050	-		0.00050	mg/L	-		14-AUG-14	R2918380
Bismuth (Bi)-Dissolved	<0.000050	-		0.000050	mg/L	-		14-AUG-14	R2918380
Boron (B)-Dissolved	0.061	+/-0.007		0.010	mg/L	0		14-AUG-14	R2918380

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1495990-1 16053140731001 Sampled By: CLIENT on 31-JUL-14 @ 09:31 Matrix: WATER									
Dissolved Metals in Water by CRC ICPMS									
Cadmium (Cd)-Dissolved	<0.000010	-		0.000010	mg/L	-		14-AUG-14	R2918380
Calcium (Ca)-Dissolved	105	+/-14		0.10	mg/L	0		14-AUG-14	R2918380
Chromium (Cr)-Dissolved	0.00046	+/-0.00004		0.00010	mg/L	0		14-AUG-14	R2918380
Cobalt (Co)-Dissolved	<0.00010	-		0.00010	mg/L	-		14-AUG-14	R2918380
Copper (Cu)-Dissolved	<0.00010	-		0.00010	mg/L	-		14-AUG-14	R2918380
Iron (Fe)-Dissolved	30.8	+/-2.8		0.030	mg/L	0		14-AUG-14	R2918380
Lead (Pb)-Dissolved	<0.000050	-		0.000050	mg/L	-		14-AUG-14	R2918380
Lithium (Li)-Dissolved	0.0176	+/-0.0022		0.0050	mg/L	0		14-AUG-14	R2918380
Magnesium (Mg)-Dissolved	14.2	+/-1.1		0.10	mg/L	0		14-AUG-14	R2918380
Manganese (Mn)-Dissolved	0.526	+/-0.036		0.0050	mg/L	0		14-AUG-14	R2918380
Molybdenum (Mo)-Dissolved	0.000073	+/-0.000017		0.000050	mg/L	0		14-AUG-14	R2918380
Nickel (Ni)-Dissolved	0.00028	+/-0.00005		0.00010	mg/L	0		14-AUG-14	R2918380
Potassium (K)-Dissolved	1.58	+/-0.12		0.50	mg/L	0		14-AUG-14	R2918380
Selenium (Se)-Dissolved	<0.00010	-		0.00010	mg/L	-		14-AUG-14	R2918380
Silicon (Si)-Dissolved	10.0	+/-0.85		0.050	mg/L	0		14-AUG-14	R2918380
Silver (Ag)-Dissolved	<0.000010	-		0.000010	mg/L	-		14-AUG-14	R2918380
Sodium (Na)-Dissolved	4.8	+/-0.3		1.0	mg/L	0		14-AUG-14	R2918380
Strontium (Sr)-Dissolved	0.271	+/-0.020		0.00010	mg/L	0		14-AUG-14	R2918380
Thallium (Tl)-Dissolved	<0.000050	-		0.000050	mg/L	-		14-AUG-14	R2918380
Titanium (Ti)-Dissolved	0.00094	+/-0.00045		0.00030	mg/L	0		14-AUG-14	R2918380
Tin (Sn)-Dissolved	<0.00010	-		0.00010	mg/L	-		14-AUG-14	R2918380
Uranium (U)-Dissolved	<0.000010	-		0.000010	mg/L	-		14-AUG-14	R2918380
Vanadium (V)-Dissolved	0.00272	+/-0.00022		0.00010	mg/L	0		14-AUG-14	R2918380
Zinc (Zn)-Dissolved	<0.0050	-		0.0050	mg/L	-		14-AUG-14	R2918380
Ion Balance Calculation									
Ion Balance	105	-			%	-		15-AUG-14	
TDS (Calculated)	318	-			mg/L	-		15-AUG-14	
Hardness (as CaCO3)	321	-			mg/L	-		15-AUG-14	
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		01-AUG-14	R2906695
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		06-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		01-AUG-14	R2906695
Sulfate by IC									
Sulfate (SO4)	<0.50	-		0.50	mg/L	-		01-AUG-14	R2906695
pH, Conductivity and Total Alkalinity									
pH	7.46	+/-0.04		0.10	pH	0		02-AUG-14	R2906537
Conductivity (EC)	574	+/-19		0.20	uS/cm	0		02-AUG-14	R2906537
Bicarbonate (HCO3)	390	-		5.0	mg/L	-		02-AUG-14	R2906537
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		02-AUG-14	R2906537
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		02-AUG-14	R2906537
Alkalinity, Total (as CaCO3)	320	+/-12		2.0	mg/L	0		02-AUG-14	R2906537
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	21.5	-		0.11	mg/L	-		15-AUG-14	
L1495990-2 16053140731002 Sampled By: CLIENT on 31-JUL-14 @ 12:51 Matrix: WATER									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1495990-2 16053140731002									
Sampled By: CLIENT on 31-JUL-14 @ 12:51									
Matrix: WATER									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
Toluene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
EthylBenzene	0.00062	-		0.00050	mg/L	-		10-AUG-14	R2908774
o-Xylene	0.00116	-		0.00050	mg/L	-		10-AUG-14	R2908774
m+p-Xylene	0.00207	-		0.00050	mg/L	-		10-AUG-14	R2908774
Styrene	<0.0010	-		0.0010	mg/L	-		10-AUG-14	R2908774
F1(C6-C10)	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908774
F1-BTEX	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908774
Xylenes	0.00323	-		0.00071	mg/L	-		10-AUG-14	R2908774
Surr: 1,4-Difluorobenzene (SS)	98.8	-		N/A	%	-		10-AUG-14	R2908774
Surr: 4-Bromofluorobenzene (SS)	92.7	-		N/A	%	-		10-AUG-14	R2908774
Surr: 3,4-Dichlorotoluene (SS)	104.4	-		N/A	%	-		10-AUG-14	R2908774
F2, F3, F4									
F2 (>C10-C16)	0.61	+/-0.16		0.25	mg/L	0	06-AUG-14	06-AUG-14	R2910432
F3 (C16-C34)	4.94	+/-1.2		0.25	mg/L	0	06-AUG-14	06-AUG-14	R2910432
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	06-AUG-14	06-AUG-14	R2910432
Surr: 2-Bromobenzotrifluoride	80.1	-		N/A	%	-	06-AUG-14	06-AUG-14	R2910432
Dissolved Metals - Matrix									
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		14-AUG-14	R2919287
				0					
Total Metals - Matrix									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		14-AUG-14	R2919287
				0					
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.123	+/-0.020	DLM	0.030	mg/L	0		10-AUG-14	R2912618
Antimony (Sb)-Total	0.0012	+/-0.0002	DLM	0.0010	mg/L	0		10-AUG-14	R2912618
Arsenic (As)-Total	0.0017	+/-0.0002	DLM	0.0010	mg/L	0		10-AUG-14	R2912618
Barium (Ba)-Total	0.416	+/-0.047	DLM	0.00050	mg/L	0		10-AUG-14	R2912618
Beryllium (Be)-Total	<0.0010	-	DLM	0.0010	mg/L	-		10-AUG-14	R2912618
Bismuth (Bi)-Total	<0.00050	-	DLM	0.00050	mg/L	-		10-AUG-14	R2912618
Boron (B)-Total	2.19	+/-0.35	DLM	0.10	mg/L	0		10-AUG-14	R2912618
Cadmium (Cd)-Total	<0.00010	-	DLM	0.00010	mg/L	-		10-AUG-14	R2912618
Calcium (Ca)-Total	39.3	+/-4.6	DLM	0.20	mg/L	0		10-AUG-14	R2912618
Chromium (Cr)-Total	0.0079	+/-0.0011	DLM	0.0010	mg/L	0		10-AUG-14	R2912618
Cobalt (Co)-Total	0.0060	+/-0.0008	DLM	0.0010	mg/L	0		10-AUG-14	R2912618
Copper (Cu)-Total	0.0381	+/-0.0044	DLM	0.0010	mg/L	0		10-AUG-14	R2912618
Iron (Fe)-Total	43.5	+/-6.9	DLM	0.10	mg/L	0		10-AUG-14	R2912618
Lead (Pb)-Total	0.0136	+/-0.0022	DLM	0.00050	mg/L	0		10-AUG-14	R2912618
Lithium (Li)-Total	0.283	+/-0.053	DLM	0.050	mg/L	0		10-AUG-14	R2912618
Magnesium (Mg)-Total	25.4	+/-3.1	DLM	0.10	mg/L	0		10-AUG-14	R2912618
Manganese (Mn)-Total	0.223	+/-0.022	DLM	0.0050	mg/L	0		10-AUG-14	R2912618
Molybdenum (Mo)-Total	0.00345	+/-0.00042	DLM	0.00050	mg/L	0		10-AUG-14	R2912618
Nickel (Ni)-Total	0.0429	+/-0.0047	DLM	0.0010	mg/L	0		10-AUG-14	R2912618
Potassium (K)-Total	17.3	+/-2.1	DLM	0.50	mg/L	0		10-AUG-14	R2912618
Selenium (Se)-Total	<0.0010	-	DLM	0.0010	mg/L	-		10-AUG-14	R2912618
Silicon (Si)-Total	2.81	+/-0.56	DLM	0.50	mg/L	0		10-AUG-14	R2912618
Silver (Ag)-Total	<0.00010	-	DLM	0.00010	mg/L	-		10-AUG-14	R2912618
Sodium (Na)-Total	1560	+/-190	DLM	1.0	mg/L	0		10-AUG-14	R2912618
Strontium (Sr)-Total	1.25	+/-0.18	DLM	0.0010	mg/L	0		10-AUG-14	R2912618
Thallium (Tl)-Total	<0.00010	-	DLM	0.00010	mg/L	-		10-AUG-14	R2912618

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1495990-2 16053140731002									
Sampled By: CLIENT on 31-JUL-14 @ 12:51									
Matrix: WATER									
Total Metals in Water by CRC ICPMS									
Tin (Sn)-Total	0.0017	+/-0.0002	DLM	0.0010	mg/L	0		10-AUG-14	R2912618
Titanium (Ti)-Total	0.0044	+/-0.0014	DLM	0.0030	mg/L	0		10-AUG-14	R2912618
Uranium (U)-Total	<0.00010	-	DLM	0.00010	mg/L	-		10-AUG-14	R2912618
Vanadium (V)-Total	<0.0010	-	DLB	0.0010	mg/L	-		10-AUG-14	R2912618
Zinc (Zn)-Total	0.099	+/-0.016	DLM	0.030	mg/L	0		10-AUG-14	R2912618
Miscellaneous Parameters									
Ammonia, Total (as N)	2.40	-		0.050	mg/L	-		13-AUG-14	R2916747
Dissolved Organic Carbon	38.0	+/-4.0		1.0	mg/L	0		13-AUG-14	R2915774
Iron Bacteria	See Attached	-				-		09-AUG-14	R2936168
Naphthenic Acids	47.4	+/-8.2		1.0	mg/L	0	13-AUG-14	25-AUG-14	R2927870
Phenols (4AAP)	0.0064	+/-0.0011		0.0010	mg/L	-7.4%		14-AUG-14	R2918451
Sulphate Reducing Bacteria	See Attached	-				-		09-AUG-14	R2936168
Total Dissolved Solids	3900	+/-260		10	mg/L	0		08-JUL-14	R2911966
Silicon (as SiO2)-Total	6.0	-		1.1	mg/L	-		10-AUG-14	
Turbidity	124	+/-6.9		0.10	NTU	0		02-AUG-14	R2906614
CCME PAHs									
Naphthalene	0.000077	+/-0.000037		0.000050	mg/L	-22.9%	07-AUG-14	07-AUG-14	R2912646
Quinoline	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Acenaphthene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Fluorene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Phenanthrene	<0.000050	-		0.000050	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Anthracene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Acridine	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Fluoranthene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Pyrene	0.000025	+/-0.000015		0.000010	mg/L	-9.8%	07-AUG-14	07-AUG-14	R2912646
Benzo(a)anthracene	0.000020	+/-0.000009		0.000010	mg/L	-12.8%	07-AUG-14	07-AUG-14	R2912646
Chrysene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(a)pyrene	<0.0000050	-		0.000005	mg/L	-	07-AUG-14	07-AUG-14	R2912646
				0					
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	07-AUG-14	07-AUG-14	R2912646
				0					
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Surr: d10-Acenaphthene	77.5	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Surr: d10-Phenanthrene	78.5	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Surr: d12-Chrysene	64.4	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Routine Water Analysis									
Chloride by IC									
Chloride (Cl)	1130	+/-64	DLM	5.0	mg/L	0		01-AUG-14	R2906695
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	0.0010	+/-0.0004		0.0010	mg/L	0		14-AUG-14	R2918380
Antimony (Sb)-Dissolved	<0.00010	-		0.00010	mg/L	-		14-AUG-14	R2918380
Arsenic (As)-Dissolved	0.00013	+/-0.00001		0.00010	mg/L	0		14-AUG-14	R2918380
Barium (Ba)-Dissolved	0.396	+/-0.034		0.000050	mg/L	0		14-AUG-14	R2918380
Beryllium (Be)-Dissolved	<0.00050	-		0.00050	mg/L	-		14-AUG-14	R2918380
Bismuth (Bi)-Dissolved	<0.000050	-		0.000050	mg/L	-		14-AUG-14	R2918380
Boron (B)-Dissolved	2.49	+/-0.30		0.010	mg/L	0		14-AUG-14	R2918380
Cadmium (Cd)-Dissolved	<0.000010	-		0.000010	mg/L	-		14-AUG-14	R2918380

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1495990-2 16053140731002 Sampled By: CLIENT on 31-JUL-14 @ 12:51 Matrix: WATER									
Dissolved Metals in Water by CRC ICPMS									
Calcium (Ca)-Dissolved	39.8	+/-5.4		0.10	mg/L	0		14-AUG-14	R2918380
Chromium (Cr)-Dissolved	<0.00010	-		0.00010	mg/L	-		14-AUG-14	R2918380
Cobalt (Co)-Dissolved	0.00015	+/-0.00001		0.00010	mg/L	0		14-AUG-14	R2918380
Copper (Cu)-Dissolved	<0.00010	-		0.00010	mg/L	-		14-AUG-14	R2918380
Iron (Fe)-Dissolved	3.30	+/-0.30		0.030	mg/L	0		14-AUG-14	R2918380
Lead (Pb)-Dissolved	<0.000050	-		0.000050	mg/L	-		14-AUG-14	R2918380
Lithium (Li)-Dissolved	0.327	+/-0.040		0.0050	mg/L	0		14-AUG-14	R2918380
Magnesium (Mg)-Dissolved	26.4	+/-2.1		0.10	mg/L	0		14-AUG-14	R2918380
Manganese (Mn)-Dissolved	0.0496	+/-0.0034		0.0050	mg/L	0		14-AUG-14	R2918380
Molybdenum (Mo)-Dissolved	0.00125	+/-0.00013		0.000050	mg/L	0		14-AUG-14	R2918380
Nickel (Ni)-Dissolved	0.00228	+/-0.00019		0.00010	mg/L	0		14-AUG-14	R2918380
Potassium (K)-Dissolved	20.1	+/-1.6		0.50	mg/L	0		14-AUG-14	R2918380
Selenium (Se)-Dissolved	<0.00010	-		0.00010	mg/L	-		14-AUG-14	R2918380
Silicon (Si)-Dissolved	3.16	+/-0.27		0.050	mg/L	0		14-AUG-14	R2918380
Silver (Ag)-Dissolved	<0.000010	-		0.000010	mg/L	-		14-AUG-14	R2918380
Sodium (Na)-Dissolved	1420	+/-100		1.0	mg/L	0		15-AUG-14	R2920546
Strontium (Sr)-Dissolved	1.24	+/-0.092		0.00010	mg/L	0		14-AUG-14	R2918380
Thallium (Tl)-Dissolved	<0.000050	-		0.000050	mg/L	-		14-AUG-14	R2918380
Titanium (Ti)-Dissolved	<0.00030	-		0.00030	mg/L	-		14-AUG-14	R2918380
Tin (Sn)-Dissolved	<0.00010	-		0.00010	mg/L	-		14-AUG-14	R2918380
Uranium (U)-Dissolved	<0.000010	-		0.000010	mg/L	-		14-AUG-14	R2918380
Vanadium (V)-Dissolved	<0.00010	-		0.00010	mg/L	-		14-AUG-14	R2918380
Zinc (Zn)-Dissolved	<0.0050	-		0.0050	mg/L	-		14-AUG-14	R2918380
Ion Balance Calculation									
Ion Balance	97.6	-			%	-		15-AUG-14	
TDS (Calculated)	3730	-			mg/L	-		15-AUG-14	
Hardness (as CaCO3)	208	-			mg/L	-		15-AUG-14	
Nitrate as N by IC									
Nitrate (as N)	<0.50	-	DLM	0.50	mg/L	-		01-AUG-14	R2906695
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.54	-		0.54	mg/L	-		06-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.20	-	DLM	0.20	mg/L	-		01-AUG-14	R2906695
Sulfate by IC									
Sulfate (SO4)	<5.0	-	DLM	5.0	mg/L	-		01-AUG-14	R2906695
pH, Conductivity and Total Alkalinity									
pH	7.95	+/-0.04		0.10	pH	0		02-AUG-14	R2906537
Conductivity (EC)	6300	+/-210		0.20	uS/cm	0		02-AUG-14	R2906537
Bicarbonate (HCO3)	2220	-		5.0	mg/L	-		02-AUG-14	R2906537
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		02-AUG-14	R2906537
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		02-AUG-14	R2906537
Alkalinity, Total (as CaCO3)	1820	+/-63		2.0	mg/L	0		02-AUG-14	R2906537
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	6.75	-		0.11	mg/L	-		15-AUG-14	
L1495990-3 16053140731003 Sampled By: CLIENT on 31-JUL-14 @ 14:41 Matrix: WATER									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1495990-3 16053140731003									
Sampled By: CLIENT on 31-JUL-14 @ 14:41									
Matrix: WATER									
BTEX, Styrene and F1 (C6-C10)									
Toluene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
EthylBenzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
o-Xylene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
Styrene	<0.0010	-		0.0010	mg/L	-		10-AUG-14	R2908774
F1(C6-C10)	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908774
F1-BTEX	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908774
Xylenes	<0.00071	-		0.00071	mg/L	-		10-AUG-14	R2908774
Surr: 1,4-Difluorobenzene (SS)	99.7	-		N/A	%	-		10-AUG-14	R2908774
Surr: 4-Bromofluorobenzene (SS)	92.0	-		N/A	%	-		10-AUG-14	R2908774
Surr: 3,4-Dichlorotoluene (SS)	84.8	-		N/A	%	-		10-AUG-14	R2908774
F2, F3, F4									
F2 (>C10-C16)	13.1	+/-3.2		0.25	mg/L	0	07-AUG-14	07-AUG-14	R2910432
F3 (C16-C34)	52.9	+/-12		0.25	mg/L	0	07-AUG-14	07-AUG-14	R2910432
F4 (C34-C50)	29.9	+/-6.7		0.25	mg/L	0	07-AUG-14	07-AUG-14	R2910432
Surr: 2-Bromobenzotrifluoride	113.3	-		N/A	%	-	07-AUG-14	07-AUG-14	R2910432
Dissolved Metals - Matrix									
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.000005 0	mg/L	-		14-AUG-14	R2919287
Total Metals - Matrix									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.000005 0	mg/L	-		14-AUG-14	R2919287
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	8.58	+/-1.4		0.0030	mg/L	0		10-AUG-14	R2912618
Antimony (Sb)-Total	0.00619	+/-0.00071		0.00010	mg/L	0		10-AUG-14	R2912618
Arsenic (As)-Total	0.0178	+/-0.0021		0.00010	mg/L	0		10-AUG-14	R2912618
Barium (Ba)-Total	0.453	+/-0.051		0.000050	mg/L	0		10-AUG-14	R2912618
Beryllium (Be)-Total	0.00079	+/-0.00018		0.00050	mg/L	0		10-AUG-14	R2912618
Bismuth (Bi)-Total	0.000202	+/-0.000042		0.000050	mg/L	0		10-AUG-14	R2912618
Boron (B)-Total	0.043	+/-0.007		0.010	mg/L	0		10-AUG-14	R2912618
Cadmium (Cd)-Total	0.00454	+/-0.00087		0.000010	mg/L	0		10-AUG-14	R2912618
Calcium (Ca)-Total	150	+/-18		0.10	mg/L	0		10-AUG-14	R2912618
Chromium (Cr)-Total	0.0875	+/-0.013		0.00010	mg/L	0		10-AUG-14	R2912618
Cobalt (Co)-Total	0.182	+/-0.025		0.00010	mg/L	0		10-AUG-14	R2912618
Copper (Cu)-Total	0.362	+/-0.042		0.00010	mg/L	0		10-AUG-14	R2912618
Iron (Fe)-Total	406	+/-64		0.030	mg/L	0		11-AUG-14	R2914191
Lead (Pb)-Total	0.354	+/-0.056		0.000050	mg/L	0		10-AUG-14	R2912618
Lithium (Li)-Total	0.0139	+/-0.0026		0.0050	mg/L	0		10-AUG-14	R2912618
Magnesium (Mg)-Total	26.1	+/-3.2		0.10	mg/L	0		10-AUG-14	R2912618
Manganese (Mn)-Total	3.86	+/-0.39		0.0050	mg/L	0		10-AUG-14	R2912618
Molybdenum (Mo)-Total	0.0312	+/-0.0038		0.000050	mg/L	0		10-AUG-14	R2912618
Nickel (Ni)-Total	0.651	+/-0.071		0.00010	mg/L	0		10-AUG-14	R2912618
Potassium (K)-Total	1.52	+/-0.19		0.50	mg/L	0		10-AUG-14	R2912618
Selenium (Se)-Total	0.00035	+/-0.00005		0.00010	mg/L	0		10-AUG-14	R2912618
Silicon (Si)-Total	18.4	+/-3.7		0.050	mg/L	0		10-AUG-14	R2912618
Silver (Ag)-Total	0.000429	+/-0.000087		0.000010	mg/L	0		10-AUG-14	R2912618
Sodium (Na)-Total	3.7	+/-0.5		1.0	mg/L	0		10-AUG-14	R2912618
Strontium (Sr)-Total	0.286	+/-0.041		0.00010	mg/L	0		10-AUG-14	R2912618
Thallium (Tl)-Total	0.000257	+/-0.000040		0.000050	mg/L	0		10-AUG-14	R2912618
Tin (Sn)-Total	0.00806	+/-0.0011		0.00010	mg/L	0		10-AUG-14	R2912618

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1495990-3 16053140731003									
Sampled By: CLIENT on 31-JUL-14 @ 14:41									
Matrix: WATER									
Total Metals in Water by CRC ICPMS									
Titanium (Ti)-Total	0.0918	+/-0.030		0.00030	mg/L	0		10-AUG-14	R2912618
Uranium (U)-Total	0.00440	+/-0.00062		0.000010	mg/L	0		10-AUG-14	R2912618
Vanadium (V)-Total	0.0410	+/-0.0049		0.00010	mg/L	0		10-AUG-14	R2912618
Zinc (Zn)-Total	1.10	+/-0.17		0.0050	mg/L	0		10-AUG-14	R2912618
Miscellaneous Parameters									
Ammonia, Total (as N)	0.198	-		0.050	mg/L	-		13-AUG-14	R2916747
Dissolved Organic Carbon	15.3	+/-1.8		1.0	mg/L	0		13-AUG-14	R2915774
Iron Bacteria	See Attached	-				-		09-AUG-14	R2936168
Naphthenic Acids	<1.0	-		1.0	mg/L	-	13-AUG-14	25-AUG-14	R2927870
Phenols (4AAP)	0.0130	+/-0.0018		0.0010	mg/L	-7.4%		14-AUG-14	R2918451
Sulphate Reducing Bacteria	See Attached	-				-		09-AUG-14	R2936168
Total Dissolved Solids	401	+/-27		10	mg/L	0		08-JUL-14	R2911966
Silicon (as SiO2)-Total	39.4	-		0.11	mg/L	-		12-AUG-14	
Turbidity	1220	+/-67		0.10	NTU	0		02-AUG-14	R2906614
CCME PAHs									
Naphthalene	0.000509	+/-0.00019		0.000050	mg/L	-22.9%	07-AUG-14	07-AUG-14	R2912646
Quinoline	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Acenaphthene	0.000098	+/-0.000036		0.000020	mg/L	-19.1%	07-AUG-14	07-AUG-14	R2912646
Fluorene	0.000110	+/-0.000040		0.000020	mg/L	-15.1%	07-AUG-14	07-AUG-14	R2912646
Phenanthrene	0.000464	+/-0.00016		0.000050	mg/L	-13.3%	07-AUG-14	07-AUG-14	R2912646
Anthracene	<0.000030	-	DLM	0.000030	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Acridine	<0.000060	-	DLM	0.000060	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Fluoranthene	0.000074	+/-0.000027		0.000020	mg/L	-9.8%	07-AUG-14	07-AUG-14	R2912646
Pyrene	0.000280	+/-0.000091		0.000010	mg/L	-9.8%	07-AUG-14	07-AUG-14	R2912646
Benzo(a)anthracene	<0.000020	-	DLM	0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Chrysene	0.000110	+/-0.000037		0.000020	mg/L	-13.7%	07-AUG-14	07-AUG-14	R2912646
Benzo(b&j)fluoranthene	<0.000020	-	DLM	0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(a)pyrene	0.0000050	+/-0.0000031		0.000005	mg/L	-16.6%	07-AUG-14	07-AUG-14	R2912646
				0					
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	07-AUG-14	07-AUG-14	R2912646
				0					
B(A)P Total Potency Equivalent	0.000012	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Surr: d10-Acenaphthene	79.1	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Surr: d10-Phenanthrene	76.4	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Surr: d12-Chrysene	73.4	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Routine Water Analysis									
Chloride by IC									
Chloride (Cl)	0.97	+/-0.10		0.50	mg/L	0		01-AUG-14	R2906695
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	0.0035	+/-0.0007		0.0010	mg/L	0		14-AUG-14	R2918380
Antimony (Sb)-Dissolved	0.00066	+/-0.00006		0.00010	mg/L	0		14-AUG-14	R2918380
Arsenic (As)-Dissolved	0.00250	+/-0.00026		0.00010	mg/L	0		14-AUG-14	R2918380
Barium (Ba)-Dissolved	0.202	+/-0.017		0.000050	mg/L	0		14-AUG-14	R2918380
Beryllium (Be)-Dissolved	<0.00050	-		0.00050	mg/L	-		14-AUG-14	R2918380
Bismuth (Bi)-Dissolved	<0.000050	-		0.000050	mg/L	-		14-AUG-14	R2918380
Boron (B)-Dissolved	0.028	+/-0.003		0.010	mg/L	0		15-AUG-14	R2920546
Cadmium (Cd)-Dissolved	<0.000010	-		0.000010	mg/L	-		14-AUG-14	R2918380
Calcium (Ca)-Dissolved	118	+/-16		0.10	mg/L	0		14-AUG-14	R2918380

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1495990-3 16053140731003									
Sampled By: CLIENT on 31-JUL-14 @ 14:41									
Matrix: WATER									
Dissolved Metals in Water by CRC ICPMS									
Chromium (Cr)-Dissolved	<0.00010	-		0.00010	mg/L	-		14-AUG-14	R2918380
Cobalt (Co)-Dissolved	0.0161	+/-0.0015		0.00010	mg/L	0		14-AUG-14	R2918380
Copper (Cu)-Dissolved	0.00037	+/-0.00005		0.00010	mg/L	0		14-AUG-14	R2918380
Iron (Fe)-Dissolved	23.6	+/-2.1		0.030	mg/L	0		14-AUG-14	R2918380
Lead (Pb)-Dissolved	0.000068	+/-0.000008		0.000050	mg/L	0		14-AUG-14	R2918380
Lithium (Li)-Dissolved	0.0075	+/-0.0010		0.0050	mg/L	0		14-AUG-14	R2918380
Magnesium (Mg)-Dissolved	23.8	+/-1.9		0.10	mg/L	0		14-AUG-14	R2918380
Manganese (Mn)-Dissolved	0.688	+/-0.047		0.0050	mg/L	0		14-AUG-14	R2918380
Molybdenum (Mo)-Dissolved	0.00979	+/-0.0010		0.000050	mg/L	0		14-AUG-14	R2918380
Nickel (Ni)-Dissolved	0.0460	+/-0.0038		0.00010	mg/L	0		14-AUG-14	R2918380
Potassium (K)-Dissolved	<0.50	-		0.50	mg/L	-		14-AUG-14	R2918380
Selenium (Se)-Dissolved	<0.00010	-		0.00010	mg/L	-		14-AUG-14	R2918380
Silicon (Si)-Dissolved	5.45	+/-0.46		0.050	mg/L	0		14-AUG-14	R2918380
Silver (Ag)-Dissolved	<0.000010	-		0.000010	mg/L	-		14-AUG-14	R2918380
Sodium (Na)-Dissolved	4.2	+/-0.3		1.0	mg/L	0		14-AUG-14	R2918380
Strontium (Sr)-Dissolved	0.244	+/-0.018		0.00010	mg/L	0		14-AUG-14	R2918380
Thallium (Tl)-Dissolved	<0.000050	-		0.000050	mg/L	-		14-AUG-14	R2918380
Titanium (Ti)-Dissolved	<0.00030	-		0.00030	mg/L	-		14-AUG-14	R2918380
Tin (Sn)-Dissolved	<0.00010	-		0.00010	mg/L	-		14-AUG-14	R2918380
Uranium (U)-Dissolved	0.000479	+/-0.000050		0.000010	mg/L	0		14-AUG-14	R2918380
Vanadium (V)-Dissolved	0.00020	+/-0.00002		0.00010	mg/L	0		14-AUG-14	R2918380
Zinc (Zn)-Dissolved	<0.0050	-		0.0050	mg/L	-		14-AUG-14	R2918380
Ion Balance Calculation									
Ion Balance	112	-	BL:INT		%	-		15-AUG-14	
TDS (Calculated)	373	-			mg/L	-		15-AUG-14	
Hardness (as CaCO3)	393	-			mg/L	-		15-AUG-14	
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		01-AUG-14	R2906695
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		06-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		01-AUG-14	R2906695
Sulfate by IC									
Sulfate (SO4)	30.5	+/-1.7		0.50	mg/L	0		01-AUG-14	R2906695
pH, Conductivity and Total Alkalinity									
pH	7.45	+/-0.04		0.10	pH	0		02-AUG-14	R2906537
Conductivity (EC)	647	+/-22		0.20	uS/cm	0		02-AUG-14	R2906537
Bicarbonate (HCO3)	397	-		5.0	mg/L	-		02-AUG-14	R2906537
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		02-AUG-14	R2906537
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		02-AUG-14	R2906537
Alkalinity, Total (as CaCO3)	326	+/-12		2.0	mg/L	0		02-AUG-14	R2906537
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	11.7	-		0.11	mg/L	-		15-AUG-14	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Antimony (Sb)-Total	DLM	
Duplicate	Arsenic (As)-Total	DLM	
Duplicate	Barium (Ba)-Total	DLM	
Duplicate	Beryllium (Be)-Total	DLM	
Duplicate	Bismuth (Bi)-Total	DLM	
Duplicate	Boron (B)-Total	DLM	
Duplicate	Cadmium (Cd)-Total	DLM	
Duplicate	Calcium (Ca)-Total	DLM	
Duplicate	Chromium (Cr)-Total	DLM	
Duplicate	Cobalt (Co)-Total	DLM	
Duplicate	Copper (Cu)-Total	DLM	
Duplicate	Iron (Fe)-Total	DLM	
Duplicate	Lead (Pb)-Total	DLM	
Duplicate	Lithium (Li)-Total	DLM	
Duplicate	Magnesium (Mg)-Total	DLM	
Duplicate	Manganese (Mn)-Total	DLM	
Duplicate	Molybdenum (Mo)-Total	DLM	
Duplicate	Nickel (Ni)-Total	DLM	
Duplicate	Potassium (K)-Total	DLM	
Duplicate	Selenium (Se)-Total	DLM	
Duplicate	Silicon (Si)-Total	DLM	
Duplicate	Silver (Ag)-Total	DLM	
Duplicate	Sodium (Na)-Total	DLM	
Duplicate	Strontium (Sr)-Total	DLM	
Duplicate	Thallium (Tl)-Total	DLM	
Duplicate	Titanium (Ti)-Total	DLM	
Duplicate	Uranium (U)-Total	DLM	
Duplicate	Vanadium (V)-Total	DLM	
Duplicate	Zinc (Zn)-Total	DLM	
Duplicate	Aluminum (Al)-Total	DLM	
Duplicate	Antimony (Sb)-Total	DLM	
Duplicate	Arsenic (As)-Total	DLM	
Duplicate	Barium (Ba)-Total	DLM	
Duplicate	Beryllium (Be)-Total	DLM	
Duplicate	Bismuth (Bi)-Total	DLM	
Duplicate	Boron (B)-Total	DLM	
Duplicate	Cadmium (Cd)-Total	DLM	
Duplicate	Calcium (Ca)-Total	DLM	
Duplicate	Chromium (Cr)-Total	DLM	
Duplicate	Cobalt (Co)-Total	DLM	
Duplicate	Copper (Cu)-Total	DLM	
Duplicate	Iron (Fe)-Total	DLM	
Duplicate	Lead (Pb)-Total	DLM	
Duplicate	Lithium (Li)-Total	DLM	
Duplicate	Magnesium (Mg)-Total	DLM	
Duplicate	Manganese (Mn)-Total	DLM	
Duplicate	Molybdenum (Mo)-Total	DLM	
Duplicate	Nickel (Ni)-Total	DLM	
Duplicate	Potassium (K)-Total	DLM	
Duplicate	Selenium (Se)-Total	DLM	
Duplicate	Silicon (Si)-Total	DLM	
Duplicate	Silver (Ag)-Total	DLM	
Duplicate	Sodium (Na)-Total	DLM	
Duplicate	Strontium (Sr)-Total	DLM	
Duplicate	Thallium (Tl)-Total	DLM	
Duplicate	Tin (Sn)-Total	DLM	

Reference Information

	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Titanium (Ti)-Total	DLM	
Duplicate	Uranium (U)-Total	DLM	
Duplicate	Vanadium (V)-Total	DLM	
Duplicate	Zinc (Zn)-Total	DLM	
Matrix Spike	Dissolved Organic Carbon	MS-B	

Sample Parameter Qualifier Key:

Qualifier	Description
BL:INT	Balance Reviewed: Interference Or Non-Measured Component
DLB	Detection Limit was raised due to detection of analyte at comparable level in Method Blank.
DLM	Detection Limit Adjusted due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
BTXS,F1-ED	Water	BTEX, Styrene and F1 (C6-C10)		EPA 5021/8015&8260 GC-MS & FID
C-DIS-ORG-ED	Water	Dissolved Organic Carbon		APHA 5310 B-Instrumental
CL-IC-ED	Water	Chloride by IC		APHA 4110 B-ION CHROMATOGRAPHY
F2,F3,F4-ED	Water	F2, F3, F4		EPA 3510/CCME PHC CWS-GC-FID
HG-D-L-CVAA-ED	Water	Mercury (Hg) - Dissolved		EPA 245.7 / EPA 245.1
HG-T-L-CVAA-ED	Water	Mercury (Hg)		EPA 245.7 / EPA 245.1
IB-BART-PB	Water	Iron Bacteria		BART Test Kit
BART Test Kit Analysis performed at PBR Laboratories Inc., Edmonton.				
IONBALANCE-ED	Water	Ion Balance Calculation		APHA 1030E
MET-D-CCMS-ED	Water	Dissolved Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
NAPHTHENIC-ACID-FM	Water	Naphthenic Acids by FTIR		Naphthenic Acids by FTIR, Syncrude, 1994
Dissolved naphthenic acids are solvent extracted from acidified aqueous samples using Dichloromethane prior to quantitation by Fourier Transform Infra-Red spectroscopy. Note that FTIR is not uniquely selective to naphthenic acids. If present, other carboxylic acids (e.g. humic acids, fulvic acids) may also be detected by this method.				
NH3-CFA-ED	Water	Ammonia in Water by Colour		APHA 4500 NH3-NITROGEN (AMMONIA)
This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.				
NO2+NO3-CALC-ED	Water	Nitrate+Nitrite		CALCULATION
NO2-IC-ED	Water	Nitrite as N by IC		APHA 4110 B-ION CHROMATOGRAPHY
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
NO3-IC-ED	Water	Nitrate as N by IC		APHA 4110 B-ION CHROMATOGRAPHY
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
PAH-CCME-CL	Water	CCME PAHs		EPA 3510/8270-GC/MS
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity		APHA 4500-H, 2510, 2320
All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)				
PHENOLS-4AAP-ED	Water	Phenols (4AAP)		AB ENV.06537-COLORIMETRIC

This analysis is carried out using procedures adapted from ENVIRODAT VMV 06537 689, Method Code 154, in "Methods Manual for Chemical Analysis of Water and Wastes" published by the Alberta Environmental Centre. This automated method is based on the distillation of phenol and subsequent

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
reaction of the distillate with alkaline ferricyanide and 4-aminoantipyrine to form a red complex which is measured at 505 nm.				
SIO2-D-CALC-ED	Water	Dissolved Silicon (reported as Silica)		CALCULATION
SIO2-T-CALC-ED	Water	Total Silicon (reported as Silica)		CALCULATION
SO4-IC-ED	Water	Sulfate by IC		APHA 4110 B-ION CHROMATOGRAPHY
SOLIDS-TDS-ED	Water	Total Dissolved Solids		APHA 2540 C
SRB-BART-PB	Water	Sulphate Reducing Bacteria / BART method		BART TEST KIT
BART Test Kit				
TURBIDITY-ED	Water	Turbidity		APHA 2130 B-Nephelometer

** The indicated Method Reference is the closest nationally or internationally recognized reference for the applicable ALS test method. ALS methods may incorporate modifications from the specified reference to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
PB	PBR LABORATORIES
FM	ALS ENVIRONMENTAL - FORT MCMURRAY, ALBERTA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

M076075

GLOSSARY OF REPORT TERMS

Surr - Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

MU: Measurement Uncertainty. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 which gives a level of confidence of approximately 95%.

Bias: The reported method bias is the average long term deviation from the target value for a long term reference or control sample, measured in percent. Zero values indicate no detectable method bias.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Environmental

Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 1 of 33

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R2908774							
WG1925165-2	LCS							
Benzene			111.6		%		70-130	06-AUG-14
Toluene			122.3		%		70-130	06-AUG-14
EthylBenzene			115.1		%		70-130	06-AUG-14
o-Xylene			118.9		%		70-130	06-AUG-14
m+p-Xylene			120.5		%		70-130	06-AUG-14
Styrene			119.9		%		70-130	06-AUG-14
WG1925165-3	LCS							
F1(C6-C10)			103.2		%		70-130	06-AUG-14
WG1925165-6	LCS							
Benzene			114.6		%		70-130	08-AUG-14
Toluene			126.0		%		70-130	08-AUG-14
EthylBenzene			115.8		%		70-130	08-AUG-14
o-Xylene			121.9		%		70-130	08-AUG-14
m+p-Xylene			123.1		%		70-130	08-AUG-14
Styrene			124.4		%		70-130	08-AUG-14
WG1925165-7	LCS							
F1(C6-C10)			103.3		%		70-130	08-AUG-14
WG1925165-1	MB							
Benzene			<0.00050		mg/L		0.0005	06-AUG-14
Toluene			<0.00050		mg/L		0.0005	06-AUG-14
EthylBenzene			<0.00050		mg/L		0.0005	06-AUG-14
o-Xylene			<0.00050		mg/L		0.0005	06-AUG-14
m+p-Xylene			<0.00050		mg/L		0.0005	06-AUG-14
Styrene			<0.0010		mg/L		0.001	06-AUG-14
F1(C6-C10)			<0.10		mg/L		0.1	06-AUG-14
Surrogate: 1,4-Difluorobenzene (SS)			99.0		%		70-130	06-AUG-14
Surrogate: 4-Bromofluorobenzene (SS)			89.0		%		70-130	06-AUG-14
Surrogate: 3,4-Dichlorotoluene (SS)			88.0		%		70-130	06-AUG-14
WG1925165-5	MB							
Benzene			<0.00050		mg/L		0.0005	08-AUG-14
Toluene			<0.00050		mg/L		0.0005	08-AUG-14
EthylBenzene			<0.00050		mg/L		0.0005	08-AUG-14
o-Xylene			<0.00050		mg/L		0.0005	08-AUG-14
m+p-Xylene			<0.00050		mg/L		0.0005	08-AUG-14
							0.001	



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 2 of 33

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R2908774							
WG1925165-5	MB							
Styrene			<0.0010		mg/L		0.001	08-AUG-14
F1(C6-C10)			<0.10		mg/L		0.1	08-AUG-14
Surrogate: 1,4-Difluorobenzene (SS)			98.0		%		70-130	08-AUG-14
Surrogate: 4-Bromofluorobenzene (SS)			90.0		%		70-130	08-AUG-14
Surrogate: 3,4-Dichlorotoluene (SS)			81.0		%		70-130	08-AUG-14
C-DIS-ORG-ED		Water						
Batch	R2915774							
WG1929238-3	CVS							
Dissolved Organic Carbon			110.3		%		80-160	13-AUG-14
WG1929238-6	DUP	L1496508-1						
Dissolved Organic Carbon		38.7	39.3		mg/L	1.5	20	12-AUG-14
WG1929238-2	LCS							
Dissolved Organic Carbon			95.1		%		80-120	12-AUG-14
WG1929238-1	MB							
Dissolved Organic Carbon			<1.0		mg/L		1	12-AUG-14
WG1929238-7	MS	L1496508-1						
Dissolved Organic Carbon			N/A	MS-B	%		-	12-AUG-14
CL-IC-ED		Water						
Batch	R2906695							
WG1923826-2	LCS							
Chloride (Cl)			99.6		%		90-110	01-AUG-14
WG1923826-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	01-AUG-14
F2,F3,F4-ED		Water						
Batch	R2910432							
WG1924416-2	LCS							
F2 (>C10-C16)			95.5		%		65-135	06-AUG-14
F3 (C16-C34)			95.6		%		65-135	06-AUG-14
F4 (C34-C50)			90.5		%		65-135	06-AUG-14
WG1924416-1	MB							
F2 (>C10-C16)			<0.25		mg/L		0.25	06-AUG-14
F3 (C16-C34)			<0.25		mg/L		0.25	06-AUG-14
F4 (C34-C50)			<0.25		mg/L		0.25	06-AUG-14
Surrogate: 2-Bromobenzotrifluoride			67.4		%		50-150	06-AUG-14
HG-D-L-CVAA-ED		Water						



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 3 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-L-CVAA-ED		Water						
Batch	R2919287							
WG1930358-47 DUP		L1496580-1						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	14-AUG-14
WG1930358-46 LCS								
Mercury (Hg)-Dissolved			86.4		%		80-120	14-AUG-14
WG1930358-50 LCS								
Mercury (Hg)-Dissolved			87.2		%		80-120	14-AUG-14
WG1930358-54 LCS								
Mercury (Hg)-Dissolved			98.6		%		80-120	14-AUG-14
WG1930358-58 LCS								
Mercury (Hg)-Dissolved			94.4		%		80-120	14-AUG-14
WG1930358-45 MB								
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	14-AUG-14
WG1930358-49 MB								
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	14-AUG-14
WG1930358-53 MB								
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	14-AUG-14
WG1930358-57 MB								
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	14-AUG-14
WG1930358-48 MS		L1496580-1						
Mercury (Hg)-Dissolved			83.8		%		70-130	14-AUG-14
HG-T-L-CVAA-ED		Water						
Batch	R2919287							
WG1930360-3 DUP		L1494613-1						
Mercury (Hg)-Total		0.0000051	0.0000062		mg/L	19	20	14-AUG-14
WG1930360-2 LCS								
Mercury (Hg)-Total			86.3		%		80-120	14-AUG-14
WG1930360-6 LCS								
Mercury (Hg)-Total			92.3		%		80-120	14-AUG-14
WG1930360-1 MB								
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	14-AUG-14
WG1930360-5 MB								
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	14-AUG-14
WG1930360-4 MS		L1494613-1						
Mercury (Hg)-Total			83.3		%		70-130	14-AUG-14
MET-D-CCMS-ED	Water							



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 4 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2918380							
WG1930772-10 CRM		ED-HIGH-WATRM						
Aluminum (Al)-Dissolved			96.3		%		80-120	14-AUG-14
Antimony (Sb)-Dissolved			99.3		%		80-120	14-AUG-14
Arsenic (As)-Dissolved			95.6		%		80-120	14-AUG-14
Barium (Ba)-Dissolved			99.1		%		80-120	14-AUG-14
Beryllium (Be)-Dissolved			98.4		%		80-120	14-AUG-14
Bismuth (Bi)-Dissolved			98.7		%		80-120	14-AUG-14
Boron (B)-Dissolved			99.9		%		80-120	14-AUG-14
Cadmium (Cd)-Dissolved			107.1		%		80-120	14-AUG-14
Calcium (Ca)-Dissolved			103.6		%		80-120	14-AUG-14
Chromium (Cr)-Dissolved			99.7		%		80-120	14-AUG-14
Cobalt (Co)-Dissolved			98.5		%		80-120	14-AUG-14
Copper (Cu)-Dissolved			98.1		%		80-120	14-AUG-14
Lead (Pb)-Dissolved			99.3		%		80-120	14-AUG-14
Lithium (Li)-Dissolved			98.0		%		80-120	14-AUG-14
Magnesium (Mg)-Dissolved			99.1		%		80-120	14-AUG-14
Manganese (Mn)-Dissolved			99.6		%		80-120	14-AUG-14
Molybdenum (Mo)-Dissolved			102.6		%		80-120	14-AUG-14
Nickel (Ni)-Dissolved			99.7		%		80-120	14-AUG-14
Potassium (K)-Dissolved			97.0		%		80-120	14-AUG-14
Selenium (Se)-Dissolved			102.1		%		80-120	14-AUG-14
Silicon (Si)-Dissolved			83.5		%		80-120	14-AUG-14
Silver (Ag)-Dissolved			89.6		%		80-120	14-AUG-14
Sodium (Na)-Dissolved			99.6		%		80-120	14-AUG-14
Strontium (Sr)-Dissolved			106.4		%		80-120	14-AUG-14
Thallium (Tl)-Dissolved			98.1		%		80-120	14-AUG-14
Titanium (Ti)-Dissolved			105.4		%		80-120	14-AUG-14
Tin (Sn)-Dissolved			97.7		%		80-120	14-AUG-14
Uranium (U)-Dissolved			98.2		%		80-120	14-AUG-14
Vanadium (V)-Dissolved			100.8		%		80-120	14-AUG-14
Zinc (Zn)-Dissolved			99.1		%		80-120	14-AUG-14
WG1930772-12 CRM		ED-HIGH-WATRM						
Aluminum (Al)-Dissolved			98.9		%		80-120	14-AUG-14
Antimony (Sb)-Dissolved			98.8		%		80-120	14-AUG-14
Arsenic (As)-Dissolved			97.4		%		80-120	14-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 5 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2918380							
WG1930772-12 CRM		ED-HIGH-WATRM						
Barium (Ba)-Dissolved			101.2		%		80-120	14-AUG-14
Beryllium (Be)-Dissolved			104.9		%		80-120	14-AUG-14
Bismuth (Bi)-Dissolved			103.2		%		80-120	14-AUG-14
Boron (B)-Dissolved			105.0		%		80-120	14-AUG-14
Cadmium (Cd)-Dissolved			110.4		%		80-120	14-AUG-14
Calcium (Ca)-Dissolved			110.6		%		80-120	14-AUG-14
Chromium (Cr)-Dissolved			102.3		%		80-120	14-AUG-14
Cobalt (Co)-Dissolved			99.6		%		80-120	14-AUG-14
Copper (Cu)-Dissolved			101.9		%		80-120	14-AUG-14
Lead (Pb)-Dissolved			103.7		%		80-120	14-AUG-14
Lithium (Li)-Dissolved			104.8		%		80-120	14-AUG-14
Magnesium (Mg)-Dissolved			97.9		%		80-120	14-AUG-14
Manganese (Mn)-Dissolved			100.3		%		80-120	14-AUG-14
Molybdenum (Mo)-Dissolved			108.5		%		80-120	14-AUG-14
Nickel (Ni)-Dissolved			101.2		%		80-120	14-AUG-14
Potassium (K)-Dissolved			99.6		%		80-120	14-AUG-14
Selenium (Se)-Dissolved			103.6		%		80-120	14-AUG-14
Silicon (Si)-Dissolved			87.3		%		80-120	14-AUG-14
Silver (Ag)-Dissolved			93.1		%		80-120	14-AUG-14
Sodium (Na)-Dissolved			98.0		%		80-120	14-AUG-14
Strontium (Sr)-Dissolved			112.7		%		80-120	14-AUG-14
Thallium (Tl)-Dissolved			102.4		%		80-120	14-AUG-14
Titanium (Ti)-Dissolved			108.4		%		80-120	14-AUG-14
Tin (Sn)-Dissolved			99.6		%		80-120	14-AUG-14
Uranium (U)-Dissolved			109.2		%		80-120	14-AUG-14
Vanadium (V)-Dissolved			103.2		%		80-120	14-AUG-14
Zinc (Zn)-Dissolved			101.6		%		80-120	14-AUG-14
WG1930772-2 CRM		ED-HIGH-WATRM						
Aluminum (Al)-Dissolved			100.7		%		80-120	14-AUG-14
Antimony (Sb)-Dissolved			100.7		%		80-120	14-AUG-14
Arsenic (As)-Dissolved			101.4		%		80-120	14-AUG-14
Barium (Ba)-Dissolved			98.2		%		80-120	14-AUG-14
Beryllium (Be)-Dissolved			102.8		%		80-120	14-AUG-14
Bismuth (Bi)-Dissolved			98.9		%		80-120	14-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 6 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2918380							
WG1930772-2	CRM	ED-HIGH-WATRM						
Boron (B)-Dissolved			102.5		%		80-120	14-AUG-14
Cadmium (Cd)-Dissolved			102.3		%		80-120	14-AUG-14
Calcium (Ca)-Dissolved			103.8		%		80-120	14-AUG-14
Chromium (Cr)-Dissolved			99.6		%		80-120	14-AUG-14
Cobalt (Co)-Dissolved			98.9		%		80-120	14-AUG-14
Copper (Cu)-Dissolved			97.2		%		80-120	14-AUG-14
Lead (Pb)-Dissolved			100.1		%		80-120	14-AUG-14
Lithium (Li)-Dissolved			110.2		%		80-120	14-AUG-14
Magnesium (Mg)-Dissolved			101.4		%		80-120	14-AUG-14
Manganese (Mn)-Dissolved			99.6		%		80-120	14-AUG-14
Molybdenum (Mo)-Dissolved			99.4		%		80-120	14-AUG-14
Nickel (Ni)-Dissolved			98.2		%		80-120	14-AUG-14
Potassium (K)-Dissolved			102.2		%		80-120	14-AUG-14
Selenium (Se)-Dissolved			100.9		%		80-120	14-AUG-14
Silicon (Si)-Dissolved			98.6		%		80-120	14-AUG-14
Silver (Ag)-Dissolved			99.2		%		80-120	14-AUG-14
Sodium (Na)-Dissolved			108.1		%		80-120	14-AUG-14
Strontium (Sr)-Dissolved			105.7		%		80-120	14-AUG-14
Thallium (Tl)-Dissolved			102.5		%		80-120	14-AUG-14
Titanium (Ti)-Dissolved			95.6		%		80-120	14-AUG-14
Tin (Sn)-Dissolved			102.7		%		80-120	14-AUG-14
Uranium (U)-Dissolved			96.5		%		80-120	14-AUG-14
Vanadium (V)-Dissolved			101.6		%		80-120	14-AUG-14
Zinc (Zn)-Dissolved			101.1		%		80-120	14-AUG-14
WG1930772-6	CRM	ED-HIGH-WATRM						
Aluminum (Al)-Dissolved			96.3		%		80-120	14-AUG-14
Antimony (Sb)-Dissolved			97.0		%		80-120	14-AUG-14
Arsenic (As)-Dissolved			95.6		%		80-120	14-AUG-14
Barium (Ba)-Dissolved			98.5		%		80-120	14-AUG-14
Beryllium (Be)-Dissolved			96.9		%		80-120	14-AUG-14
Bismuth (Bi)-Dissolved			100.6		%		80-120	14-AUG-14
Boron (B)-Dissolved			101.2		%		80-120	14-AUG-14
Cadmium (Cd)-Dissolved			104.5		%		80-120	14-AUG-14
Calcium (Ca)-Dissolved			103.7		%		80-120	14-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 7 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2918380							
WG1930772-6 CRM	ED-HIGH-WATRM							
Chromium (Cr)-Dissolved			99.6		%		80-120	14-AUG-14
Cobalt (Co)-Dissolved			97.9		%		80-120	14-AUG-14
Copper (Cu)-Dissolved			98.4		%		80-120	14-AUG-14
Lead (Pb)-Dissolved			100.3		%		80-120	14-AUG-14
Lithium (Li)-Dissolved			96.4		%		80-120	14-AUG-14
Magnesium (Mg)-Dissolved			99.1		%		80-120	14-AUG-14
Manganese (Mn)-Dissolved			98.3		%		80-120	14-AUG-14
Molybdenum (Mo)-Dissolved			103.5		%		80-120	14-AUG-14
Nickel (Ni)-Dissolved			99.7		%		80-120	14-AUG-14
Potassium (K)-Dissolved			97.0		%		80-120	14-AUG-14
Selenium (Se)-Dissolved			102.8		%		80-120	14-AUG-14
Silicon (Si)-Dissolved			84.0		%		80-120	14-AUG-14
Silver (Ag)-Dissolved			93.2		%		80-120	14-AUG-14
Sodium (Na)-Dissolved			95.6		%		80-120	14-AUG-14
Strontium (Sr)-Dissolved			108.1		%		80-120	14-AUG-14
Thallium (Tl)-Dissolved			100.4		%		80-120	14-AUG-14
Titanium (Ti)-Dissolved			98.7		%		80-120	14-AUG-14
Tin (Sn)-Dissolved			99.9		%		80-120	14-AUG-14
Uranium (U)-Dissolved			100.0		%		80-120	14-AUG-14
Vanadium (V)-Dissolved			100.6		%		80-120	14-AUG-14
Zinc (Zn)-Dissolved			98.5		%		80-120	14-AUG-14
WG1930772-8 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			96.0		%		80-120	14-AUG-14
Antimony (Sb)-Dissolved			97.1		%		80-120	14-AUG-14
Arsenic (As)-Dissolved			96.1		%		80-120	14-AUG-14
Barium (Ba)-Dissolved			100.2		%		80-120	14-AUG-14
Beryllium (Be)-Dissolved			97.9		%		80-120	14-AUG-14
Bismuth (Bi)-Dissolved			105.4		%		80-120	14-AUG-14
Boron (B)-Dissolved			99.6		%		80-120	14-AUG-14
Cadmium (Cd)-Dissolved			104.5		%		80-120	14-AUG-14
Calcium (Ca)-Dissolved			103.5		%		80-120	14-AUG-14
Chromium (Cr)-Dissolved			100.8		%		80-120	14-AUG-14
Cobalt (Co)-Dissolved			98.2		%		80-120	14-AUG-14
Copper (Cu)-Dissolved			100.0		%		80-120	14-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 8 of 33

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2918380							
WG1930772-8	CRM	ED-HIGH-WATRM						
Lead (Pb)-Dissolved			101.7		%		80-120	14-AUG-14
Lithium (Li)-Dissolved			95.5		%		80-120	14-AUG-14
Magnesium (Mg)-Dissolved			99.3		%		80-120	14-AUG-14
Manganese (Mn)-Dissolved			98.9		%		80-120	14-AUG-14
Molybdenum (Mo)-Dissolved			101.5		%		80-120	14-AUG-14
Nickel (Ni)-Dissolved			100.3		%		80-120	14-AUG-14
Potassium (K)-Dissolved			97.6		%		80-120	14-AUG-14
Selenium (Se)-Dissolved			102.5		%		80-120	14-AUG-14
Silicon (Si)-Dissolved			83.1		%		80-120	14-AUG-14
Silver (Ag)-Dissolved			93.5		%		80-120	14-AUG-14
Sodium (Na)-Dissolved			96.8		%		80-120	14-AUG-14
Strontium (Sr)-Dissolved			109.9		%		80-120	14-AUG-14
Thallium (Tl)-Dissolved			102.2		%		80-120	14-AUG-14
Titanium (Ti)-Dissolved			107.8		%		80-120	14-AUG-14
Tin (Sn)-Dissolved			101.2		%		80-120	14-AUG-14
Uranium (U)-Dissolved			101.1		%		80-120	14-AUG-14
Vanadium (V)-Dissolved			100.9		%		80-120	14-AUG-14
Zinc (Zn)-Dissolved			98.2		%		80-120	14-AUG-14
WG1930772-13	DUP	L1499211-3						
Aluminum (Al)-Dissolved		0.0023	0.0014	J	mg/L	0.0009	0.002	14-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-AUG-14
Arsenic (As)-Dissolved		0.0123	0.0123		mg/L	0.3	20	14-AUG-14
Barium (Ba)-Dissolved		0.197	0.192		mg/L	2.5	20	14-AUG-14
Beryllium (Be)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	14-AUG-14
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-AUG-14
Boron (B)-Dissolved		0.169	0.158		mg/L	6.7	20	14-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-AUG-14
Calcium (Ca)-Dissolved		111	109		mg/L	1.9	20	14-AUG-14
Chromium (Cr)-Dissolved		0.00031	0.00027		mg/L	14	20	14-AUG-14
Cobalt (Co)-Dissolved		0.00169	0.00166		mg/L	2.0	20	14-AUG-14
Copper (Cu)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-AUG-14
Iron (Fe)-Dissolved		2.92	2.86		mg/L	2.1	20	14-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 9 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2918380							
WG1930772-13	DUP	L1499211-3						
Lithium (Li)-Dissolved		0.0481	0.0467		mg/L	3.1	20	14-AUG-14
Magnesium (Mg)-Dissolved		35.7	34.6		mg/L	3.1	20	14-AUG-14
Manganese (Mn)-Dissolved		0.992	0.957		mg/L	3.5	20	14-AUG-14
Molybdenum (Mo)-Dissolved		0.00670	0.00657		mg/L	2.0	20	14-AUG-14
Nickel (Ni)-Dissolved		0.00252	0.00250		mg/L	1.1	20	14-AUG-14
Potassium (K)-Dissolved		4.71	4.68		mg/L	0.7	20	14-AUG-14
Selenium (Se)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-AUG-14
Silicon (Si)-Dissolved		7.82	7.65		mg/L	2.2	20	14-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-AUG-14
Sodium (Na)-Dissolved		64.5	65.7		mg/L	2.0	20	14-AUG-14
Strontium (Sr)-Dissolved		0.575	0.573		mg/L	0.3	20	14-AUG-14
Thallium (Tl)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-AUG-14
Titanium (Ti)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	14-AUG-14
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-AUG-14
Uranium (U)-Dissolved		0.00873	0.00847		mg/L	3.0	20	14-AUG-14
Vanadium (V)-Dissolved		0.00020	0.00023		mg/L	17	20	14-AUG-14
Zinc (Zn)-Dissolved		0.0109	0.0109		mg/L	0.3	20	14-AUG-14
WG1930772-14	DUP	L1496739-3						
Aluminum (Al)-Dissolved		0.0064	0.0066		mg/L	3.2	20	14-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-AUG-14
Arsenic (As)-Dissolved		0.00175	0.00173		mg/L	1.6	20	14-AUG-14
Barium (Ba)-Dissolved		0.0424	0.0419		mg/L	1.1	20	14-AUG-14
Beryllium (Be)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	14-AUG-14
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-AUG-14
Boron (B)-Dissolved		0.175	0.175		mg/L	0.2	20	14-AUG-14
Cadmium (Cd)-Dissolved		0.000030	0.000033		mg/L	8.4	20	14-AUG-14
Calcium (Ca)-Dissolved		88.0	91.4		mg/L	3.7	20	14-AUG-14
Chromium (Cr)-Dissolved		0.00022	0.00019		mg/L	12	20	14-AUG-14
Cobalt (Co)-Dissolved		0.00041	0.00043		mg/L	4.5	20	14-AUG-14
Copper (Cu)-Dissolved		0.00015	0.00015		mg/L	0.2	20	14-AUG-14
Iron (Fe)-Dissolved		0.169	0.176		mg/L	3.8	20	14-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-AUG-14
Lithium (Li)-Dissolved		0.0392	0.0383		mg/L	2.5	20	14-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 10 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2918380							
WG1930772-14	DUP	L1496739-3						
Magnesium (Mg)-Dissolved		28.6	28.1		mg/L	1.6	20	14-AUG-14
Manganese (Mn)-Dissolved		0.335	0.336		mg/L	0.4	20	14-AUG-14
Molybdenum (Mo)-Dissolved		0.000184	0.000151		mg/L	20	20	14-AUG-14
Nickel (Ni)-Dissolved		0.00176	0.00178		mg/L	1.0	20	14-AUG-14
Potassium (K)-Dissolved		4.21	4.04		mg/L	4.2	20	14-AUG-14
Selenium (Se)-Dissolved		0.00015	0.00014		mg/L	6.9	20	14-AUG-14
Silicon (Si)-Dissolved		3.17	3.22		mg/L	1.3	20	14-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-AUG-14
Sodium (Na)-Dissolved		89.1	89.0		mg/L	0.2	20	14-AUG-14
Strontium (Sr)-Dissolved		0.457	0.476		mg/L	4.1	20	14-AUG-14
Thallium (Tl)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-AUG-14
Titanium (Ti)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	14-AUG-14
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-AUG-14
Uranium (U)-Dissolved		0.000446	0.000435		mg/L	2.4	20	14-AUG-14
Vanadium (V)-Dissolved		0.00038	0.00039		mg/L	4.7	20	14-AUG-14
Zinc (Zn)-Dissolved		0.0013	0.0012		mg/L	8.2	20	14-AUG-14
WG1930772-15	DUP	L1495473-1						
Aluminum (Al)-Dissolved		0.0065	0.0072		mg/L	10	20	14-AUG-14
Antimony (Sb)-Dissolved		0.00032	0.00031		mg/L	0.2	20	14-AUG-14
Arsenic (As)-Dissolved		0.00011	0.00010		mg/L	5.3	20	14-AUG-14
Barium (Ba)-Dissolved		0.0832	0.0862		mg/L	3.6	20	14-AUG-14
Beryllium (Be)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-AUG-14
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-AUG-14
Boron (B)-Dissolved		0.034	0.033		mg/L	3.2	20	14-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-AUG-14
Calcium (Ca)-Dissolved		99.4	100		mg/L	0.7	20	14-AUG-14
Chromium (Cr)-Dissolved		<0.00010	0.00011	RPD-NA	mg/L	N/A	20	14-AUG-14
Cobalt (Co)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-AUG-14
Copper (Cu)-Dissolved		0.00030	0.00028		mg/L	4.7	20	14-AUG-14
Iron (Fe)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	20	14-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-AUG-14
Lithium (Li)-Dissolved		0.0400	0.0399		mg/L	0.2	20	14-AUG-14
Magnesium (Mg)-Dissolved		45.8	45.8		mg/L	0.2	20	14-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 11 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2918380							
WG1930772-15 DUP		L1495473-1						
Manganese (Mn)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	14-AUG-14
Molybdenum (Mo)-Dissolved		0.00186	0.00189		mg/L	1.8	20	14-AUG-14
Nickel (Ni)-Dissolved		0.00335	0.00326		mg/L	2.9	20	14-AUG-14
Potassium (K)-Dissolved		1.39	1.39		mg/L	0.2	20	14-AUG-14
Selenium (Se)-Dissolved		0.0306	0.0311		mg/L	1.6	20	14-AUG-14
Silicon (Si)-Dissolved		1.77	1.72		mg/L	3.0	20	14-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-AUG-14
Sodium (Na)-Dissolved		21.1	21.0		mg/L	0.4	20	14-AUG-14
Strontium (Sr)-Dissolved		0.775	0.795		mg/L	2.5	20	14-AUG-14
Thallium (Tl)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-AUG-14
Titanium (Ti)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	14-AUG-14
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-AUG-14
Uranium (U)-Dissolved		0.00300	0.00295		mg/L	1.7	20	14-AUG-14
Vanadium (V)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-AUG-14
Zinc (Zn)-Dissolved		0.0014	<0.0010	RPD-NA	mg/L	N/A	20	14-AUG-14
WG1930772-16 DUP		L1498894-7						
Aluminum (Al)-Dissolved		0.0031	0.0031		mg/L	1.1	20	14-AUG-14
Antimony (Sb)-Dissolved		0.00011	0.00012		mg/L	3.1	20	14-AUG-14
Arsenic (As)-Dissolved		0.00024	0.00023		mg/L	5.9	20	14-AUG-14
Barium (Ba)-Dissolved		0.0568	0.0571		mg/L	0.5	20	14-AUG-14
Beryllium (Be)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-AUG-14
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-AUG-14
Boron (B)-Dissolved		0.059	0.054		mg/L	8.2	20	14-AUG-14
Cadmium (Cd)-Dissolved		0.000050	0.000046		mg/L	8.3	20	14-AUG-14
Calcium (Ca)-Dissolved		133	132		mg/L	1.3	20	14-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-AUG-14
Cobalt (Co)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-AUG-14
Copper (Cu)-Dissolved		0.00075	0.00074		mg/L	0.9	20	14-AUG-14
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	14-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-AUG-14
Lithium (Li)-Dissolved		0.0339	0.0327		mg/L	3.4	20	14-AUG-14
Magnesium (Mg)-Dissolved		36.1	35.5		mg/L	1.7	20	14-AUG-14
Manganese (Mn)-Dissolved		0.108	0.106		mg/L	1.6	20	14-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 12 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2918380							
WG1930772-16	DUP	L1498894-7						
Molybdenum (Mo)-Dissolved		0.00284	0.00281		mg/L	1.2	20	14-AUG-14
Nickel (Ni)-Dissolved		0.00099	0.00097		mg/L	1.5	20	14-AUG-14
Potassium (K)-Dissolved		4.33	4.10		mg/L	5.3	20	14-AUG-14
Selenium (Se)-Dissolved		0.00014	0.00015		mg/L	2.7	20	14-AUG-14
Silicon (Si)-Dissolved		4.87	4.87		mg/L	0.1	20	14-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-AUG-14
Sodium (Na)-Dissolved		42.1	41.1		mg/L	2.5	20	14-AUG-14
Strontium (Sr)-Dissolved		0.627	0.621		mg/L	0.9	20	14-AUG-14
Thallium (Tl)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-AUG-14
Titanium (Ti)-Dissolved		0.00030	<0.00030	RPD-NA	mg/L	N/A	20	14-AUG-14
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-AUG-14
Uranium (U)-Dissolved		0.00340	0.00341		mg/L	0.4	20	14-AUG-14
Vanadium (V)-Dissolved		0.00023	0.00023		mg/L	1.1	20	14-AUG-14
Zinc (Zn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	14-AUG-14
WG1930772-17	DUP	L1498946-16						
Aluminum (Al)-Dissolved		0.0262	0.0264		mg/L	0.6	20	14-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-AUG-14
Arsenic (As)-Dissolved		0.00037	0.00038		mg/L	2.8	20	14-AUG-14
Barium (Ba)-Dissolved		0.0551	0.0540		mg/L	2.0	20	14-AUG-14
Beryllium (Be)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-AUG-14
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-AUG-14
Boron (B)-Dissolved		0.337	0.341		mg/L	1.2	20	14-AUG-14
Cadmium (Cd)-Dissolved		0.000013	<0.000010	RPD-NA	mg/L	N/A	20	14-AUG-14
Calcium (Ca)-Dissolved		3.71	3.76		mg/L	1.4	20	14-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-AUG-14
Cobalt (Co)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-AUG-14
Copper (Cu)-Dissolved		0.00058	0.00057		mg/L	1.8	20	14-AUG-14
Iron (Fe)-Dissolved		0.017	0.018		mg/L	2.1	20	14-AUG-14
Lead (Pb)-Dissolved		0.000051	<0.000050	RPD-NA	mg/L	N/A	20	14-AUG-14
Lithium (Li)-Dissolved		0.0755	0.0762		mg/L	0.9	20	14-AUG-14
Magnesium (Mg)-Dissolved		0.32	0.32		mg/L	0.3	20	14-AUG-14
Manganese (Mn)-Dissolved		0.0104	0.0103		mg/L	0.8	20	14-AUG-14
Molybdenum (Mo)-Dissolved		0.0111	0.0111		mg/L	0.0	20	14-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 13 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2918380							
WG1930772-17 DUP		L1498946-16						
Nickel (Ni)-Dissolved		0.00048	0.00047		mg/L	1.3	20	14-AUG-14
Potassium (K)-Dissolved		0.83	0.84		mg/L	0.8	20	14-AUG-14
Selenium (Se)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-AUG-14
Silicon (Si)-Dissolved		3.48	3.47		mg/L	0.4	20	14-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-AUG-14
Strontium (Sr)-Dissolved		0.0773	0.0772		mg/L	0.2	20	14-AUG-14
Thallium (Tl)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-AUG-14
Titanium (Ti)-Dissolved		0.00130	0.00115		mg/L	12	20	14-AUG-14
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-AUG-14
Uranium (U)-Dissolved		0.000313	0.000309		mg/L	1.3	20	14-AUG-14
Vanadium (V)-Dissolved		0.00013	0.00013		mg/L	6.4	20	14-AUG-14
Zinc (Zn)-Dissolved		0.0013	0.0012		mg/L	7.4	20	14-AUG-14
WG1930772-18 DUP		L1499214-3						
Aluminum (Al)-Dissolved		0.0170	0.0163		mg/L	4.3	20	14-AUG-14
Antimony (Sb)-Dissolved		0.00029	0.00029		mg/L	0.3	20	14-AUG-14
Arsenic (As)-Dissolved		0.00602	0.00601		mg/L	0.2	20	14-AUG-14
Barium (Ba)-Dissolved		0.0439	0.0430		mg/L	2.2	20	14-AUG-14
Beryllium (Be)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	14-AUG-14
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-AUG-14
Boron (B)-Dissolved		0.792	0.749		mg/L	5.5	20	14-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-AUG-14
Calcium (Ca)-Dissolved		19.0	18.7		mg/L	1.8	20	14-AUG-14
Chromium (Cr)-Dissolved		<0.00010	0.00010	RPD-NA	mg/L	N/A	20	14-AUG-14
Cobalt (Co)-Dissolved		0.00101	0.00100		mg/L	1.4	20	14-AUG-14
Copper (Cu)-Dissolved		0.00130	0.00131		mg/L	0.4	20	14-AUG-14
Iron (Fe)-Dissolved		0.012	0.012		mg/L	4.0	20	14-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-AUG-14
Lithium (Li)-Dissolved		0.0459	0.0424		mg/L	8.0	20	14-AUG-14
Magnesium (Mg)-Dissolved		5.31	5.54		mg/L	4.1	20	14-AUG-14
Manganese (Mn)-Dissolved		0.0632	0.0639		mg/L	1.1	20	14-AUG-14
Molybdenum (Mo)-Dissolved		0.0150	0.0146		mg/L	2.9	20	14-AUG-14
Nickel (Ni)-Dissolved		0.00375	0.00389		mg/L	3.6	20	14-AUG-14
Potassium (K)-Dissolved		2.86	2.94		mg/L	2.7	20	14-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 14 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2918380							
WG1930772-18	DUP	L1499214-3						
Selenium (Se)-Dissolved		0.00033	0.00029		mg/L	13	20	14-AUG-14
Silicon (Si)-Dissolved		5.57	5.73		mg/L	2.8	20	14-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-AUG-14
Sodium (Na)-Dissolved		196	199		mg/L	1.8	20	14-AUG-14
Strontium (Sr)-Dissolved		0.200	0.195		mg/L	2.5	20	14-AUG-14
Thallium (Tl)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-AUG-14
Titanium (Ti)-Dissolved		0.00052	0.00047		mg/L	10	20	14-AUG-14
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-AUG-14
Uranium (U)-Dissolved		0.00162	0.00159		mg/L	1.5	20	14-AUG-14
Vanadium (V)-Dissolved		0.00168	0.00166		mg/L	0.7	20	14-AUG-14
Zinc (Zn)-Dissolved		0.0035	0.0037		mg/L	4.2	20	14-AUG-14
WG1930772-1	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	14-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-14
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	14-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	14-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	14-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	14-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-14
Lithium (Li)-Dissolved			<0.0030		mg/L		0.003	14-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	14-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-14
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	14-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 15 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2918380							
WG1930772-1 MB								
			<0.050		mg/L		0.05	14-AUG-14
			<0.000010		mg/L		0.00001	14-AUG-14
			<0.050		mg/L		0.05	14-AUG-14
			<0.00010		mg/L		0.0001	14-AUG-14
			<0.000010		mg/L		0.00001	14-AUG-14
			<0.00030		mg/L		0.0003	14-AUG-14
			<0.00010		mg/L		0.0001	14-AUG-14
			<0.000010		mg/L		0.00001	14-AUG-14
			<0.00010		mg/L		0.0001	14-AUG-14
			<0.0010		mg/L		0.001	14-AUG-14
WG1930772-3 MB								
			<0.0010		mg/L		0.001	14-AUG-14
			<0.00010		mg/L		0.0001	14-AUG-14
			<0.00010		mg/L		0.0001	14-AUG-14
			<0.000050		mg/L		0.00005	14-AUG-14
			<0.00010		mg/L		0.0001	14-AUG-14
			<0.000050		mg/L		0.00005	14-AUG-14
			<0.010		mg/L		0.01	14-AUG-14
			<0.000010		mg/L		0.00001	14-AUG-14
			<0.020		mg/L		0.02	14-AUG-14
			<0.00010		mg/L		0.0001	14-AUG-14
			<0.00010		mg/L		0.0001	14-AUG-14
			<0.00010		mg/L		0.0001	14-AUG-14
			<0.010		mg/L		0.01	14-AUG-14
			<0.000050		mg/L		0.00005	14-AUG-14
			<0.0030		mg/L		0.003	14-AUG-14
			<0.0050		mg/L		0.005	14-AUG-14
			<0.000050		mg/L		0.00005	14-AUG-14
			<0.000050		mg/L		0.00005	14-AUG-14
			<0.00010		mg/L		0.0001	14-AUG-14
			<0.050		mg/L		0.05	14-AUG-14
			<0.00010		mg/L		0.0001	14-AUG-14
			<0.050		mg/L		0.05	14-AUG-14
			<0.000010		mg/L		0.00001	14-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 16 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2918380							
WG1930772-3 MB								
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	14-AUG-14
Strontium (Sr)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	14-AUG-14
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	14-AUG-14
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	14-AUG-14
Vanadium (V)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	14-AUG-14
WG1930772-5 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	14-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-14
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	14-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	14-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	14-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	14-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-14
Lithium (Li)-Dissolved			<0.0030		mg/L		0.003	14-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	14-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-14
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	14-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	14-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	14-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	14-AUG-14
Strontium (Sr)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 17 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2918380							
WG1930772-5 MB								
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	14-AUG-14
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	14-AUG-14
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	14-AUG-14
Vanadium (V)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	14-AUG-14
WG1930772-7 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	14-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-14
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	14-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	14-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	14-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	14-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-14
Lithium (Li)-Dissolved			<0.0030		mg/L		0.003	14-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	14-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-14
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	14-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	14-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	14-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	14-AUG-14
Strontium (Sr)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	14-AUG-14
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	14-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 18 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2918380							
WG1930772-7 MB								
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	14-AUG-14
Vanadium (V)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	14-AUG-14
WG1930772-9 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	14-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-14
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	14-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	14-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	14-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	14-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-14
Lithium (Li)-Dissolved			<0.0030		mg/L		0.003	14-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	14-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-14
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	14-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	14-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	14-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	14-AUG-14
Strontium (Sr)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	14-AUG-14
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	14-AUG-14
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	14-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 19 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch R2918380								
WG1930772-9 MB								
	Vanadium (V)-Dissolved		<0.00010		mg/L		0.0001	14-AUG-14
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	14-AUG-14
Batch R2920546								
WG1931727-2 CRM		ED-HIGH-WATRM						
	Boron (B)-Dissolved		102.8		%		80-120	15-AUG-14
	Sodium (Na)-Dissolved		100.4		%		80-120	15-AUG-14
WG1931727-5 CRM		ED-HIGH-WATRM						
	Boron (B)-Dissolved		99.1		%		80-120	15-AUG-14
	Sodium (Na)-Dissolved		98.8		%		80-120	15-AUG-14
WG1930772-17 DUP		L1498946-16						
	Sodium (Na)-Dissolved	326	331		mg/L	1.4	20	15-AUG-14
WG1931727-3 DUP		L1495473-12						
	Boron (B)-Dissolved	0.015	0.015		mg/L	4.5	20	15-AUG-14
	Sodium (Na)-Dissolved	17.4	17.8		mg/L	2.7	20	15-AUG-14
WG1931727-1 MB								
	Boron (B)-Dissolved		<0.010		mg/L		0.01	15-AUG-14
	Sodium (Na)-Dissolved		<0.050		mg/L		0.05	15-AUG-14
WG1931727-4 MB								
	Boron (B)-Dissolved		<0.010		mg/L		0.01	15-AUG-14
	Sodium (Na)-Dissolved		<0.050		mg/L		0.05	15-AUG-14
MET-T-CCMS-ED		Water						
Batch R2912618								
WG1925500-7 DUP		L1496613-1						
	Antimony (Sb)-Total	<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-AUG-14
	Arsenic (As)-Total	<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-AUG-14
	Barium (Ba)-Total	0.127	0.127		mg/L	0.1	20	10-AUG-14
	Beryllium (Be)-Total	<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-AUG-14
	Bismuth (Bi)-Total	<0.00025	<0.00025	RPD-NA	mg/L	N/A	20	10-AUG-14
	Boron (B)-Total	1.36	1.38		mg/L	1.5	20	10-AUG-14
	Cadmium (Cd)-Total	<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	10-AUG-14
	Calcium (Ca)-Total	37.7	37.7		mg/L	0.2	20	10-AUG-14
	Chromium (Cr)-Total	<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	10-AUG-14
	Cobalt (Co)-Total	<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-AUG-14
	Copper (Cu)-Total	0.0020	0.0022		mg/L	12	20	10-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 20 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R2912618							
WG1925500-7	DUP	L1496613-1						
Iron (Fe)-Total		0.763	0.864		mg/L	12	20	10-AUG-14
Lead (Pb)-Total		0.00201	0.00174		mg/L	14	20	10-AUG-14
Lithium (Li)-Total		0.326	0.333		mg/L	2.2	20	10-AUG-14
Magnesium (Mg)-Total		32.4	31.8		mg/L	2.0	20	10-AUG-14
Manganese (Mn)-Total		0.0311	0.0311		mg/L	0.1	20	10-AUG-14
Molybdenum (Mo)-Total		0.00044	0.00049		mg/L	9.3	20	10-AUG-14
Nickel (Ni)-Total		0.0066	0.0068		mg/L	2.2	20	10-AUG-14
Potassium (K)-Total		25.7	24.1		mg/L	6.6	20	10-AUG-14
Selenium (Se)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-AUG-14
Silicon (Si)-Total		2.87	2.85		mg/L	0.6	20	10-AUG-14
Silver (Ag)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	10-AUG-14
Sodium (Na)-Total		637	610		mg/L	4.2	20	10-AUG-14
Strontium (Sr)-Total		1.31	1.30		mg/L	0.2	20	10-AUG-14
Thallium (Tl)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	10-AUG-14
Titanium (Ti)-Total		<0.0015	<0.0015	RPD-NA	mg/L	N/A	20	10-AUG-14
Uranium (U)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-AUG-14
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-AUG-14
Zinc (Zn)-Total		0.022	0.020		mg/L	7.1	20	10-AUG-14
WG1925500-8	DUP	L1496580-3						
Aluminum (Al)-Total		0.0521	0.0486		mg/L	6.9	20	10-AUG-14
Antimony (Sb)-Total		0.00059	0.00056		mg/L	4.9	20	10-AUG-14
Arsenic (As)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	10-AUG-14
Barium (Ba)-Total		0.0699	0.0696		mg/L	0.4	20	10-AUG-14
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-AUG-14
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	10-AUG-14
Boron (B)-Total		0.543	0.512		mg/L	5.8	20	10-AUG-14
Cadmium (Cd)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	10-AUG-14
Calcium (Ca)-Total		13.1	12.5		mg/L	5.4	20	10-AUG-14
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	10-AUG-14
Cobalt (Co)-Total		0.00015	0.00017		mg/L	14	20	10-AUG-14
Copper (Cu)-Total		0.0025	0.0024		mg/L	6.6	20	10-AUG-14
Iron (Fe)-Total		1.07	0.998		mg/L	6.8	20	10-AUG-14
Lead (Pb)-Total		0.00155	0.00151		mg/L	2.8	20	10-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 21 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R2912618							
WG1925500-8	DUP	L1496580-3						
Lithium (Li)-Total		0.0462	0.0435		mg/L	6.0	20	10-AUG-14
Magnesium (Mg)-Total		3.96	3.72		mg/L	6.1	20	10-AUG-14
Manganese (Mn)-Total		0.0281	0.0266		mg/L	5.4	20	10-AUG-14
Molybdenum (Mo)-Total		0.00236	0.00221		mg/L	6.7	20	10-AUG-14
Nickel (Ni)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	10-AUG-14
Potassium (K)-Total		6.77	6.59		mg/L	2.7	20	10-AUG-14
Selenium (Se)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	10-AUG-14
Silicon (Si)-Total		6.50	6.42		mg/L	1.4	20	10-AUG-14
Silver (Ag)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	10-AUG-14
Sodium (Na)-Total		207	203		mg/L	2.3	20	10-AUG-14
Strontium (Sr)-Total		0.145	0.138		mg/L	5.3	20	10-AUG-14
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	10-AUG-14
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-AUG-14
Uranium (U)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-AUG-14
Vanadium (V)-Total		0.00035	0.00031		mg/L	11	20	10-AUG-14
Zinc (Zn)-Total		<0.0040	<0.0040	RPD-NA	mg/L	N/A	20	10-AUG-14
WG1925500-9	DUP	L1491901-1						
Aluminum (Al)-Total		0.331	0.337		mg/L	1.9	20	10-AUG-14
Antimony (Sb)-Total		0.00050	0.00051		mg/L	1.3	20	10-AUG-14
Arsenic (As)-Total		0.337	0.343		mg/L	1.7	20	10-AUG-14
Barium (Ba)-Total		0.00698	0.00678		mg/L	2.9	20	10-AUG-14
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-AUG-14
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	10-AUG-14
Boron (B)-Total		0.029	0.030		mg/L	2.7	20	10-AUG-14
Cadmium (Cd)-Total		0.000014	0.000012		mg/L	12	20	10-AUG-14
Calcium (Ca)-Total		23.3	24.9		mg/L	6.7	20	10-AUG-14
Chromium (Cr)-Total		0.00069	0.00078		mg/L	13	20	10-AUG-14
Cobalt (Co)-Total		0.00039	0.00040		mg/L	1.0	20	10-AUG-14
Copper (Cu)-Total		0.00965	0.00972		mg/L	0.7	20	10-AUG-14
Iron (Fe)-Total		0.096	0.091		mg/L	5.1	20	10-AUG-14
Lead (Pb)-Total		0.00150	0.00153		mg/L	2.0	20	10-AUG-14
Lithium (Li)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	10-AUG-14
Magnesium (Mg)-Total		4.57	4.75		mg/L	3.9	20	10-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 22 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R2912618							
WG1925500-9	DUP	L1491901-1						
Manganese (Mn)-Total		0.0119	0.0120		mg/L	0.9	20	10-AUG-14
Molybdenum (Mo)-Total		0.00443	0.00464		mg/L	4.5	20	10-AUG-14
Nickel (Ni)-Total		0.00228	0.00230		mg/L	1.0	20	10-AUG-14
Potassium (K)-Total		2.68	2.72		mg/L	1.3	20	10-AUG-14
Selenium (Se)-Total		0.00014	0.00014		mg/L	0.9	20	10-AUG-14
Silicon (Si)-Total		1.18	1.19		mg/L	1.4	20	10-AUG-14
Silver (Ag)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	10-AUG-14
Sodium (Na)-Total		2.95	2.99		mg/L	1.1	20	10-AUG-14
Strontium (Sr)-Total		0.0428	0.0433		mg/L	1.1	20	10-AUG-14
Thallium (Tl)-Total		0.000022	0.000021		mg/L	5.3	20	10-AUG-14
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-AUG-14
Titanium (Ti)-Total		0.00246	0.00247		mg/L	0.5	20	10-AUG-14
Uranium (U)-Total		0.000623	0.000639		mg/L	2.5	20	10-AUG-14
Vanadium (V)-Total		0.00180	0.00180		mg/L	0.1	20	10-AUG-14
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	10-AUG-14
WG1925500-5	LCS							
Aluminum (Al)-Total			106.0		%		70-130	10-AUG-14
Antimony (Sb)-Total			105.8		%		70-130	10-AUG-14
Arsenic (As)-Total			101.5		%		70-130	10-AUG-14
Barium (Ba)-Total			101.1		%		70-130	10-AUG-14
Beryllium (Be)-Total			94.7		%		70-130	10-AUG-14
Bismuth (Bi)-Total			100.0		%		70-130	10-AUG-14
Boron (B)-Total			90.7		%		70-130	10-AUG-14
Cadmium (Cd)-Total			98.6		%		70-130	10-AUG-14
Calcium (Ca)-Total			98.2		%		70-130	10-AUG-14
Chromium (Cr)-Total			105.1		%		70-130	10-AUG-14
Cobalt (Co)-Total			102.0		%		70-130	10-AUG-14
Copper (Cu)-Total			102.3		%		70-130	10-AUG-14
Iron (Fe)-Total			92.3		%		70-130	10-AUG-14
Lead (Pb)-Total			100.9		%		70-130	10-AUG-14
Lithium (Li)-Total			94.1		%		70-130	10-AUG-14
Magnesium (Mg)-Total			106.0		%		70-130	10-AUG-14
Manganese (Mn)-Total			102.4		%		70-130	10-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 23 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2912618							
WG1925500-5	LCS							
Molybdenum (Mo)-Total			97.2		%		70-130	10-AUG-14
Nickel (Ni)-Total			102.8		%		70-130	10-AUG-14
Potassium (K)-Total			106.7		%		70-130	10-AUG-14
Selenium (Se)-Total			99.98		%		70-130	10-AUG-14
Silicon (Si)-Total			94.0		%		70-130	10-AUG-14
Silver (Ag)-Total			104.9		%		70-130	10-AUG-14
Sodium (Na)-Total			108.0		%		70-130	10-AUG-14
Strontium (Sr)-Total			97.5		%		70-130	10-AUG-14
Thallium (Tl)-Total			104.1		%		70-130	10-AUG-14
Tin (Sn)-Total			97.7		%		70-130	10-AUG-14
Titanium (Ti)-Total			101.0		%		70-130	10-AUG-14
Uranium (U)-Total			100.5		%		70-130	10-AUG-14
Vanadium (V)-Total			105.4		%		70-130	10-AUG-14
Zinc (Zn)-Total			107.6		%		70-130	10-AUG-14
WG1925500-6	LCS							
Aluminum (Al)-Total			100.8		%		70-130	10-AUG-14
Antimony (Sb)-Total			101.7		%		70-130	10-AUG-14
Arsenic (As)-Total			95.4		%		70-130	10-AUG-14
Barium (Ba)-Total			97.6		%		70-130	10-AUG-14
Beryllium (Be)-Total			90.9		%		70-130	10-AUG-14
Bismuth (Bi)-Total			99.1		%		70-130	10-AUG-14
Boron (B)-Total			89.6		%		70-130	10-AUG-14
Cadmium (Cd)-Total			92.8		%		70-130	10-AUG-14
Calcium (Ca)-Total			94.6		%		70-130	10-AUG-14
Chromium (Cr)-Total			98.8		%		70-130	10-AUG-14
Cobalt (Co)-Total			96.8		%		70-130	10-AUG-14
Copper (Cu)-Total			94.9		%		70-130	10-AUG-14
Iron (Fe)-Total			87.2		%		70-130	10-AUG-14
Lead (Pb)-Total			99.4		%		70-130	10-AUG-14
Lithium (Li)-Total			90.1		%		70-130	10-AUG-14
Magnesium (Mg)-Total			99.1		%		70-130	10-AUG-14
Manganese (Mn)-Total			97.2		%		70-130	10-AUG-14
Molybdenum (Mo)-Total			91.3		%		70-130	10-AUG-14
Nickel (Ni)-Total			96.1		%		70-130	10-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 24 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2912618							
WG1925500-6 LCS								
Potassium (K)-Total			99.1		%		70-130	10-AUG-14
Selenium (Se)-Total			96.0		%		70-130	10-AUG-14
Silicon (Si)-Total			89.9		%		70-130	10-AUG-14
Silver (Ag)-Total			98.1		%		70-130	10-AUG-14
Sodium (Na)-Total			100.3		%		70-130	10-AUG-14
Strontium (Sr)-Total			91.4		%		70-130	10-AUG-14
Thallium (Tl)-Total			101.2		%		70-130	10-AUG-14
Tin (Sn)-Total			90.9		%		70-130	10-AUG-14
Titanium (Ti)-Total			90.0		%		70-130	10-AUG-14
Uranium (U)-Total			95.5		%		70-130	10-AUG-14
Vanadium (V)-Total			98.6		%		70-130	10-AUG-14
Zinc (Zn)-Total			100.9		%		70-130	10-AUG-14
WG1925500-2 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	10-AUG-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Boron (B)-Total			<0.010		mg/L		0.01	10-AUG-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Copper (Cu)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Iron (Fe)-Total			<0.010		mg/L		0.01	10-AUG-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Lithium (Li)-Total			<0.0050		mg/L		0.005	10-AUG-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	10-AUG-14
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Potassium (K)-Total			<0.050		mg/L		0.05	10-AUG-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Silicon (Si)-Total			<0.050		mg/L		0.05	10-AUG-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Sodium (Na)-Total			<0.050		mg/L		0.05	10-AUG-14
Strontium (Sr)-Total			<0.00010		mg/L		0.0001	10-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 25 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2912618							
WG1925500-2 MB								
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Tin (Sn)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	10-AUG-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Vanadium (V)-Total			<0.00020		mg/L		0.0002	10-AUG-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	10-AUG-14
WG1925500-3 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	10-AUG-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Barium (Ba)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Boron (B)-Total			<0.010		mg/L		0.01	10-AUG-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Calcium (Ca)-Total			<0.020		mg/L		0.02	10-AUG-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Copper (Cu)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Iron (Fe)-Total			<0.010		mg/L		0.01	10-AUG-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Lithium (Li)-Total			<0.0050		mg/L		0.005	10-AUG-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	10-AUG-14
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Nickel (Ni)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Potassium (K)-Total			<0.050		mg/L		0.05	10-AUG-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Silicon (Si)-Total			<0.050		mg/L		0.05	10-AUG-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Sodium (Na)-Total			<0.050		mg/L		0.05	10-AUG-14
Strontium (Sr)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Tin (Sn)-Total			<0.00010		mg/L		0.0001	10-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 26 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2912618							
WG1925500-3 MB								
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	10-AUG-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Vanadium (V)-Total			<0.00020		mg/L		0.0002	10-AUG-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	10-AUG-14
NAPHTHENIC-ACID-FM		Water						
Batch	R2927870							
WG1929715-3 DUP		L1494650-2						
Naphthenic Acids		<1.0	<1.0	RPD-NA	mg/L	N/A	30	25-AUG-14
WG1929715-4 LCS			91.6		%		70-130	25-AUG-14
Naphthenic Acids								
WG1929715-1 MB			<1.0		mg/L		1	25-AUG-14
Naphthenic Acids								
WG1929715-2 MS		L1494650-1	90.4		%		50-150	25-AUG-14
Naphthenic Acids								
NH3-CFA-ED		Water						
Batch	R2916747							
WG1929601-6 DUP		L1499153-1						
Ammonia, Total (as N)		1.89	1.87		mg/L	1.2	20	13-AUG-14
WG1929601-9 DUP		L1501160-1						
Ammonia, Total (as N)		0.291	0.302		mg/L	3.8	20	13-AUG-14
WG1929601-2 LCS			97.1		%		85-115	13-AUG-14
Ammonia, Total (as N)								
WG1929601-1 MB			<0.050		mg/L		0.05	13-AUG-14
Ammonia, Total (as N)								
WG1929601-7 MS		L1498895-2	87.0		%		75-125	13-AUG-14
Ammonia, Total (as N)								
WG1929601-8 MS		L1499329-1	105.1		%		75-125	13-AUG-14
Ammonia, Total (as N)								
NO2-IC-ED		Water						
Batch	R2906695							
WG1923826-2 LCS			92.8		%		90-110	01-AUG-14
Nitrite (as N)								
WG1923826-1 MB			<0.020		mg/L		0.02	01-AUG-14
Nitrite (as N)								
NO3-IC-ED		Water						



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 27 of 33

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-ED	Water							
Batch	R2906695							
WG1923826-2	LCS							
Nitrate (as N)			98.3		%		90-110	01-AUG-14
WG1923826-1	MB							
Nitrate (as N)			<0.050		mg/L		0.05	01-AUG-14
PAH-CCME-CL	Water							
Batch	R2912646							
WG1927607-2	LCS							
Naphthalene			93.3		%		50-130	07-AUG-14
Quinoline			100.9		%		60-130	07-AUG-14
Acenaphthene			92.8		%		60-130	07-AUG-14
Fluorene			94.4		%		60-130	07-AUG-14
Phenanthrene			100.4		%		60-130	07-AUG-14
Anthracene			100.3		%		60-130	07-AUG-14
Acridine			103.1		%		60-130	07-AUG-14
Fluoranthene			98.0		%		60-130	07-AUG-14
Pyrene			105.4		%		60-130	07-AUG-14
Benzo(a)anthracene			101.5		%		60-130	07-AUG-14
Chrysene			100.8		%		60-130	07-AUG-14
Benzo(b&j)fluoranthene			95.8		%		60-130	07-AUG-14
Benzo(k)fluoranthene			94.9		%		60-130	07-AUG-14
Benzo(a)pyrene			94.7		%		60-130	07-AUG-14
Benzo(g,h,i)perylene			101.5		%		60-130	07-AUG-14
Indeno(1,2,3-cd)pyrene			100.1		%		60-130	07-AUG-14
Dibenzo(a,h)anthracene			101.2		%		60-130	07-AUG-14
WG1927607-4	LCS							
Naphthalene			91.2		%		50-130	07-AUG-14
Quinoline			97.5		%		60-130	07-AUG-14
Acenaphthene			87.6		%		60-130	07-AUG-14
Fluorene			91.0		%		60-130	07-AUG-14
Phenanthrene			96.4		%		60-130	07-AUG-14
Anthracene			100.5		%		60-130	07-AUG-14
Acridine			100.2		%		60-130	07-AUG-14
Fluoranthene			94.4		%		60-130	07-AUG-14
Pyrene			102.5		%		60-130	07-AUG-14
Benzo(a)anthracene			96.8		%		60-130	07-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 28 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-CCME-CL		Water						
Batch	R2912646							
WG1927607-4	LCS							
Chrysene			93.0		%		60-130	07-AUG-14
Benzo(b&j)fluoranthene			79.4		%		60-130	07-AUG-14
Benzo(k)fluoranthene			76.3		%		60-130	07-AUG-14
Benzo(a)pyrene			77.9		%		60-130	07-AUG-14
Benzo(g,h,i)perylene			99.3		%		60-130	07-AUG-14
Indeno(1,2,3-cd)pyrene			76.6		%		60-130	07-AUG-14
Dibenzo(a,h)anthracene			94.3		%		60-130	07-AUG-14
WG1927607-1	MB							
Naphthalene			<0.000050		mg/L		0.00005	07-AUG-14
Quinoline			<0.000020		mg/L		0.00002	07-AUG-14
Acenaphthene			<0.000020		mg/L		0.00002	07-AUG-14
Fluorene			<0.000020		mg/L		0.00002	07-AUG-14
Phenanthrene			<0.000050		mg/L		0.00005	07-AUG-14
Anthracene			<0.000010		mg/L		0.00001	07-AUG-14
Acridine			<0.000020		mg/L		0.00002	07-AUG-14
Fluoranthene			<0.000020		mg/L		0.00002	07-AUG-14
Pyrene			<0.000010		mg/L		0.00001	07-AUG-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	07-AUG-14
Chrysene			<0.000020		mg/L		0.00002	07-AUG-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	07-AUG-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	07-AUG-14
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	07-AUG-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	07-AUG-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	07-AUG-14
Dibenzo(a,h)anthracene			<0.0000050		mg/L		0.000005	07-AUG-14
Surrogate: d10-Acenaphthene			100.4		%		60-130	07-AUG-14
Surrogate: d10-Phenanthrene			97.9		%		60-130	07-AUG-14
Surrogate: d12-Chrysene			96.7		%		60-130	07-AUG-14
WG1927607-3	MB							
Naphthalene			<0.000050		mg/L		0.00005	07-AUG-14
Quinoline			<0.000020		mg/L		0.00002	07-AUG-14
Acenaphthene			<0.000020		mg/L		0.00002	07-AUG-14
Fluorene			<0.000020		mg/L		0.00002	07-AUG-14
Phenanthrene			<0.000050		mg/L		0.00005	07-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 29 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-CCME-CL		Water						
Batch	R2912646							
WG1927607-3	MB							
Anthracene			<0.000010		mg/L		0.00001	07-AUG-14
Acridine			<0.000020		mg/L		0.00002	07-AUG-14
Fluoranthene			<0.000020		mg/L		0.00002	07-AUG-14
Pyrene			<0.000010		mg/L		0.00001	07-AUG-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	07-AUG-14
Chrysene			<0.000020		mg/L		0.00002	07-AUG-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	07-AUG-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	07-AUG-14
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	07-AUG-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	07-AUG-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	07-AUG-14
Dibenzo(a,h)anthracene			<0.0000050		mg/L		0.000005	07-AUG-14
Surrogate: d10-Acenaphthene			88.3		%		60-130	07-AUG-14
Surrogate: d10-Phenanthrene			96.8		%		60-130	07-AUG-14
Surrogate: d12-Chrysene			99.2		%		60-130	07-AUG-14
WG1927607-5	MB							
Naphthalene			<0.000050		mg/L		0.00005	11-AUG-14
Quinoline			<0.000020		mg/L		0.00002	11-AUG-14
Acenaphthene			<0.000020		mg/L		0.00002	11-AUG-14
Fluorene			<0.000020		mg/L		0.00002	11-AUG-14
Phenanthrene			<0.000050		mg/L		0.00005	11-AUG-14
Anthracene			<0.000010		mg/L		0.00001	11-AUG-14
Acridine			<0.000020		mg/L		0.00002	11-AUG-14
Fluoranthene			<0.000020		mg/L		0.00002	11-AUG-14
Pyrene			<0.000010		mg/L		0.00001	11-AUG-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	11-AUG-14
Chrysene			<0.000020		mg/L		0.00002	11-AUG-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	11-AUG-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	11-AUG-14
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	11-AUG-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	11-AUG-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	11-AUG-14
Dibenzo(a,h)anthracene			<0.0000050		mg/L		0.000005	11-AUG-14
Surrogate: d10-Acenaphthene			91.0		%		60-130	11-AUG-14



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 30 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-CCME-CL		Water						
Batch	R2912646							
WG1927607-5 MB								
Surrogate: d10-Phenanthrene			94.4		%		60-130	11-AUG-14
Surrogate: d12-Chrysene			95.5		%		60-130	11-AUG-14
PH/EC/ALK-ED		Water						
Batch	R2906537							
WG1923565-8 DUP	L1496471-12							
pH		8.37	8.32	J	pH	0.04	0.3	02-AUG-14
Conductivity (EC)		2600	2600		uS/cm	0.0	10	02-AUG-14
Bicarbonate (HCO3)		771	772		mg/L	0.1	25	02-AUG-14
Carbonate (CO3)		7.3	<5.0	RPD-NA	mg/L	N/A	25	02-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	02-AUG-14
Alkalinity, Total (as CaCO3)		644	640		mg/L	0.6	20	02-AUG-14
WG1923565-10 LCS								
Conductivity (EC)			99.6		%		90-110	02-AUG-14
WG1923565-11 LCS								
pH			7.03		pH		6.7-7.3	02-AUG-14
WG1923565-12 LCS								
Alkalinity, Total (as CaCO3)			99.4		%		85-115	02-AUG-14
WG1923565-13 LCS								
Conductivity (EC)			97.8		%		90-110	02-AUG-14
WG1923565-15 LCS								
Conductivity (EC)			97.9		%		90-110	02-AUG-14
WG1923565-16 LCS								
pH			7.03		pH		6.7-7.3	02-AUG-14
WG1923565-17 LCS								
Alkalinity, Total (as CaCO3)			99.4		%		85-115	02-AUG-14
WG1923565-18 LCS								
Conductivity (EC)			96.8		%		90-110	02-AUG-14
WG1923565-2 LCS								
Conductivity (EC)			99.5		%		90-110	02-AUG-14
WG1923565-3 LCS								
pH			7.01		pH		6.7-7.3	02-AUG-14
WG1923565-4 LCS								
Alkalinity, Total (as CaCO3)			99.5		%		85-115	02-AUG-14
WG1923565-5 LCS								
Conductivity (EC)			98.3		%		90-110	02-AUG-14
WG1923565-1 MB								



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 31 of 33

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R2906537							
WG1923565-1	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	02-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	02-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	02-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	02-AUG-14
WG1923565-14	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	02-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	02-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	02-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	02-AUG-14
WG1923565-9	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	02-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	02-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	02-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	02-AUG-14
PHENOLS-4AAP-ED		Water						
Batch	R2918451							
WG1931047-3	DUP	L1498240-6						
Phenols (4AAP)		0.0159	0.0169		mg/L	6.1	15	14-AUG-14
WG1931047-4	DUP	L1492147-2						
Phenols (4AAP)		0.0039	0.0032	J	mg/L	0.0007	0.002	14-AUG-14
WG1931047-5	DUP	L1495055-1						
Phenols (4AAP)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	15	14-AUG-14
WG1931047-2	LCS							
Phenols (4AAP)			100.0		%		85-115	14-AUG-14
WG1931047-1	MB							
Phenols (4AAP)			<0.0010		mg/L		0.001	14-AUG-14
WG1931047-6	MS	L1495055-1						
Phenols (4AAP)			97.0		%		75-125	14-AUG-14
SO4-IC-ED		Water						
Batch	R2906695							
WG1923826-2	LCS							
Sulfate (SO4)			99.8		%		90-110	01-AUG-14
WG1923826-1	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	01-AUG-14
SOLIDS-TDS-ED		Water						



Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Page 32 of 33

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-ED		Water						
Batch	R2911966							
WG1926345-3	DUP	L1497473-2						
Total Dissolved Solids		195	202		mg/L	3.5	20	07-JUL-14
WG1926345-2	LCS							
Total Dissolved Solids			100.0		%		85-115	07-JUL-14
WG1926345-1	MB							
Total Dissolved Solids			<10		mg/L		10	07-JUL-14
TURBIDITY-ED		Water						
Batch	R2906614							
WG1923594-2	LCS							
Turbidity			98.6		%		70-130	02-AUG-14
WG1923594-1	MB							
Turbidity			<0.10		NTU		0.1	02-AUG-14

Quality Control Report

Workorder: L1495990

Report Date: 03-SEP-14

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Page 33 of 33

Contact: AKIN OWOJORI

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects.
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



ALS 140811-10 (14-CDM)

CONFIDENTIAL ANALYSIS REPORT

REPORT #: 140811-10

WO #: 14-CDM

PO #: L1495990

CLIENT: ALS Laboratory Group - Edmonton
9936-67 Avenue
Edmonton, AB
T6E 0P5

ATTENTION: ALS-ED Reporting
Tel: (780) 413-5227
Fax: (780) 437-2311

SAMPLE DESCRIPTION: Water Samples

DATE AND TIME OF SAMPLE COLLECTION: July 31, 2014

DATE AND TIME OF SAMPLE RECEIPT: August 02, 2014/16:45

SAMPLE TEMPERATURE WHEN RECEIVED: 5.5° Celsius

TEST PERFORMED:
Iron Related Bacteria
Sulfate Reducing Bacteria

TEST START DATE: August 02, 2014/16:50

DATE COMPLETED: August 09, 2014

CERTIFICATE OF ANALYSIS: See Page 2

QUALITY CONTROL DATA: See Attached Appendix 1

The report shall not be reproduced, except in full, without the written authority of PBR Laboratories Inc.

Certificate of Analysis

PBR ID	Sample #	Client ID	Lot #	Test	Protocol	Quantity Analyzed	*DF	Result	Units	Note
14-CDM-01		16053140731001		Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		200	CFU/ml	1
14-CDM-02		16053140731002		Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		1.8×10^4	CFU/ml	1
14-CDM-03		16053140731003		Iron Related Bacteria	BART	15 ml		1.4×10^5	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		1.8×10^4	CFU/ml	1

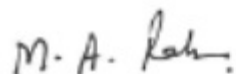
*DF - Dilution Factor used for analysis

Notes

1 CFU = Colony Forming Unit.

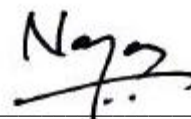
BART results represent the Approximate Population only.

The reported results apply only to the items tested.



Abdul Rahman Mohammed (Analyst)
Date: Aug 11 2014

Approved By: _____



Narayan Pokharel, Ph.D.
Date: Aug 11 2014





PIBR
Laboratories Inc.

ALS 140811-10 (14-CDM)

APPENDIX 1

Quality Control Data for Iron Related Bacteria (BART)

Controls	Organism/Medium	Result
Sterility (media blank)	BART medium	Pass
Positive	Acidithiobacillus ferrooxidans	Pass
Negative	D/W Sterile	Pass

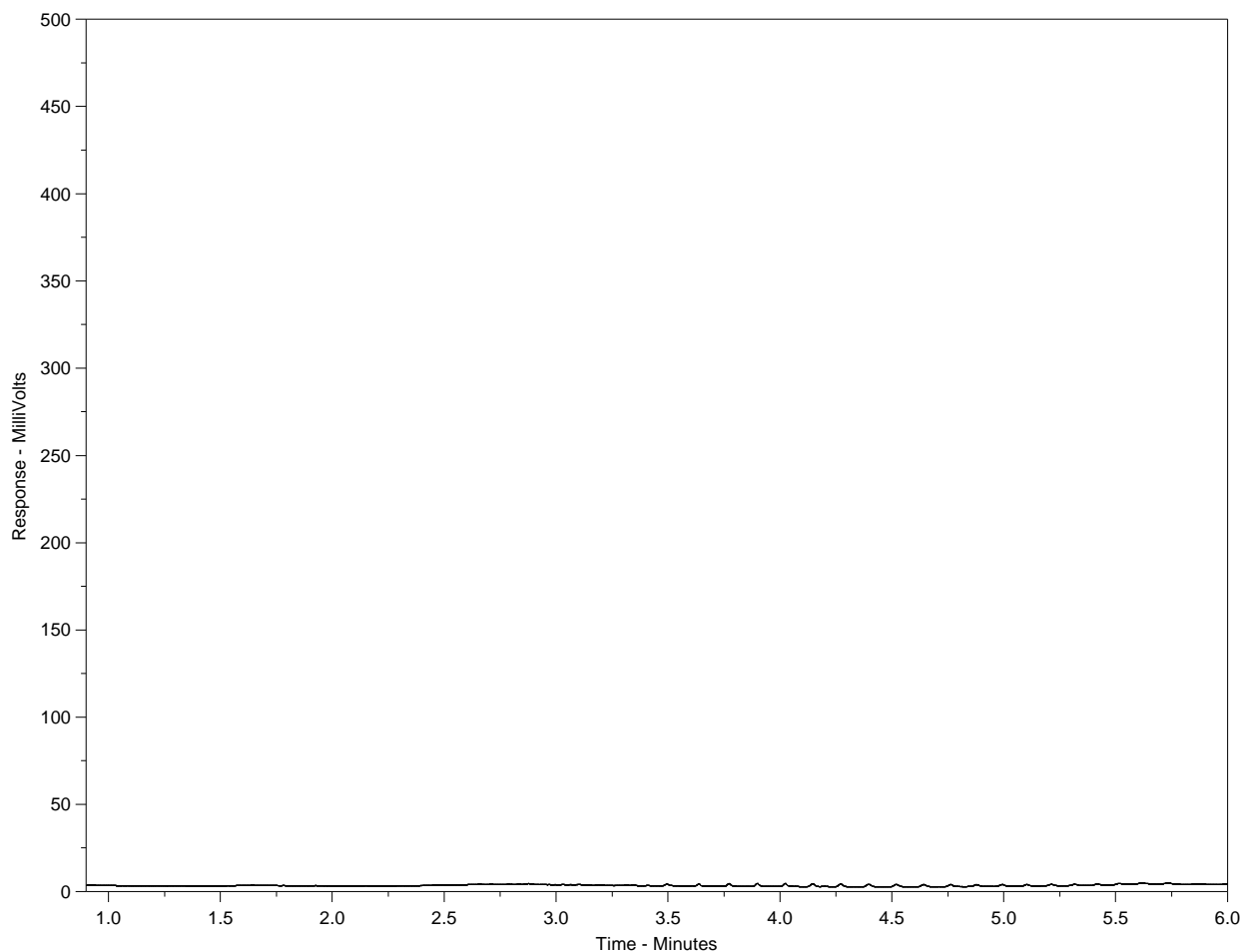
Quality Control Data for Sulfate Reducing Bacteria (BART)

Controls	Organism/Medium	Result
Sterility	BART medium	Pass
Positive	SRB	Pass
Negative	D/W Sterile	Pass

Hydrocarbon Distribution Report



ALS Sample ID: L1495990-1
Client ID: 16053140731001



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	1067°F				
← Gasoline →			← Motor Oils/ Lube Oils/ Grease →				
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

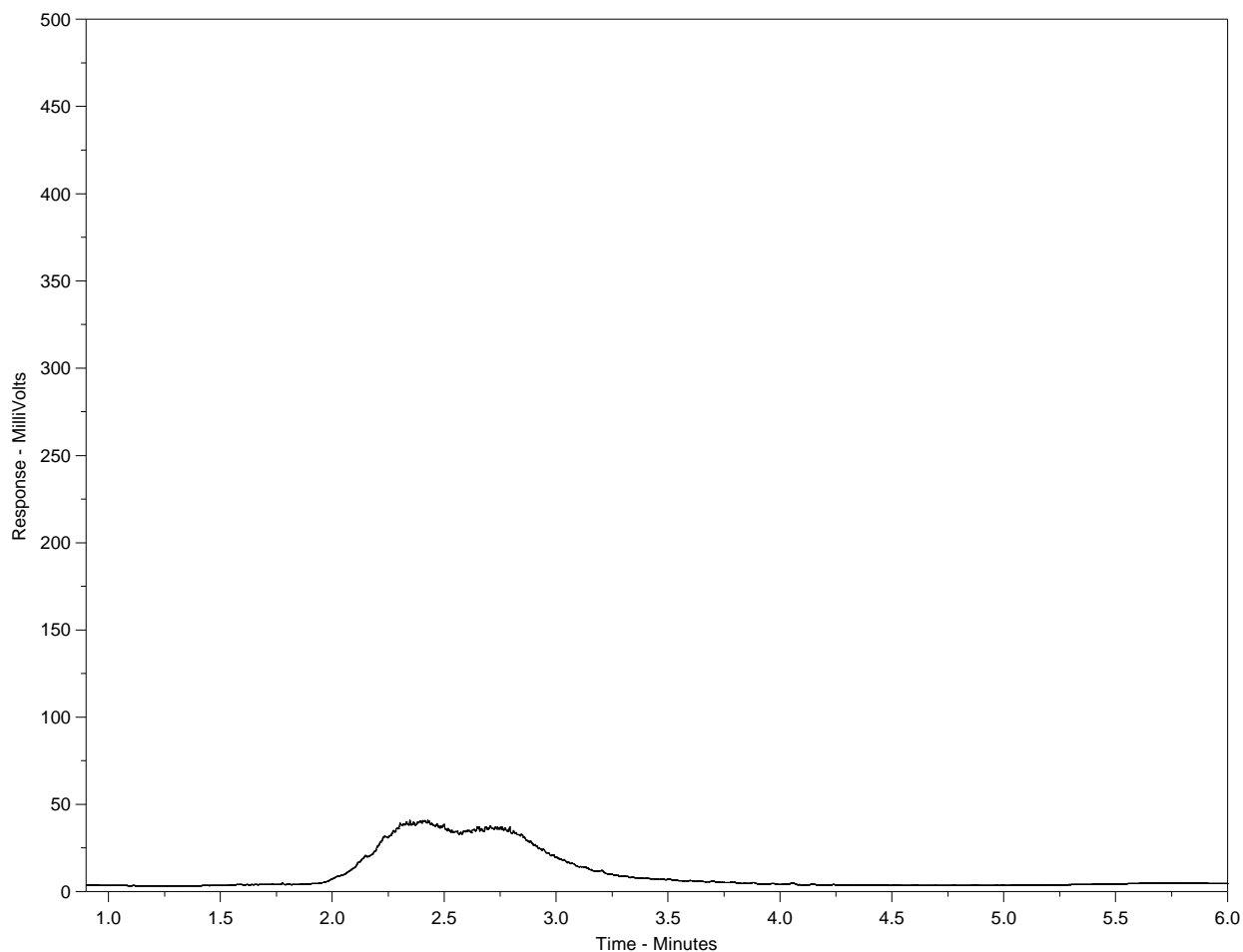
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1495990-2
 Client ID: 16053140731002



F2		F3		F4		F4	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	1067°F				
Gasoline				Motor Oils/ Lube Oils/ Grease			
Diesel/ Jet Fuels							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

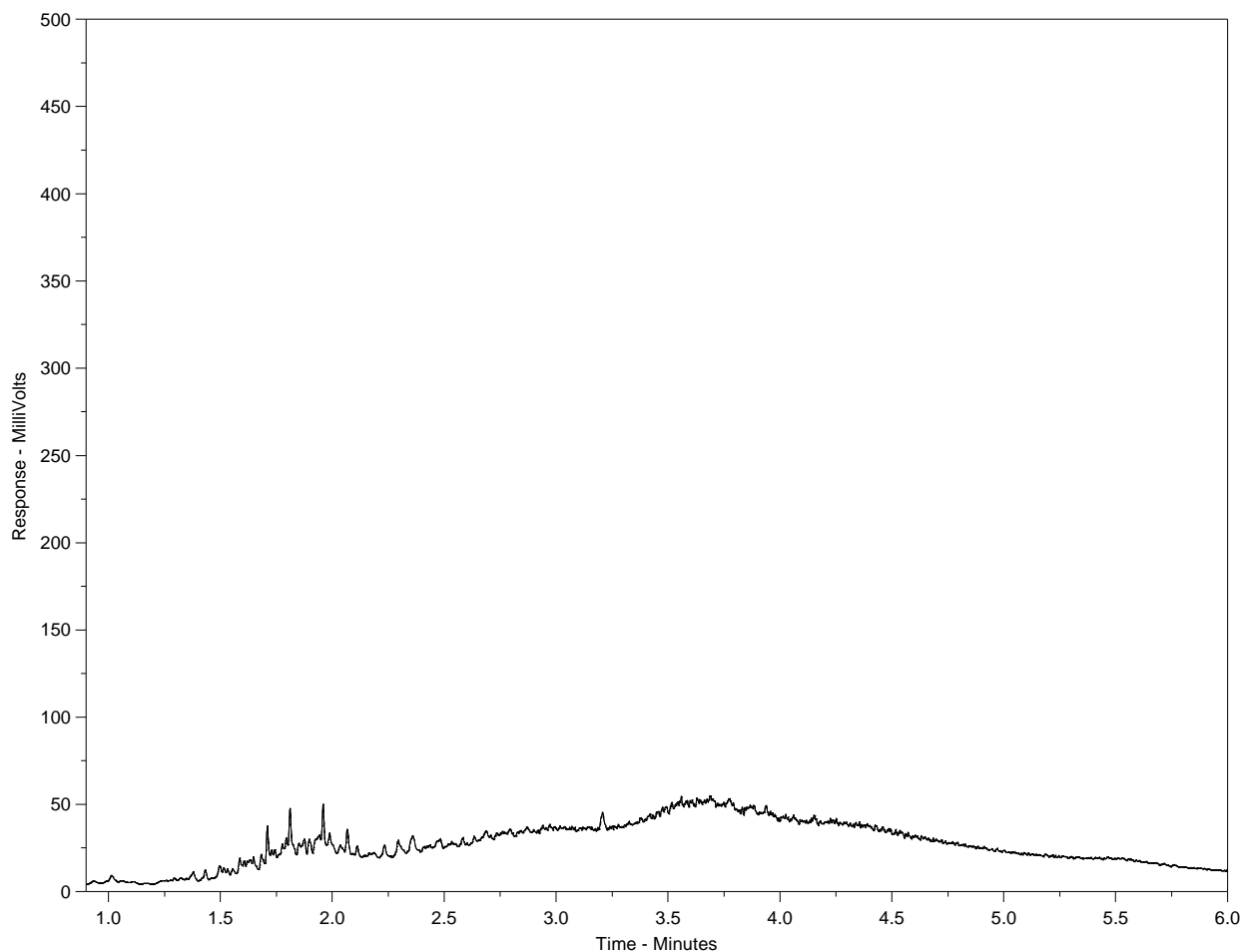
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1495990-3
 Client ID: 16053140731003



← F2 →		← F3 →		← F4 →		← F4 →	
nC10		nC16		nC34		nC50	
174°C		287°C		481°C		575°C	
346°F		549°F		898°F		1067°F	
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.



Matrix Solutions Inc.
ATTN: AKIN OWOJORI
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Date Received: 02-AUG-14
Report Date: 21-AUG-14 17:08 (MT)
Version: FINAL

Client Phone: 403-513-2275

Certificate of Analysis

Lab Work Order #: L1496514
Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers: M047716, M061011
Legal Site Desc:

Nicole Thibault
Account Manager

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ADDRESS: 9936-67 Avenue, Edmonton, AB T6E 0P5 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496514-1 16053140801004									
Sampled By: Bobby/Jeremy/Gulled on 01-AUG-14 @ 16:44									
Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908669
Toluene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908669
EthylBenzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908669
o-Xylene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908669
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908669
Styrene	<0.0010	-		0.0010	mg/L	-		10-AUG-14	R2908669
F1(C6-C10)	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908669
F1-BTEX	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908669
Xylenes	<0.00071	-		0.00071	mg/L	-		10-AUG-14	R2908669
Surr: 1,4-Difluorobenzene (SS)	100.9	-		N/A	%	-		10-AUG-14	R2908669
Surr: 4-Bromofluorobenzene (SS)	93.7	-		N/A	%	-		10-AUG-14	R2908669
Surr: 3,4-Dichlorotoluene (SS)	100.0	-		N/A	%	-		10-AUG-14	R2908669
F2, F3, F4									
F2 (>C10-C16)	0.36	+/-0.10		0.25	mg/L	0	07-AUG-14	07-AUG-14	R2910252
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	07-AUG-14	07-AUG-14	R2910252
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	07-AUG-14	07-AUG-14	R2910252
Surr: 2-Bromobenzotrifluoride	91.6	-		N/A	%	-	07-AUG-14	07-AUG-14	R2910252
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		16-AUG-14	R2919287
				0					
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	13.7	+/-2.2	DLM	0.015	mg/L	0		10-AUG-14	R2912618
Antimony (Sb)-Total	0.00076	+/-0.00012	DLM	0.00050	mg/L	0		10-AUG-14	R2912618
Arsenic (As)-Total	0.0192	+/-0.0022	DLM	0.00050	mg/L	0		10-AUG-14	R2912618
Barium (Ba)-Total	0.233	+/-0.026	DLM	0.0050	mg/L	0		10-AUG-14	R2912618
Boron (B)-Total	1.89	+/-0.30	DLM	0.050	mg/L	0		10-AUG-14	R2912618
Cadmium (Cd)-Total	0.00140	+/-0.00027	DLM	0.00020	mg/L	0		10-AUG-14	R2912618
Calcium (Ca)-Total	22.2	+/-2.6	DLM	0.50	mg/L	0		10-AUG-14	R2912618
Chromium (Cr)-Total	0.0413	+/-0.0060	DLM	0.0050	mg/L	0		10-AUG-14	R2912618
Copper (Cu)-Total	0.0806	+/-0.0094	DLM	0.0010	mg/L	0		10-AUG-14	R2912618
Iron (Fe)-Total	132	+/-21	DLM	0.050	mg/L	0		10-AUG-14	R2912618
Lead (Pb)-Total	0.107	+/-0.017	DLM	0.00025	mg/L	0		10-AUG-14	R2912618
Magnesium (Mg)-Total	16.1	+/-1.9	DLM	0.10	mg/L	0		10-AUG-14	R2912618
Manganese (Mn)-Total	0.796	+/-0.080	DLM	0.0020	mg/L	0		10-AUG-14	R2912618
Nickel (Ni)-Total	0.0531	+/-0.0058	DLM	0.0020	mg/L	0		10-AUG-14	R2912618
Potassium (K)-Total	9.52	+/-1.2	DLM	0.25	mg/L	0		10-AUG-14	R2912618
Selenium (Se)-Total	0.00066	+/-0.00009	DLM	0.00050	mg/L	0		10-AUG-14	R2912618
Silicon (Si)-Total	27.1	+/-5.4	DLM	0.25	mg/L	0		10-AUG-14	R2912618
Silver (Ag)-Total	<0.00040	-	DLM	0.00040	mg/L	-		10-AUG-14	R2912618
Sodium (Na)-Total	1000	+/-120	DLM	1.0	mg/L	0		10-AUG-14	R2912618
Uranium (U)-Total	0.00197	+/-0.00028	DLM	0.00010	mg/L	0		10-AUG-14	R2912618
Zinc (Zn)-Total	0.313	+/-0.048	DLM	0.015	mg/L	0		10-AUG-14	R2912618
Miscellaneous Parameters									
Ammonia, Total (as N)	3.52	-		0.050	mg/L	-		14-AUG-14	R2918088
Dissolved Organic Carbon	10.1	+/-1.2		1.0	mg/L	0		13-AUG-14	R2916939
Iron Bacteria	See Attached	-				-		05-AUG-14	R2913448
Naphthenic Acids	<1.0	-		1.0	mg/L	-	14-AUG-14	21-AUG-14	R2925493
Phenols (4AAP)	0.0483	+/-0.0062		0.0010	mg/L	-7.4%		15-AUG-14	R2920049
Sulphate Reducing Bacteria	See Attached	-				-		05-AUG-14	R2913448

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496514-1 16053140801004									
Sampled By: Bobby/Jeremy/Gulled on 01-AUG-14 @ 16:44									
Matrix: H2O									
Total Dissolved Solids	2490	+/-170	DLA	40	mg/L	0		05-AUG-14	R2909129
Silicon (as SiO2)-Total	58.0	-		0.53	mg/L	-		10-AUG-14	
Turbidity	1720	+/-95		0.10	NTU	0		03-AUG-14	R2906870
PAH & Carcinogenic PAH List									
Acenaphthene	<0.00038	-	DLM	0.00038	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Acenaphthylene	<0.00020	-	DLM	0.00020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Anthracene	<0.000050	-	DLM	0.000050	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Fluoranthene	<0.000090	-	DLM	0.000090	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Fluorene	0.000354	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Naphthalene	0.0275	-	DLA	0.00050	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Phenanthrene	0.000970	-		0.000050	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Pyrene	0.000218	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(a)anthracene	<0.000040	-	DLM	0.000040	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(b&j)fluoranthene	<0.000030	-	DLM	0.000030	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(a)pyrene	<0.000012	-	DLM	0.000012	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Chrysene	<0.00012	-	DLM	0.00012	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	07-AUG-14	07-AUG-14	R2912646
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
B(A)P Total Potency Equivalent	<0.000014	-		0.000014	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Surr: d10-Acenaphthene	72.8	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Surr: d10-Phenanthrene	79.6	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Surr: d12-Chrysene	83.2	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	169	+/-9.5	DLM	2.5	mg/L	0		03-AUG-14	R2909449
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	0.0054	+/-0.0009	DLM	0.0050	mg/L	0		17-AUG-14	R2921196
Antimony (Sb)-Dissolved	0.00193	+/-0.00018	DLM	0.00050	mg/L	0		18-AUG-14	R2922376
Arsenic (As)-Dissolved	0.00852	+/-0.00090	DLM	0.00050	mg/L	0		17-AUG-14	R2921196
Barium (Ba)-Dissolved	0.0497	+/-0.0043	DLM	0.0050	mg/L	0		17-AUG-14	R2921196
Boron (B)-Dissolved	3.08	+/-0.37	DLM	0.050	mg/L	0		18-AUG-14	R2922376
Cadmium (Cd)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		17-AUG-14	R2921196
Calcium (Ca)-Dissolved	7.35	+/-1.0	DLM	0.50	mg/L	0		17-AUG-14	R2921196
Chromium (Cr)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		17-AUG-14	R2921196
Copper (Cu)-Dissolved	0.0021	+/-0.0002	DLM	0.0010	mg/L	0		17-AUG-14	R2921196
Iron (Fe)-Dissolved	0.288	+/-0.026	DLM	0.050	mg/L	0		17-AUG-14	R2921196
Lead (Pb)-Dissolved	<0.00025	-	DLM	0.00025	mg/L	-		17-AUG-14	R2921196
Magnesium (Mg)-Dissolved	6.52	+/-0.51	DLM	0.10	mg/L	0		17-AUG-14	R2921196
Manganese (Mn)-Dissolved	0.0573	+/-0.0039	DLM	0.0020	mg/L	0		17-AUG-14	R2921196
Nickel (Ni)-Dissolved	0.0073	+/-0.0006	DLM	0.0020	mg/L	0		17-AUG-14	R2921196
Potassium (K)-Dissolved	6.53	+/-0.51	DLM	0.25	mg/L	0		17-AUG-14	R2921196
Selenium (Se)-Dissolved	<0.00050	-	DLM	0.00050	mg/L	-		17-AUG-14	R2921196
Silicon (Si)-Dissolved	2.71	+/-0.23	DLM	0.25	mg/L	0		17-AUG-14	R2921196
Silver (Ag)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		17-AUG-14	R2921196
Sodium (Na)-Dissolved	905	+/-64	DLM	1.0	mg/L	0		17-AUG-14	R2921196
Uranium (U)-Dissolved	0.00013	+/-0.00001	DLM	0.00010	mg/L	0		17-AUG-14	R2921196
Zinc (Zn)-Dissolved	0.0114	+/-0.0014	DLM	0.0050	mg/L	0		17-AUG-14	R2921196
Ion Balance Calculation									
Ion Balance	93.2	-			%	-		18-AUG-14	
TDS (Calculated)	2350	-			mg/L	-		18-AUG-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496514-1 16053140801004									
Sampled By: Bobby/Jeremy/Gulled on 01-AUG-14 @ 16:44									
Matrix: H2O									
Ion Balance Calculation									
Hardness (as CaCO3)	45.2	-			mg/L	-		18-AUG-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		16-AUG-14	R2919287
Nitrate as N by IC									
Nitrate (as N)	<0.25	-	DLM	0.25	mg/L	-		03-AUG-14	R2909449
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.27	-		0.27	mg/L	-		07-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.10	-	DLM	0.10	mg/L	-		03-AUG-14	R2909449
Sulfate by IC									
Sulfate (SO4)	242	+/-14	DLM	2.5	mg/L	0		03-AUG-14	R2909449
pH, Conductivity and Total Alkalinity									
pH	8.39	+/-0.04		0.10	pH	0		04-AUG-14	R2906988
Conductivity (EC)	3760	+/-130		0.20	uS/cm	0		04-AUG-14	R2906988
Bicarbonate (HCO3)	2010	-		5.0	mg/L	-		04-AUG-14	R2906988
Carbonate (CO3)	26.6	-		5.0	mg/L	-		04-AUG-14	R2906988
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		04-AUG-14	R2906988
Alkalinity, Total (as CaCO3)	1690	+/-58		2.0	mg/L	0		04-AUG-14	R2906988
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	5.79	-		0.53	mg/L	-		18-AUG-14	
L1496514-2 16053140801005									
Sampled By: Bobby/Jeremy/Gulled on 01-AUG-14 @ 15:46									
Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908669
Toluene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908669
EthylBenzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908669
o-Xylene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908669
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908669
Styrene	<0.0010	-		0.0010	mg/L	-		10-AUG-14	R2908669
F1(C6-C10)	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908669
F1-BTEX	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908669
Xylenes	<0.00071	-		0.00071	mg/L	-		10-AUG-14	R2908669
Surr: 1,4-Difluorobenzene (SS)	100.6	-		N/A	%	-		10-AUG-14	R2908669
Surr: 4-Bromofluorobenzene (SS)	94.6	-		N/A	%	-		10-AUG-14	R2908669
Surr: 3,4-Dichlorotoluene (SS)	97.1	-		N/A	%	-		10-AUG-14	R2908669
F2, F3, F4									
F2 (>C10-C16)	0.74	+/-0.19		0.25	mg/L	0	07-AUG-14	07-AUG-14	R2910252
F3 (C16-C34)	2.26	+/-0.54		0.25	mg/L	0	07-AUG-14	07-AUG-14	R2910252
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	07-AUG-14	07-AUG-14	R2910252
Surr: 2-Bromobenzotrifluoride	91.5	-		N/A	%	-	07-AUG-14	07-AUG-14	R2910252
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		16-AUG-14	R2919287
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.0767	+/-0.013		0.0030	mg/L	0		10-AUG-14	R2912618
Antimony (Sb)-Total	0.00070	+/-0.00011		0.00040	mg/L	0		10-AUG-14	R2912618
Arsenic (As)-Total	0.00119	+/-0.00015		0.00040	mg/L	0		10-AUG-14	R2912618

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496514-2 16053140801005									
Sampled By: Bobby/Jeremy/Gulled on 01-AUG-14 @ 15:46									
Matrix: H2O									
Chloride by IC									
Chloride (Cl)	1.43	+/-0.12		0.50	mg/L	0		03-AUG-14	R2909449
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-		17-AUG-14	R2921196
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-		17-AUG-14	R2921196
Arsenic (As)-Dissolved	<0.00040	-		0.00040	mg/L	-		17-AUG-14	R2921196
Barium (Ba)-Dissolved	0.227	+/-0.020		0.0050	mg/L	0		17-AUG-14	R2921196
Boron (B)-Dissolved	0.484	+/-0.059	RRV	0.050	mg/L	0		18-AUG-14	R2922376
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		17-AUG-14	R2921196
Calcium (Ca)-Dissolved	68.4	+/-9.3		0.50	mg/L	0		17-AUG-14	R2921196
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		17-AUG-14	R2921196
Copper (Cu)-Dissolved	0.0026	+/-0.0002		0.0010	mg/L	0		17-AUG-14	R2921196
Iron (Fe)-Dissolved	1.69	+/-0.15		0.010	mg/L	0		17-AUG-14	R2921196
Lead (Pb)-Dissolved	<0.00010	-		0.00010	mg/L	-		17-AUG-14	R2921196
Magnesium (Mg)-Dissolved	43.0	+/-3.3		0.10	mg/L	0		17-AUG-14	R2921196
Manganese (Mn)-Dissolved	0.412	+/-0.028		0.0020	mg/L	0		17-AUG-14	R2921196
Nickel (Ni)-Dissolved	<0.0020	-		0.0020	mg/L	-		17-AUG-14	R2921196
Potassium (K)-Dissolved	6.84	+/-0.53		0.10	mg/L	0		17-AUG-14	R2921196
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-		17-AUG-14	R2921196
Silicon (Si)-Dissolved	2.69	+/-0.23		0.050	mg/L	0		17-AUG-14	R2921196
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		17-AUG-14	R2921196
Sodium (Na)-Dissolved	68.6	+/-4.8		1.0	mg/L	0		17-AUG-14	R2921196
Uranium (U)-Dissolved	<0.00010	-		0.00010	mg/L	-		17-AUG-14	R2921196
Zinc (Zn)-Dissolved	0.0254	+/-0.0030		0.0030	mg/L	0		17-AUG-14	R2921196
Ion Balance Calculation									
Ion Balance	102	-			%	-		18-AUG-14	
TDS (Calculated)	488	-			mg/L	-		18-AUG-14	
Hardness (as CaCO3)	348	-			mg/L	-		18-AUG-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		16-AUG-14	R2919287
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		03-AUG-14	R2909449
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		07-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		03-AUG-14	R2909449
Sulfate by IC									
Sulfate (SO4)	<0.50	-		0.50	mg/L	-		03-AUG-14	R2909449
pH, Conductivity and Total Alkalinity									
pH	7.97	+/-0.04		0.10	pH	0		04-AUG-14	R2906988
Conductivity (EC)	870	+/-29		0.20	uS/cm	0		04-AUG-14	R2906988
Bicarbonate (HCO3)	609	-		5.0	mg/L	-		04-AUG-14	R2906988
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		04-AUG-14	R2906988
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		04-AUG-14	R2906988
Alkalinity, Total (as CaCO3)	499	+/-18		2.0	mg/L	0		04-AUG-14	R2906988
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	5.76	-		0.11	mg/L	-		18-AUG-14	
* Refer to Referenced Information for Qualifiers (if any) and Methodology.									

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Antimony (Sb)-Total	DLM	
Duplicate	Arsenic (As)-Total	DLM	
Duplicate	Barium (Ba)-Total	DLM	
Duplicate	Boron (B)-Total	DLM	
Duplicate	Cadmium (Cd)-Total	DLM	
Duplicate	Calcium (Ca)-Total	DLM	
Duplicate	Chromium (Cr)-Total	DLM	
Duplicate	Copper (Cu)-Total	DLM	
Duplicate	Iron (Fe)-Total	DLM	
Duplicate	Lead (Pb)-Total	DLM	
Duplicate	Magnesium (Mg)-Total	DLM	
Duplicate	Manganese (Mn)-Total	DLM	
Duplicate	Nickel (Ni)-Total	DLM	
Duplicate	Potassium (K)-Total	DLM	
Duplicate	Selenium (Se)-Total	DLM	
Duplicate	Silicon (Si)-Total	DLM	
Duplicate	Silver (Ag)-Total	DLM	
Duplicate	Sodium (Na)-Total	DLM	
Duplicate	Uranium (U)-Total	DLM	
Duplicate	Zinc (Zn)-Total	DLM	
Duplicate	Aluminum (Al)-Total	DLM	
Duplicate	Antimony (Sb)-Total	DLM	
Duplicate	Arsenic (As)-Total	DLM	
Duplicate	Barium (Ba)-Total	DLM	
Duplicate	Boron (B)-Total	DLM	
Duplicate	Cadmium (Cd)-Total	DLM	
Duplicate	Calcium (Ca)-Total	DLM	
Duplicate	Chromium (Cr)-Total	DLM	
Duplicate	Copper (Cu)-Total	DLM	
Duplicate	Iron (Fe)-Total	DLM	
Duplicate	Lead (Pb)-Total	DLM	
Duplicate	Magnesium (Mg)-Total	DLM	
Duplicate	Manganese (Mn)-Total	DLM	
Duplicate	Nickel (Ni)-Total	DLM	
Duplicate	Potassium (K)-Total	DLM	
Duplicate	Selenium (Se)-Total	DLM	
Duplicate	Silicon (Si)-Total	DLM	
Duplicate	Silver (Ag)-Total	DLM	
Duplicate	Sodium (Na)-Total	DLM	
Duplicate	Uranium (U)-Total	DLM	
Duplicate	Zinc (Zn)-Total	DLM	
Matrix Spike	Dissolved Organic Carbon	MS-B	

Sample Parameter Qualifier Key:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLM	Detection Limit Adjusted due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis
SMI	Surrogate recovery could not be measured due to sample matrix interference.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
BTXS,F1-ED	Water	BTEX, Styrene and F1 (C6-C10)		EPA 5021/8015&8260 GC-MS & FID
C-DIS-ORG-ED	Water	Dissolved Organic Carbon		APHA 5310 B-Instrumental
CL-IC-ED	Water	Chloride by IC		APHA 4110 B-ION CHROMATOGRAPHY
F2,F3,F4-ED	Water	F2, F3, F4		EPA 3510/CCME PHC CWS-GC-FID
HG-D-L-CVAA-ED	Water	Mercury (Hg) - Dissolved		EPA 245.7 / EPA 245.1
HG-T-L-CVAA-ED	Water	Mercury (Hg)		EPA 245.7 / EPA 245.1
IB-BART-PB	Water	Iron Bacteria		BART Test Kit
BART Test Kit Analysis performed at PBR Laboratories Inc., Edmonton.				
IONBALANCE-ED	Water	Ion Balance Calculation		APHA 1030E
MET-D-CCMS-ED	Water	Dissolved Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
NAPHTHENIC-ACID-FM	Water	Naphthenic Acids by FTIR		Naphthenic Acids by FTIR, Syncrude, 1994
Dissolved naphthenic acids are solvent extracted from acidified aqueous samples using Dichloromethane prior to quantitation by Fourier Transform Infra-Red spectroscopy. Note that FTIR is not uniquely selective to naphthenic acids. If present, other carboxylic acids (e.g. humic acids, fulvic acids) may also be detected by this method.				
NH3-CFA-ED	Water	Ammonia in Water by Colour		APHA 4500 NH3-NITROGEN (AMMONIA)
This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.				
NO2+NO3-CALC-ED	Water	Nitrate+Nitrite		CALCULATION
NO2-IC-ED	Water	Nitrite as N by IC		APHA 4110 B-ION CHROMATOGRAPHY
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
NO3-IC-ED	Water	Nitrate as N by IC		APHA 4110 B-ION CHROMATOGRAPHY
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
PAH-ABT1-CL	Water	PAH & Carcinogenic PAH List		EPA 3510/8270-GC/MS
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity		APHA 4500-H, 2510, 2320
All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)				
PHENOLS-4AAP-ED	Water	Phenols (4AAP)		AB ENV.06537-COLORIMETRIC
This analysis is carried out using procedures adapted from ENVIRODAT VMV 06537 689, Method Code 154, in "Methods Manual for Chemical Analysis of Water and Wastes" published by the Alberta Environmental Centre. This automated method is based on the distillation of phenol and subsequent reaction of the distillate with alkaline ferricyanide and 4-aminoantipyrine to form a red complex which is measured at 505 nm.				
SIO2-D-CALC-ED	Water	Dissolved Silicon (reported as Silica)		CALCULATION
SIO2-T-CALC-ED	Water	Total Silicon (reported as Silica)		CALCULATION
SO4-IC-ED	Water	Sulfate by IC		APHA 4110 B-ION CHROMATOGRAPHY
SOLIDS-TDS-ED	Water	Total Dissolved Solids		APHA 2540 C
SRB-BART-PB	Water	Sulphate Reducing Bacteria / BART method		BART TEST KIT
BART Test Kit				
TURBIDITY-ED	Water	Turbidity		APHA 2130 B-Nephelometer

** The indicated Method Reference is the closest nationally or internationally recognized reference for the applicable ALS test method. ALS methods may incorporate modifications from the specified reference to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
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Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
Laboratory Definition Code	Laboratory Location			
ED		ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA		
PB		PBR LABORATORIES		
FM		ALS ENVIRONMENTAL - FORT MCMURRAY, ALBERTA, CANADA		
CL		ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA		

Chain of Custody Numbers:

M047716	M061011
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GLOSSARY OF REPORT TERMS

Surr - Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

MU: Measurement Uncertainty. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 which gives a level of confidence of approximately 95%.

Bias: The reported method bias is the average long term deviation from the target value for a long term reference or control sample, measured in percent. Zero values indicate no detectable method bias.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 1 of 26

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R2908669							
WG1925513-4	DUP	L1496560-7						
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
EthylBenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
o-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	10-AUG-14
m+p-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	10-AUG-14
Styrene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	50	10-AUG-14
F1(C6-C10)		<0.10	<0.10	RPD-NA	mg/L	N/A	30	10-AUG-14
WG1925513-8	DUP	L1497237-2						
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
EthylBenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
o-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	10-AUG-14
m+p-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	10-AUG-14
Styrene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	50	10-AUG-14
F1(C6-C10)		<0.10	<0.10	RPD-NA	mg/L	N/A	30	10-AUG-14
WG1925513-2	LCS							
Benzene			110.7		%		70-130	10-AUG-14
Toluene			88.3		%		70-130	10-AUG-14
EthylBenzene			94.1		%		70-130	10-AUG-14
o-Xylene			94.4		%		70-130	10-AUG-14
m+p-Xylene			95.5		%		70-130	10-AUG-14
Styrene			86.7		%		70-130	10-AUG-14
WG1925513-3	LCS							
F1(C6-C10)			109.3		%		70-130	10-AUG-14
WG1925513-6	LCS							
Benzene			114.5		%		70-130	10-AUG-14
Toluene			100.7		%		70-130	10-AUG-14
EthylBenzene			104.9		%		70-130	10-AUG-14
o-Xylene			105.5		%		70-130	10-AUG-14
m+p-Xylene			106.7		%		70-130	10-AUG-14
Styrene			93.5		%		70-130	10-AUG-14
WG1925513-7	LCS							
F1(C6-C10)			100.2		%		70-130	10-AUG-14
WG1925513-1	MB							



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 2 of 26

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R2908669							
WG1925513-1	MB							
Benzene			<0.00050		mg/L		0.0005	10-AUG-14
Toluene			<0.00050		mg/L		0.0005	10-AUG-14
EthylBenzene			<0.00050		mg/L		0.0005	10-AUG-14
o-Xylene			<0.00050		mg/L		0.0005	10-AUG-14
m+p-Xylene			<0.00050		mg/L		0.0005	10-AUG-14
Styrene			<0.0010		mg/L		0.001	10-AUG-14
F1(C6-C10)			<0.10		mg/L		0.1	10-AUG-14
Surrogate: 1,4-Difluorobenzene (SS)			101.5		%		70-130	10-AUG-14
Surrogate: 4-Bromofluorobenzene (SS)			97.0		%		70-130	10-AUG-14
Surrogate: 3,4-Dichlorotoluene (SS)			98.6		%		70-130	10-AUG-14
WG1925513-5	MB							
Benzene			<0.00050		mg/L		0.0005	10-AUG-14
Toluene			<0.00050		mg/L		0.0005	10-AUG-14
EthylBenzene			<0.00050		mg/L		0.0005	10-AUG-14
o-Xylene			<0.00050		mg/L		0.0005	10-AUG-14
m+p-Xylene			<0.00050		mg/L		0.0005	10-AUG-14
Styrene			<0.0010		mg/L		0.001	10-AUG-14
F1(C6-C10)			<0.10		mg/L		0.1	10-AUG-14
Surrogate: 1,4-Difluorobenzene (SS)			100.7		%		70-130	10-AUG-14
Surrogate: 4-Bromofluorobenzene (SS)			95.5		%		70-130	10-AUG-14
Surrogate: 3,4-Dichlorotoluene (SS)			92.1		%		70-130	10-AUG-14
C-DIS-ORG-ED		Water						
Batch	R2916939							
WG1929772-3	CVS							
Dissolved Organic Carbon			111.1		%		80-160	13-AUG-14
WG1929772-10	DUP	L1500452-18						
Dissolved Organic Carbon		<1.0	<1.0	RPD-NA	mg/L	N/A	20	14-AUG-14
WG1929772-6	DUP	L1496613-7						
Dissolved Organic Carbon		19.1	19.1		mg/L	0.2	20	13-AUG-14
WG1929772-8	DUP	L1496774-5						
Dissolved Organic Carbon		8.3	8.4		mg/L	1.3	20	14-AUG-14
WG1929772-2	LCS							
Dissolved Organic Carbon			94.4		%		80-120	13-AUG-14
WG1929772-1	MB							
Dissolved Organic Carbon			<1.0		mg/L		1	13-AUG-14



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 3 of 26

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-ED								
	Water							
Batch	R2916939							
WG1929772-11 MS		L1500452-18						
Dissolved Organic Carbon			107.8		%		70-130	14-AUG-14
WG1929772-7 MS		L1496613-7						
Dissolved Organic Carbon			N/A	MS-B	%		-	13-AUG-14
WG1929772-9 MS		L1496774-5						
Dissolved Organic Carbon			90.0		%		70-130	14-AUG-14
CL-IC-ED								
	Water							
Batch	R2909449							
WG1924000-2 LCS								
Chloride (Cl)			102.8		%		90-110	03-AUG-14
WG1924000-5 LCS								
Chloride (Cl)			102.0		%		90-110	03-AUG-14
WG1924000-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	03-AUG-14
WG1924000-6 MB								
Chloride (Cl)			<0.50		mg/L		0.5	03-AUG-14
F2,F3,F4-ED								
	Water							
Batch	R2910252							
WG1924986-2 LCS								
F2 (>C10-C16)			100.4		%		65-135	06-AUG-14
F3 (C16-C34)			101.8		%		65-135	06-AUG-14
F4 (C34-C50)			96.8		%		65-135	06-AUG-14
WG1924986-5 LCS								
F2 (>C10-C16)			95.3		%		65-135	07-AUG-14
F3 (C16-C34)			101.1		%		65-135	07-AUG-14
F4 (C34-C50)			92.9		%		65-135	07-AUG-14
WG1924986-1 MB								
F2 (>C10-C16)			<0.25		mg/L		0.25	06-AUG-14
F3 (C16-C34)			<0.25		mg/L		0.25	06-AUG-14
F4 (C34-C50)			<0.25		mg/L		0.25	06-AUG-14
Surrogate: 2-Bromobenzotrifluoride			101.3		%		50-150	06-AUG-14
WG1924986-4 MB								
F2 (>C10-C16)			<0.25		mg/L		0.25	07-AUG-14
F3 (C16-C34)			<0.25		mg/L		0.25	07-AUG-14
F4 (C34-C50)			<0.25		mg/L		0.25	07-AUG-14
Surrogate: 2-Bromobenzotrifluoride			97.5		%		50-150	07-AUG-14



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 4 of 26

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-L-CVAA-ED		Water						
Batch	R2919287							
WG1930358-47 DUP		L1496580-1						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	14-AUG-14
WG1930358-46 LCS								
Mercury (Hg)-Dissolved			86.4		%		80-120	14-AUG-14
WG1930358-50 LCS								
Mercury (Hg)-Dissolved			87.2		%		80-120	14-AUG-14
WG1930358-54 LCS								
Mercury (Hg)-Dissolved			98.6		%		80-120	14-AUG-14
WG1930358-58 LCS								
Mercury (Hg)-Dissolved			94.4		%		80-120	14-AUG-14
WG1930358-45 MB								
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	14-AUG-14
WG1930358-49 MB								
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	14-AUG-14
WG1930358-53 MB								
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	14-AUG-14
WG1930358-57 MB								
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	14-AUG-14
WG1930358-48 MS		L1496580-1						
Mercury (Hg)-Dissolved			83.8		%		70-130	14-AUG-14
HG-T-L-CVAA-ED		Water						
Batch	R2919287							
WG1930360-3 DUP		L1494613-1						
Mercury (Hg)-Total		0.0000051	0.0000062		mg/L	19	20	14-AUG-14
WG1930360-2 LCS								
Mercury (Hg)-Total			86.3		%		80-120	14-AUG-14
WG1930360-6 LCS								
Mercury (Hg)-Total			92.3		%		80-120	14-AUG-14
WG1930360-1 MB								
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	14-AUG-14
WG1930360-5 MB								
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	14-AUG-14
WG1930360-4 MS		L1494613-1						
Mercury (Hg)-Total			83.3		%		70-130	14-AUG-14
MET-D-CCMS-ED	Water							



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 5 of 26

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2921196							
WG1932634-14 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			103.2		%		80-120	17-AUG-14
Antimony (Sb)-Dissolved			103.4		%		80-120	17-AUG-14
Arsenic (As)-Dissolved			101.2		%		80-120	17-AUG-14
Barium (Ba)-Dissolved			102.6		%		80-120	17-AUG-14
Cadmium (Cd)-Dissolved			101.9		%		80-120	17-AUG-14
Calcium (Ca)-Dissolved			105.7		%		80-120	17-AUG-14
Chromium (Cr)-Dissolved			101.4		%		80-120	17-AUG-14
Copper (Cu)-Dissolved			101.2		%		80-120	17-AUG-14
Lead (Pb)-Dissolved			99.3		%		80-120	17-AUG-14
Magnesium (Mg)-Dissolved			108.2		%		80-120	17-AUG-14
Manganese (Mn)-Dissolved			100.3		%		80-120	17-AUG-14
Nickel (Ni)-Dissolved			102.6		%		80-120	17-AUG-14
Potassium (K)-Dissolved			98.0		%		80-120	17-AUG-14
Selenium (Se)-Dissolved			100.7		%		80-120	17-AUG-14
Silicon (Si)-Dissolved			95.0		%		80-120	17-AUG-14
Silver (Ag)-Dissolved			108.8		%		80-120	17-AUG-14
Sodium (Na)-Dissolved			116.2		%		80-120	17-AUG-14
Uranium (U)-Dissolved			93.8		%		80-120	17-AUG-14
Zinc (Zn)-Dissolved			101.5		%		80-120	17-AUG-14
WG1932634-2 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			99.6		%		80-120	17-AUG-14
Antimony (Sb)-Dissolved			99.6		%		80-120	17-AUG-14
Arsenic (As)-Dissolved			100.8		%		80-120	17-AUG-14
Barium (Ba)-Dissolved			103.8		%		80-120	17-AUG-14
Cadmium (Cd)-Dissolved			99.0		%		80-120	17-AUG-14
Calcium (Ca)-Dissolved			98.8		%		80-120	17-AUG-14
Chromium (Cr)-Dissolved			101.4		%		80-120	17-AUG-14
Copper (Cu)-Dissolved			100.1		%		80-120	17-AUG-14
Lead (Pb)-Dissolved			99.1		%		80-120	17-AUG-14
Magnesium (Mg)-Dissolved			104.3		%		80-120	17-AUG-14
Manganese (Mn)-Dissolved			101.8		%		80-120	17-AUG-14
Nickel (Ni)-Dissolved			100.6		%		80-120	17-AUG-14
Potassium (K)-Dissolved			100.4		%		80-120	17-AUG-14
Selenium (Se)-Dissolved			97.7		%		80-120	17-AUG-14



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 6 of 26

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2921196							
WG1932634-2 CRM	ED-HIGH-WATRM							
Silicon (Si)-Dissolved			97.3		%		80-120	17-AUG-14
Silver (Ag)-Dissolved			99.9		%		80-120	17-AUG-14
Sodium (Na)-Dissolved			103.6		%		80-120	17-AUG-14
Uranium (U)-Dissolved			94.9		%		80-120	17-AUG-14
Zinc (Zn)-Dissolved			96.3		%		80-120	17-AUG-14
WG1932634-4 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			99.8		%		80-120	17-AUG-14
Antimony (Sb)-Dissolved			99.0		%		80-120	17-AUG-14
Arsenic (As)-Dissolved			98.6		%		80-120	17-AUG-14
Barium (Ba)-Dissolved			103.1		%		80-120	17-AUG-14
Cadmium (Cd)-Dissolved			99.1		%		80-120	17-AUG-14
Calcium (Ca)-Dissolved			103.0		%		80-120	17-AUG-14
Chromium (Cr)-Dissolved			99.0		%		80-120	17-AUG-14
Copper (Cu)-Dissolved			96.7		%		80-120	17-AUG-14
Lead (Pb)-Dissolved			94.6		%		80-120	17-AUG-14
Magnesium (Mg)-Dissolved			102.2		%		80-120	17-AUG-14
Manganese (Mn)-Dissolved			103.1		%		80-120	17-AUG-14
Nickel (Ni)-Dissolved			100.4		%		80-120	17-AUG-14
Potassium (K)-Dissolved			99.5		%		80-120	17-AUG-14
Selenium (Se)-Dissolved			97.9		%		80-120	17-AUG-14
Silicon (Si)-Dissolved			103.0		%		80-120	17-AUG-14
Silver (Ag)-Dissolved			101.3		%		80-120	17-AUG-14
Sodium (Na)-Dissolved			94.1		%		80-120	17-AUG-14
Uranium (U)-Dissolved			89.7		%		80-120	17-AUG-14
Zinc (Zn)-Dissolved			103.7		%		80-120	17-AUG-14
WG1932634-6 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			100.7		%		80-120	17-AUG-14
Antimony (Sb)-Dissolved			99.3		%		80-120	17-AUG-14
Arsenic (As)-Dissolved			99.6		%		80-120	17-AUG-14
Barium (Ba)-Dissolved			103.2		%		80-120	17-AUG-14
Cadmium (Cd)-Dissolved			98.8		%		80-120	17-AUG-14
Calcium (Ca)-Dissolved			103.3		%		80-120	17-AUG-14
Chromium (Cr)-Dissolved			99.3		%		80-120	17-AUG-14
Copper (Cu)-Dissolved			96.1		%		80-120	17-AUG-14



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 7 of 26

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2921196							
WG1932634-6 CRM	ED-HIGH-WATRM							
Lead (Pb)-Dissolved			94.9		%		80-120	17-AUG-14
Magnesium (Mg)-Dissolved			103.9		%		80-120	17-AUG-14
Manganese (Mn)-Dissolved			102.1		%		80-120	17-AUG-14
Nickel (Ni)-Dissolved			99.7		%		80-120	17-AUG-14
Potassium (K)-Dissolved			101.6		%		80-120	17-AUG-14
Selenium (Se)-Dissolved			96.3		%		80-120	17-AUG-14
Silicon (Si)-Dissolved			99.3		%		80-120	17-AUG-14
Silver (Ag)-Dissolved			101.8		%		80-120	17-AUG-14
Sodium (Na)-Dissolved			98.9		%		80-120	17-AUG-14
Uranium (U)-Dissolved			90.5		%		80-120	17-AUG-14
Zinc (Zn)-Dissolved			95.8		%		80-120	17-AUG-14
WG1932634-8 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			96.1		%		80-120	17-AUG-14
Antimony (Sb)-Dissolved			101.0		%		80-120	17-AUG-14
Arsenic (As)-Dissolved			98.4		%		80-120	17-AUG-14
Barium (Ba)-Dissolved			103.5		%		80-120	17-AUG-14
Cadmium (Cd)-Dissolved			102.4		%		80-120	17-AUG-14
Calcium (Ca)-Dissolved			99.7		%		80-120	17-AUG-14
Chromium (Cr)-Dissolved			96.5		%		80-120	17-AUG-14
Copper (Cu)-Dissolved			96.7		%		80-120	17-AUG-14
Lead (Pb)-Dissolved			93.7		%		80-120	17-AUG-14
Magnesium (Mg)-Dissolved			101.8		%		80-120	17-AUG-14
Manganese (Mn)-Dissolved			101.6		%		80-120	17-AUG-14
Nickel (Ni)-Dissolved			100.3		%		80-120	17-AUG-14
Potassium (K)-Dissolved			99.0		%		80-120	17-AUG-14
Selenium (Se)-Dissolved			96.7		%		80-120	17-AUG-14
Silicon (Si)-Dissolved			98.3		%		80-120	17-AUG-14
Silver (Ag)-Dissolved			102.7		%		80-120	17-AUG-14
Sodium (Na)-Dissolved			96.3		%		80-120	17-AUG-14
Uranium (U)-Dissolved			89.9		%		80-120	17-AUG-14
Zinc (Zn)-Dissolved			95.0		%		80-120	17-AUG-14
WG1932634-10 DUP		L1498513-1						
Aluminum (Al)-Dissolved		0.0033	0.0038		mg/L	15	20	17-AUG-14
Antimony (Sb)-Dissolved		0.00013	0.00013		mg/L	2.6	20	17-AUG-14



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 8 of 26

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2921196							
WG1932634-10 DUP		L1498513-1						
Arsenic (As)-Dissolved		0.00084	0.00088		mg/L	4.3	20	17-AUG-14
Barium (Ba)-Dissolved		0.469	0.468		mg/L	0.2	20	17-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-AUG-14
Calcium (Ca)-Dissolved		35.8	33.8		mg/L	5.5	20	17-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-AUG-14
Copper (Cu)-Dissolved		<0.00010	0.00010	RPD-NA	mg/L	N/A	20	17-AUG-14
Iron (Fe)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	20	17-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-AUG-14
Magnesium (Mg)-Dissolved		12.0	12.0		mg/L	0.1	20	17-AUG-14
Manganese (Mn)-Dissolved		0.0456	0.0457		mg/L	0.2	20	17-AUG-14
Nickel (Ni)-Dissolved		0.00048	0.00047		mg/L	3.4	20	17-AUG-14
Potassium (K)-Dissolved		16.4	16.3		mg/L	0.3	20	17-AUG-14
Selenium (Se)-Dissolved		0.00072	0.00060		mg/L	18	20	17-AUG-14
Silicon (Si)-Dissolved		2.99	3.07		mg/L	2.5	20	17-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-AUG-14
Sodium (Na)-Dissolved		201	201		mg/L	0.1	20	17-AUG-14
Uranium (U)-Dissolved		0.00122	0.00125		mg/L	1.9	20	17-AUG-14
Zinc (Zn)-Dissolved		0.0066	0.0075		mg/L	13	20	17-AUG-14
WG1932634-11 DUP		L1498513-7						
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-AUG-14
Arsenic (As)-Dissolved		0.00016	0.00015		mg/L	7.4	20	17-AUG-14
Barium (Ba)-Dissolved		0.158	0.157		mg/L	1.1	20	17-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-AUG-14
Calcium (Ca)-Dissolved		117	119		mg/L	1.2	20	17-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-AUG-14
Copper (Cu)-Dissolved		0.00035	0.00041		mg/L	14	20	17-AUG-14
Iron (Fe)-Dissolved		4.23	4.21		mg/L	0.6	20	17-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-AUG-14
Magnesium (Mg)-Dissolved		23.6	23.8		mg/L	0.6	20	17-AUG-14
Manganese (Mn)-Dissolved		0.404	0.411		mg/L	1.6	20	17-AUG-14
Nickel (Ni)-Dissolved		0.00017	0.00018		mg/L	6.6	20	17-AUG-14
Potassium (K)-Dissolved		1.09	1.09		mg/L	0.1	20	17-AUG-14
Selenium (Se)-Dissolved		0.00010	0.00011		mg/L	8.1	20	17-AUG-14



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 9 of 26

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2921196							
WG1932634-11	DUP	L1498513-7						
Silicon (Si)-Dissolved		7.77	8.15		mg/L	4.8	20	17-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-AUG-14
Sodium (Na)-Dissolved		8.2	8.3		mg/L	0.5	20	17-AUG-14
Uranium (U)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-AUG-14
Zinc (Zn)-Dissolved		0.0100	0.0123		mg/L	20	20	17-AUG-14
WG1932634-12	DUP	L1498878-11						
Aluminum (Al)-Dissolved		0.0094	0.0101		mg/L	7.5	20	17-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-AUG-14
Arsenic (As)-Dissolved		0.00100	0.00105		mg/L	4.5	20	17-AUG-14
Barium (Ba)-Dissolved		0.0300	0.0304		mg/L	1.3	20	17-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-AUG-14
Calcium (Ca)-Dissolved		25.0	26.0		mg/L	3.8	20	17-AUG-14
Chromium (Cr)-Dissolved		0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-AUG-14
Copper (Cu)-Dissolved		0.00049	0.00048		mg/L	2.6	20	17-AUG-14
Iron (Fe)-Dissolved		0.307	0.296		mg/L	3.8	20	17-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-AUG-14
Magnesium (Mg)-Dissolved		7.15	6.94		mg/L	3.0	20	17-AUG-14
Manganese (Mn)-Dissolved		0.00346	0.00338		mg/L	2.3	20	17-AUG-14
Nickel (Ni)-Dissolved		0.00126	0.00130		mg/L	3.4	20	17-AUG-14
Potassium (K)-Dissolved		0.93	0.92		mg/L	0.4	20	17-AUG-14
Selenium (Se)-Dissolved		0.00012	0.00012		mg/L	0.1	20	17-AUG-14
Silicon (Si)-Dissolved		0.444	0.448		mg/L	0.9	20	17-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-AUG-14
Sodium (Na)-Dissolved		8.5	8.3		mg/L	1.6	20	17-AUG-14
Uranium (U)-Dissolved		0.000137	0.000134		mg/L	1.7	20	17-AUG-14
Zinc (Zn)-Dissolved		0.0016	0.0011	J	mg/L	0.0004	0.002	17-AUG-14
WG1932634-9	DUP	L1492791-1						
Aluminum (Al)-Dissolved		0.0178	0.0182		mg/L	2.0	20	17-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-AUG-14
Arsenic (As)-Dissolved		0.00230	0.00230		mg/L	0.3	20	17-AUG-14
Barium (Ba)-Dissolved		0.0358	0.0361		mg/L	0.9	20	17-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-AUG-14
Calcium (Ca)-Dissolved		33.2	33.4		mg/L	0.6	20	17-AUG-14



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 10 of 26

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2921196							
WG1932634-9	DUP	L1492791-1						
Chromium (Cr)-Dissolved		0.00026	0.00019	J	mg/L	0.00007	0.0002	17-AUG-14
Copper (Cu)-Dissolved		0.00047	0.00042		mg/L	9.7	20	17-AUG-14
Iron (Fe)-Dissolved		2.93	2.93		mg/L	0.0	20	17-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-AUG-14
Magnesium (Mg)-Dissolved		10.6	10.4		mg/L	1.3	20	17-AUG-14
Manganese (Mn)-Dissolved		0.992	1.01		mg/L	1.7	20	17-AUG-14
Nickel (Ni)-Dissolved		0.00207	0.00207		mg/L	0.1	20	17-AUG-14
Potassium (K)-Dissolved		1.52	1.50		mg/L	1.2	20	17-AUG-14
Selenium (Se)-Dissolved		0.00014	0.00015		mg/L	4.5	20	17-AUG-14
Silicon (Si)-Dissolved		4.20	4.15		mg/L	1.1	20	17-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-AUG-14
Sodium (Na)-Dissolved		17.3	17.2		mg/L	0.1	20	17-AUG-14
Uranium (U)-Dissolved		0.000095	0.000095		mg/L	0.1	20	17-AUG-14
WG1932634-1	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	17-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	17-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	17-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	17-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 11 of 26

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2921196							
WG1932634-1 MB								
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	17-AUG-14
WG1932634-13 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	17-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	17-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	17-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	17-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	17-AUG-14
WG1932634-3 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	17-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	17-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	17-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	17-AUG-14



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 12 of 26

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2921196							
WG1932634-3 MB								
	Manganese (Mn)-Dissolved		<0.000050		mg/L		0.00005	17-AUG-14
	Nickel (Ni)-Dissolved		<0.00010		mg/L		0.0001	17-AUG-14
	Potassium (K)-Dissolved		<0.050		mg/L		0.05	17-AUG-14
	Selenium (Se)-Dissolved		<0.00010		mg/L		0.0001	17-AUG-14
	Silicon (Si)-Dissolved		<0.050		mg/L		0.05	17-AUG-14
	Silver (Ag)-Dissolved		<0.000010		mg/L		0.00001	17-AUG-14
	Sodium (Na)-Dissolved		<0.050		mg/L		0.05	17-AUG-14
	Uranium (U)-Dissolved		<0.000010		mg/L		0.00001	17-AUG-14
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	17-AUG-14
WG1932634-5 MB								
	Aluminum (Al)-Dissolved		<0.0010		mg/L		0.001	17-AUG-14
	Antimony (Sb)-Dissolved		<0.00010		mg/L		0.0001	17-AUG-14
	Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	17-AUG-14
	Barium (Ba)-Dissolved		<0.000050		mg/L		0.00005	17-AUG-14
	Cadmium (Cd)-Dissolved		<0.000010		mg/L		0.00001	17-AUG-14
	Calcium (Ca)-Dissolved		<0.020		mg/L		0.02	17-AUG-14
	Chromium (Cr)-Dissolved		<0.00010		mg/L		0.0001	17-AUG-14
	Copper (Cu)-Dissolved		<0.00010		mg/L		0.0001	17-AUG-14
	Iron (Fe)-Dissolved		<0.010		mg/L		0.01	17-AUG-14
	Lead (Pb)-Dissolved		<0.000050		mg/L		0.00005	17-AUG-14
	Magnesium (Mg)-Dissolved		<0.0050		mg/L		0.005	17-AUG-14
	Manganese (Mn)-Dissolved		<0.000050		mg/L		0.00005	17-AUG-14
	Nickel (Ni)-Dissolved		<0.00010		mg/L		0.0001	17-AUG-14
	Potassium (K)-Dissolved		<0.050		mg/L		0.05	17-AUG-14
	Selenium (Se)-Dissolved		<0.00010		mg/L		0.0001	17-AUG-14
	Silicon (Si)-Dissolved		<0.050		mg/L		0.05	17-AUG-14
	Silver (Ag)-Dissolved		<0.000010		mg/L		0.00001	17-AUG-14
	Sodium (Na)-Dissolved		<0.050		mg/L		0.05	17-AUG-14
	Uranium (U)-Dissolved		<0.000010		mg/L		0.00001	17-AUG-14
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	17-AUG-14
WG1932634-7 MB								
	Aluminum (Al)-Dissolved		<0.0010		mg/L		0.001	17-AUG-14
	Antimony (Sb)-Dissolved		<0.00010		mg/L		0.0001	17-AUG-14
	Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	17-AUG-14



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 13 of 26

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2921196							
WG1932634-7 MB								
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	17-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	17-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	17-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	17-AUG-14
Batch	R2922376							
WG1933064-11 CRM	ED-HIGH-WATRM							
Antimony (Sb)-Dissolved			102.9		%		80-120	18-AUG-14
Boron (B)-Dissolved			103.4		%		80-120	18-AUG-14
WG1933064-2 CRM	ED-HIGH-WATRM							
Antimony (Sb)-Dissolved			103.2		%		80-120	18-AUG-14
Boron (B)-Dissolved			90.4		%		80-120	18-AUG-14
WG1933064-5 CRM	ED-HIGH-WATRM							
Antimony (Sb)-Dissolved			102.5		%		80-120	18-AUG-14
Boron (B)-Dissolved			101.5		%		80-120	18-AUG-14
WG1933064-12 DUP	L1500452-18							
Antimony (Sb)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	18-AUG-14
Boron (B)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	18-AUG-14
WG1933064-3 DUP	L1498571-1							
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	18-AUG-14
Boron (B)-Dissolved		0.348	0.338		mg/L	3.0	20	18-AUG-14
WG1933064-6 DUP	L1501888-1							
Antimony (Sb)-Dissolved		0.00946	0.00947		mg/L	0.1	20	19-AUG-14



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 14 of 26

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch R2922376								
WG1933064-6 DUP		L1501888-1						
Boron (B)-Dissolved		0.798	0.856		mg/L	7.0	20	19-AUG-14
WG1933064-9 DUP		L1499701-6						
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	19-AUG-14
Boron (B)-Dissolved		0.277	0.280		mg/L	1.1	20	19-AUG-14
WG1933064-1 MB								
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	18-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	18-AUG-14
WG1933064-10 MB								
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	18-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	18-AUG-14
WG1933064-4 MB								
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	18-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	18-AUG-14
WG1933064-7 MB								
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	18-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	18-AUG-14
MET-T-CCMS-ED		Water						
Batch R2912618								
WG1925500-7 DUP		L1496613-1						
Antimony (Sb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-AUG-14
Arsenic (As)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-AUG-14
Barium (Ba)-Total		0.127	0.127		mg/L	0.1	20	10-AUG-14
Boron (B)-Total		1.36	1.38		mg/L	1.5	20	10-AUG-14
Cadmium (Cd)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	10-AUG-14
Calcium (Ca)-Total		37.7	37.7		mg/L	0.2	20	10-AUG-14
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	10-AUG-14
Copper (Cu)-Total		0.0020	0.0022		mg/L	12	20	10-AUG-14
Iron (Fe)-Total		0.763	0.864		mg/L	12	20	10-AUG-14
Lead (Pb)-Total		0.00201	0.00174		mg/L	14	20	10-AUG-14
Magnesium (Mg)-Total		32.4	31.8		mg/L	2.0	20	10-AUG-14
Manganese (Mn)-Total		0.0311	0.0311		mg/L	0.1	20	10-AUG-14
Nickel (Ni)-Total		0.0066	0.0068		mg/L	2.2	20	10-AUG-14
Potassium (K)-Total		25.7	24.1		mg/L	6.6	20	10-AUG-14
Selenium (Se)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-AUG-14



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 15 of 26

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R2912618							
WG1925500-7	DUP	L1496613-1						
Silicon (Si)-Total		2.87	2.85		mg/L	0.6	20	10-AUG-14
Silver (Ag)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	10-AUG-14
Sodium (Na)-Total		637	610		mg/L	4.2	20	10-AUG-14
Uranium (U)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-AUG-14
Zinc (Zn)-Total		0.022	0.020		mg/L	7.1	20	10-AUG-14
WG1925500-8	DUP	L1496580-3						
Aluminum (Al)-Total		0.0521	0.0486		mg/L	6.9	20	10-AUG-14
Antimony (Sb)-Total		0.00059	0.00056		mg/L	4.9	20	10-AUG-14
Arsenic (As)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	10-AUG-14
Barium (Ba)-Total		0.0699	0.0696		mg/L	0.4	20	10-AUG-14
Boron (B)-Total		0.543	0.512		mg/L	5.8	20	10-AUG-14
Cadmium (Cd)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	10-AUG-14
Calcium (Ca)-Total		13.1	12.5		mg/L	5.4	20	10-AUG-14
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	10-AUG-14
Copper (Cu)-Total		0.0025	0.0024		mg/L	6.6	20	10-AUG-14
Iron (Fe)-Total		1.07	0.998		mg/L	6.8	20	10-AUG-14
Lead (Pb)-Total		0.00155	0.00151		mg/L	2.8	20	10-AUG-14
Magnesium (Mg)-Total		3.96	3.72		mg/L	6.1	20	10-AUG-14
Manganese (Mn)-Total		0.0281	0.0266		mg/L	5.4	20	10-AUG-14
Nickel (Ni)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	10-AUG-14
Potassium (K)-Total		6.77	6.59		mg/L	2.7	20	10-AUG-14
Selenium (Se)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	10-AUG-14
Silicon (Si)-Total		6.50	6.42		mg/L	1.4	20	10-AUG-14
Silver (Ag)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	10-AUG-14
Sodium (Na)-Total		207	203		mg/L	2.3	20	10-AUG-14
Uranium (U)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-AUG-14
Zinc (Zn)-Total		<0.0040	<0.0040	RPD-NA	mg/L	N/A	20	10-AUG-14
WG1925500-9	DUP	L1491901-1						
Aluminum (Al)-Total		0.331	0.337		mg/L	1.9	20	10-AUG-14
Antimony (Sb)-Total		0.00050	0.00051		mg/L	1.3	20	10-AUG-14
Arsenic (As)-Total		0.337	0.343		mg/L	1.7	20	10-AUG-14
Barium (Ba)-Total		0.00698	0.00678		mg/L	2.9	20	10-AUG-14
Boron (B)-Total		0.029	0.030		mg/L	2.7	20	10-AUG-14



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 16 of 26

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R2912618							
WG1925500-9	DUP	L1491901-1						
Cadmium (Cd)-Total		0.000014	0.000012		mg/L	12	20	10-AUG-14
Calcium (Ca)-Total		23.3	24.9		mg/L	6.7	20	10-AUG-14
Chromium (Cr)-Total		0.00069	0.00078		mg/L	13	20	10-AUG-14
Copper (Cu)-Total		0.00965	0.00972		mg/L	0.7	20	10-AUG-14
Iron (Fe)-Total		0.096	0.091		mg/L	5.1	20	10-AUG-14
Lead (Pb)-Total		0.00150	0.00153		mg/L	2.0	20	10-AUG-14
Magnesium (Mg)-Total		4.57	4.75		mg/L	3.9	20	10-AUG-14
Manganese (Mn)-Total		0.0119	0.0120		mg/L	0.9	20	10-AUG-14
Nickel (Ni)-Total		0.00228	0.00230		mg/L	1.0	20	10-AUG-14
Potassium (K)-Total		2.68	2.72		mg/L	1.3	20	10-AUG-14
Selenium (Se)-Total		0.00014	0.00014		mg/L	0.9	20	10-AUG-14
Silicon (Si)-Total		1.18	1.19		mg/L	1.4	20	10-AUG-14
Silver (Ag)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	10-AUG-14
Sodium (Na)-Total		2.95	2.99		mg/L	1.1	20	10-AUG-14
Uranium (U)-Total		0.000623	0.000639		mg/L	2.5	20	10-AUG-14
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	10-AUG-14
WG1925500-5	LCS							
Aluminum (Al)-Total			106.0		%		70-130	10-AUG-14
Antimony (Sb)-Total			105.8		%		70-130	10-AUG-14
Arsenic (As)-Total			101.5		%		70-130	10-AUG-14
Barium (Ba)-Total			101.1		%		70-130	10-AUG-14
Boron (B)-Total			90.7		%		70-130	10-AUG-14
Cadmium (Cd)-Total			98.6		%		70-130	10-AUG-14
Calcium (Ca)-Total			98.2		%		70-130	10-AUG-14
Chromium (Cr)-Total			105.1		%		70-130	10-AUG-14
Copper (Cu)-Total			102.3		%		70-130	10-AUG-14
Iron (Fe)-Total			92.3		%		70-130	10-AUG-14
Lead (Pb)-Total			100.9		%		70-130	10-AUG-14
Magnesium (Mg)-Total			106.0		%		70-130	10-AUG-14
Manganese (Mn)-Total			102.4		%		70-130	10-AUG-14
Nickel (Ni)-Total			102.8		%		70-130	10-AUG-14
Potassium (K)-Total			106.7		%		70-130	10-AUG-14
Selenium (Se)-Total			99.98		%		70-130	10-AUG-14



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 17 of 26

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2912618							
WG1925500-5 LCS								
Silicon (Si)-Total			94.0		%		70-130	10-AUG-14
Silver (Ag)-Total			104.9		%		70-130	10-AUG-14
Sodium (Na)-Total			108.0		%		70-130	10-AUG-14
Uranium (U)-Total			100.5		%		70-130	10-AUG-14
Zinc (Zn)-Total			107.6		%		70-130	10-AUG-14
WG1925500-6 LCS								
Aluminum (Al)-Total			100.8		%		70-130	10-AUG-14
Antimony (Sb)-Total			101.7		%		70-130	10-AUG-14
Arsenic (As)-Total			95.4		%		70-130	10-AUG-14
Barium (Ba)-Total			97.6		%		70-130	10-AUG-14
Boron (B)-Total			89.6		%		70-130	10-AUG-14
Cadmium (Cd)-Total			92.8		%		70-130	10-AUG-14
Calcium (Ca)-Total			94.6		%		70-130	10-AUG-14
Chromium (Cr)-Total			98.8		%		70-130	10-AUG-14
Copper (Cu)-Total			94.9		%		70-130	10-AUG-14
Iron (Fe)-Total			87.2		%		70-130	10-AUG-14
Lead (Pb)-Total			99.4		%		70-130	10-AUG-14
Magnesium (Mg)-Total			99.1		%		70-130	10-AUG-14
Manganese (Mn)-Total			97.2		%		70-130	10-AUG-14
Nickel (Ni)-Total			96.1		%		70-130	10-AUG-14
Potassium (K)-Total			99.1		%		70-130	10-AUG-14
Selenium (Se)-Total			96.0		%		70-130	10-AUG-14
Silicon (Si)-Total			89.9		%		70-130	10-AUG-14
Silver (Ag)-Total			98.1		%		70-130	10-AUG-14
Sodium (Na)-Total			100.3		%		70-130	10-AUG-14
Uranium (U)-Total			95.5		%		70-130	10-AUG-14
Zinc (Zn)-Total			100.9		%		70-130	10-AUG-14
WG1925500-2 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	10-AUG-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Boron (B)-Total			<0.010		mg/L		0.01	10-AUG-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	10-AUG-14



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 18 of 26

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2912618							
WG1925500-2 MB								
Copper (Cu)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Iron (Fe)-Total			<0.010		mg/L		0.01	10-AUG-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	10-AUG-14
Potassium (K)-Total			<0.050		mg/L		0.05	10-AUG-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Silicon (Si)-Total			<0.050		mg/L		0.05	10-AUG-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Sodium (Na)-Total			<0.050		mg/L		0.05	10-AUG-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	10-AUG-14
WG1925500-3 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	10-AUG-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Barium (Ba)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Boron (B)-Total			<0.010		mg/L		0.01	10-AUG-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Calcium (Ca)-Total			<0.020		mg/L		0.02	10-AUG-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Copper (Cu)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Iron (Fe)-Total			<0.010		mg/L		0.01	10-AUG-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	10-AUG-14
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Nickel (Ni)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Potassium (K)-Total			<0.050		mg/L		0.05	10-AUG-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Silicon (Si)-Total			<0.050		mg/L		0.05	10-AUG-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Sodium (Na)-Total			<0.050		mg/L		0.05	10-AUG-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	10-AUG-14
NAPHTHENIC-ACID-FM		Water						



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 19 of 26

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NAPHTHENIC-ACID-FM		Water						
Batch	R2925493							
WG1930702-3	DUP	L1494459-2						
Naphthenic Acids		3.1	3.3		mg/L	6.3	30	21-AUG-14
WG1930702-7	DUP	L1498049-2						
Naphthenic Acids		11.7	11.6		mg/L	0.9	30	21-AUG-14
WG1930702-4	LCS							
Naphthenic Acids			94.3		%		70-130	21-AUG-14
WG1930702-8	LCS							
Naphthenic Acids			88.9		%		70-130	21-AUG-14
WG1930702-1	MB							
Naphthenic Acids			<1.0		mg/L		1	21-AUG-14
WG1930702-5	MB							
Naphthenic Acids			<1.0		mg/L		1	21-AUG-14
WG1930702-2	MS	L1494459-1						
Naphthenic Acids			102.7		%		50-150	21-AUG-14
WG1930702-6	MS	L1498049-1						
Naphthenic Acids			96.1		%		50-150	21-AUG-14
NH3-CFA-ED		Water						
Batch	R2918088							
WG1930533-10	DUP	L1500452-18						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	14-AUG-14
WG1930533-6	DUP	L1498824-1						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	14-AUG-14
WG1930533-7	DUP	L1501996-1						
Ammonia, Total (as N)		0.443	0.451		mg/L	1.8	20	14-AUG-14
WG1930533-2	LCS							
Ammonia, Total (as N)			97.4		%		85-115	14-AUG-14
WG1930533-1	MB							
Ammonia, Total (as N)			<0.050		mg/L		0.05	14-AUG-14
WG1930533-11	MS	L1499744-2						
Ammonia, Total (as N)			99.5		%		75-125	14-AUG-14
WG1930533-5	MS	L1498878-11						
Ammonia, Total (as N)			101.1		%		75-125	14-AUG-14
WG1930533-9	MS	L1500452-11						
Ammonia, Total (as N)			104.6		%		75-125	14-AUG-14
NO2-IC-ED		Water						



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 20 of 26

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-ED		Water						
Batch	R2909449							
WG1924000-2	LCS							
Nitrite (as N)			97.6		%		90-110	03-AUG-14
WG1924000-5	LCS							
Nitrite (as N)			94.9		%		90-110	03-AUG-14
WG1924000-1	MB							
Nitrite (as N)			<0.020		mg/L		0.02	03-AUG-14
WG1924000-6	MB							
Nitrite (as N)			<0.020		mg/L		0.02	03-AUG-14
NO3-IC-ED		Water						
Batch	R2909449							
WG1924000-2	LCS							
Nitrate (as N)			101.7		%		90-110	03-AUG-14
WG1924000-5	LCS							
Nitrate (as N)			100.4		%		90-110	03-AUG-14
WG1924000-1	MB							
Nitrate (as N)			<0.050		mg/L		0.05	03-AUG-14
WG1924000-6	MB							
Nitrate (as N)			<0.050		mg/L		0.05	03-AUG-14
PAH-ABT1-CL		Water						
Batch	R2912646							
WG1927607-2	LCS							
Acenaphthene			92.8		%		60-130	07-AUG-14
Acenaphthylene			102.0		%		60-130	07-AUG-14
Anthracene			100.3		%		60-130	07-AUG-14
Fluoranthene			98.0		%		60-130	07-AUG-14
Fluorene			94.4		%		60-130	07-AUG-14
Naphthalene			93.3		%		50-130	07-AUG-14
Phenanthrene			100.4		%		60-130	07-AUG-14
Pyrene			105.4		%		60-130	07-AUG-14
Benzo(a)anthracene			101.5		%		60-130	07-AUG-14
Benzo(k)fluoranthene			94.9		%		60-130	07-AUG-14
Benzo(b&j)fluoranthene			95.8		%		60-130	07-AUG-14
Benzo(g,h,i)perylene			101.5		%		60-130	07-AUG-14
Benzo(a)pyrene			94.7		%		60-130	07-AUG-14
Chrysene			100.8		%		60-130	07-AUG-14
Dibenzo(a,h)anthracene			101.2		%		60-130	07-AUG-14



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 21 of 26

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch	R2912646							
WG1927607-2	LCS							
Indeno(1,2,3-cd)pyrene			100.1		%		60-130	07-AUG-14
WG1927607-4	LCS							
Acenaphthene			87.6		%		60-130	07-AUG-14
Acenaphthylene			96.9		%		60-130	07-AUG-14
Anthracene			100.5		%		60-130	07-AUG-14
Fluoranthene			94.4		%		60-130	07-AUG-14
Fluorene			91.0		%		60-130	07-AUG-14
Naphthalene			91.2		%		50-130	07-AUG-14
Phenanthrene			96.4		%		60-130	07-AUG-14
Pyrene			102.5		%		60-130	07-AUG-14
Benzo(a)anthracene			96.8		%		60-130	07-AUG-14
Benzo(k)fluoranthene			76.3		%		60-130	07-AUG-14
Benzo(b&j)fluoranthene			79.4		%		60-130	07-AUG-14
Benzo(g,h,i)perylene			99.3		%		60-130	07-AUG-14
Benzo(a)pyrene			77.9		%		60-130	07-AUG-14
Chrysene			93.0		%		60-130	07-AUG-14
Dibenzo(a,h)anthracene			94.3		%		60-130	07-AUG-14
Indeno(1,2,3-cd)pyrene			76.6		%		60-130	07-AUG-14
WG1927607-1	MB							
Acenaphthene			<0.000020		mg/L		0.00002	07-AUG-14
Acenaphthylene			<0.000020		mg/L		0.00002	07-AUG-14
Anthracene			<0.000010		mg/L		0.00001	07-AUG-14
Fluoranthene			<0.000020		mg/L		0.00002	07-AUG-14
Fluorene			<0.000020		mg/L		0.00002	07-AUG-14
Naphthalene			<0.000050		mg/L		0.00005	07-AUG-14
Phenanthrene			<0.000050		mg/L		0.00005	07-AUG-14
Pyrene			<0.000010		mg/L		0.00001	07-AUG-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	07-AUG-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	07-AUG-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	07-AUG-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	07-AUG-14
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	07-AUG-14
Chrysene			<0.000020		mg/L		0.00002	07-AUG-14
Dibenzo(a,h)anthracene			<0.0000050		mg/L		0.000005	07-AUG-14



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 22 of 26

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch	R2912646							
WG1927607-1	MB							
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	07-AUG-14
Surrogate: d10-Acenaphthene			100.4		%		60-130	07-AUG-14
Surrogate: d10-Phenanthrene			97.9		%		60-130	07-AUG-14
Surrogate: d12-Chrysene			96.7		%		60-130	07-AUG-14
WG1927607-3	MB							
Acenaphthene			<0.000020		mg/L		0.00002	07-AUG-14
Acenaphthylene			<0.000020		mg/L		0.00002	07-AUG-14
Anthracene			<0.000010		mg/L		0.00001	07-AUG-14
Fluoranthene			<0.000020		mg/L		0.00002	07-AUG-14
Fluorene			<0.000020		mg/L		0.00002	07-AUG-14
Naphthalene			<0.000050		mg/L		0.00005	07-AUG-14
Phenanthrene			<0.000050		mg/L		0.00005	07-AUG-14
Pyrene			<0.000010		mg/L		0.00001	07-AUG-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	07-AUG-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	07-AUG-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	07-AUG-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	07-AUG-14
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	07-AUG-14
Chrysene			<0.000020		mg/L		0.00002	07-AUG-14
Dibenzo(a,h)anthracene			<0.0000050		mg/L		0.000005	07-AUG-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	07-AUG-14
Surrogate: d10-Acenaphthene			88.3		%		60-130	07-AUG-14
Surrogate: d10-Phenanthrene			96.8		%		60-130	07-AUG-14
Surrogate: d12-Chrysene			99.2		%		60-130	07-AUG-14
WG1927607-5	MB							
Acenaphthene			<0.000020		mg/L		0.00002	11-AUG-14
Acenaphthylene			<0.000020		mg/L		0.00002	11-AUG-14
Anthracene			<0.000010		mg/L		0.00001	11-AUG-14
Fluoranthene			<0.000020		mg/L		0.00002	11-AUG-14
Fluorene			<0.000020		mg/L		0.00002	11-AUG-14
Naphthalene			<0.000050		mg/L		0.00005	11-AUG-14
Phenanthrene			<0.000050		mg/L		0.00005	11-AUG-14
Pyrene			<0.000010		mg/L		0.00001	11-AUG-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	11-AUG-14



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 23 of 26

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch	R2912646							
WG1927607-5 MB								
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	11-AUG-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	11-AUG-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	11-AUG-14
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	11-AUG-14
Chrysene			<0.000020		mg/L		0.00002	11-AUG-14
Dibenzo(a,h)anthracene			<0.0000050		mg/L		0.000005	11-AUG-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	11-AUG-14
Surrogate: d10-Acenaphthene			91.0		%		60-130	11-AUG-14
Surrogate: d10-Phenanthrene			94.4		%		60-130	11-AUG-14
Surrogate: d12-Chrysene			95.5		%		60-130	11-AUG-14
PH/EC/ALK-ED		Water						
Batch	R2906988							
WG1924012-8 DUP		L1496554-7						
pH		7.70	7.64	J	pH	0.05	0.3	04-AUG-14
Conductivity (EC)		680	681		uS/cm	0.2	10	04-AUG-14
Bicarbonate (HCO3)		465	465		mg/L	0.1	25	04-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	04-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	04-AUG-14
Alkalinity, Total (as CaCO3)		382	381		mg/L	0.1	20	04-AUG-14
WG1924012-10 LCS								
Conductivity (EC)			99.6		%		90-110	04-AUG-14
WG1924012-11 LCS								
pH			6.99		pH		6.7-7.3	04-AUG-14
WG1924012-12 LCS								
Alkalinity, Total (as CaCO3)			98.3		%		85-115	04-AUG-14
WG1924012-13 LCS								
Conductivity (EC)			97.8		%		90-110	04-AUG-14
WG1924012-15 LCS								
Conductivity (EC)			98.5		%		90-110	04-AUG-14
WG1924012-16 LCS								
pH			6.98		pH		6.7-7.3	04-AUG-14
WG1924012-17 LCS								
Alkalinity, Total (as CaCO3)			96.8		%		85-115	04-AUG-14
WG1924012-18 LCS								
Conductivity (EC)			97.2		%		90-110	04-AUG-14



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 24 of 26

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R2906988							
WG1924012-2	LCS							
Conductivity (EC)			99.9		%		90-110	04-AUG-14
WG1924012-3	LCS							
pH			6.99		pH		6.7-7.3	04-AUG-14
WG1924012-4	LCS							
Alkalinity, Total (as CaCO3)			98.3		%		85-115	04-AUG-14
WG1924012-5	LCS							
Conductivity (EC)			98.2		%		90-110	04-AUG-14
WG1924012-1	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	04-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	04-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	04-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	04-AUG-14
WG1924012-14	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	04-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	04-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	04-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	04-AUG-14
WG1924012-9	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	04-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	04-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	04-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	04-AUG-14
PHENOLS-4AAP-ED		Water						
Batch	R2920049							
WG1931763-3	DUP	L1496514-2						
Phenols (4AAP)		0.0034	0.0040	J	mg/L	0.0006	0.002	15-AUG-14
WG1931763-2	LCS							
Phenols (4AAP)			99.0		%		85-115	15-AUG-14
WG1931763-1	MB							
Phenols (4AAP)			<0.0010		mg/L		0.001	15-AUG-14
WG1931763-4	MS	L1496514-2						
Phenols (4AAP)			105.0		%		75-125	15-AUG-14
SO4-IC-ED		Water						



Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Page 25 of 26

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-ED		Water						
Batch	R2909449							
WG1924000-2	LCS							
Sulfate (SO4)			103.3		%		90-110	03-AUG-14
WG1924000-5	LCS							
Sulfate (SO4)			102.5		%		90-110	03-AUG-14
WG1924000-1	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	03-AUG-14
WG1924000-6	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	03-AUG-14
SOLIDS-TDS-ED		Water						
Batch	R2909129							
WG1924195-3	DUP	L1496474-5						
Total Dissolved Solids		15000	15500		mg/L	2.8	20	05-AUG-14
WG1924195-2	LCS							
Total Dissolved Solids			99.5		%		85-115	05-AUG-14
WG1924195-1	MB							
Total Dissolved Solids			<10		mg/L		10	05-AUG-14
TURBIDITY-ED		Water						
Batch	R2906870							
WG1923865-3	DUP	L1496514-1						
Turbidity		1720	1770		NTU	2.6	15	03-AUG-14
WG1923865-2	LCS							
Turbidity			98.6		%		70-130	03-AUG-14
WG1923865-1	MB							
Turbidity			<0.10		NTU		0.1	03-AUG-14

Quality Control Report

Workorder: L1496514

Report Date: 21-AUG-14

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Page 26 of 26

Contact: AKIN OWOJORI

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects.
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



ALS 140808-05 (14-CDS)

CONFIDENTIAL ANALYSIS REPORT

REPORT #: 140808-05

WO #: 14-CDS

PO #: L1496514

CLIENT: ALS Laboratory Group - Edmonton
9936-67 Avenue
Edmonton, AB
T6E 0P5

ATTENTION: ALS-ED Reporting
Tel: (780) 413-5227
Fax: (780) 437-2311

SAMPLE DESCRIPTION: Water Samples

DATE AND TIME OF SAMPLE COLLECTION: August 01, 2014

DATE AND TIME OF SAMPLE RECEIPT: August 05, 2014/11:59

SAMPLE TEMPERATURE WHEN RECEIVED: 9° Celsius

TEST PERFORMED:
Sulfate Reducing Bacteria
Iron Related Bacteria

TEST START DATE: August 05, 2014/12:59

DATE COMPLETED: August 08, 2014

CERTIFICATE OF ANALYSIS: See Page 2

QUALITY CONTROL DATA: See Attached Appendix 1

The report shall not be reproduced, except in full, without the written authority of PBR Laboratories Inc.

Certificate of Analysis

PBR ID	Sample #	Client ID	Lot #	Test	Protocol	Quantity Analyzed	*DF	Result	Units	Note
14-CDS-01	L1496514-1	16053140801004		Sulfate Reducing Bacteria	BART	15 ml		7.0×10^5	CFU/ml	1
				Iron Related Bacteria	BART	15 ml		1.4×10^5	CFU/ml	1
14-CDS-02	L1496514-2	16053140801005		Sulfate Reducing Bacteria	BART	15 ml		1.8×10^4	CFU/ml	1
				Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	1

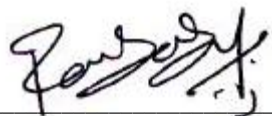
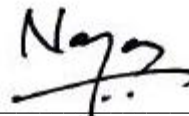
*DF - Dilution Factor used for analysis

Notes

1 CFU = Colony Forming Unit.

BART results represent the Approximate Population only.

The reported results apply only to the items tested.


Rambabu Naravaneni Ph. D (Analyst)
Date: Aug 08 2014


Approved By: _____

Narayan Pokharel, Ph.D.
Date: Aug 08 2014



P|B|R
Laboratories Inc.

ALS 140808-05 (14-CDS)

APPENDIX 1

Quality Control Data for Sulfate Reducing Bacteria (BART)

Controls	Organism/Medium	Result
Sterility	BART medium	Pass
Positive	SRB	Pass
Negative	D/W Sterile	Pass

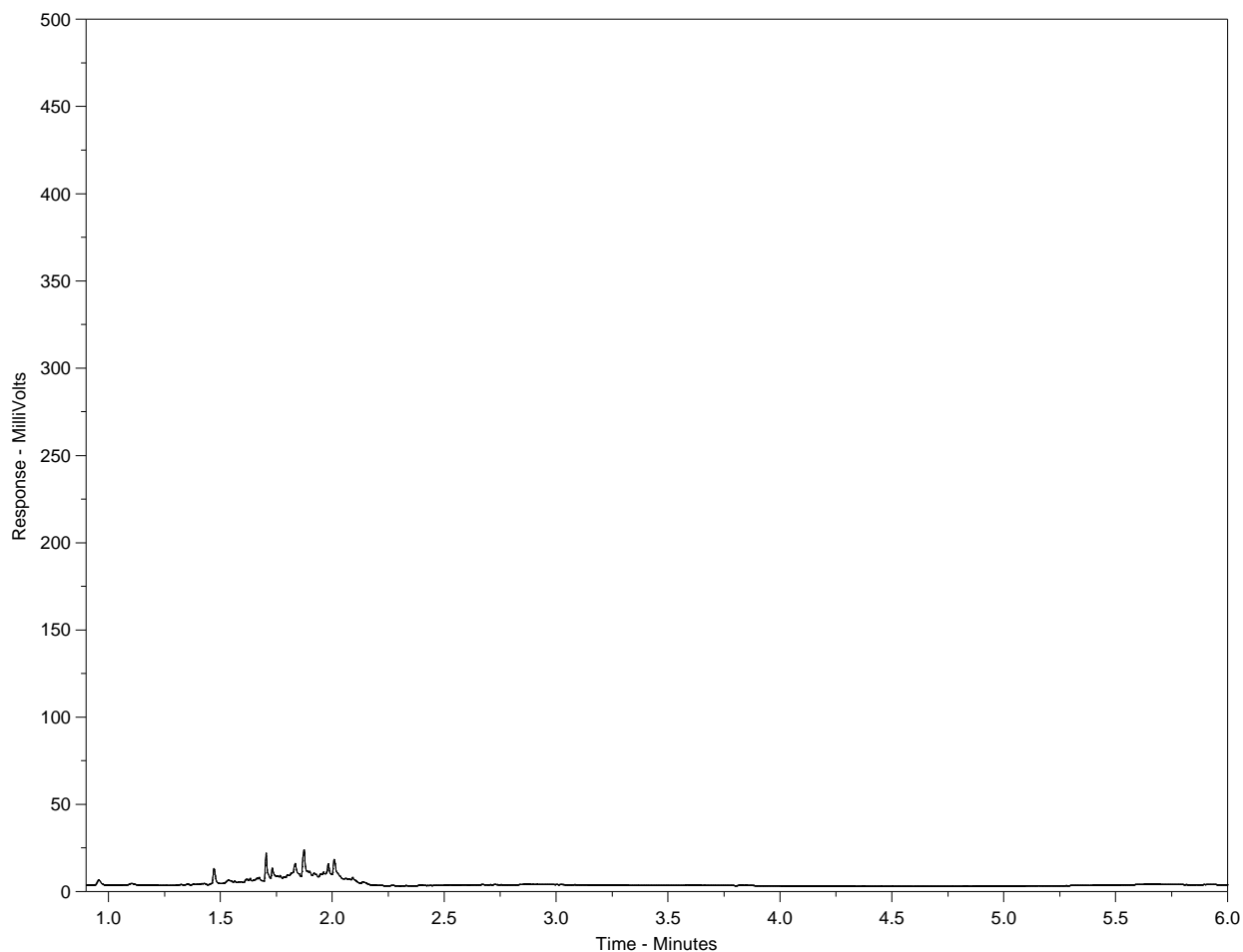
Quality Control Data for Iron Related Bacteria (BART)

Controls	Organism/Medium	Result
Sterility (media blank)	BART medium	Pass
Positive	Acidithiobacillus ferrooxidans	Pass
Negative	D/W Sterile	Pass

Hydrocarbon Distribution Report



ALS Sample ID: L1496514-1
 Client ID: 16053140801004



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	1067°F				
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

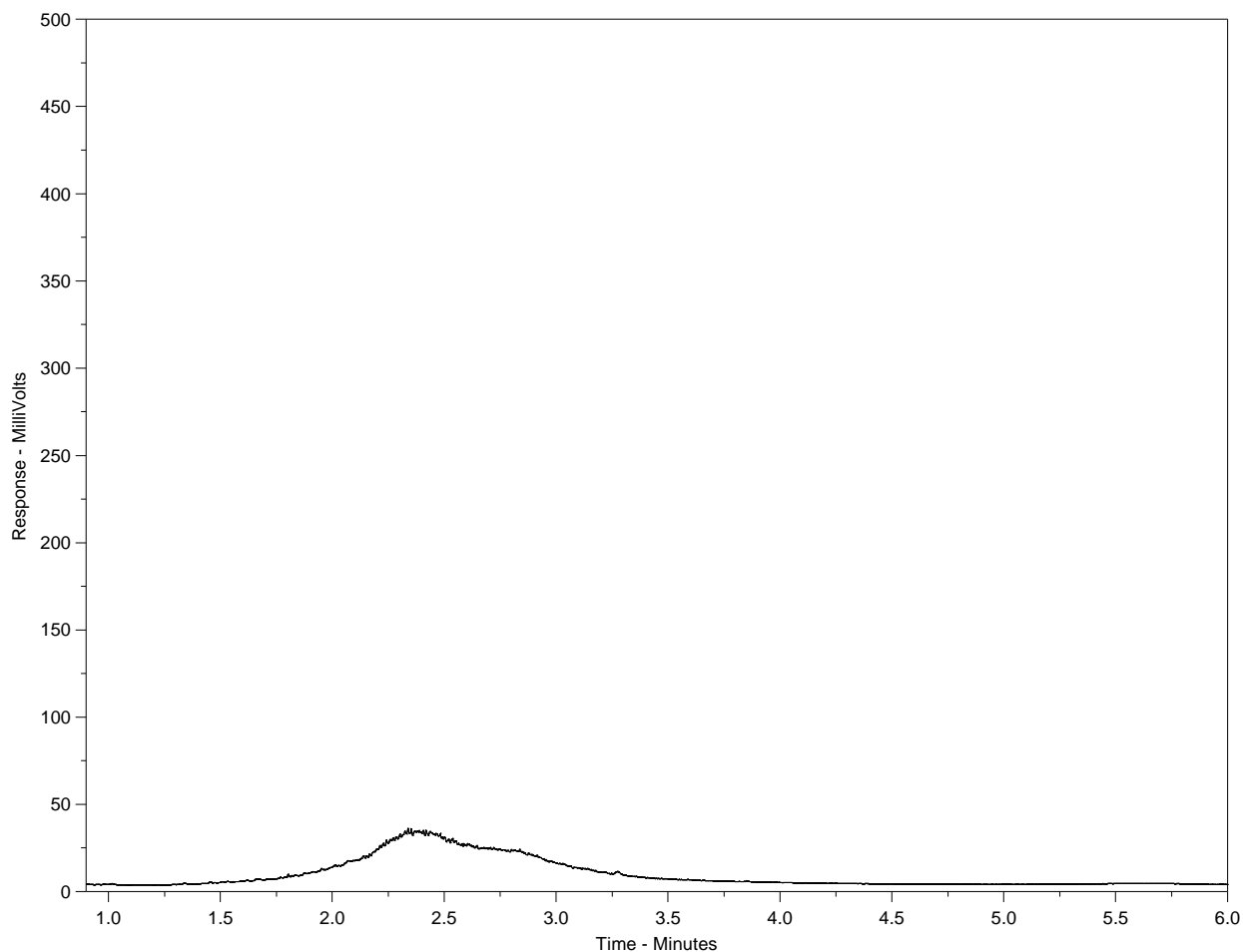
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1496514-2
 Client ID: 16053140801005



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	1067°F				
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.



Matrix Solutions Inc.
ATTN: AKIN OWOJORI
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Date Received: 03-AUG-14
Report Date: 25-AUG-14 16:16 (MT)
Version: FINAL

Client Phone: 403-513-2275

Certificate of Analysis

Lab Work Order #: L1496580
Project P.O. #: NOT SUBMITTED
Job Reference: 16053-502 NAOS
C of C Numbers: M076076
Legal Site Desc: 05-30-94-07 W4M

Nicole Thibault
Account Manager

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ADDRESS: 9936-67 Avenue, Edmonton, AB T6E 0P5 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496580-1 16053140802006									
Sampled By: Gulled/Jeremy/Bobby on 02-AUG-14 @ 12:07									
Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-	RRV	0.00050	mg/L	-	06-AUG-14	07-AUG-14	R2908669
Toluene	0.00101	-	RRV	0.00050	mg/L	-	06-AUG-14	07-AUG-14	R2908669
EthylBenzene	0.00661	-	RRV	0.00050	mg/L	-	06-AUG-14	07-AUG-14	R2908669
o-Xylene	0.0235	-	RRV	0.00050	mg/L	-	06-AUG-14	07-AUG-14	R2908669
m+p-Xylene	0.0352	-	RRV	0.00050	mg/L	-	06-AUG-14	07-AUG-14	R2908669
Styrene	<0.0010	-	RRV	0.0010	mg/L	-	06-AUG-14	07-AUG-14	R2908669
F1(C6-C10)	2.61	-	RRV	0.10	mg/L	-	06-AUG-14	07-AUG-14	R2908669
F1-BTEX	2.54	-		0.10	mg/L	-	06-AUG-14	07-AUG-14	R2908669
Xylenes	0.0587	-		0.00071	mg/L	-	06-AUG-14	07-AUG-14	R2908669
Surr: 1,4-Difluorobenzene (SS)	100.0	-		N/A	%	-	06-AUG-14	07-AUG-14	R2908669
Surr: 4-Bromofluorobenzene (SS)	98.0	-		N/A	%	-	06-AUG-14	07-AUG-14	R2908669
Surr: 3,4-Dichlorotoluene (SS)	102.0	-		N/A	%	-	06-AUG-14	07-AUG-14	R2908669
F2, F3, F4									
F2 (>C10-C16)	484	+/-120		0.25	mg/L	0	07-AUG-14	07-AUG-14	R2912224
F3 (C16-C34)	173	+/-40		0.25	mg/L	0	07-AUG-14	07-AUG-14	R2912224
F4 (C34-C50)	24.4	+/-5.5		0.25	mg/L	0	07-AUG-14	07-AUG-14	R2912224
Surr: 2-Bromobenzotrifluoride	311.2	-	SMI	N/A	%	-	07-AUG-14	07-AUG-14	R2912224
Dissolved Metals - Matrix									
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		14-AUG-14	R2919287
				0					
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	0.0000580	+/-0.0000099	DLM	0.0000050	mg/L	0		14-AUG-14	R2919287
				0					
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	224	+/-35	DLM	0.30	mg/L	0		10-AUG-14	R2912618
Antimony (Sb)-Total	<0.010	-	DLM	0.010	mg/L	-		10-AUG-14	R2912618
Arsenic (As)-Total	0.100	+/-0.011	DLM	0.010	mg/L	0		10-AUG-14	R2912618
Barium (Ba)-Total	6.24	+/-0.70	DLM	0.0050	mg/L	0		10-AUG-14	R2912618
Boron (B)-Total	2.0	+/-0.3	DLM	1.0	mg/L	0		10-AUG-14	R2912618
Cadmium (Cd)-Total	0.0206	+/-0.0039	DLM	0.0010	mg/L	0		10-AUG-14	R2912618
Calcium (Ca)-Total	1670	+/-200	DLM	2.0	mg/L	0		10-AUG-14	R2912618
Chromium (Cr)-Total	0.581	+/-0.084	DLM	0.010	mg/L	0		10-AUG-14	R2912618
Copper (Cu)-Total	1.79	+/-0.21	DLM	0.010	mg/L	0		10-AUG-14	R2912618
Iron (Fe)-Total	1710	+/-270	DLM	1.0	mg/L	0		10-AUG-14	R2912618
Lead (Pb)-Total	1.99	+/-0.31	DLM	0.0050	mg/L	0		10-AUG-14	R2912618
Magnesium (Mg)-Total	470	+/-57	DLM	0.50	mg/L	0		10-AUG-14	R2912618
Manganese (Mn)-Total	31.8	+/-3.2	DLM	0.0050	mg/L	0		10-AUG-14	R2912618
Nickel (Ni)-Total	2.06	+/-0.22	DLM	0.010	mg/L	0		10-AUG-14	R2912618
Potassium (K)-Total	45.7	+/-5.6	DLM	5.0	mg/L	0		10-AUG-14	R2912618
Selenium (Se)-Total	<0.010	-	DLM	0.010	mg/L	-		10-AUG-14	R2912618
Silicon (Si)-Total	264	+/-52	DLM	5.0	mg/L	0		10-AUG-14	R2912618
Silver (Ag)-Total	0.0058	+/-0.0012	DLM	0.0010	mg/L	0		10-AUG-14	R2912618
Sodium (Na)-Total	171	+/-21	DLM	5.0	mg/L	0		10-AUG-14	R2912618
Uranium (U)-Total	0.0419	+/-0.0059	DLM	0.0010	mg/L	0		10-AUG-14	R2912618
Zinc (Zn)-Total	8.79	+/-1.3	DLM	0.30	mg/L	0		10-AUG-14	R2912618
Miscellaneous Parameters									
Ammonia, Total (as N)	4.40	-		0.050	mg/L	-		12-AUG-14	R2915568
Dissolved Organic Carbon	13.2	+/-1.5		1.0	mg/L	0		11-AUG-14	R2913968
Iron Bacteria	See Attached	-				-		04-AUG-14	R2917220

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496580-1 16053140802006									
Sampled By: Gulled/Jeremy/Bobby on 02-AUG-14 @ 12:07									
Matrix: H2O									
Naphthenic Acids	1.0	+/-0.4		1.0	mg/L	0	13-AUG-14	25-AUG-14	R2927870
Phenols (4AAP)	0.0165	+/-0.0022	RRV	0.0010	mg/L	-7.4%		13-AUG-14	R2917007
Sulphate Reducing Bacteria	See Attached	-				-		04-AUG-14	R2917220
Total Dissolved Solids	1030	+/-69	DLA	10	mg/L	0		08-AUG-14	R2912810
Silicon (as SiO2)-Total	564	-		11	mg/L	-		10-AUG-14	
Turbidity	28.9	+/-1.6		0.10	NTU	0		08-AUG-14	R2911521
CCME PAHs									
Naphthalene	0.0346	+/-0.012	DLA	0.00050	mg/L	-22.9%	07-AUG-14	07-AUG-14	R2912646
Quinoline	<0.0016	-	DLM	0.0016	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Acenaphthene	<0.0018	-	DLM	0.0018	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Fluorene	0.00227	+/-0.00071	DLA	0.00020	mg/L	-15.1%	07-AUG-14	07-AUG-14	R2912646
Phenanthrene	0.00493	+/-0.0015	DLA	0.00050	mg/L	-13.3%	07-AUG-14	07-AUG-14	R2912646
Anthracene	<0.00030	-	DLM	0.00030	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Acridine	<0.00020	-	DLA	0.00020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Fluoranthene	<0.00020	-	DLA	0.00020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Pyrene	0.00063	+/-0.00020	DLA	0.00010	mg/L	-9.8%	07-AUG-14	07-AUG-14	R2912646
Benzo(a)anthracene	<0.00010	-	DLA	0.00010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Chrysene	0.00025	+/-0.00008	DLA	0.00020	mg/L	-13.7%	07-AUG-14	07-AUG-14	R2912646
Benzo(b&j)fluoranthene	<0.00010	-	DLA	0.00010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(k)fluoranthene	<0.00010	-	DLA	0.00010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(a)pyrene	<0.000050	-	DLA	0.000050	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(g,h,i)perylene	<0.00020	-	DLA	0.00020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Indeno(1,2,3-cd)pyrene	<0.00010	-	DLA	0.00010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Dibenzo(a,h)anthracene	<0.000050	-	DLA	0.000050	mg/L	-	07-AUG-14	07-AUG-14	R2912646
B(A)P Total Potency Equivalent	0.000074	-		0.000072	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Surr: d10-Acenaphthene	61.4	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Surr: d10-Phenanthrene	76.1	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Surr: d12-Chrysene	67.8	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Note: SAMPLE DILUTED DUE TO MATRIX EFFECT									
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	0.0381	+/-0.0058		0.0010	mg/L	0		13-AUG-14	R2918051
Antimony (Sb)-Dissolved	0.00123	+/-0.00012		0.00010	mg/L	0		13-AUG-14	R2918051
Arsenic (As)-Dissolved	0.00158	+/-0.00017		0.00010	mg/L	0		13-AUG-14	R2918051
Barium (Ba)-Dissolved	0.0428	+/-0.0037		0.000050	mg/L	0		13-AUG-14	R2918051
Beryllium (Be)-Dissolved	<0.00050	-		0.00050	mg/L	-		13-AUG-14	R2918051
Bismuth (Bi)-Dissolved	<0.000050	-		0.000050	mg/L	-		13-AUG-14	R2918051
Boron (B)-Dissolved	0.931	+/-0.11		0.010	mg/L	0		13-AUG-14	R2918051
Cadmium (Cd)-Dissolved	0.000016	+/-0.000002		0.000010	mg/L	0		13-AUG-14	R2918051
Calcium (Ca)-Dissolved	11.8	+/-1.6		0.10	mg/L	0		13-AUG-14	R2918051
Chromium (Cr)-Dissolved	<0.00010	-		0.00010	mg/L	-		13-AUG-14	R2918051
Cobalt (Co)-Dissolved	0.00023	+/-0.00002		0.00010	mg/L	0		13-AUG-14	R2918051
Copper (Cu)-Dissolved	0.00023	+/-0.00005		0.00010	mg/L	0		13-AUG-14	R2918051
Iron (Fe)-Dissolved	0.108	+/-0.010		0.030	mg/L	0		13-AUG-14	R2918051
Lead (Pb)-Dissolved	0.000079	+/-0.000008		0.000050	mg/L	0		13-AUG-14	R2918051
Lithium (Li)-Dissolved	0.0382	+/-0.0048		0.0050	mg/L	0		13-AUG-14	R2918051
Magnesium (Mg)-Dissolved	7.60	+/-0.59		0.10	mg/L	0		13-AUG-14	R2918051
Manganese (Mn)-Dissolved	0.0195	+/-0.0013		0.0050	mg/L	0		13-AUG-14	R2918051
Molybdenum (Mo)-Dissolved	0.0338	+/-0.0035		0.000050	mg/L	0		13-AUG-14	R2918051
Nickel (Ni)-Dissolved	0.00392	+/-0.00032		0.00010	mg/L	0		13-AUG-14	R2918051
Potassium (K)-Dissolved	4.16	+/-0.32		0.50	mg/L	0		13-AUG-14	R2918051
Selenium (Se)-Dissolved	<0.00010	-		0.00010	mg/L	-		13-AUG-14	R2918051

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496580-1 16053140802006									
Sampled By: Gulled/Jeremy/Bobby on 02-AUG-14 @ 12:07									
Matrix: H2O									
Dissolved Metals in Water by CRC ICPMS									
Silicon (Si)-Dissolved	1.00	+/-0.084		0.050	mg/L	0		13-AUG-14	R2918051
Silver (Ag)-Dissolved	<0.000010	-		0.000010	mg/L	-		13-AUG-14	R2918051
Sodium (Na)-Dissolved	157	+/-11		1.0	mg/L	0		13-AUG-14	R2918051
Strontium (Sr)-Dissolved	0.0770	+/-0.0057		0.00010	mg/L	0		13-AUG-14	R2918051
Thallium (Tl)-Dissolved	<0.000050	-		0.000050	mg/L	-		13-AUG-14	R2918051
Titanium (Ti)-Dissolved	0.00052	+/-0.00026		0.00030	mg/L	0		13-AUG-14	R2918051
Tin (Sn)-Dissolved	<0.00010	-		0.00010	mg/L	-		13-AUG-14	R2918051
Uranium (U)-Dissolved	0.000598	+/-0.000062		0.000010	mg/L	0		13-AUG-14	R2918051
Vanadium (V)-Dissolved	0.00036	+/-0.00003		0.00010	mg/L	0		13-AUG-14	R2918051
Zinc (Zn)-Dissolved	<0.0050	-		0.0050	mg/L	-		13-AUG-14	R2918051
Routine Water Analysis									
Chloride by IC									
Chloride (Cl)	1.46	+/-0.12		0.50	mg/L	0		08-AUG-14	R2912274
Ion Balance Calculation									
Ion Balance	104	-			%	-		14-AUG-14	
TDS (Calculated)	426	-			mg/L	-		14-AUG-14	
Hardness (as CaCO3)	60.8	-			mg/L	-		14-AUG-14	
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		08-AUG-14	R2912274
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		13-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		08-AUG-14	R2912274
Sulfate by IC									
Sulfate (SO4)	<0.50	-		0.50	mg/L	-		08-AUG-14	R2912274
pH, Conductivity and Total Alkalinity									
pH	8.40	+/-0.04		0.10	pH	0		08-AUG-14	R2910608
Conductivity (EC)	734	+/-24		0.20	uS/cm	0		08-AUG-14	R2910608
Bicarbonate (HCO3)	482	-		5.0	mg/L	-		08-AUG-14	R2910608
Carbonate (CO3)	6.0	-		5.0	mg/L	-		08-AUG-14	R2910608
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		08-AUG-14	R2910608
Alkalinity, Total (as CaCO3)	406	+/-15		2.0	mg/L	0		08-AUG-14	R2910608
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	2.14	-		0.11	mg/L	-		14-AUG-14	
L1496580-2 16053140802007									
Sampled By: Gulled/Jeremy/Bobby on 02-AUG-14 @ 15:01									
Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-	RRV	0.00050	mg/L	-	06-AUG-14	07-AUG-14	R2908669
Toluene	<0.00050	-	RRV	0.00050	mg/L	-	06-AUG-14	07-AUG-14	R2908669
EthylBenzene	<0.00050	-	RRV	0.00050	mg/L	-	06-AUG-14	07-AUG-14	R2908669
o-Xylene	<0.00050	-	RRV	0.00050	mg/L	-	06-AUG-14	07-AUG-14	R2908669
m+p-Xylene	<0.00050	-	RRV	0.00050	mg/L	-	06-AUG-14	07-AUG-14	R2908669
Styrene	<0.0010	-	RRV	0.0010	mg/L	-	06-AUG-14	07-AUG-14	R2908669
F1(C6-C10)	<0.10	-	RRV	0.10	mg/L	-	06-AUG-14	07-AUG-14	R2908669
F1-BTEX	<0.10	-		0.10	mg/L	-	06-AUG-14	07-AUG-14	R2908669
Xylenes	<0.00071	-		0.00071	mg/L	-	06-AUG-14	07-AUG-14	R2908669
Surr: 1,4-Difluorobenzene (SS)	100.0	-		N/A	%	-	06-AUG-14	07-AUG-14	R2908669
Surr: 4-Bromofluorobenzene (SS)	91.0	-		N/A	%	-	06-AUG-14	07-AUG-14	R2908669

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496580-2 16053140802007									
Sampled By: Gulled/Jeremy/Bobby on 02-AUG-14 @ 15:01									
Matrix: H2O									
BTEX, Styrene and F1 (C6-C10)									
Surr: 3,4-Dichlorotoluene (SS)	90.0	-		N/A	%	-	06-AUG-14	07-AUG-14	R2908669
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	07-AUG-14	07-AUG-14	R2912224
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	07-AUG-14	07-AUG-14	R2912224
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	07-AUG-14	07-AUG-14	R2912224
Surr: 2-Bromobenzotrifluoride	98.2	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912224
Dissolved Metals - Matrix									
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		14-AUG-14	R2919287
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	0.0000097	+/-0.0000044		0.0000050	mg/L	0		14-AUG-14	R2919287
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	16.9	+/-2.7	DLM	0.015	mg/L	0		10-AUG-14	R2912618
Antimony (Sb)-Total	0.00102	+/-0.00014	DLM	0.00050	mg/L	0		10-AUG-14	R2912618
Arsenic (As)-Total	0.0208	+/-0.0024	DLM	0.00050	mg/L	0		10-AUG-14	R2912618
Barium (Ba)-Total	0.333	+/-0.037	DLM	0.0050	mg/L	0		10-AUG-14	R2912618
Boron (B)-Total	1.90	+/-0.30	DLM	0.050	mg/L	0		10-AUG-14	R2912618
Cadmium (Cd)-Total	0.00021	+/-0.00004	DLM	0.00020	mg/L	0		10-AUG-14	R2912618
Calcium (Ca)-Total	40.8	+/-4.8	DLM	0.50	mg/L	0		10-AUG-14	R2912618
Chromium (Cr)-Total	0.0475	+/-0.0069	DLM	0.0050	mg/L	0		10-AUG-14	R2912618
Copper (Cu)-Total	0.100	+/-0.012	DLM	0.0010	mg/L	0		10-AUG-14	R2912618
Iron (Fe)-Total	65.0	+/-10	DLM	0.050	mg/L	0		10-AUG-14	R2912618
Lead (Pb)-Total	0.0343	+/-0.0054	DLM	0.00025	mg/L	0		10-AUG-14	R2912618
Magnesium (Mg)-Total	12.8	+/-1.6	DLM	0.10	mg/L	0		10-AUG-14	R2912618
Manganese (Mn)-Total	0.505	+/-0.051	DLM	0.0020	mg/L	0		10-AUG-14	R2912618
Nickel (Ni)-Total	0.188	+/-0.020	DLM	0.0020	mg/L	0		10-AUG-14	R2912618
Potassium (K)-Total	6.63	+/-0.81	DLM	0.25	mg/L	0		10-AUG-14	R2912618
Selenium (Se)-Total	0.00094	+/-0.00013	DLM	0.00050	mg/L	0		10-AUG-14	R2912618
Silicon (Si)-Total	32.9	+/-6.5	DLM	0.25	mg/L	0		10-AUG-14	R2912618
Silver (Ag)-Total	<0.00040	-	DLM	0.00040	mg/L	-		10-AUG-14	R2912618
Sodium (Na)-Total	628	+/-77	DLM	1.0	mg/L	0		10-AUG-14	R2912618
Uranium (U)-Total	0.00241	+/-0.00034	DLM	0.00010	mg/L	0		10-AUG-14	R2912618
Zinc (Zn)-Total	0.483	+/-0.074	DLM	0.015	mg/L	0		10-AUG-14	R2912618
Miscellaneous Parameters									
Ammonia, Total (as N)	1.66	-		0.050	mg/L	-		12-AUG-14	R2915568
Dissolved Organic Carbon	6.6	+/-0.9		1.0	mg/L	0		11-AUG-14	R2913968
Iron Bacteria	See Attached	-				-		04-AUG-14	R2917220
Naphthenic Acids	1.0	+/-0.4		1.0	mg/L	0	13-AUG-14	25-AUG-14	R2927870
Phenols (4AAP)	0.0013	+/-0.0008		0.0010	mg/L	-7.4%		13-AUG-14	R2917007
Sulphate Reducing Bacteria	See Attached	-				-		04-AUG-14	R2917220
Total Dissolved Solids	1590	+/-110	DLA	10	mg/L	0		08-AUG-14	R2912810
Silicon (as SiO2)-Total	70.4	-		0.53	mg/L	-		10-AUG-14	
Turbidity	947	+/-52		0.10	NTU	0		04-AUG-14	R2912832
CCME PAHs									
Naphthalene	0.000068	+/-0.000034		0.000050	mg/L	-22.9%	07-AUG-14	07-AUG-14	R2912646
Quinoline	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Acenaphthene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Fluorene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496580-2 16053140802007									
Sampled By: Gulled/Jeremy/Bobby on 02-AUG-14 @ 15:01									
Matrix: H2O									
CCME PAHs									
Phenanthrene	<0.000050	-		0.000050	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Anthracene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Acridine	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Fluoranthene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Pyrene	0.000016	+/-0.000013		0.000010	mg/L	-9.8%	07-AUG-14	07-AUG-14	R2912646
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Chrysene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(b&j)fluoranthene	0.000064	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(k)fluoranthene	0.000023	+/-0.000009		0.000010	mg/L	-15.4%	07-AUG-14	07-AUG-14	R2912646
Benzo(a)pyrene	0.0000200	+/-0.0000084		0.000005	mg/L	-16.6%	07-AUG-14	07-AUG-14	R2912646
				0					
Benzo(g,h,i)perylene	0.000113	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Indeno(1,2,3-cd)pyrene	0.000067	+/-0.000026		0.000010	mg/L	-17.1%	07-AUG-14	07-AUG-14	R2912646
Dibenzo(a,h)anthracene	0.0000120	+/-0.0000045		0.000005	mg/L	-17.6%	07-AUG-14	07-AUG-14	R2912646
				0					
B(A)P Total Potency Equivalent	0.000049	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Surr: d10-Acenaphthene	79.7	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Surr: d10-Phenanthrene	88.2	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Surr: d12-Chrysene	85.9	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Routine Water Analysis									
Chloride by IC									
Chloride (Cl)	180	+/-10		0.50	mg/L	0		04-AUG-14	R2909357
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	0.015	+/-0.002	DLM	0.010	mg/L	0		13-AUG-14	R2918051
Antimony (Sb)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		13-AUG-14	R2918051
Arsenic (As)-Dissolved	0.0013	+/-0.0001	DLM	0.0010	mg/L	0		13-AUG-14	R2918051
Barium (Ba)-Dissolved	0.0461	+/-0.0040	DLM	0.00050	mg/L	0		13-AUG-14	R2918051
Beryllium (Be)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		13-AUG-14	R2918051
Bismuth (Bi)-Dissolved	<0.00050	-	DLM	0.00050	mg/L	-		13-AUG-14	R2918051
Boron (B)-Dissolved	3.65	+/-0.44	DLM	0.10	mg/L	0		14-AUG-14	R2918380
Cadmium (Cd)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		13-AUG-14	R2918051
Calcium (Ca)-Dissolved	2.88	+/-0.39	DLM	0.50	mg/L	0		13-AUG-14	R2918051
Chromium (Cr)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		13-AUG-14	R2918051
Cobalt (Co)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		13-AUG-14	R2918051
Copper (Cu)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		13-AUG-14	R2918051
Iron (Fe)-Dissolved	<0.10	-	DLM	0.10	mg/L	-		13-AUG-14	R2918051
Lead (Pb)-Dissolved	<0.00050	-	DLM	0.00050	mg/L	-		13-AUG-14	R2918051
Lithium (Li)-Dissolved	0.109	+/-0.013	DLM	0.030	mg/L	0		13-AUG-14	R2918051
Magnesium (Mg)-Dissolved	1.77	+/-0.14	DLM	0.10	mg/L	0		13-AUG-14	R2918051
Manganese (Mn)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		13-AUG-14	R2918051
Molybdenum (Mo)-Dissolved	0.00970	+/-0.0010	DLM	0.00050	mg/L	0		13-AUG-14	R2918051
Nickel (Ni)-Dissolved	0.0112	+/-0.0009	DLM	0.0010	mg/L	0		13-AUG-14	R2918051
Potassium (K)-Dissolved	3.41	+/-0.26	DLM	0.50	mg/L	0		13-AUG-14	R2918051
Selenium (Se)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		13-AUG-14	R2918051
Silicon (Si)-Dissolved	2.41	+/-0.20	DLM	0.50	mg/L	0		13-AUG-14	R2918051
Silver (Ag)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		13-AUG-14	R2918051
Sodium (Na)-Dissolved	605	+/-43	DLM	1.0	mg/L	0		13-AUG-14	R2918051
Strontium (Sr)-Dissolved	0.153	+/-0.011	DLM	0.0010	mg/L	0		13-AUG-14	R2918051
Thallium (Tl)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		13-AUG-14	R2918051
Titanium (Ti)-Dissolved	<0.0030	-	DLM	0.0030	mg/L	-		13-AUG-14	R2918051
Tin (Sn)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		13-AUG-14	R2918051
Uranium (U)-Dissolved	0.00010	+/-0.00001	DLM	0.00010	mg/L	0		13-AUG-14	R2918051

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496580-3 16053140802008									
Sampled By: Gulled/Jeremy/Bobby on 02-AUG-14 @ 14:00									
Matrix: H2O									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		14-AUG-14	R2919287
				0					
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.0521	+/-0.0090		0.0030	mg/L	0		10-AUG-14	R2912618
Antimony (Sb)-Total	0.00059	+/-0.00010		0.00040	mg/L	0		10-AUG-14	R2912618
Arsenic (As)-Total	<0.00040	-		0.00040	mg/L	-		10-AUG-14	R2912618
Barium (Ba)-Total	0.0699	+/-0.0078		0.0050	mg/L	0		10-AUG-14	R2912618
Boron (B)-Total	0.543	+/-0.087		0.050	mg/L	0		10-AUG-14	R2912618
Cadmium (Cd)-Total	<0.00020	-		0.00020	mg/L	-		10-AUG-14	R2912618
Calcium (Ca)-Total	13.1	+/-1.6		0.50	mg/L	0		10-AUG-14	R2912618
Chromium (Cr)-Total	<0.0050	-		0.0050	mg/L	-		10-AUG-14	R2912618
Copper (Cu)-Total	0.0025	+/-0.0003		0.0010	mg/L	0		10-AUG-14	R2912618
Iron (Fe)-Total	1.07	+/-0.17		0.010	mg/L	0		10-AUG-14	R2912618
Lead (Pb)-Total	0.00155	+/-0.00025		0.00010	mg/L	0		10-AUG-14	R2912618
Magnesium (Mg)-Total	3.96	+/-0.48		0.10	mg/L	0		10-AUG-14	R2912618
Manganese (Mn)-Total	0.0281	+/-0.0028		0.0020	mg/L	0		10-AUG-14	R2912618
Nickel (Ni)-Total	<0.0020	-		0.0020	mg/L	-		10-AUG-14	R2912618
Potassium (K)-Total	6.77	+/-0.83		0.10	mg/L	0		10-AUG-14	R2912618
Selenium (Se)-Total	<0.00040	-		0.00040	mg/L	-		10-AUG-14	R2912618
Silicon (Si)-Total	6.50	+/-1.3		0.050	mg/L	0		10-AUG-14	R2912618
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		10-AUG-14	R2912618
Sodium (Na)-Total	207	+/-25		1.0	mg/L	0		10-AUG-14	R2912618
Uranium (U)-Total	<0.00010	-		0.00010	mg/L	-		10-AUG-14	R2912618
Zinc (Zn)-Total	<0.0040	-		0.0040	mg/L	-		10-AUG-14	R2912618
Miscellaneous Parameters									
Ammonia, Total (as N)	0.613	-		0.050	mg/L	-		12-AUG-14	R2915568
Dissolved Organic Carbon	8.8	+/-1.1		1.0	mg/L	0		11-AUG-14	R2913968
Iron Bacteria	See Attached	-				-		04-AUG-14	R2917220
Naphthenic Acids	1.0	+/-0.4		1.0	mg/L	0	13-AUG-14	25-AUG-14	R2927870
Phenols (4AAP)	0.0017	+/-0.0008		0.0010	mg/L	-7.4%		13-AUG-14	R2917007
Sulphate Reducing Bacteria	See Attached	-				-		04-AUG-14	R2917220
Total Dissolved Solids	546	+/-36		10	mg/L	0		08-AUG-14	R2912810
Silicon (as SiO2)-Total	13.9	-		0.11	mg/L	-		10-AUG-14	
Turbidity	1.97	+/-0.16		0.10	NTU	0		04-AUG-14	R2912832
CCME PAHs									
Naphthalene	0.000968	+/-0.00035		0.000050	mg/L	-22.9%	07-AUG-14	07-AUG-14	R2912646
Quinoline	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Acenaphthene	<0.000050	-	DLM	0.000050	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Fluorene	0.000091	+/-0.000034		0.000020	mg/L	-15.1%	07-AUG-14	07-AUG-14	R2912646
Phenanthrene	0.000089	+/-0.000055		0.000050	mg/L	-13.3%	07-AUG-14	07-AUG-14	R2912646
Anthracene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Acridine	<0.000030	-	DLM	0.000030	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Fluoranthene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Pyrene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Chrysene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(a)pyrene	<0.0000050	-		0.0000050	mg/L	-	07-AUG-14	07-AUG-14	R2912646
				0					
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496580-3 16053140802008									
Sampled By: Gulled/Jeremy/Bobby on 02-AUG-14 @ 14:00									
Matrix: H2O									
CCME PAHs									
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005 0	mg/L	-	07-AUG-14	07-AUG-14	R2912646
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Surr: d10-Acenaphthene	98.9	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Surr: d10-Phenanthrene	97.4	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Surr: d12-Chrysene	93.1	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Routine Water Analysis									
Chloride by IC									
Chloride (Cl)	1.54	+/-0.12		0.50	mg/L	0		04-AUG-14	R2909357
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	0.0033	+/-0.0006		0.0010	mg/L	0		13-AUG-14	R2918051
Antimony (Sb)-Dissolved	0.00032	+/-0.00003		0.00010	mg/L	0		13-AUG-14	R2918051
Arsenic (As)-Dissolved	0.00013	+/-0.00001		0.00010	mg/L	0		13-AUG-14	R2918051
Barium (Ba)-Dissolved	0.0690	+/-0.0060		0.000050	mg/L	0		13-AUG-14	R2918051
Beryllium (Be)-Dissolved	<0.00050	-		0.00050	mg/L	-		13-AUG-14	R2918051
Bismuth (Bi)-Dissolved	<0.000050	-		0.000050	mg/L	-		13-AUG-14	R2918051
Boron (B)-Dissolved	1.02	+/-0.12	DLM	0.010	mg/L	0		14-AUG-14	R2918380
Cadmium (Cd)-Dissolved	<0.000010	-		0.000010	mg/L	-		13-AUG-14	R2918051
Calcium (Ca)-Dissolved	13.3	+/-1.8		0.10	mg/L	0		13-AUG-14	R2918051
Chromium (Cr)-Dissolved	<0.00010	-		0.00010	mg/L	-		13-AUG-14	R2918051
Cobalt (Co)-Dissolved	<0.00010	-		0.00010	mg/L	-		13-AUG-14	R2918051
Copper (Cu)-Dissolved	0.00013	+/-0.00004		0.00010	mg/L	0		13-AUG-14	R2918051
Iron (Fe)-Dissolved	0.494	+/-0.044		0.030	mg/L	0		13-AUG-14	R2918051
Lead (Pb)-Dissolved	<0.000050	-		0.000050	mg/L	-		13-AUG-14	R2918051
Lithium (Li)-Dissolved	0.0461	+/-0.0057		0.0050	mg/L	0		13-AUG-14	R2918051
Magnesium (Mg)-Dissolved	4.00	+/-0.31		0.10	mg/L	0		13-AUG-14	R2918051
Manganese (Mn)-Dissolved	0.0239	+/-0.0016		0.0050	mg/L	0		13-AUG-14	R2918051
Molybdenum (Mo)-Dissolved	0.00190	+/-0.00020		0.000050	mg/L	0		13-AUG-14	R2918051
Nickel (Ni)-Dissolved	0.00086	+/-0.00008		0.00010	mg/L	0		13-AUG-14	R2918051
Potassium (K)-Dissolved	6.44	+/-0.50		0.50	mg/L	0		13-AUG-14	R2918051
Selenium (Se)-Dissolved	<0.00010	-		0.00010	mg/L	-		13-AUG-14	R2918051
Silicon (Si)-Dissolved	6.31	+/-0.54		0.050	mg/L	0		13-AUG-14	R2918051
Silver (Ag)-Dissolved	<0.000010	-		0.000010	mg/L	-		13-AUG-14	R2918051
Sodium (Na)-Dissolved	197	+/-14		1.0	mg/L	0		13-AUG-14	R2918051
Strontium (Sr)-Dissolved	0.133	+/-0.0099		0.00010	mg/L	0		13-AUG-14	R2918051
Thallium (Tl)-Dissolved	<0.000050	-		0.000050	mg/L	-		13-AUG-14	R2918051
Titanium (Ti)-Dissolved	<0.00030	-		0.00030	mg/L	-		13-AUG-14	R2918051
Tin (Sn)-Dissolved	<0.00010	-		0.00010	mg/L	-		13-AUG-14	R2918051
Uranium (U)-Dissolved	<0.000010	-		0.000010	mg/L	-		13-AUG-14	R2918051
Vanadium (V)-Dissolved	0.00037	+/-0.00003		0.00010	mg/L	0		13-AUG-14	R2918051
Zinc (Zn)-Dissolved	<0.0050	-		0.0050	mg/L	-		13-AUG-14	R2918051
Ion Balance Calculation									
Ion Balance	101	-			%	-		15-AUG-14	
TDS (Calculated)	513	-			mg/L	-		15-AUG-14	
Hardness (as CaCO3)	49.7	-			mg/L	-		15-AUG-14	
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		04-AUG-14	R2909357
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		07-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		04-AUG-14	R2909357

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496580-3 16053140802008 Sampled By: Gulled/Jeremy/Bobby on 02-AUG-14 @ 14:00 Matrix: H2O									
Sulfate by IC									
Sulfate (SO4)	0.89	+/-0.11		0.50	mg/L	0		04-AUG-14	R2909357
pH, Conductivity and Total Alkalinity									
pH	8.43	+/-0.04		0.10	pH	0		04-AUG-14	R2906988
Conductivity (EC)	869	+/-29		0.20	uS/cm	0		04-AUG-14	R2906988
Bicarbonate (HCO3)	570	-		5.0	mg/L	-		04-AUG-14	R2906988
Carbonate (CO3)	9.5	-		5.0	mg/L	-		04-AUG-14	R2906988
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		04-AUG-14	R2906988
Alkalinity, Total (as CaCO3)	483	+/-17		2.0	mg/L	0		04-AUG-14	R2906988
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	13.5	-		0.11	mg/L	-		15-AUG-14	
L1496580-4 16053140802009 Sampled By: Gulled/Jeremy/Bobby on 02-AUG-14 @ 16:30 Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908669
Toluene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908669
EthylBenzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908669
o-Xylene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908669
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908669
Styrene	<0.0010	-		0.0010	mg/L	-		10-AUG-14	R2908669
F1(C6-C10)	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908669
F1-BTEX	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908669
Xylenes	<0.00071	-		0.00071	mg/L	-		10-AUG-14	R2908669
Surr: 1,4-Difluorobenzene (SS)	101.7	-		N/A	%	-		10-AUG-14	R2908669
Surr: 4-Bromofluorobenzene (SS)	97.4	-		N/A	%	-		10-AUG-14	R2908669
Surr: 3,4-Dichlorotoluene (SS)	93.1	-		N/A	%	-		10-AUG-14	R2908669
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	07-AUG-14	07-AUG-14	R2912224
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	07-AUG-14	07-AUG-14	R2912224
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	07-AUG-14	07-AUG-14	R2912224
Surr: 2-Bromobenzotrifluoride	122.2	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912224
Dissolved Metals - Matrix									
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	0.0000059	-		0.000005 0	mg/L	-		14-AUG-14	R2919287
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.000005 0	mg/L	-		14-AUG-14	R2919287
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.0699	+/-0.012		0.0030	mg/L	0		10-AUG-14	R2912618
Antimony (Sb)-Total	<0.00040	-		0.00040	mg/L	-		10-AUG-14	R2912618
Arsenic (As)-Total	0.00091	+/-0.00012		0.00040	mg/L	0		10-AUG-14	R2912618
Barium (Ba)-Total	0.0141	+/-0.0016		0.0050	mg/L	0		10-AUG-14	R2912618
Boron (B)-Total	<0.050	-		0.050	mg/L	-		10-AUG-14	R2912618
Cadmium (Cd)-Total	<0.00020	-		0.00020	mg/L	-		10-AUG-14	R2912618
Calcium (Ca)-Total	11.6	+/-1.4		0.50	mg/L	0		10-AUG-14	R2912618
Chromium (Cr)-Total	<0.0050	-		0.0050	mg/L	-		10-AUG-14	R2912618
Copper (Cu)-Total	0.0038	+/-0.0005		0.0010	mg/L	0		10-AUG-14	R2912618
Iron (Fe)-Total	8.04	+/-1.3		0.010	mg/L	0		10-AUG-14	R2912618

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496580-4 16053140802009									
Sampled By: Gulled/Jeremy/Bobby on 02-AUG-14 @ 16:30									
Matrix: H2O									
Total Metals in Water by CRC ICPMS									
Lead (Pb)-Total	0.00134	+/-0.00021		0.00010	mg/L	0		10-AUG-14	R2912618
Magnesium (Mg)-Total	0.70	+/-0.09		0.10	mg/L	0		10-AUG-14	R2912618
Manganese (Mn)-Total	0.150	+/-0.015		0.0020	mg/L	0		10-AUG-14	R2912618
Nickel (Ni)-Total	0.0138	+/-0.0015		0.0020	mg/L	0		10-AUG-14	R2912618
Potassium (K)-Total	87.5	+/-11		0.10	mg/L	0		10-AUG-14	R2912618
Selenium (Se)-Total	<0.00040	-		0.00040	mg/L	-		10-AUG-14	R2912618
Silicon (Si)-Total	0.160	+/-0.032		0.050	mg/L	0		10-AUG-14	R2912618
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		10-AUG-14	R2912618
Sodium (Na)-Total	165	+/-20		1.0	mg/L	0		10-AUG-14	R2912618
Uranium (U)-Total	<0.00010	-		0.00010	mg/L	-		10-AUG-14	R2912618
Zinc (Zn)-Total	0.560	+/-0.086		0.0040	mg/L	0		10-AUG-14	R2912618
Miscellaneous Parameters									
Total Dissolved Solids	620	+/-41	DLA	10	mg/L	0		08-AUG-14	R2912810
Silicon (as SiO2)-Total	0.34	-		0.11	mg/L	-		10-AUG-14	
Turbidity	42.2	+/-2.4		0.10	NTU	0		07-AUG-14	R2911021
CCME PAHs									
Naphthalene	<0.000050	-		0.000050	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Quinoline	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Acenaphthene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Fluorene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Phenanthrene	<0.000050	-		0.000050	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Anthracene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Acridine	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Fluoranthene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Pyrene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Chrysene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Benzo(a)pyrene	<0.000050	-		0.000005	mg/L	-	07-AUG-14	07-AUG-14	R2912646
				0					
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Dibenzo(a,h)anthracene	<0.000050	-		0.000005	mg/L	-	07-AUG-14	07-AUG-14	R2912646
				0					
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	07-AUG-14	07-AUG-14	R2912646
Surr: d10-Acenaphthene	79.3	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Surr: d10-Phenanthrene	81.5	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Surr: d12-Chrysene	81.9	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912646
Routine Water Analysis									
Chloride by IC									
Chloride (Cl)	8.33	+/-0.49		0.50	mg/L	0		04-AUG-14	R2909357
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	0.0017	+/-0.0004		0.0010	mg/L	0		13-AUG-14	R2918051
Antimony (Sb)-Dissolved	<0.00010	-		0.00010	mg/L	-		13-AUG-14	R2918051
Arsenic (As)-Dissolved	0.00047	+/-0.00005		0.00010	mg/L	0		13-AUG-14	R2918051
Barium (Ba)-Dissolved	0.0107	+/-0.00093		0.000050	mg/L	0		13-AUG-14	R2918051
Beryllium (Be)-Dissolved	<0.00050	-		0.00050	mg/L	-		13-AUG-14	R2918051
Bismuth (Bi)-Dissolved	<0.000050	-		0.000050	mg/L	-		13-AUG-14	R2918051
Boron (B)-Dissolved	0.072	+/-0.009		0.010	mg/L	0		13-AUG-14	R2918051
Cadmium (Cd)-Dissolved	<0.000010	-		0.000010	mg/L	-		13-AUG-14	R2918051
Calcium (Ca)-Dissolved	11.4	+/-1.6		0.10	mg/L	0		13-AUG-14	R2918051

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496580-4 16053140802009									
Sampled By: Gulled/Jeremy/Bobby on 02-AUG-14 @ 16:30									
Matrix: H2O									
Dissolved Metals in Water by CRC ICPMS									
Chromium (Cr)-Dissolved	<0.00010	-		0.00010	mg/L	-		13-AUG-14	R2918051
Cobalt (Co)-Dissolved	<0.00010	-		0.00010	mg/L	-		13-AUG-14	R2918051
Copper (Cu)-Dissolved	0.00159	+/-0.00012		0.00010	mg/L	0		13-AUG-14	R2918051
Iron (Fe)-Dissolved	<0.030	-		0.030	mg/L	-		13-AUG-14	R2918051
Lead (Pb)-Dissolved	<0.000050	-		0.000050	mg/L	-		13-AUG-14	R2918051
Lithium (Li)-Dissolved	0.560	+/-0.069		0.0050	mg/L	0		13-AUG-14	R2918051
Magnesium (Mg)-Dissolved	0.61	+/-0.05		0.10	mg/L	0		13-AUG-14	R2918051
Manganese (Mn)-Dissolved	0.0578	+/-0.0040		0.0050	mg/L	0		13-AUG-14	R2918051
Molybdenum (Mo)-Dissolved	0.00338	+/-0.00035		0.000050	mg/L	0		13-AUG-14	R2918051
Nickel (Ni)-Dissolved	0.00195	+/-0.00016		0.00010	mg/L	0		13-AUG-14	R2918051
Potassium (K)-Dissolved	90.7	+/-7.1		0.50	mg/L	0		13-AUG-14	R2918051
Selenium (Se)-Dissolved	<0.00010	-		0.00010	mg/L	-		13-AUG-14	R2918051
Silicon (Si)-Dissolved	<0.050	-		0.050	mg/L	-		13-AUG-14	R2918051
Silver (Ag)-Dissolved	<0.000010	-		0.000010	mg/L	-		13-AUG-14	R2918051
Sodium (Na)-Dissolved	163	+/-11		1.0	mg/L	0		13-AUG-14	R2918051
Strontium (Sr)-Dissolved	0.256	+/-0.019		0.00010	mg/L	0		13-AUG-14	R2918051
Thallium (Tl)-Dissolved	<0.000050	-		0.000050	mg/L	-		13-AUG-14	R2918051
Titanium (Ti)-Dissolved	<0.00030	-		0.00030	mg/L	-		13-AUG-14	R2918051
Tin (Sn)-Dissolved	0.00013	+/-0.00001		0.00010	mg/L	0		13-AUG-14	R2918051
Uranium (U)-Dissolved	<0.000010	-		0.000010	mg/L	-		13-AUG-14	R2918051
Vanadium (V)-Dissolved	<0.00010	-		0.00010	mg/L	-		13-AUG-14	R2918051
Zinc (Zn)-Dissolved	0.0111	+/-0.0013		0.0050	mg/L	0		13-AUG-14	R2918051
Ion Balance Calculation									
Ion Balance	101	-			%	-		14-AUG-14	
TDS (Calculated)	566	-			mg/L	-		14-AUG-14	
Hardness (as CaCO3)	31.0	-			mg/L	-		14-AUG-14	
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		04-AUG-14	R2909357
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		07-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		04-AUG-14	R2909357
Sulfate by IC									
Sulfate (SO4)	3.59	+/-0.23		0.50	mg/L	0		04-AUG-14	R2909357
pH, Conductivity and Total Alkalinity									
pH	8.37	+/-0.04		0.10	pH	0		04-AUG-14	R2906988
Conductivity (EC)	937	+/-31		0.20	uS/cm	0		04-AUG-14	R2906988
Bicarbonate (HCO3)	573	-		5.0	mg/L	-		04-AUG-14	R2906988
Carbonate (CO3)	6.7	-		5.0	mg/L	-		04-AUG-14	R2906988
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		04-AUG-14	R2906988
Alkalinity, Total (as CaCO3)	481	+/-17		2.0	mg/L	0		04-AUG-14	R2906988
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	<0.11	-		0.11	mg/L	-		14-AUG-14	
* Refer to Referenced Information for Qualifiers (if any) and Methodology.									

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Antimony (Sb)-Total	DLM	
Duplicate	Arsenic (As)-Total	DLM	
Duplicate	Barium (Ba)-Total	DLM	
Duplicate	Boron (B)-Total	DLM	
Duplicate	Cadmium (Cd)-Total	DLM	
Duplicate	Calcium (Ca)-Total	DLM	
Duplicate	Chromium (Cr)-Total	DLM	
Duplicate	Copper (Cu)-Total	DLM	
Duplicate	Iron (Fe)-Total	DLM	
Duplicate	Lead (Pb)-Total	DLM	
Duplicate	Magnesium (Mg)-Total	DLM	
Duplicate	Manganese (Mn)-Total	DLM	
Duplicate	Nickel (Ni)-Total	DLM	
Duplicate	Potassium (K)-Total	DLM	
Duplicate	Selenium (Se)-Total	DLM	
Duplicate	Silicon (Si)-Total	DLM	
Duplicate	Silver (Ag)-Total	DLM	
Duplicate	Sodium (Na)-Total	DLM	
Duplicate	Uranium (U)-Total	DLM	
Duplicate	Zinc (Zn)-Total	DLM	
Duplicate	Aluminum (Al)-Total	DLM	
Duplicate	Antimony (Sb)-Total	DLM	
Duplicate	Arsenic (As)-Total	DLM	
Duplicate	Barium (Ba)-Total	DLM	
Duplicate	Boron (B)-Total	DLM	
Duplicate	Cadmium (Cd)-Total	DLM	
Duplicate	Calcium (Ca)-Total	DLM	
Duplicate	Chromium (Cr)-Total	DLM	
Duplicate	Copper (Cu)-Total	DLM	
Duplicate	Iron (Fe)-Total	DLM	
Duplicate	Lead (Pb)-Total	DLM	
Duplicate	Magnesium (Mg)-Total	DLM	
Duplicate	Manganese (Mn)-Total	DLM	
Duplicate	Nickel (Ni)-Total	DLM	
Duplicate	Potassium (K)-Total	DLM	
Duplicate	Selenium (Se)-Total	DLM	
Duplicate	Silicon (Si)-Total	DLM	
Duplicate	Silver (Ag)-Total	DLM	
Duplicate	Sodium (Na)-Total	DLM	
Duplicate	Uranium (U)-Total	DLM	
Duplicate	Zinc (Zn)-Total	DLM	
Matrix Spike	Nitrate (as N)	MS-B	
Matrix Spike	Sulfate (SO4)	MS-B	

Sample Parameter Qualifier Key:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLM	Detection Limit Adjusted due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis
SMI	Surrogate recovery could not be measured due to sample matrix interference.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
BTXS,F1-ED	Water	BTEX, Styrene and F1 (C6-C10)		EPA 5021/8015&8260 GC-MS & FID
C-DIS-ORG-ED	Water	Dissolved Organic Carbon		APHA 5310 B-Instrumental
CL-IC-ED	Water	Chloride by IC		APHA 4110 B-ION CHROMATOGRAPHY
F2,F3,F4-ED	Water	F2, F3, F4		EPA 3510/CCME PHC CWS-GC-FID
HG-D-L-CVAA-ED	Water	Mercury (Hg) - Dissolved		EPA 245.7 / EPA 245.1
HG-T-L-CVAA-ED	Water	Mercury (Hg)		EPA 245.7 / EPA 245.1
IB-BART-PB	Water	Iron Bacteria		BART Test Kit
BART Test Kit Analysis performed at PBR Laboratories Inc., Edmonton.				
IONBALANCE-ED	Water	Ion Balance Calculation		APHA 1030E
MET-D-CCMS-ED	Water	Dissolved Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
NAPHTHENIC-ACID-FM	Water	Naphthenic Acids by FTIR		Naphthenic Acids by FTIR, Syncrude, 1994
Dissolved naphthenic acids are solvent extracted from acidified aqueous samples using Dichloromethane prior to quantitation by Fourier Transform Infra-Red spectroscopy. Note that FTIR is not uniquely selective to naphthenic acids. If present, other carboxylic acids (e.g. humic acids, fulvic acids) may also be detected by this method.				
NH3-CFA-ED	Water	Ammonia in Water by Colour		APHA 4500 NH3-NITROGEN (AMMONIA)
This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.				
NO2+NO3-CALC-ED	Water	Nitrate+Nitrite		CALCULATION
NO2-IC-ED	Water	Nitrite as N by IC		APHA 4110 B-ION CHROMATOGRAPHY
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
NO3-IC-ED	Water	Nitrate as N by IC		APHA 4110 B-ION CHROMATOGRAPHY
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
PAH-CCME-CL	Water	CCME PAHs		EPA 3510/8270-GC/MS
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity		APHA 4500-H, 2510, 2320
All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)				
PHENOLS-4AAP-ED	Water	Phenols (4AAP)		AB ENV.06537-COLORIMETRIC
This analysis is carried out using procedures adapted from ENVIRODAT VMV 06537 689, Method Code 154, in "Methods Manual for Chemical Analysis of Water and Wastes" published by the Alberta Environmental Centre. This automated method is based on the distillation of phenol and subsequent reaction of the distillate with alkaline ferricyanide and 4-aminoantipyrine to form a red complex which is measured at 505 nm.				
SIO2-D-CALC-ED	Water	Dissolved Silicon (reported as Silica)		CALCULATION
SIO2-T-CALC-ED	Water	Total Silicon (reported as Silica)		CALCULATION
SO4-IC-ED	Water	Sulfate by IC		APHA 4110 B-ION CHROMATOGRAPHY
SOLIDS-TDS-ED	Water	Total Dissolved Solids		APHA 2540 C
SRB-BART-PB	Water	Sulphate Reducing Bacteria / BART method		BART TEST KIT
BART Test Kit				
TURBIDITY-ED	Water	Turbidity		APHA 2130 B-Nephelometer

** The indicated Method Reference is the closest nationally or internationally recognized reference for the applicable ALS test method. ALS methods may incorporate modifications from the specified reference to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
----------------------------	---------------------

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
Laboratory Definition Code	Laboratory Location			
ED		ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA		
PB		PBR LABORATORIES		
FM		ALS ENVIRONMENTAL - FORT MCMURRAY, ALBERTA, CANADA		
CL		ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA		

Chain of Custody Numbers:

M076076

GLOSSARY OF REPORT TERMS

Surr - Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

MU: Measurement Uncertainty. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 which gives a level of confidence of approximately 95%.

Bias: The reported method bias is the average long term deviation from the target value for a long term reference or control sample, measured in percent.

Zero values indicate no detectable method bias.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 1 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R2908669							
WG1925513-4	DUP	L1496560-7						
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
EthylBenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
o-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	10-AUG-14
m+p-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	10-AUG-14
Styrene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	50	10-AUG-14
F1(C6-C10)		<0.10	<0.10	RPD-NA	mg/L	N/A	30	10-AUG-14
WG1925513-8	DUP	L1497237-2						
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
EthylBenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
o-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	10-AUG-14
m+p-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	10-AUG-14
Styrene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	50	10-AUG-14
F1(C6-C10)		<0.10	<0.10	RPD-NA	mg/L	N/A	30	10-AUG-14
WG1925513-2	LCS							
Benzene			110.7		%		70-130	10-AUG-14
Toluene			88.3		%		70-130	10-AUG-14
EthylBenzene			94.1		%		70-130	10-AUG-14
o-Xylene			94.4		%		70-130	10-AUG-14
m+p-Xylene			95.5		%		70-130	10-AUG-14
Styrene			86.7		%		70-130	10-AUG-14
WG1925513-3	LCS							
F1(C6-C10)			109.3		%		70-130	10-AUG-14
WG1925513-6	LCS							
Benzene			114.5		%		70-130	10-AUG-14
Toluene			100.7		%		70-130	10-AUG-14
EthylBenzene			104.9		%		70-130	10-AUG-14
o-Xylene			105.5		%		70-130	10-AUG-14
m+p-Xylene			106.7		%		70-130	10-AUG-14
Styrene			93.5		%		70-130	10-AUG-14
WG1925513-7	LCS							
F1(C6-C10)			100.2		%		70-130	10-AUG-14
WG1925513-1	MB							



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 2 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R2908669							
WG1925513-1	MB							
Benzene			<0.00050		mg/L		0.0005	10-AUG-14
Toluene			<0.00050		mg/L		0.0005	10-AUG-14
EthylBenzene			<0.00050		mg/L		0.0005	10-AUG-14
o-Xylene			<0.00050		mg/L		0.0005	10-AUG-14
m+p-Xylene			<0.00050		mg/L		0.0005	10-AUG-14
Styrene			<0.0010		mg/L		0.001	10-AUG-14
F1(C6-C10)			<0.10		mg/L		0.1	10-AUG-14
Surrogate: 1,4-Difluorobenzene (SS)			101.5		%		70-130	10-AUG-14
Surrogate: 4-Bromofluorobenzene (SS)			97.0		%		70-130	10-AUG-14
Surrogate: 3,4-Dichlorotoluene (SS)			98.6		%		70-130	10-AUG-14
WG1925513-5	MB							
Benzene			<0.00050		mg/L		0.0005	10-AUG-14
Toluene			<0.00050		mg/L		0.0005	10-AUG-14
EthylBenzene			<0.00050		mg/L		0.0005	10-AUG-14
o-Xylene			<0.00050		mg/L		0.0005	10-AUG-14
m+p-Xylene			<0.00050		mg/L		0.0005	10-AUG-14
Styrene			<0.0010		mg/L		0.001	10-AUG-14
F1(C6-C10)			<0.10		mg/L		0.1	10-AUG-14
Surrogate: 1,4-Difluorobenzene (SS)			100.7		%		70-130	10-AUG-14
Surrogate: 4-Bromofluorobenzene (SS)			95.5		%		70-130	10-AUG-14
Surrogate: 3,4-Dichlorotoluene (SS)			92.1		%		70-130	10-AUG-14
C-DIS-ORG-ED		Water						
Batch	R2913968							
WG1928058-3	CVS							
Dissolved Organic Carbon			109.4		%		80-160	11-AUG-14
WG1928058-2	LCS							
Dissolved Organic Carbon			93.3		%		80-120	11-AUG-14
WG1928058-1	MB							
Dissolved Organic Carbon			<1.0		mg/L		1	11-AUG-14
CL-IC-ED		Water						
Batch	R2909357							
WG1924081-3	DUP	L1496589-8						
Chloride (Cl)		44.4	44.5		mg/L	0.2	20	04-AUG-14
WG1924081-2	LCS							
Chloride (Cl)			101.9		%		90-110	04-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 3 of 38

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-ED		Water						
Batch	R2909357							
WG1924081-5	LCS							
Chloride (Cl)			101.4		%		90-110	04-AUG-14
WG1924081-7	LCS							
Chloride (Cl)			102.2		%		90-110	04-AUG-14
WG1924081-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	04-AUG-14
WG1924081-6	MB							
Chloride (Cl)			<0.50		mg/L		0.5	04-AUG-14
WG1924081-8	MB							
Chloride (Cl)			<0.50		mg/L		0.5	04-AUG-14
WG1924081-4	MS	L1496589-8						
Chloride (Cl)			95.1		%		75-125	04-AUG-14
Batch	R2912274							
WG1926502-3	DUP	L1498061-9						
Chloride (Cl)		88.7	88.9		mg/L	0.3	20	08-AUG-14
WG1926502-5	DUP	L1498878-7						
Chloride (Cl)		<0.50	<0.50	RPD-NA	mg/L	N/A	20	08-AUG-14
WG1926502-11	LCS							
Chloride (Cl)			100.7		%		90-110	08-AUG-14
WG1926502-13	LCS							
Chloride (Cl)			101.6		%		90-110	08-AUG-14
WG1926502-15	LCS							
Chloride (Cl)			102.4		%		90-110	08-AUG-14
WG1926502-17	LCS							
Chloride (Cl)			102.4		%		90-110	08-AUG-14
WG1926502-2	LCS							
Chloride (Cl)			101.1		%		90-110	08-AUG-14
WG1926502-9	LCS							
Chloride (Cl)			101.7		%		90-110	08-AUG-14
WG1926502-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	08-AUG-14
WG1926502-10	MB							
Chloride (Cl)			<0.50		mg/L		0.5	08-AUG-14
WG1926502-12	MB							
Chloride (Cl)			<0.50		mg/L		0.5	08-AUG-14
WG1926502-14	MB							
Chloride (Cl)			<0.50		mg/L		0.5	08-AUG-14
WG1926502-16	MB							



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 4 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-ED								
	Water							
Batch	R2912274							
WG1926502-16	MB							
Chloride (Cl)			<0.50		mg/L		0.5	08-AUG-14
WG1926502-18	MB							
Chloride (Cl)			<0.50		mg/L		0.5	08-AUG-14
WG1926502-4	MS	L1498061-9						
Chloride (Cl)			92.7		%		75-125	08-AUG-14
WG1926502-6	MS	L1498878-7						
Chloride (Cl)			102.2		%		75-125	08-AUG-14
F2,F3,F4-ED								
	Water							
Batch	R2912224							
WG1925006-2	LCS							
F2 (>C10-C16)			86.1		%		65-135	07-AUG-14
F3 (C16-C34)			96.8		%		65-135	07-AUG-14
F4 (C34-C50)			88.1		%		65-135	07-AUG-14
WG1925006-5	LCS							
F2 (>C10-C16)			97.2		%		65-135	07-AUG-14
F3 (C16-C34)			95.8		%		65-135	07-AUG-14
F4 (C34-C50)			91.1		%		65-135	07-AUG-14
WG1925006-1	MB							
F2 (>C10-C16)			<0.25		mg/L		0.25	07-AUG-14
F3 (C16-C34)			<0.25		mg/L		0.25	07-AUG-14
F4 (C34-C50)			<0.25		mg/L		0.25	07-AUG-14
Surrogate: 2-Bromobenzotrifluoride			95.2		%		50-150	07-AUG-14
WG1925006-4	MB							
F2 (>C10-C16)			<0.25		mg/L		0.25	07-AUG-14
F3 (C16-C34)			<0.25		mg/L		0.25	07-AUG-14
F4 (C34-C50)			<0.25		mg/L		0.25	07-AUG-14
Surrogate: 2-Bromobenzotrifluoride			109.5		%		50-150	07-AUG-14
WG1925006-6	MS	L1496613-6						
F2 (>C10-C16)			97.8		%		50-150	07-AUG-14
F3 (C16-C34)			98.1		%		50-150	07-AUG-14
F4 (C34-C50)			93.1		%		50-150	07-AUG-14
HG-D-L-CVAA-ED								
	Water							



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 5 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-L-CVAA-ED								
	Water							
Batch	R2919287							
WG1930358-47	DUP	L1496580-1						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	14-AUG-14
WG1930358-46	LCS							
Mercury (Hg)-Dissolved			86.4		%		80-120	14-AUG-14
WG1930358-50	LCS							
Mercury (Hg)-Dissolved			87.2		%		80-120	14-AUG-14
WG1930358-54	LCS							
Mercury (Hg)-Dissolved			98.6		%		80-120	14-AUG-14
WG1930358-58	LCS							
Mercury (Hg)-Dissolved			94.4		%		80-120	14-AUG-14
WG1930358-45	MB							
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	14-AUG-14
WG1930358-49	MB							
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	14-AUG-14
WG1930358-53	MB							
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	14-AUG-14
WG1930358-57	MB							
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	14-AUG-14
WG1930358-48	MS	L1496580-1						
Mercury (Hg)-Dissolved			83.8		%		70-130	14-AUG-14
HG-T-L-CVAA-ED								
	Water							
Batch	R2919287							
WG1930360-3	DUP	L1494613-1						
Mercury (Hg)-Total		0.0000051	0.0000062		mg/L	19	20	14-AUG-14
WG1930360-2	LCS							
Mercury (Hg)-Total			86.3		%		80-120	14-AUG-14
WG1930360-6	LCS							
Mercury (Hg)-Total			92.3		%		80-120	14-AUG-14
WG1930360-1	MB							
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	14-AUG-14
WG1930360-5	MB							
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	14-AUG-14
WG1930360-4	MS	L1494613-1						
Mercury (Hg)-Total			83.3		%		70-130	14-AUG-14
MET-D-CCMS-ED								
	Water							



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 6 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2918051							
WG1930314-11 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			102.6		%		80-120	13-AUG-14
Antimony (Sb)-Dissolved			98.5		%		80-120	13-AUG-14
Arsenic (As)-Dissolved			100.4		%		80-120	13-AUG-14
Barium (Ba)-Dissolved			101.4		%		80-120	13-AUG-14
Beryllium (Be)-Dissolved			101.9		%		80-120	13-AUG-14
Bismuth (Bi)-Dissolved			104.4		%		80-120	13-AUG-14
Boron (B)-Dissolved			101.0		%		80-120	13-AUG-14
Cadmium (Cd)-Dissolved			101.5		%		80-120	13-AUG-14
Calcium (Ca)-Dissolved			102.2		%		80-120	13-AUG-14
Chromium (Cr)-Dissolved			101.3		%		80-120	13-AUG-14
Cobalt (Co)-Dissolved			100.5		%		80-120	13-AUG-14
Copper (Cu)-Dissolved			98.9		%		80-120	13-AUG-14
Lead (Pb)-Dissolved			104.0		%		80-120	13-AUG-14
Lithium (Li)-Dissolved			105.3		%		80-120	13-AUG-14
Magnesium (Mg)-Dissolved			106.3		%		80-120	13-AUG-14
Manganese (Mn)-Dissolved			102.5		%		80-120	13-AUG-14
Molybdenum (Mo)-Dissolved			102.2		%		80-120	13-AUG-14
Nickel (Ni)-Dissolved			100.2		%		80-120	13-AUG-14
Potassium (K)-Dissolved			103.7		%		80-120	13-AUG-14
Selenium (Se)-Dissolved			100.5		%		80-120	13-AUG-14
Silicon (Si)-Dissolved			99.2		%		80-120	13-AUG-14
Silver (Ag)-Dissolved			89.5		%		80-120	13-AUG-14
Sodium (Na)-Dissolved			101.5		%		80-120	13-AUG-14
Strontium (Sr)-Dissolved			98.7		%		80-120	13-AUG-14
Thallium (Tl)-Dissolved			108.1		%		80-120	13-AUG-14
Titanium (Ti)-Dissolved			104.7		%		80-120	13-AUG-14
Tin (Sn)-Dissolved			100.3		%		80-120	13-AUG-14
Uranium (U)-Dissolved			102.0		%		80-120	13-AUG-14
Vanadium (V)-Dissolved			102.3		%		80-120	13-AUG-14
Zinc (Zn)-Dissolved			100.0		%		80-120	13-AUG-14
WG1930314-14 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			104.2		%		80-120	13-AUG-14
Antimony (Sb)-Dissolved			101.5		%		80-120	13-AUG-14
Arsenic (As)-Dissolved			101.1		%		80-120	13-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 7 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2918051							
WG1930314-14 CRM	ED-HIGH-WATRM							
Barium (Ba)-Dissolved			99.6		%		80-120	13-AUG-14
Beryllium (Be)-Dissolved			102.4		%		80-120	13-AUG-14
Bismuth (Bi)-Dissolved			102.9		%		80-120	13-AUG-14
Boron (B)-Dissolved			99.0		%		80-120	13-AUG-14
Cadmium (Cd)-Dissolved			101.8		%		80-120	13-AUG-14
Calcium (Ca)-Dissolved			101.5		%		80-120	13-AUG-14
Chromium (Cr)-Dissolved			102.8		%		80-120	13-AUG-14
Cobalt (Co)-Dissolved			101.0		%		80-120	13-AUG-14
Copper (Cu)-Dissolved			99.7		%		80-120	13-AUG-14
Lead (Pb)-Dissolved			102.8		%		80-120	13-AUG-14
Lithium (Li)-Dissolved			104.7		%		80-120	13-AUG-14
Magnesium (Mg)-Dissolved			105.6		%		80-120	13-AUG-14
Manganese (Mn)-Dissolved			101.4		%		80-120	13-AUG-14
Molybdenum (Mo)-Dissolved			100.9		%		80-120	13-AUG-14
Nickel (Ni)-Dissolved			100.1		%		80-120	13-AUG-14
Potassium (K)-Dissolved			104.9		%		80-120	13-AUG-14
Selenium (Se)-Dissolved			101.2		%		80-120	13-AUG-14
Silicon (Si)-Dissolved			97.9		%		80-120	13-AUG-14
Silver (Ag)-Dissolved			92.8		%		80-120	13-AUG-14
Sodium (Na)-Dissolved			101.5		%		80-120	13-AUG-14
Strontium (Sr)-Dissolved			98.2		%		80-120	13-AUG-14
Thallium (Tl)-Dissolved			107.6		%		80-120	13-AUG-14
Titanium (Ti)-Dissolved			99.5		%		80-120	13-AUG-14
Tin (Sn)-Dissolved			102.8		%		80-120	13-AUG-14
Uranium (U)-Dissolved			100.8		%		80-120	13-AUG-14
Vanadium (V)-Dissolved			103.0		%		80-120	13-AUG-14
Zinc (Zn)-Dissolved			97.3		%		80-120	13-AUG-14
WG1930314-2 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			107.7		%		80-120	13-AUG-14
Antimony (Sb)-Dissolved			103.0		%		80-120	13-AUG-14
Arsenic (As)-Dissolved			103.3		%		80-120	13-AUG-14
Barium (Ba)-Dissolved			105.9		%		80-120	13-AUG-14
Beryllium (Be)-Dissolved			103.8		%		80-120	13-AUG-14
Bismuth (Bi)-Dissolved			103.1		%		80-120	13-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 8 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2918051							
WG1930314-2 CRM	ED-HIGH-WATRM							
Boron (B)-Dissolved			119.9		%		80-120	13-AUG-14
Cadmium (Cd)-Dissolved			106.1		%		80-120	13-AUG-14
Calcium (Ca)-Dissolved			105.5		%		80-120	13-AUG-14
Chromium (Cr)-Dissolved			106.9		%		80-120	13-AUG-14
Cobalt (Co)-Dissolved			104.5		%		80-120	13-AUG-14
Copper (Cu)-Dissolved			104.0		%		80-120	13-AUG-14
Lead (Pb)-Dissolved			103.7		%		80-120	13-AUG-14
Lithium (Li)-Dissolved			108.0		%		80-120	13-AUG-14
Magnesium (Mg)-Dissolved			106.2		%		80-120	13-AUG-14
Manganese (Mn)-Dissolved			106.0		%		80-120	13-AUG-14
Molybdenum (Mo)-Dissolved			103.7		%		80-120	13-AUG-14
Nickel (Ni)-Dissolved			104.4		%		80-120	13-AUG-14
Potassium (K)-Dissolved			108.4		%		80-120	13-AUG-14
Selenium (Se)-Dissolved			104.2		%		80-120	13-AUG-14
Silicon (Si)-Dissolved			106.2		%		80-120	13-AUG-14
Silver (Ag)-Dissolved			95.4		%		80-120	13-AUG-14
Sodium (Na)-Dissolved			109.6		%		80-120	13-AUG-14
Strontium (Sr)-Dissolved			101.1		%		80-120	13-AUG-14
Thallium (Tl)-Dissolved			107.4		%		80-120	13-AUG-14
Titanium (Ti)-Dissolved			103.7		%		80-120	13-AUG-14
Tin (Sn)-Dissolved			105.7		%		80-120	13-AUG-14
Uranium (U)-Dissolved			101.7		%		80-120	13-AUG-14
Vanadium (V)-Dissolved			106.3		%		80-120	13-AUG-14
Zinc (Zn)-Dissolved			101.9		%		80-120	13-AUG-14
WG1930314-5 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			103.9		%		80-120	13-AUG-14
Antimony (Sb)-Dissolved			99.0		%		80-120	13-AUG-14
Arsenic (As)-Dissolved			100.5		%		80-120	13-AUG-14
Barium (Ba)-Dissolved			99.5		%		80-120	13-AUG-14
Beryllium (Be)-Dissolved			103.9		%		80-120	13-AUG-14
Bismuth (Bi)-Dissolved			103.7		%		80-120	13-AUG-14
Boron (B)-Dissolved			109.1		%		80-120	13-AUG-14
Cadmium (Cd)-Dissolved			102.4		%		80-120	13-AUG-14
Calcium (Ca)-Dissolved			102.9		%		80-120	13-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 9 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2918051							
WG1930314-5 CRM	ED-HIGH-WATRM							
Chromium (Cr)-Dissolved			103.7		%		80-120	13-AUG-14
Cobalt (Co)-Dissolved			101.3		%		80-120	13-AUG-14
Copper (Cu)-Dissolved			101.1		%		80-120	13-AUG-14
Lead (Pb)-Dissolved			102.6		%		80-120	13-AUG-14
Lithium (Li)-Dissolved			104.9		%		80-120	13-AUG-14
Magnesium (Mg)-Dissolved			105.9		%		80-120	13-AUG-14
Manganese (Mn)-Dissolved			103.1		%		80-120	13-AUG-14
Molybdenum (Mo)-Dissolved			102.3		%		80-120	13-AUG-14
Nickel (Ni)-Dissolved			100.6		%		80-120	13-AUG-14
Potassium (K)-Dissolved			101.8		%		80-120	13-AUG-14
Selenium (Se)-Dissolved			101.3		%		80-120	13-AUG-14
Silicon (Si)-Dissolved			100.5		%		80-120	13-AUG-14
Silver (Ag)-Dissolved			93.7		%		80-120	13-AUG-14
Sodium (Na)-Dissolved			102.5		%		80-120	13-AUG-14
Strontium (Sr)-Dissolved			99.7		%		80-120	13-AUG-14
Thallium (Tl)-Dissolved			110.3		%		80-120	13-AUG-14
Titanium (Ti)-Dissolved			113.1		%		80-120	13-AUG-14
Tin (Sn)-Dissolved			103.8		%		80-120	13-AUG-14
Uranium (U)-Dissolved			103.3		%		80-120	13-AUG-14
Vanadium (V)-Dissolved			103.6		%		80-120	13-AUG-14
Zinc (Zn)-Dissolved			99.3		%		80-120	13-AUG-14
WG1930314-12 DUP		L1498340-1						
Aluminum (Al)-Dissolved		0.0040	0.0043		mg/L	8.2	20	13-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-14
Arsenic (As)-Dissolved		0.00014	0.00014		mg/L	1.2	20	13-AUG-14
Barium (Ba)-Dissolved		0.0338	0.0343		mg/L	1.4	20	13-AUG-14
Beryllium (Be)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-14
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Boron (B)-Dissolved		0.438	0.453		mg/L	3.5	20	13-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	13-AUG-14
Calcium (Ca)-Dissolved		2.77	2.81		mg/L	1.4	20	13-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-14
Cobalt (Co)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 10 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2918051							
WG1930314-12	DUP	L1498340-1						
Copper (Cu)-Dissolved		0.00906	0.00913		mg/L	0.8	20	13-AUG-14
Iron (Fe)-Dissolved		0.038	0.038		mg/L	0.5	20	13-AUG-14
Lead (Pb)-Dissolved		0.000716	0.000742		mg/L	3.6	20	13-AUG-14
Lithium (Li)-Dissolved		0.0910	0.0942		mg/L	3.4	20	13-AUG-14
Magnesium (Mg)-Dissolved		0.73	0.74		mg/L	0.6	20	13-AUG-14
Manganese (Mn)-Dissolved		0.00422	0.00427		mg/L	1.2	20	13-AUG-14
Molybdenum (Mo)-Dissolved		0.00156	0.00157		mg/L	0.4	20	13-AUG-14
Nickel (Ni)-Dissolved		0.00015	0.00015		mg/L	2.3	20	13-AUG-14
Potassium (K)-Dissolved		1.72	1.89		mg/L	9.3	20	13-AUG-14
Selenium (Se)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-14
Silicon (Si)-Dissolved		3.90	4.03		mg/L	3.4	20	13-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	13-AUG-14
Sodium (Na)-Dissolved		260	271		mg/L	4.1	20	13-AUG-14
Strontium (Sr)-Dissolved		0.0618	0.0624		mg/L	0.9	20	13-AUG-14
Thallium (Tl)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	13-AUG-14
Titanium (Ti)-Dissolved		0.00471	0.00439		mg/L	7.1	20	13-AUG-14
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-14
Uranium (U)-Dissolved		0.000077	0.000079		mg/L	3.2	20	13-AUG-14
Vanadium (V)-Dissolved		0.00026	0.00019	J	mg/L	0.00007	0.0002	13-AUG-14
Zinc (Zn)-Dissolved		0.108	0.108		mg/L	0.8	20	13-AUG-14
WG1930314-15	DUP	L1498485-18						
Aluminum (Al)-Dissolved		<0.020	<0.020	RPD-NA	mg/L	N/A	20	13-AUG-14
Antimony (Sb)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	13-AUG-14
Arsenic (As)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	13-AUG-14
Barium (Ba)-Dissolved		0.0468	0.0473		mg/L	1.1	20	13-AUG-14
Beryllium (Be)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	13-AUG-14
Bismuth (Bi)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	13-AUG-14
Boron (B)-Dissolved		13.9	15.3		mg/L	9.6	20	13-AUG-14
Cadmium (Cd)-Dissolved		0.00021	0.00022		mg/L	2.0	20	13-AUG-14
Calcium (Ca)-Dissolved		217	226		mg/L	3.9	20	13-AUG-14
Chromium (Cr)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	13-AUG-14
Cobalt (Co)-Dissolved		0.0052	0.0054		mg/L	2.4	20	13-AUG-14
Copper (Cu)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	13-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 11 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2918051							
WG1930314-15 DUP		L1498485-18						
Iron (Fe)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	20	13-AUG-14
Lead (Pb)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	13-AUG-14
Lithium (Li)-Dissolved		0.111	0.119		mg/L	6.8	20	13-AUG-14
Magnesium (Mg)-Dissolved		61.7	62.0		mg/L	0.5	20	13-AUG-14
Manganese (Mn)-Dissolved		1.74	1.77		mg/L	1.7	20	13-AUG-14
Molybdenum (Mo)-Dissolved		0.0014	0.0014		mg/L	4.6	20	13-AUG-14
Nickel (Ni)-Dissolved		0.0248	0.0246		mg/L	0.9	20	13-AUG-14
Potassium (K)-Dissolved		6.9	7.0		mg/L	1.8	20	13-AUG-14
Selenium (Se)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	13-AUG-14
Silicon (Si)-Dissolved		3.7	3.8		mg/L	2.6	20	13-AUG-14
Silver (Ag)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	13-AUG-14
Sodium (Na)-Dissolved		401	410		mg/L	2.1	20	13-AUG-14
Strontium (Sr)-Dissolved		2.03	2.07		mg/L	2.2	20	13-AUG-14
Thallium (Tl)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	13-AUG-14
Titanium (Ti)-Dissolved		<0.0060	<0.0060	RPD-NA	mg/L	N/A	20	13-AUG-14
Tin (Sn)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	13-AUG-14
Uranium (U)-Dissolved		0.00737	0.00721		mg/L	2.1	20	13-AUG-14
Vanadium (V)-Dissolved		0.0024	0.0022		mg/L	8.6	20	13-AUG-14
Zinc (Zn)-Dissolved		<0.020	<0.020	RPD-NA	mg/L	N/A	20	13-AUG-14
WG1930314-3 DUP		L1489910-1						
Aluminum (Al)-Dissolved		0.0035	0.0032		mg/L	7.1	20	13-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-14
Arsenic (As)-Dissolved		0.00046	0.00041		mg/L	11	20	13-AUG-14
Barium (Ba)-Dissolved		0.0741	0.0746		mg/L	0.6	20	13-AUG-14
Beryllium (Be)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-AUG-14
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Boron (B)-Dissolved		0.063	0.063		mg/L	1.0	20	13-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	13-AUG-14
Calcium (Ca)-Dissolved		84.7	83.9		mg/L	0.9	20	13-AUG-14
Chromium (Cr)-Dissolved		0.00011	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-14
Cobalt (Co)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-14
Copper (Cu)-Dissolved		0.00045	0.00045		mg/L	1.7	20	13-AUG-14
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	13-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 12 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2918051							
WG1930314-3	DUP	L1489910-1						
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Lithium (Li)-Dissolved		0.0095	0.0091		mg/L	4.4	20	13-AUG-14
Magnesium (Mg)-Dissolved		15.0	14.8		mg/L	1.3	20	13-AUG-14
Manganese (Mn)-Dissolved		0.000261	0.000260		mg/L	0.3	20	13-AUG-14
Molybdenum (Mo)-Dissolved		0.000406	0.000421		mg/L	3.6	20	13-AUG-14
Nickel (Ni)-Dissolved		0.00092	0.00094		mg/L	1.8	20	13-AUG-14
Potassium (K)-Dissolved		1.51	1.49		mg/L	1.2	20	13-AUG-14
Selenium (Se)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-14
Silicon (Si)-Dissolved		1.34	1.33		mg/L	0.8	20	13-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	13-AUG-14
Sodium (Na)-Dissolved		12.5	12.2		mg/L	2.3	20	13-AUG-14
Strontium (Sr)-Dissolved		0.165	0.161		mg/L	2.9	20	13-AUG-14
Thallium (Tl)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Titanium (Ti)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	13-AUG-14
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-14
Uranium (U)-Dissolved		0.000356	0.000364		mg/L	2.1	20	13-AUG-14
Vanadium (V)-Dissolved		0.00024	0.00021		mg/L	16	20	13-AUG-14
Zinc (Zn)-Dissolved		0.0024	0.0042	J	mg/L	0.0019	0.002	13-AUG-14
WG1930314-6	DUP	L1498061-1						
Aluminum (Al)-Dissolved		0.0016	0.0016		mg/L	0.9	20	13-AUG-14
Antimony (Sb)-Dissolved		<0.00010	0.00011	RPD-NA	mg/L	N/A	20	13-AUG-14
Arsenic (As)-Dissolved		0.00032	0.00031		mg/L	4.7	20	13-AUG-14
Barium (Ba)-Dissolved		0.116	0.120		mg/L	2.9	20	13-AUG-14
Beryllium (Be)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-AUG-14
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Boron (B)-Dissolved		0.105	0.103		mg/L	2.1	20	13-AUG-14
Cadmium (Cd)-Dissolved		0.000035	0.000039		mg/L	11	20	13-AUG-14
Calcium (Ca)-Dissolved		202	201		mg/L	0.9	20	13-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-14
Cobalt (Co)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-14
Copper (Cu)-Dissolved		0.00751	0.00756		mg/L	0.6	20	13-AUG-14
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	13-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 13 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2918051							
WG1930314-6	DUP	L1498061-1						
Lithium (Li)-Dissolved		0.0942	0.0932		mg/L	1.1	20	13-AUG-14
Magnesium (Mg)-Dissolved		61.0	61.6		mg/L	0.9	20	13-AUG-14
Manganese (Mn)-Dissolved		0.00436	0.00442		mg/L	1.4	20	13-AUG-14
Molybdenum (Mo)-Dissolved		0.000829	0.000828		mg/L	0.0	20	13-AUG-14
Nickel (Ni)-Dissolved		0.00165	0.00162		mg/L	1.8	20	13-AUG-14
Potassium (K)-Dissolved		2.55	2.65		mg/L	3.7	20	13-AUG-14
Selenium (Se)-Dissolved		0.00016	0.00015		mg/L	7.3	20	13-AUG-14
Silicon (Si)-Dissolved		9.22	9.15		mg/L	0.8	20	13-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	13-AUG-14
Sodium (Na)-Dissolved		21.7	21.7		mg/L	0.2	20	13-AUG-14
Strontium (Sr)-Dissolved		0.909	0.925		mg/L	1.7	20	13-AUG-14
Thallium (Tl)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Titanium (Ti)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	13-AUG-14
Tin (Sn)-Dissolved		0.00033	0.00031		mg/L	5.9	20	13-AUG-14
Uranium (U)-Dissolved		0.0282	0.0286		mg/L	1.7	20	13-AUG-14
Vanadium (V)-Dissolved		0.00015	0.00015		mg/L	1.0	20	13-AUG-14
Zinc (Zn)-Dissolved		0.0035	0.0040		mg/L	14	20	13-AUG-14
WG1930314-9	DUP	L1498067-4						
Aluminum (Al)-Dissolved		0.0035	0.0037		mg/L	5.3	20	13-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-14
Arsenic (As)-Dissolved		0.00043	0.00045		mg/L	4.1	20	13-AUG-14
Barium (Ba)-Dissolved		0.0835	0.0787		mg/L	5.9	20	13-AUG-14
Beryllium (Be)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-14
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Boron (B)-Dissolved		0.066	0.066		mg/L	0.2	20	13-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	13-AUG-14
Calcium (Ca)-Dissolved		81.2	82.7		mg/L	1.8	20	13-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-14
Cobalt (Co)-Dissolved		0.00011	0.00012		mg/L	8.7	20	13-AUG-14
Copper (Cu)-Dissolved		0.00043	0.00040		mg/L	7.3	20	13-AUG-14
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	13-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Lithium (Li)-Dissolved		0.0090	0.0092		mg/L	1.2	20	13-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 14 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2918051							
WG1930314-9	DUP	L1498067-4						
Magnesium (Mg)-Dissolved		15.6	15.1		mg/L	3.2	20	13-AUG-14
Manganese (Mn)-Dissolved		0.0168	0.0166		mg/L	1.1	20	13-AUG-14
Molybdenum (Mo)-Dissolved		0.000266	0.000261		mg/L	1.9	20	13-AUG-14
Nickel (Ni)-Dissolved		0.00110	0.00103		mg/L	6.7	20	13-AUG-14
Potassium (K)-Dissolved		1.59	1.57		mg/L	1.2	20	13-AUG-14
Selenium (Se)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-14
Silicon (Si)-Dissolved		1.98	1.99		mg/L	0.6	20	13-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	13-AUG-14
Sodium (Na)-Dissolved		11.7	11.6		mg/L	0.0	20	13-AUG-14
Strontium (Sr)-Dissolved		0.151	0.156		mg/L	3.1	20	13-AUG-14
Thallium (Tl)-Dissolved		0.000011	0.000010		mg/L	8.4	20	13-AUG-14
Titanium (Ti)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	13-AUG-14
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-14
Uranium (U)-Dissolved		0.000360	0.000355		mg/L	1.6	20	13-AUG-14
Vanadium (V)-Dissolved		0.00033	0.00029		mg/L	11	20	13-AUG-14
Zinc (Zn)-Dissolved		0.0023	0.0013	J	mg/L	0.0010	0.002	13-AUG-14
WG1930314-1	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	13-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	13-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	13-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	13-AUG-14
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	13-AUG-14
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	13-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	13-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	13-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	13-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	13-AUG-14
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	13-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	13-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	13-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	13-AUG-14
Lithium (Li)-Dissolved			<0.0030		mg/L		0.003	13-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	13-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 15 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2918051							
WG1930314-1 MB								
	Manganese (Mn)-Dissolved		<0.000050		mg/L		0.00005	13-AUG-14
	Molybdenum (Mo)-Dissolved		<0.000050		mg/L		0.00005	13-AUG-14
	Nickel (Ni)-Dissolved		<0.00010		mg/L		0.0001	13-AUG-14
	Potassium (K)-Dissolved		<0.050		mg/L		0.05	13-AUG-14
	Selenium (Se)-Dissolved		<0.00010		mg/L		0.0001	13-AUG-14
	Silicon (Si)-Dissolved		<0.050		mg/L		0.05	13-AUG-14
	Silver (Ag)-Dissolved		<0.000010		mg/L		0.00001	13-AUG-14
	Sodium (Na)-Dissolved		<0.050		mg/L		0.05	13-AUG-14
	Strontium (Sr)-Dissolved		<0.00010		mg/L		0.0001	13-AUG-14
	Thallium (Tl)-Dissolved		<0.000010		mg/L		0.00001	13-AUG-14
	Titanium (Ti)-Dissolved		<0.00030		mg/L		0.0003	13-AUG-14
	Tin (Sn)-Dissolved		<0.00010		mg/L		0.0001	13-AUG-14
	Uranium (U)-Dissolved		<0.000010		mg/L		0.00001	13-AUG-14
	Vanadium (V)-Dissolved		<0.00010		mg/L		0.0001	13-AUG-14
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	13-AUG-14
WG1930314-10 MB								
	Aluminum (Al)-Dissolved		<0.0010		mg/L		0.001	13-AUG-14
	Antimony (Sb)-Dissolved		<0.00010		mg/L		0.0001	13-AUG-14
	Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	13-AUG-14
	Barium (Ba)-Dissolved		<0.000050		mg/L		0.00005	13-AUG-14
	Beryllium (Be)-Dissolved		<0.00010		mg/L		0.0001	13-AUG-14
	Bismuth (Bi)-Dissolved		<0.000050		mg/L		0.00005	13-AUG-14
	Boron (B)-Dissolved		<0.010		mg/L		0.01	13-AUG-14
	Cadmium (Cd)-Dissolved		<0.000010		mg/L		0.00001	13-AUG-14
	Calcium (Ca)-Dissolved		<0.020		mg/L		0.02	13-AUG-14
	Chromium (Cr)-Dissolved		<0.00010		mg/L		0.0001	13-AUG-14
	Cobalt (Co)-Dissolved		<0.00010		mg/L		0.0001	13-AUG-14
	Copper (Cu)-Dissolved		<0.00010		mg/L		0.0001	13-AUG-14
	Iron (Fe)-Dissolved		<0.010		mg/L		0.01	13-AUG-14
	Lead (Pb)-Dissolved		<0.000050		mg/L		0.00005	13-AUG-14
	Lithium (Li)-Dissolved		<0.0030		mg/L		0.003	13-AUG-14
	Magnesium (Mg)-Dissolved		<0.0050		mg/L		0.005	13-AUG-14
	Manganese (Mn)-Dissolved		<0.000050		mg/L		0.00005	13-AUG-14
	Molybdenum (Mo)-Dissolved		<0.000050		mg/L		0.00005	13-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 16 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2918051							
WG1930314-10 MB								
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	13-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	13-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	13-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	13-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	13-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	13-AUG-14
Strontium (Sr)-Dissolved			<0.00010		mg/L		0.0001	13-AUG-14
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	13-AUG-14
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	13-AUG-14
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	13-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	13-AUG-14
Vanadium (V)-Dissolved			<0.00010		mg/L		0.0001	13-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	13-AUG-14
WG1930314-4 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	13-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	13-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	13-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	13-AUG-14
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	13-AUG-14
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	13-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	13-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	13-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	13-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	13-AUG-14
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	13-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	13-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	13-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	13-AUG-14
Lithium (Li)-Dissolved			<0.0030		mg/L		0.003	13-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	13-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	13-AUG-14
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	13-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	13-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	13-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 17 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2918051							
WG1930314-4 MB								
	Selenium (Se)-Dissolved		<0.00010		mg/L		0.0001	13-AUG-14
	Silicon (Si)-Dissolved		<0.050		mg/L		0.05	13-AUG-14
	Silver (Ag)-Dissolved		<0.000010		mg/L		0.00001	13-AUG-14
	Sodium (Na)-Dissolved		<0.050		mg/L		0.05	13-AUG-14
	Strontium (Sr)-Dissolved		<0.00010		mg/L		0.0001	13-AUG-14
	Thallium (Tl)-Dissolved		<0.000010		mg/L		0.00001	13-AUG-14
	Titanium (Ti)-Dissolved		<0.00030		mg/L		0.0003	13-AUG-14
	Tin (Sn)-Dissolved		<0.00010		mg/L		0.0001	13-AUG-14
	Uranium (U)-Dissolved		<0.000010		mg/L		0.00001	13-AUG-14
	Vanadium (V)-Dissolved		<0.00010		mg/L		0.0001	13-AUG-14
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	13-AUG-14
WG1930314-7 MB								
	Aluminum (Al)-Dissolved		<0.0010		mg/L		0.001	13-AUG-14
	Antimony (Sb)-Dissolved		<0.00010		mg/L		0.0001	13-AUG-14
	Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	13-AUG-14
	Barium (Ba)-Dissolved		<0.000050		mg/L		0.00005	13-AUG-14
	Beryllium (Be)-Dissolved		<0.00010		mg/L		0.0001	13-AUG-14
	Bismuth (Bi)-Dissolved		<0.000050		mg/L		0.00005	13-AUG-14
	Boron (B)-Dissolved		<0.010		mg/L		0.01	13-AUG-14
	Cadmium (Cd)-Dissolved		<0.000010		mg/L		0.00001	13-AUG-14
	Calcium (Ca)-Dissolved		<0.020		mg/L		0.02	13-AUG-14
	Chromium (Cr)-Dissolved		<0.00010		mg/L		0.0001	13-AUG-14
	Cobalt (Co)-Dissolved		<0.00010		mg/L		0.0001	13-AUG-14
	Copper (Cu)-Dissolved		<0.00010		mg/L		0.0001	13-AUG-14
	Iron (Fe)-Dissolved		<0.010		mg/L		0.01	13-AUG-14
	Lead (Pb)-Dissolved		<0.000050		mg/L		0.00005	13-AUG-14
	Lithium (Li)-Dissolved		<0.0030		mg/L		0.003	13-AUG-14
	Magnesium (Mg)-Dissolved		<0.0050		mg/L		0.005	13-AUG-14
	Manganese (Mn)-Dissolved		<0.000050		mg/L		0.00005	13-AUG-14
	Molybdenum (Mo)-Dissolved		<0.000050		mg/L		0.00005	13-AUG-14
	Nickel (Ni)-Dissolved		<0.00010		mg/L		0.0001	13-AUG-14
	Potassium (K)-Dissolved		<0.050		mg/L		0.05	13-AUG-14
	Selenium (Se)-Dissolved		<0.00010		mg/L		0.0001	13-AUG-14
	Silicon (Si)-Dissolved		<0.050		mg/L		0.05	13-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 18 of 38

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2918051							
WG1930314-7 MB								
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	13-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	13-AUG-14
Strontium (Sr)-Dissolved			<0.00010		mg/L		0.0001	13-AUG-14
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	13-AUG-14
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	13-AUG-14
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	13-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	13-AUG-14
Vanadium (V)-Dissolved			<0.00010		mg/L		0.0001	13-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	13-AUG-14
Batch	R2918380							
WG1930772-10 CRM	ED-HIGH-WATRM							
Boron (B)-Dissolved			99.9		%		80-120	14-AUG-14
WG1930772-12 CRM	ED-HIGH-WATRM							
Boron (B)-Dissolved			105.0		%		80-120	14-AUG-14
WG1930772-2 CRM	ED-HIGH-WATRM							
Boron (B)-Dissolved			102.5		%		80-120	14-AUG-14
WG1930772-6 CRM	ED-HIGH-WATRM							
Boron (B)-Dissolved			101.2		%		80-120	14-AUG-14
WG1930772-8 CRM	ED-HIGH-WATRM							
Boron (B)-Dissolved			99.6		%		80-120	14-AUG-14
WG1930772-13 DUP	L1499211-3							
Boron (B)-Dissolved		0.169	0.158		mg/L	6.7	20	14-AUG-14
WG1930772-14 DUP	L1496739-3							
Boron (B)-Dissolved		0.175	0.175		mg/L	0.2	20	14-AUG-14
WG1930772-15 DUP	L1495473-1							
Boron (B)-Dissolved		0.034	0.033		mg/L	3.2	20	14-AUG-14
WG1930772-16 DUP	L1498894-7							
Boron (B)-Dissolved		0.059	0.054		mg/L	8.2	20	14-AUG-14
WG1930772-17 DUP	L1498946-16							
Boron (B)-Dissolved		0.337	0.341		mg/L	1.2	20	14-AUG-14
WG1930772-18 DUP	L1499214-3							
Boron (B)-Dissolved		0.792	0.749		mg/L	5.5	20	14-AUG-14
WG1930772-1 MB								
Boron (B)-Dissolved			<0.010		mg/L		0.01	14-AUG-14
WG1930772-3 MB								
Boron (B)-Dissolved			<0.010		mg/L		0.01	14-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 19 of 38

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2918380							
WG1930772-5 MB								
Boron (B)-Dissolved			<0.010		mg/L		0.01	14-AUG-14
WG1930772-7 MB								
Boron (B)-Dissolved			<0.010		mg/L		0.01	14-AUG-14
WG1930772-9 MB								
Boron (B)-Dissolved			<0.010		mg/L		0.01	14-AUG-14
MET-T-CCMS-ED		Water						
Batch	R2912618							
WG1925500-7 DUP		L1496613-1						
Antimony (Sb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-AUG-14
Arsenic (As)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-AUG-14
Barium (Ba)-Total		0.127	0.127		mg/L	0.1	20	10-AUG-14
Boron (B)-Total		1.36	1.38		mg/L	1.5	20	10-AUG-14
Cadmium (Cd)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	10-AUG-14
Calcium (Ca)-Total		37.7	37.7		mg/L	0.2	20	10-AUG-14
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	10-AUG-14
Copper (Cu)-Total		0.0020	0.0022		mg/L	12	20	10-AUG-14
Iron (Fe)-Total		0.763	0.864		mg/L	12	20	10-AUG-14
Lead (Pb)-Total		0.00201	0.00174		mg/L	14	20	10-AUG-14
Magnesium (Mg)-Total		32.4	31.8		mg/L	2.0	20	10-AUG-14
Manganese (Mn)-Total		0.0311	0.0311		mg/L	0.1	20	10-AUG-14
Nickel (Ni)-Total		0.0066	0.0068		mg/L	2.2	20	10-AUG-14
Potassium (K)-Total		25.7	24.1		mg/L	6.6	20	10-AUG-14
Selenium (Se)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-AUG-14
Silicon (Si)-Total		2.87	2.85		mg/L	0.6	20	10-AUG-14
Silver (Ag)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	10-AUG-14
Sodium (Na)-Total		637	610		mg/L	4.2	20	10-AUG-14
Uranium (U)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-AUG-14
Zinc (Zn)-Total		0.022	0.020		mg/L	7.1	20	10-AUG-14
WG1925500-8 DUP		L1496580-3						
Aluminum (Al)-Total		0.0521	0.0486		mg/L	6.9	20	10-AUG-14
Antimony (Sb)-Total		0.00059	0.00056		mg/L	4.9	20	10-AUG-14
Arsenic (As)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	10-AUG-14
Barium (Ba)-Total		0.0699	0.0696		mg/L	0.4	20	10-AUG-14
Boron (B)-Total		0.543	0.512		mg/L	5.8	20	10-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 20 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R2912618							
WG1925500-8	DUP	L1496580-3						
Cadmium (Cd)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	10-AUG-14
Calcium (Ca)-Total		13.1	12.5		mg/L	5.4	20	10-AUG-14
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	10-AUG-14
Copper (Cu)-Total		0.0025	0.0024		mg/L	6.6	20	10-AUG-14
Iron (Fe)-Total		1.07	0.998		mg/L	6.8	20	10-AUG-14
Lead (Pb)-Total		0.00155	0.00151		mg/L	2.8	20	10-AUG-14
Magnesium (Mg)-Total		3.96	3.72		mg/L	6.1	20	10-AUG-14
Manganese (Mn)-Total		0.0281	0.0266		mg/L	5.4	20	10-AUG-14
Nickel (Ni)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	10-AUG-14
Potassium (K)-Total		6.77	6.59		mg/L	2.7	20	10-AUG-14
Selenium (Se)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	10-AUG-14
Silicon (Si)-Total		6.50	6.42		mg/L	1.4	20	10-AUG-14
Silver (Ag)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	10-AUG-14
Sodium (Na)-Total		207	203		mg/L	2.3	20	10-AUG-14
Uranium (U)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-AUG-14
Zinc (Zn)-Total		<0.0040	<0.0040	RPD-NA	mg/L	N/A	20	10-AUG-14
WG1925500-9	DUP	L1491901-1						
Aluminum (Al)-Total		0.331	0.337		mg/L	1.9	20	10-AUG-14
Antimony (Sb)-Total		0.00050	0.00051		mg/L	1.3	20	10-AUG-14
Arsenic (As)-Total		0.337	0.343		mg/L	1.7	20	10-AUG-14
Barium (Ba)-Total		0.00698	0.00678		mg/L	2.9	20	10-AUG-14
Boron (B)-Total		0.029	0.030		mg/L	2.7	20	10-AUG-14
Cadmium (Cd)-Total		0.000014	0.000012		mg/L	12	20	10-AUG-14
Calcium (Ca)-Total		23.3	24.9		mg/L	6.7	20	10-AUG-14
Chromium (Cr)-Total		0.00069	0.00078		mg/L	13	20	10-AUG-14
Copper (Cu)-Total		0.00965	0.00972		mg/L	0.7	20	10-AUG-14
Iron (Fe)-Total		0.096	0.091		mg/L	5.1	20	10-AUG-14
Lead (Pb)-Total		0.00150	0.00153		mg/L	2.0	20	10-AUG-14
Magnesium (Mg)-Total		4.57	4.75		mg/L	3.9	20	10-AUG-14
Manganese (Mn)-Total		0.0119	0.0120		mg/L	0.9	20	10-AUG-14
Nickel (Ni)-Total		0.00228	0.00230		mg/L	1.0	20	10-AUG-14
Potassium (K)-Total		2.68	2.72		mg/L	1.3	20	10-AUG-14
Selenium (Se)-Total		0.00014	0.00014		mg/L	0.9	20	10-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 21 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R2912618							
WG1925500-9	DUP	L1491901-1						
Silicon (Si)-Total		1.18	1.19		mg/L	1.4	20	10-AUG-14
Silver (Ag)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	10-AUG-14
Sodium (Na)-Total		2.95	2.99		mg/L	1.1	20	10-AUG-14
Uranium (U)-Total		0.000623	0.000639		mg/L	2.5	20	10-AUG-14
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	10-AUG-14
WG1925500-5	LCS							
Aluminum (Al)-Total			106.0		%		70-130	10-AUG-14
Antimony (Sb)-Total			105.8		%		70-130	10-AUG-14
Arsenic (As)-Total			101.5		%		70-130	10-AUG-14
Barium (Ba)-Total			101.1		%		70-130	10-AUG-14
Boron (B)-Total			90.7		%		70-130	10-AUG-14
Cadmium (Cd)-Total			98.6		%		70-130	10-AUG-14
Calcium (Ca)-Total			98.2		%		70-130	10-AUG-14
Chromium (Cr)-Total			105.1		%		70-130	10-AUG-14
Copper (Cu)-Total			102.3		%		70-130	10-AUG-14
Iron (Fe)-Total			92.3		%		70-130	10-AUG-14
Lead (Pb)-Total			100.9		%		70-130	10-AUG-14
Magnesium (Mg)-Total			106.0		%		70-130	10-AUG-14
Manganese (Mn)-Total			102.4		%		70-130	10-AUG-14
Nickel (Ni)-Total			102.8		%		70-130	10-AUG-14
Potassium (K)-Total			106.7		%		70-130	10-AUG-14
Selenium (Se)-Total			99.98		%		70-130	10-AUG-14
Silicon (Si)-Total			94.0		%		70-130	10-AUG-14
Silver (Ag)-Total			104.9		%		70-130	10-AUG-14
Sodium (Na)-Total			108.0		%		70-130	10-AUG-14
Uranium (U)-Total			100.5		%		70-130	10-AUG-14
Zinc (Zn)-Total			107.6		%		70-130	10-AUG-14
WG1925500-6	LCS							
Aluminum (Al)-Total			100.8		%		70-130	10-AUG-14
Antimony (Sb)-Total			101.7		%		70-130	10-AUG-14
Arsenic (As)-Total			95.4		%		70-130	10-AUG-14
Barium (Ba)-Total			97.6		%		70-130	10-AUG-14
Boron (B)-Total			89.6		%		70-130	10-AUG-14
Cadmium (Cd)-Total			92.8		%		70-130	10-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 22 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2912618							
WG1925500-6 LCS								
Calcium (Ca)-Total			94.6		%		70-130	10-AUG-14
Chromium (Cr)-Total			98.8		%		70-130	10-AUG-14
Copper (Cu)-Total			94.9		%		70-130	10-AUG-14
Iron (Fe)-Total			87.2		%		70-130	10-AUG-14
Lead (Pb)-Total			99.4		%		70-130	10-AUG-14
Magnesium (Mg)-Total			99.1		%		70-130	10-AUG-14
Manganese (Mn)-Total			97.2		%		70-130	10-AUG-14
Nickel (Ni)-Total			96.1		%		70-130	10-AUG-14
Potassium (K)-Total			99.1		%		70-130	10-AUG-14
Selenium (Se)-Total			96.0		%		70-130	10-AUG-14
Silicon (Si)-Total			89.9		%		70-130	10-AUG-14
Silver (Ag)-Total			98.1		%		70-130	10-AUG-14
Sodium (Na)-Total			100.3		%		70-130	10-AUG-14
Uranium (U)-Total			95.5		%		70-130	10-AUG-14
Zinc (Zn)-Total			100.9		%		70-130	10-AUG-14
WG1925500-2 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	10-AUG-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Boron (B)-Total			<0.010		mg/L		0.01	10-AUG-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Copper (Cu)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Iron (Fe)-Total			<0.010		mg/L		0.01	10-AUG-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	10-AUG-14
Potassium (K)-Total			<0.050		mg/L		0.05	10-AUG-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Silicon (Si)-Total			<0.050		mg/L		0.05	10-AUG-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Sodium (Na)-Total			<0.050		mg/L		0.05	10-AUG-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	10-AUG-14
WG1925500-3 MB								



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 23 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2912618							
WG1925500-3 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	10-AUG-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Barium (Ba)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Boron (B)-Total			<0.010		mg/L		0.01	10-AUG-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Calcium (Ca)-Total			<0.020		mg/L		0.02	10-AUG-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Copper (Cu)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Iron (Fe)-Total			<0.010		mg/L		0.01	10-AUG-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	10-AUG-14
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Nickel (Ni)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Potassium (K)-Total			<0.050		mg/L		0.05	10-AUG-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Silicon (Si)-Total			<0.050		mg/L		0.05	10-AUG-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Sodium (Na)-Total			<0.050		mg/L		0.05	10-AUG-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	10-AUG-14
NAPHTHENIC-ACID-FM		Water						
Batch	R2927870							
WG1929715-3 DUP		L1494650-2						
Naphthenic Acids		<1.0	<1.0	RPD-NA	mg/L	N/A	30	25-AUG-14
WG1929715-4 LCS								
Naphthenic Acids			91.6		%		70-130	25-AUG-14
WG1929715-1 MB								
Naphthenic Acids			<1.0		mg/L		1	25-AUG-14
WG1929715-2 MS		L1494650-1						
Naphthenic Acids			90.4		%		50-150	25-AUG-14
NH3-CFA-ED	Water							



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 24 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-CFA-ED		Water						
Batch	R2915568							
WG1928708-10	DUP	L1498571-14						
Ammonia, Total (as N)		0.148	0.152		mg/L	2.7	20	12-AUG-14
WG1928708-3	DUP	L1487828-1						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	12-AUG-14
WG1928708-5	DUP	L1497473-1						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	12-AUG-14
WG1928708-6	DUP	L1498061-1						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	12-AUG-14
WG1928708-8	DUP	L1498368-1						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	12-AUG-14
WG1928708-9	DUP	L1500338-1						
Ammonia, Total (as N)		0.412	0.402		mg/L	2.5	20	12-AUG-14
WG1928708-2	LCS							
Ammonia, Total (as N)			101.9		%		85-115	12-AUG-14
WG1928708-1	MB							
Ammonia, Total (as N)			<0.050		mg/L		0.05	12-AUG-14
WG1928708-4	MS	L1494650-3						
Ammonia, Total (as N)			99.3		%		75-125	12-AUG-14
WG1928708-7	MS	L1498044-2						
Ammonia, Total (as N)			92.0		%		75-125	12-AUG-14
NO2-IC-ED		Water						
Batch	R2909357							
WG1924081-3	DUP	L1496589-8						
Nitrite (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	04-AUG-14
WG1924081-2	LCS							
Nitrite (as N)			95.8		%		90-110	04-AUG-14
WG1924081-5	LCS							
Nitrite (as N)			91.4		%		90-110	04-AUG-14
WG1924081-7	LCS							
Nitrite (as N)			90.2		%		90-110	04-AUG-14
WG1924081-1	MB							
Nitrite (as N)			<0.020		mg/L		0.02	04-AUG-14
WG1924081-8	MB							
Nitrite (as N)			<0.020		mg/L		0.02	04-AUG-14
Batch	R2912274							
WG1926502-3	DUP	L1498061-9						
Nitrite (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	08-AUG-14
WG1926502-5	DUP	L1498878-7						



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 25 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-ED		Water						
Batch	R2912274							
WG1926502-5	DUP	L1498878-7						
Nitrite (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	08-AUG-14
WG1926502-7	DUP	L1499123-2						
Nitrite (as N)		0.043	0.043		mg/L	0.2	20	08-AUG-14
WG1926502-11	LCS							
Nitrite (as N)			90.3		%		90-110	08-AUG-14
WG1926502-13	LCS							
Nitrite (as N)			92.0		%		90-110	08-AUG-14
WG1926502-15	LCS							
Nitrite (as N)			93.8		%		90-110	08-AUG-14
WG1926502-17	LCS							
Nitrite (as N)			91.2		%		90-110	08-AUG-14
WG1926502-2	LCS							
Nitrite (as N)			93.2		%		90-110	08-AUG-14
WG1926502-9	LCS							
Nitrite (as N)			92.6		%		90-110	08-AUG-14
WG1926502-1	MB							
Nitrite (as N)			<0.020		mg/L		0.02	08-AUG-14
WG1926502-10	MB							
Nitrite (as N)			<0.020		mg/L		0.02	08-AUG-14
WG1926502-12	MB							
Nitrite (as N)			<0.020		mg/L		0.02	08-AUG-14
WG1926502-14	MB							
Nitrite (as N)			<0.020		mg/L		0.02	08-AUG-14
WG1926502-16	MB							
Nitrite (as N)			<0.020		mg/L		0.02	08-AUG-14
WG1926502-18	MB							
Nitrite (as N)			<0.020		mg/L		0.02	08-AUG-14
WG1926502-6	MS	L1498878-7						
Nitrite (as N)			91.5		%		75-125	08-AUG-14
WG1926502-8	MS	L1499123-2						
Nitrite (as N)			82.2		%		75-125	08-AUG-14
NO3-IC-ED		Water						
Batch	R2909357							
WG1924081-3	DUP	L1496589-8						
Nitrate (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	04-AUG-14
WG1924081-2	LCS							
Nitrate (as N)			98.8		%		90-110	04-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 26 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-ED								
	Water							
Batch	R2909357							
WG1924081-5	LCS							
Nitrate (as N)			97.7		%		90-110	04-AUG-14
WG1924081-7	LCS							
Nitrate (as N)			99.9		%		90-110	04-AUG-14
WG1924081-1	MB							
Nitrate (as N)			<0.050		mg/L		0.05	04-AUG-14
WG1924081-6	MB							
Nitrate (as N)			<0.050		mg/L		0.05	04-AUG-14
WG1924081-8	MB							
Nitrate (as N)			<0.050		mg/L		0.05	04-AUG-14
WG1924081-4	MS	L1496589-8						
Nitrate (as N)			93.0		%		75-125	04-AUG-14
Batch	R2912274							
WG1926502-3	DUP	L1498061-9						
Nitrate (as N)		0.157	0.161		mg/L	2.3	20	08-AUG-14
WG1926502-5	DUP	L1498878-7						
Nitrate (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	08-AUG-14
WG1926502-7	DUP	L1499123-2						
Nitrate (as N)		9.92	9.87		mg/L	0.5	20	08-AUG-14
WG1926502-11	LCS							
Nitrate (as N)			101.4		%		90-110	08-AUG-14
WG1926502-13	LCS							
Nitrate (as N)			97.8		%		90-110	08-AUG-14
WG1926502-15	LCS							
Nitrate (as N)			103.5		%		90-110	08-AUG-14
WG1926502-17	LCS							
Nitrate (as N)			101.7		%		90-110	08-AUG-14
WG1926502-2	LCS							
Nitrate (as N)			97.8		%		90-110	08-AUG-14
WG1926502-9	LCS							
Nitrate (as N)			103.1		%		90-110	08-AUG-14
WG1926502-1	MB							
Nitrate (as N)			<0.050		mg/L		0.05	08-AUG-14
WG1926502-10	MB							
Nitrate (as N)			<0.050		mg/L		0.05	08-AUG-14
WG1926502-12	MB							
Nitrate (as N)			<0.050		mg/L		0.05	08-AUG-14
WG1926502-14	MB							



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 27 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-ED		Water						
Batch	R2912274							
WG1926502-14	MB							
Nitrate (as N)			<0.050		mg/L		0.05	08-AUG-14
WG1926502-16	MB							
Nitrate (as N)			<0.050		mg/L		0.05	08-AUG-14
WG1926502-18	MB							
Nitrate (as N)			<0.050		mg/L		0.05	08-AUG-14
WG1926502-4	MS	L1498061-9						
Nitrate (as N)			91.1		%		75-125	08-AUG-14
WG1926502-6	MS	L1498878-7						
Nitrate (as N)			99.5		%		75-125	08-AUG-14
WG1926502-8	MS	L1499123-2						
Nitrate (as N)			N/A	MS-B	%		-	08-AUG-14
PAH-CCME-CL		Water						
Batch	R2912646							
WG1927607-2	LCS							
Naphthalene			93.3		%		50-130	07-AUG-14
Quinoline			100.9		%		60-130	07-AUG-14
Acenaphthene			92.8		%		60-130	07-AUG-14
Fluorene			94.4		%		60-130	07-AUG-14
Phenanthrene			100.4		%		60-130	07-AUG-14
Anthracene			100.3		%		60-130	07-AUG-14
Acridine			103.1		%		60-130	07-AUG-14
Fluoranthene			98.0		%		60-130	07-AUG-14
Pyrene			105.4		%		60-130	07-AUG-14
Benzo(a)anthracene			101.5		%		60-130	07-AUG-14
Chrysene			100.8		%		60-130	07-AUG-14
Benzo(b&j)fluoranthene			95.8		%		60-130	07-AUG-14
Benzo(k)fluoranthene			94.9		%		60-130	07-AUG-14
Benzo(a)pyrene			94.7		%		60-130	07-AUG-14
Benzo(g,h,i)perylene			101.5		%		60-130	07-AUG-14
Indeno(1,2,3-cd)pyrene			100.1		%		60-130	07-AUG-14
Dibenzo(a,h)anthracene			101.2		%		60-130	07-AUG-14
WG1927607-4	LCS							
Naphthalene			91.2		%		50-130	07-AUG-14
Quinoline			97.5		%		60-130	07-AUG-14
Acenaphthene			87.6		%		60-130	07-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 28 of 38

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-CCME-CL		Water						
Batch	R2912646							
WG1927607-4	LCS							
Fluorene			91.0		%		60-130	07-AUG-14
Phenanthrene			96.4		%		60-130	07-AUG-14
Anthracene			100.5		%		60-130	07-AUG-14
Acridine			100.2		%		60-130	07-AUG-14
Fluoranthene			94.4		%		60-130	07-AUG-14
Pyrene			102.5		%		60-130	07-AUG-14
Benzo(a)anthracene			96.8		%		60-130	07-AUG-14
Chrysene			93.0		%		60-130	07-AUG-14
Benzo(b&j)fluoranthene			79.4		%		60-130	07-AUG-14
Benzo(k)fluoranthene			76.3		%		60-130	07-AUG-14
Benzo(a)pyrene			77.9		%		60-130	07-AUG-14
Benzo(g,h,i)perylene			99.3		%		60-130	07-AUG-14
Indeno(1,2,3-cd)pyrene			76.6		%		60-130	07-AUG-14
Dibenzo(a,h)anthracene			94.3		%		60-130	07-AUG-14
WG1927607-1	MB							
Naphthalene			<0.000050		mg/L		0.00005	07-AUG-14
Quinoline			<0.000020		mg/L		0.00002	07-AUG-14
Acenaphthene			<0.000020		mg/L		0.00002	07-AUG-14
Fluorene			<0.000020		mg/L		0.00002	07-AUG-14
Phenanthrene			<0.000050		mg/L		0.00005	07-AUG-14
Anthracene			<0.000010		mg/L		0.00001	07-AUG-14
Acridine			<0.000020		mg/L		0.00002	07-AUG-14
Fluoranthene			<0.000020		mg/L		0.00002	07-AUG-14
Pyrene			<0.000010		mg/L		0.00001	07-AUG-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	07-AUG-14
Chrysene			<0.000020		mg/L		0.00002	07-AUG-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	07-AUG-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	07-AUG-14
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	07-AUG-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	07-AUG-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	07-AUG-14
Dibenzo(a,h)anthracene			<0.0000050		mg/L		0.000005	07-AUG-14
Surrogate: d10-Acenaphthene			100.4		%		60-130	07-AUG-14
Surrogate: d10-Phenanthrene			97.9		%		60-130	07-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 29 of 38

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-CCME-CL		Water						
Batch	R2912646							
WG1927607-1 MB								
Surrogate: d12-Chrysene			96.7		%		60-130	07-AUG-14
WG1927607-3 MB								
Naphthalene			<0.000050		mg/L		0.00005	07-AUG-14
Quinoline			<0.000020		mg/L		0.00002	07-AUG-14
Acenaphthene			<0.000020		mg/L		0.00002	07-AUG-14
Fluorene			<0.000020		mg/L		0.00002	07-AUG-14
Phenanthrene			<0.000050		mg/L		0.00005	07-AUG-14
Anthracene			<0.000010		mg/L		0.00001	07-AUG-14
Acridine			<0.000020		mg/L		0.00002	07-AUG-14
Fluoranthene			<0.000020		mg/L		0.00002	07-AUG-14
Pyrene			<0.000010		mg/L		0.00001	07-AUG-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	07-AUG-14
Chrysene			<0.000020		mg/L		0.00002	07-AUG-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	07-AUG-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	07-AUG-14
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	07-AUG-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	07-AUG-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	07-AUG-14
Dibenzo(a,h)anthracene			<0.0000050		mg/L		0.000005	07-AUG-14
Surrogate: d10-Acenaphthene			88.3		%		60-130	07-AUG-14
Surrogate: d10-Phenanthrene			96.8		%		60-130	07-AUG-14
Surrogate: d12-Chrysene			99.2		%		60-130	07-AUG-14
WG1927607-5 MB								
Naphthalene			<0.000050		mg/L		0.00005	11-AUG-14
Quinoline			<0.000020		mg/L		0.00002	11-AUG-14
Acenaphthene			<0.000020		mg/L		0.00002	11-AUG-14
Fluorene			<0.000020		mg/L		0.00002	11-AUG-14
Phenanthrene			<0.000050		mg/L		0.00005	11-AUG-14
Anthracene			<0.000010		mg/L		0.00001	11-AUG-14
Acridine			<0.000020		mg/L		0.00002	11-AUG-14
Fluoranthene			<0.000020		mg/L		0.00002	11-AUG-14
Pyrene			<0.000010		mg/L		0.00001	11-AUG-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	11-AUG-14
Chrysene			<0.000020		mg/L		0.00002	11-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 30 of 38

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-CCME-CL		Water						
Batch	R2912646							
WG1927607-5 MB								
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	11-AUG-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	11-AUG-14
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	11-AUG-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	11-AUG-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	11-AUG-14
Dibenzo(a,h)anthracene			<0.0000050		mg/L		0.000005	11-AUG-14
Surrogate: d10-Acenaphthene			91.0		%		60-130	11-AUG-14
Surrogate: d10-Phenanthrene			94.4		%		60-130	11-AUG-14
Surrogate: d12-Chrysene			95.5		%		60-130	11-AUG-14
PH/EC/ALK-ED		Water						
Batch	R2906988							
WG1924012-8 DUP		L1496554-7						
pH		7.70	7.64	J	pH	0.05	0.3	04-AUG-14
Conductivity (EC)		680	681		uS/cm	0.2	10	04-AUG-14
Bicarbonate (HCO3)		465	465		mg/L	0.1	25	04-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	04-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	04-AUG-14
Alkalinity, Total (as CaCO3)		382	381		mg/L	0.1	20	04-AUG-14
WG1924012-10 LCS								
Conductivity (EC)			99.6		%		90-110	04-AUG-14
WG1924012-11 LCS								
pH			6.99		pH		6.7-7.3	04-AUG-14
WG1924012-12 LCS								
Alkalinity, Total (as CaCO3)			98.3		%		85-115	04-AUG-14
WG1924012-13 LCS								
Conductivity (EC)			97.8		%		90-110	04-AUG-14
WG1924012-15 LCS								
Conductivity (EC)			98.5		%		90-110	04-AUG-14
WG1924012-16 LCS								
pH			6.98		pH		6.7-7.3	04-AUG-14
WG1924012-17 LCS								
Alkalinity, Total (as CaCO3)			96.8		%		85-115	04-AUG-14
WG1924012-18 LCS								
Conductivity (EC)			97.2		%		90-110	04-AUG-14
WG1924012-2 LCS								



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 31 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R2906988							
WG1924012-2	LCS							
Conductivity (EC)			99.9		%		90-110	04-AUG-14
WG1924012-3	LCS							
pH			6.99		pH		6.7-7.3	04-AUG-14
WG1924012-4	LCS							
Alkalinity, Total (as CaCO3)			98.3		%		85-115	04-AUG-14
WG1924012-5	LCS							
Conductivity (EC)			98.2		%		90-110	04-AUG-14
WG1924012-1	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	04-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	04-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	04-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	04-AUG-14
WG1924012-14	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	04-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	04-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	04-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	04-AUG-14
WG1924012-9	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	04-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	04-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	04-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	04-AUG-14
Batch	R2910608							
WG1925808-10	DUP	L1498067-7						
pH		8.04	8.07	J	pH	0.02	0.3	07-AUG-14
Conductivity (EC)		571	572		uS/cm	0.2	10	07-AUG-14
Bicarbonate (HCO3)		347	346		mg/L	0.1	25	07-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	07-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	07-AUG-14
Alkalinity, Total (as CaCO3)		284	284		mg/L	0.1	20	07-AUG-14
WG1925808-11	DUP	L1497746-1						
pH		8.11	8.10	J	pH	0.01	0.3	08-AUG-14
Conductivity (EC)		723	726		uS/cm	0.4	10	08-AUG-14
Bicarbonate (HCO3)		533	501		mg/L	6.1	25	08-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	08-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 32 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R2910608							
WG1925808-11	DUP	L1497746-1						
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	08-AUG-14
Alkalinity, Total (as CaCO3)		437	411		mg/L	6.1	20	08-AUG-14
WG1925808-6	DUP	L1496706-1						
pH		8.31	8.33	J	pH	0.02	0.3	07-AUG-14
Conductivity (EC)		2580	2590		uS/cm	0.4	10	07-AUG-14
Bicarbonate (HCO3)		780	775		mg/L	0.7	25	07-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	07-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	07-AUG-14
Alkalinity, Total (as CaCO3)		643	642		mg/L	0.1	20	07-AUG-14
WG1925808-7	DUP	L1497647-8						
pH		8.05	8.04	J	pH	0.01	0.3	07-AUG-14
Conductivity (EC)		1140	1140		uS/cm	0.2	10	07-AUG-14
Bicarbonate (HCO3)		593	561		mg/L	5.6	25	07-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	07-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	07-AUG-14
Alkalinity, Total (as CaCO3)		486	459		mg/L	5.6	20	07-AUG-14
WG1925808-8	DUP	L1497372-2						
pH		8.34	8.37	J	pH	0.03	0.3	08-AUG-14
Conductivity (EC)		500	504		uS/cm	0.8	10	08-AUG-14
Bicarbonate (HCO3)		336	333		mg/L	0.7	25	08-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	08-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	08-AUG-14
Alkalinity, Total (as CaCO3)		281	281		mg/L	0.1	20	08-AUG-14
WG1925808-13	LCS		99.9		%		90-110	07-AUG-14
Conductivity (EC)			99.9		%		90-110	07-AUG-14
WG1925808-14	LCS		7.00		pH		6.7-7.3	07-AUG-14
pH			7.00		pH		6.7-7.3	07-AUG-14
WG1925808-15	LCS		99.8		%		85-115	07-AUG-14
Alkalinity, Total (as CaCO3)			99.8		%		85-115	07-AUG-14
WG1925808-16	LCS		98.0		%		90-110	07-AUG-14
Conductivity (EC)			98.0		%		90-110	07-AUG-14
WG1925808-18	LCS		98.8		%		90-110	07-AUG-14
Conductivity (EC)			98.8		%		90-110	07-AUG-14
WG1925808-19	LCS		6.95		pH		6.7-7.3	07-AUG-14
pH			6.95		pH		6.7-7.3	07-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 33 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R2910608							
WG1925808-2	LCS							
Conductivity (EC)			100.4		%		90-110	07-AUG-14
WG1925808-20	LCS							
Alkalinity, Total (as CaCO3)			101.4		%		85-115	07-AUG-14
WG1925808-21	LCS							
Conductivity (EC)			97.3		%		90-110	07-AUG-14
WG1925808-23	LCS							
Conductivity (EC)			97.5		%		90-110	07-AUG-14
WG1925808-24	LCS							
pH			7.00		pH		6.7-7.3	07-AUG-14
WG1925808-25	LCS							
Alkalinity, Total (as CaCO3)			99.4		%		85-115	07-AUG-14
WG1925808-26	LCS							
Conductivity (EC)			95.7		%		90-110	08-AUG-14
WG1925808-28	LCS							
Conductivity (EC)			96.5		%		90-110	08-AUG-14
WG1925808-29	LCS							
pH			7.00		pH		6.7-7.3	08-AUG-14
WG1925808-3	LCS							
pH			6.99		pH		6.7-7.3	07-AUG-14
WG1925808-30	LCS							
Alkalinity, Total (as CaCO3)			99.1		%		85-115	08-AUG-14
WG1925808-31	LCS							
Conductivity (EC)			93.7		%		90-110	08-AUG-14
WG1925808-4	LCS							
Alkalinity, Total (as CaCO3)			98.8		%		85-115	07-AUG-14
WG1925808-5	LCS							
Conductivity (EC)			99.0		%		90-110	07-AUG-14
WG1925808-1	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	07-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	07-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	07-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	07-AUG-14
WG1925808-12	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	07-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	07-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	07-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	07-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 34 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch R2910608								
WG1925808-17 MB								
	Bicarbonate (HCO3)		<5.0		mg/L		5	07-AUG-14
	Carbonate (CO3)		<5.0		mg/L		5	07-AUG-14
	Hydroxide (OH)		<5.0		mg/L		5	07-AUG-14
	Alkalinity, Total (as CaCO3)		<2.0		mg/L		2	07-AUG-14
WG1925808-22 MB								
	Bicarbonate (HCO3)		<5.0		mg/L		5	08-AUG-14
	Carbonate (CO3)		<5.0		mg/L		5	08-AUG-14
	Hydroxide (OH)		<5.0		mg/L		5	08-AUG-14
	Alkalinity, Total (as CaCO3)		<2.0		mg/L		2	08-AUG-14
WG1925808-27 MB								
	Bicarbonate (HCO3)		<5.0		mg/L		5	08-AUG-14
	Carbonate (CO3)		<5.0		mg/L		5	08-AUG-14
	Hydroxide (OH)		<5.0		mg/L		5	08-AUG-14
	Alkalinity, Total (as CaCO3)		<2.0		mg/L		2	08-AUG-14
PHENOLS-4AAP-ED		Water						
Batch R2917007								
WG1930150-3 DUP		L1496160-9						
	Phenols (4AAP)	0.0039	0.0039		mg/L	0.0	15	13-AUG-14
WG1930150-4 DUP		L1494613-3						
	Phenols (4AAP)	0.0134	0.0135		mg/L	0.7	15	13-AUG-14
WG1930150-2 LCS								
	Phenols (4AAP)		106.0		%		85-115	13-AUG-14
WG1930150-1 MB								
	Phenols (4AAP)		<0.0010		mg/L		0.001	13-AUG-14
SO4-IC-ED		Water						
Batch R2909357								
WG1924081-3 DUP		L1496589-8						
	Sulfate (SO4)	25.0	24.9		mg/L	0.2	20	04-AUG-14
WG1924081-2 LCS								
	Sulfate (SO4)		102.1		%		90-110	04-AUG-14
WG1924081-5 LCS								
	Sulfate (SO4)		101.5		%		90-110	04-AUG-14
WG1924081-7 LCS								
	Sulfate (SO4)		102.0		%		90-110	04-AUG-14
WG1924081-1 MB								
	Sulfate (SO4)		<0.50		mg/L		0.5	04-AUG-14



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 35 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-ED		Water						
Batch	R2909357							
WG1924081-6	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	04-AUG-14
WG1924081-8	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	04-AUG-14
WG1924081-4	MS	L1496589-8						
Sulfate (SO4)			95.3		%		75-125	04-AUG-14
Batch	R2912274							
WG1926502-3	DUP	L1498061-9						
Sulfate (SO4)		51.3	51.3		mg/L	0.1	20	08-AUG-14
WG1926502-5	DUP	L1498878-7						
Sulfate (SO4)		<0.50	<0.50	RPD-NA	mg/L	N/A	20	08-AUG-14
WG1926502-7	DUP	L1499123-2						
Sulfate (SO4)		251	251		mg/L	0.1	20	08-AUG-14
WG1926502-11	LCS							
Sulfate (SO4)			100.8		%		90-110	08-AUG-14
WG1926502-13	LCS							
Sulfate (SO4)			101.6		%		90-110	08-AUG-14
WG1926502-15	LCS							
Sulfate (SO4)			102.4		%		90-110	08-AUG-14
WG1926502-17	LCS							
Sulfate (SO4)			102.3		%		90-110	08-AUG-14
WG1926502-2	LCS							
Sulfate (SO4)			101.3		%		90-110	08-AUG-14
WG1926502-9	LCS							
Sulfate (SO4)			101.8		%		90-110	08-AUG-14
WG1926502-1	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	08-AUG-14
WG1926502-10	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	08-AUG-14
WG1926502-12	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	08-AUG-14
WG1926502-14	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	08-AUG-14
WG1926502-16	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	08-AUG-14
WG1926502-18	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	08-AUG-14
WG1926502-4	MS	L1498061-9						



Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Page 36 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-ED		Water						
Batch	R2912274							
WG1926502-4	MS	L1498061-9						
Sulfate (SO4)			94.4		%		75-125	08-AUG-14
WG1926502-6	MS	L1498878-7						
Sulfate (SO4)			102.0		%		75-125	08-AUG-14
WG1926502-8	MS	L1499123-2						
Sulfate (SO4)			N/A	MS-B	%		-	08-AUG-14
SOLIDS-TDS-ED		Water						
Batch	R2912810							
WG1926634-3	DUP	L1497207-3						
Total Dissolved Solids		1210	1200		mg/L	0.7	20	08-AUG-14
WG1926634-2	LCS							
Total Dissolved Solids			99.5		%		85-115	08-AUG-14
WG1926634-1	MB							
Total Dissolved Solids			<10		mg/L		10	08-AUG-14
TURBIDITY-ED		Water						
Batch	R2911021							
WG1925868-3	DUP	L1496774-4						
Turbidity		48.7	50.4		NTU	3.4	15	07-AUG-14
WG1925868-2	LCS							
Turbidity			98.6		%		70-130	07-AUG-14
WG1925868-1	MB							
Turbidity			<0.10		NTU		0.1	07-AUG-14
Batch	R2911521							
WG1926722-3	DUP	L1498883-2						
Turbidity		62.0	63.5		NTU	2.4	15	08-AUG-14
WG1926722-2	LCS							
Turbidity			102.2		%		70-130	08-AUG-14
WG1926722-1	MB							
Turbidity			<0.10		NTU		0.1	08-AUG-14
Batch	R2912832							
WG1924043-3	DUP	L1496578-4						
Turbidity		2170	2250		NTU	3.5	15	04-AUG-14
WG1924043-2	LCS							
Turbidity			97.8		%		70-130	04-AUG-14
WG1924043-1	MB							
Turbidity			<0.10		NTU		0.1	04-AUG-14

Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2
Contact: AKIN OWOJORI

Page 37 of 38

Legend:

Limit ALS Control Limit (Data Quality Objectives)
DUP Duplicate
RPD Relative Percent Difference
N/A Not Available
LCS Laboratory Control Sample
SRM Standard Reference Material
MS Matrix Spike
MSD Matrix Spike Duplicate
ADE Average Desorption Efficiency
MB Method Blank
IRM Internal Reference Material
CRM Certified Reference Material
CCV Continuing Calibration Verification
CVS Calibration Verification Standard
LCSD Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects.
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L1496580

Report Date: 25-AUG-14

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Page 38 of 38

Contact: AKIN OWOJORI

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Turbidity	1	02-AUG-14 12:07	08-AUG-14 09:26	48	141	hours	EHT
	4	02-AUG-14 16:30	07-AUG-14 00:00	48	103	hours	EHT
Anions and Nutrients							
Nitrate as N by IC	1	02-AUG-14 12:07	08-AUG-14 08:00	48	140	hours	EHT
Nitrite as N by IC	1	02-AUG-14 12:07	08-AUG-14 08:00	48	140	hours	EHT

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1496580 were received on 03-AUG-14 11:55.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



ALS 140813-13 (14-CDO)

CONFIDENTIAL ANALYSIS REPORT

REPORT #: 140813-13

WO #: 14-CDO

PO #: L1496580

CLIENT: ALS Laboratory Group - Edmonton
9936-67 Avenue
Edmonton, AB
T6E 0P5

ATTENTION: ALSED Reporting
Tel: (780) 413-5227
Fax: (780) 437-2311

SAMPLE DESCRIPTION: Water Samples

DATE AND TIME OF SAMPLE COLLECTION: August 02, 2014

DATE AND TIME OF SAMPLE RECEIPT: August 04, 2014/11:45

SAMPLE TEMPERATURE WHEN RECEIVED: 14° Celsius

TEST PERFORMED:
Iron Related Bacteria
Sulfate Reducing Bacteria
Sulfate Reducing Bacteria [P/A]

TEST START DATE: August 04, 2014/12:00

DATE COMPLETED: August 13, 2014

CERTIFICATE OF ANALYSIS: See Page 2

QUALITY CONTROL DATA: See Attached Appendix 1

The report shall not be reproduced, except in full, without the written authority of PBR Laboratories Inc.

Certificate of Analysis

PBR ID	Sample #	Client ID	Lot #	Test	Protocol	Quantity Analyzed	*DF	Result	Units	Note
14-CDO-01	L1496580-1	16053140802006		Iron Related Bacteria	BART	15 ml		1.4×10^5	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		7.0×10^5	CFU/ml	1
14-CDO-02	L1496580-2	16053140802007		Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		7.0×10^5	CFU/ml	1
14-CDO-03	L1496580-3	16053140802008		Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	1
				Sulfate Reducing Bacteria [P/A]	BART	15 ml		Absent		

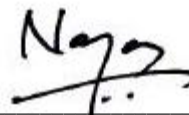
*DF - Dilution Factor used for analysis

Notes

1 CFU = Colony Forming Unit.

BART results represent the Approximate Population only.

The reported results apply only to the items tested.


Rambabu Naravaneni Ph. D (Analyst)
Date: Aug 13 2014


Approved By:

Narayan Pokharel, Ph.D.
Date: Aug 13 2014



P|B|R
Laboratories Inc.

ALS 140813-13 (14-CDO)

APPENDIX 1

Quality Control Data for Iron Related Bacteria (BART)

Controls	Organism/Medium	Result
Sterility (media blank)	BART medium	Pass
Positive	Acidithiobacillus ferrooxidans	Pass
Negative	D/W Sterile	Pass

Quality Control Data for Sulfate Reducing Bacteria (BART)

Controls	Organism/Medium	Result
Sterility	BART medium	Pass
Positive	SRB	Pass
Negative	D/W Sterile	Pass

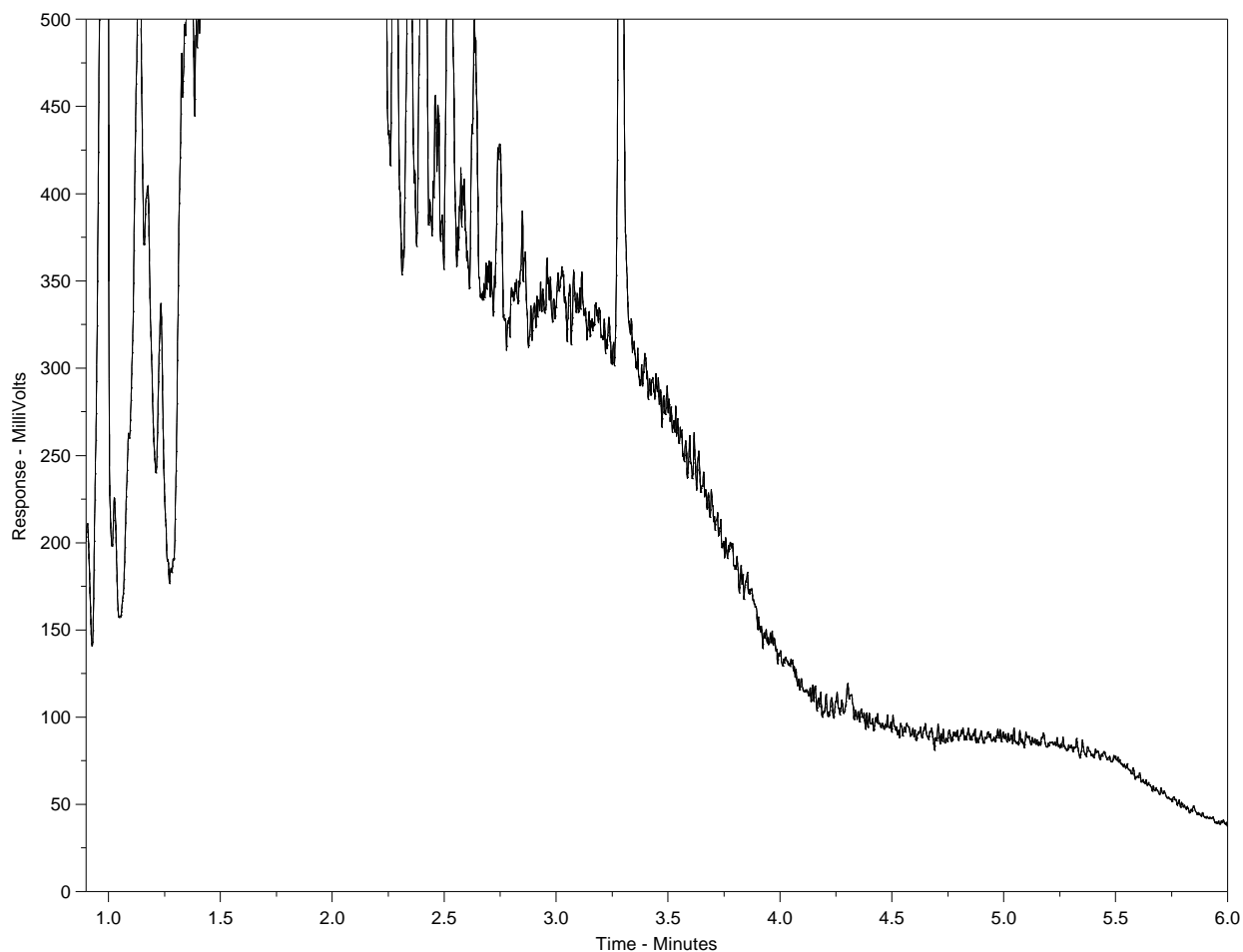
Quality Control Data for Sulfate Reducing Bacteria [P/A] (BART)

Controls	Organism/Medium	Result
Sterility	BART medium	Pass
Positive	SRB	Pass
Negative	D/W sterile	Pass

Hydrocarbon Distribution Report



ALS Sample ID: L1496580-1
Client ID: 16053140802006



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	1067°F				
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

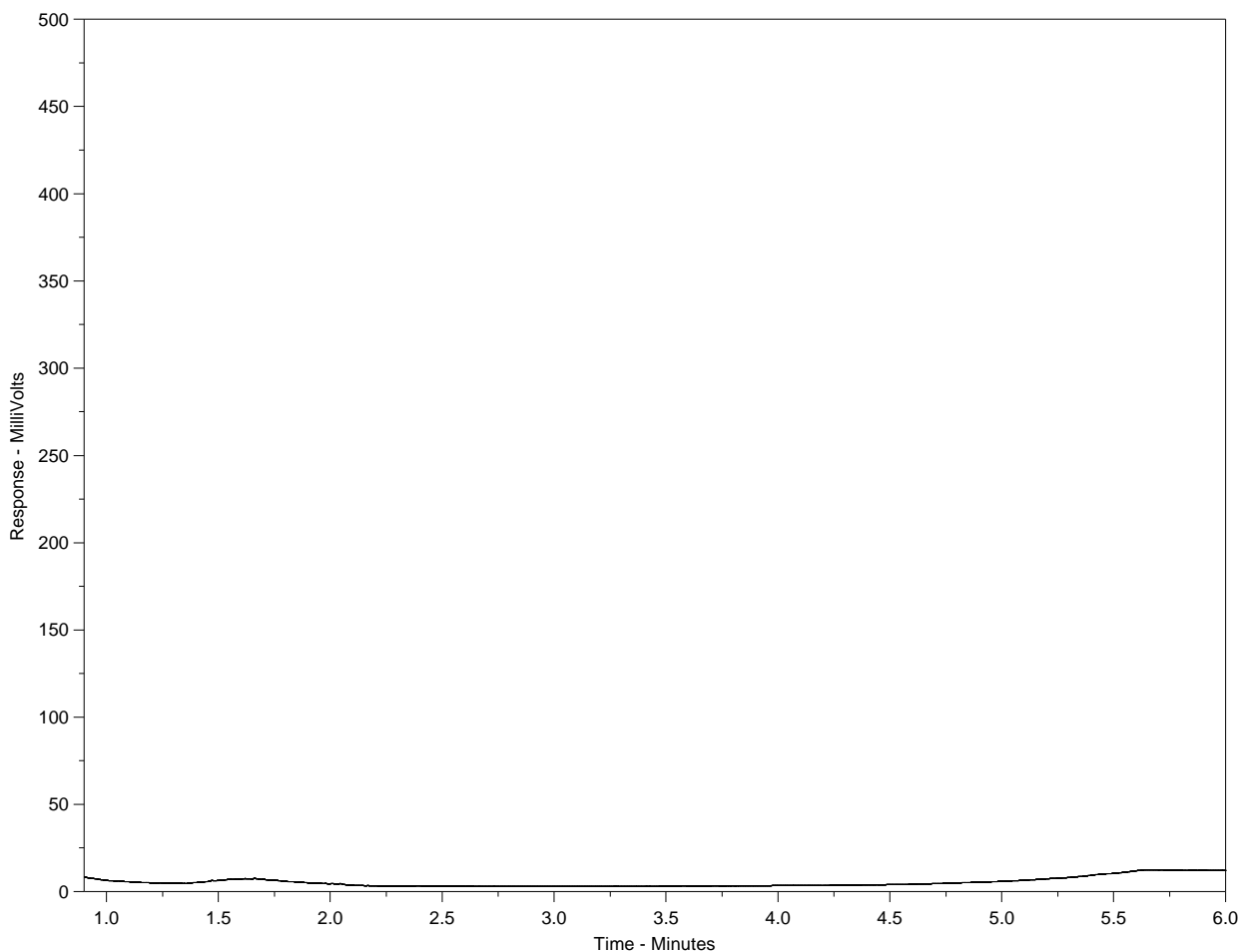
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1496580-2
 Client ID: 16053140802007



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	1067°F				
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

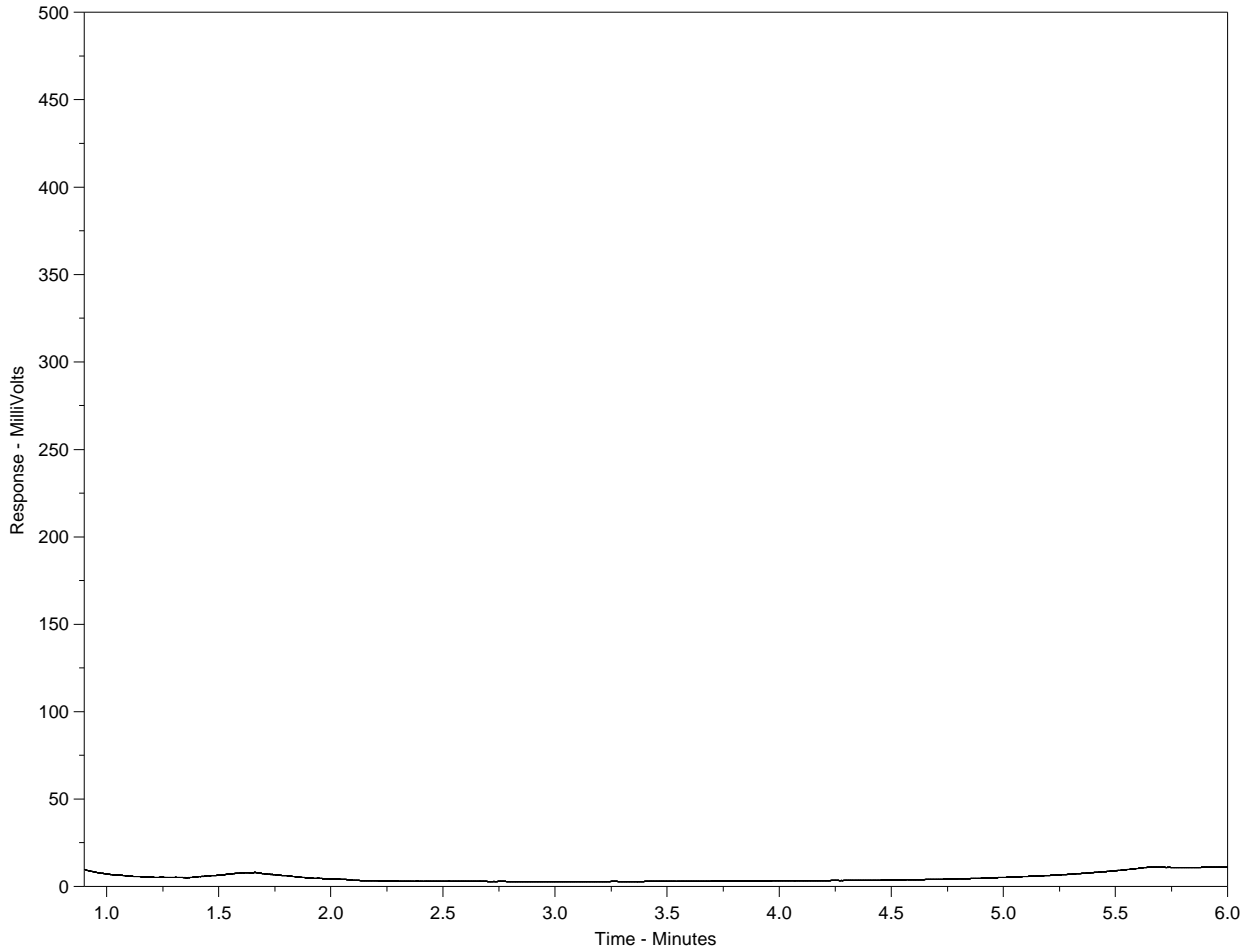
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1496580-3
 Client ID: 16053140802008



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	1067°F				
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

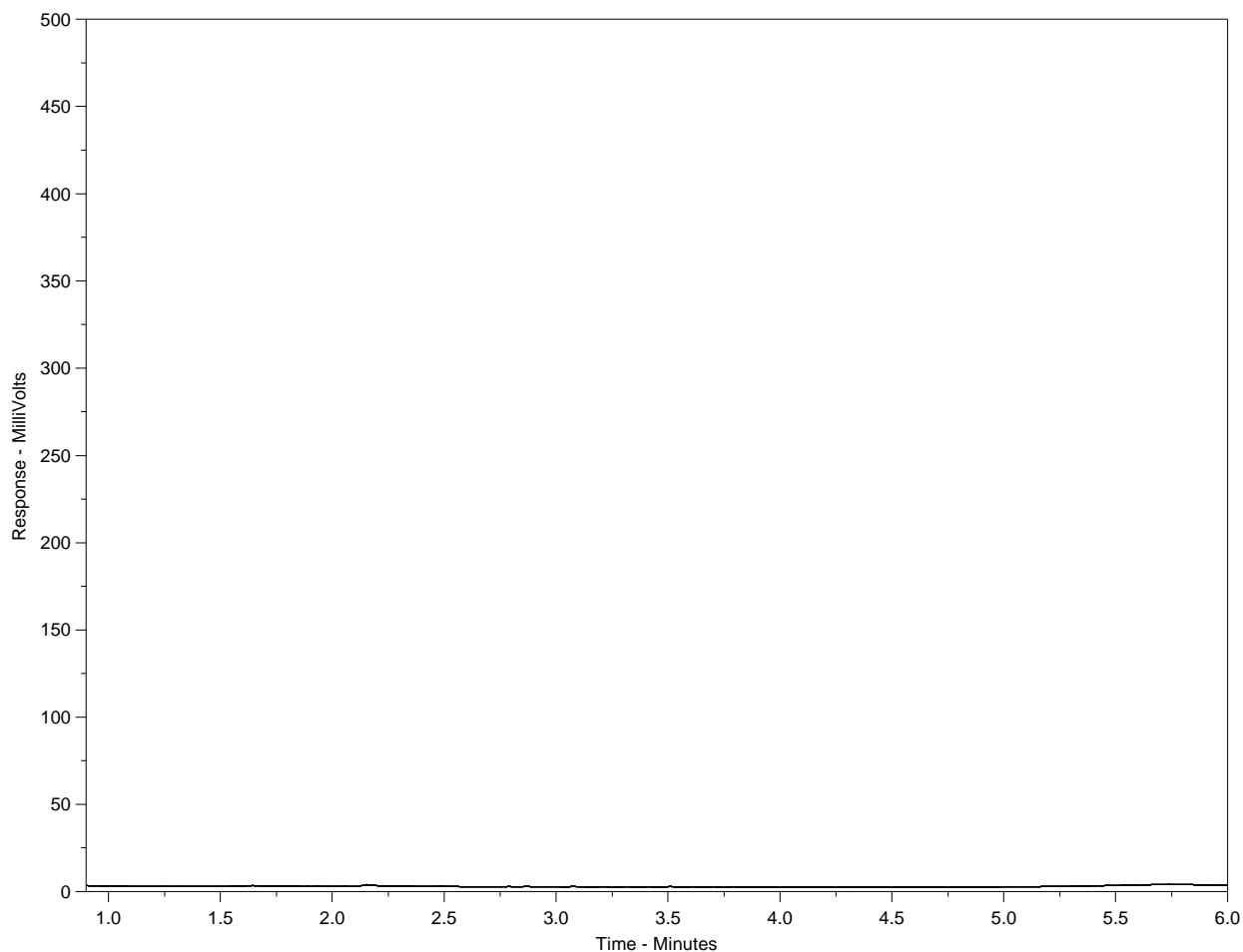
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note:
 This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1496580-4
Client ID: 16053140802009



F2		F3		F4		F4	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	1067°F				
Gasoline				Motor Oils/ Lube Oils/ Grease			
Diesel/ Jet Fuels							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.



Matrix Solutions Inc.
ATTN: AKIN OWOJORI
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Date Received: 04-AUG-14
Report Date: 26-AUG-14 09:05 (MT)
Version: FINAL

Client Phone: 403-513-2275

Certificate of Analysis

Lab Work Order #: L1496613
Project P.O. #: NOT SUBMITTED
Job Reference: 16053-502 NAOS SITE 10
C of C Numbers: M076073
Legal Site Desc: 13-20-95-08 W4M

Nicole Thibault
Account Manager

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ADDRESS: 9936-67 Avenue, Edmonton, AB T6E 0P5 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496613-1 16053140803010									
Sampled By: GULLED/JEREMY/BOBBY on 03-AUG-14 @ 13:00									
Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
Toluene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
EthylBenzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
o-Xylene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
Styrene	<0.0010	-		0.0010	mg/L	-		10-AUG-14	R2908774
F1(C6-C10)	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908774
F1-BTEX	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908774
Xylenes	<0.00071	-		0.00071	mg/L	-		10-AUG-14	R2908774
Surr: 1,4-Difluorobenzene (SS)	97.0	-		N/A	%	-		10-AUG-14	R2908774
Surr: 4-Bromofluorobenzene (SS)	83.5	-		N/A	%	-		10-AUG-14	R2908774
Surr: 3,4-Dichlorotoluene (SS)	90.6	-		N/A	%	-		10-AUG-14	R2908774
F2, F3, F4									
F2 (>C10-C16)	0.67	+/-0.17		0.25	mg/L	0	07-AUG-14	07-AUG-14	R2912224
F3 (C16-C34)	3.20	+/-0.75		0.25	mg/L	0	07-AUG-14	07-AUG-14	R2912224
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	07-AUG-14	07-AUG-14	R2912224
Surr: 2-Bromobenzotrifluoride	112.9	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912224
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		16-AUG-14	R2919287
				0					
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.0090	+/-0.0025		0.0030	mg/L	0		11-AUG-14	R2914191
Antimony (Sb)-Total	<0.00050	-	DLM	0.00050	mg/L	-		10-AUG-14	R2912618
Arsenic (As)-Total	<0.00050	-	DLM	0.00050	mg/L	-		10-AUG-14	R2912618
Barium (Ba)-Total	0.127	+/-0.014	DLM	0.0050	mg/L	0		10-AUG-14	R2912618
Boron (B)-Total	1.36	+/-0.22	DLM	0.050	mg/L	0		10-AUG-14	R2912618
Cadmium (Cd)-Total	<0.00020	-	DLM	0.00020	mg/L	-		10-AUG-14	R2912618
Calcium (Ca)-Total	37.7	+/-4.5	DLM	0.50	mg/L	0		10-AUG-14	R2912618
Chromium (Cr)-Total	<0.0050	-	DLM	0.0050	mg/L	-		10-AUG-14	R2912618
Copper (Cu)-Total	0.0020	+/-0.0003	DLM	0.0010	mg/L	0		10-AUG-14	R2912618
Iron (Fe)-Total	0.763	+/-0.12	DLM	0.050	mg/L	0		10-AUG-14	R2912618
Lead (Pb)-Total	0.00201	+/-0.00032	DLM	0.00025	mg/L	0		10-AUG-14	R2912618
Magnesium (Mg)-Total	32.4	+/-3.9	DLM	0.10	mg/L	0		10-AUG-14	R2912618
Manganese (Mn)-Total	0.0311	+/-0.0032	DLM	0.0020	mg/L	0		10-AUG-14	R2912618
Nickel (Ni)-Total	0.0066	+/-0.0007	DLM	0.0020	mg/L	0		10-AUG-14	R2912618
Potassium (K)-Total	25.7	+/-3.2	DLM	0.25	mg/L	0		10-AUG-14	R2912618
Selenium (Se)-Total	<0.00050	-	DLM	0.00050	mg/L	-		10-AUG-14	R2912618
Silicon (Si)-Total	2.87	+/-0.57	DLM	0.25	mg/L	0		10-AUG-14	R2912618
Silver (Ag)-Total	<0.00040	-	DLM	0.00040	mg/L	-		10-AUG-14	R2912618
Sodium (Na)-Total	637	+/-78	DLM	1.0	mg/L	0		10-AUG-14	R2912618
Uranium (U)-Total	<0.00010	-	DLM	0.00010	mg/L	-		10-AUG-14	R2912618
Zinc (Zn)-Total	0.022	+/-0.004	DLM	0.015	mg/L	0		10-AUG-14	R2912618
Miscellaneous Parameters									
Ammonia, Total (as N)	3.74	-		0.050	mg/L	-		14-AUG-14	R2918088
Dissolved Organic Carbon	16.9	+/-1.9		1.0	mg/L	0		13-AUG-14	R2916939
Iron Bacteria	See Attached	-				-		05-AUG-14	R2922158
Naphthenic Acids	10.6	+/-1.9		1.0	mg/L	0	15-AUG-14	25-AUG-14	R2927877
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		14-AUG-14	R2918451
Sulphate Reducing Bacteria	See Attached	-				-		05-AUG-14	R2922158

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496613-1 16053140803010									
Sampled By: GULLED/JEREMY/BOBBY on 03-AUG-14 @ 13:00									
Matrix: H2O									
Total Dissolved Solids	1640	+/-110		10	mg/L	0		08-AUG-14	R2912810
Silicon (as SiO2)-Total	6.13	-		0.53	mg/L	-		12-AUG-14	
Turbidity	1.82	+/-0.15		0.10	NTU	0		05-AUG-14	R2908422
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Anthracene	<0.000010	-		0.000010	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Fluoranthene	<0.000020	-		0.000020	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Fluorene	<0.000020	-		0.000020	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Naphthalene	<0.000050	-		0.000050	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Phenanthrene	<0.000050	-		0.000050	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Pyrene	<0.000010	-		0.000010	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Benzo(a)pyrene	<0.000050	-		0.000005	mg/L	-	11-AUG-14	11-AUG-14	R2915900
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Dibenzo(a,h)anthracene	<0.000050	-		0.000005	mg/L	-	11-AUG-14	11-AUG-14	R2915900
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	11-AUG-14	11-AUG-14	R2915900
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Surr: d10-Acenaphthene	81.8	-		N/A	%	-	11-AUG-14	11-AUG-14	R2915900
Surr: d10-Phenanthrene	88.2	-		N/A	%	-	11-AUG-14	11-AUG-14	R2915900
Surr: d12-Chrysene	76.8	-		N/A	%	-	11-AUG-14	11-AUG-14	R2915900
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	313	+/-18		0.50	mg/L	0		07-AUG-14	R2911916
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		17-AUG-14	R2921196
Antimony (Sb)-Dissolved	<0.00050	-	DLM	0.00050	mg/L	-		17-AUG-14	R2921196
Arsenic (As)-Dissolved	<0.00050	-	DLM	0.00050	mg/L	-		17-AUG-14	R2921196
Barium (Ba)-Dissolved	0.126	+/-0.011	DLM	0.0050	mg/L	0		17-AUG-14	R2921196
Boron (B)-Dissolved	1.53	+/-0.19	DLM	0.050	mg/L	0		17-AUG-14	R2921196
Cadmium (Cd)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		17-AUG-14	R2921196
Calcium (Ca)-Dissolved	36.5	+/-5.0	DLM	0.50	mg/L	0		17-AUG-14	R2921196
Chromium (Cr)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		17-AUG-14	R2921196
Copper (Cu)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		17-AUG-14	R2921196
Iron (Fe)-Dissolved	<0.050	-	DLM	0.050	mg/L	-		17-AUG-14	R2921196
Lead (Pb)-Dissolved	<0.00025	-	DLM	0.00025	mg/L	-		17-AUG-14	R2921196
Magnesium (Mg)-Dissolved	32.1	+/-2.5	DLM	0.10	mg/L	0		17-AUG-14	R2921196
Manganese (Mn)-Dissolved	0.0269	+/-0.0018	DLM	0.0020	mg/L	0		17-AUG-14	R2921196
Nickel (Ni)-Dissolved	0.0066	+/-0.0005	DLM	0.0020	mg/L	0		17-AUG-14	R2921196
Potassium (K)-Dissolved	24.2	+/-1.9	DLM	0.25	mg/L	0		17-AUG-14	R2921196
Selenium (Se)-Dissolved	<0.00050	-	DLM	0.00050	mg/L	-		17-AUG-14	R2921196
Silicon (Si)-Dissolved	2.65	+/-0.22	DLM	0.25	mg/L	0		17-AUG-14	R2921196
Silver (Ag)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		17-AUG-14	R2921196
Sodium (Na)-Dissolved	571	+/-40	DLM	1.0	mg/L	0		17-AUG-14	R2921196
Uranium (U)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		17-AUG-14	R2921196
Zinc (Zn)-Dissolved	0.0103	+/-0.0012	DLM	0.0050	mg/L	0		17-AUG-14	R2921196
Ion Balance Calculation									
Ion Balance	96.5	-			%	-		18-AUG-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496613-1 16053140803010 Sampled By: GULLED/JEREMY/BOBBY on 03-AUG-14 @ 13:00 Matrix: H2O									
Ion Balance Calculation									
TDS (Calculated)	1650	-			mg/L	-		18-AUG-14	
Hardness (as CaCO3)	223	-			mg/L	-		18-AUG-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.000005 0	mg/L	-		16-AUG-14	R2919287
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		07-AUG-14	R2911916
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		11-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		07-AUG-14	R2911916
Sulfate by IC									
Sulfate (SO4)	<0.50	-		0.50	mg/L	-		07-AUG-14	R2911916
pH, Conductivity and Total Alkalinity									
pH	8.08	+/-0.04		0.10	pH	0		05-AUG-14	R2907479
Conductivity (EC)	2850	+/-95		0.20	uS/cm	0		05-AUG-14	R2907479
Bicarbonate (HCO3)	1370	-		5.0	mg/L	-		05-AUG-14	R2907479
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		05-AUG-14	R2907479
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		05-AUG-14	R2907479
Alkalinity, Total (as CaCO3)	1120	+/-39		2.0	mg/L	0		05-AUG-14	R2907479
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	5.67	-		0.53	mg/L	-		18-AUG-14	
L1496613-2 16053140803011 Sampled By: GULLED/JEREMY/BOBBY on 03-AUG-14 @ 15:30 Matrix: H2O									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
Toluene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
EthylBenzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
o-Xylene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
Styrene	<0.0010	-		0.0010	mg/L	-		10-AUG-14	R2908774
F1(C6-C10)	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908774
F1-BTEX	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908774
Xylenes	<0.00071	-		0.00071	mg/L	-		10-AUG-14	R2908774
Surr:	1,4-Difluorobenzene (SS)	98.0	-	N/A	%	-		10-AUG-14	R2908774
Surr:	4-Bromofluorobenzene (SS)	84.1	-	N/A	%	-		10-AUG-14	R2908774
Surr:	3,4-Dichlorotoluene (SS)	88.7	-	N/A	%	-		10-AUG-14	R2908774
L1496613-3 16053140803012 Sampled By: GULLED/JEREMY/BOBBY on 03-AUG-14 @ 13:00 Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
Toluene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
EthylBenzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
o-Xylene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
Styrene	<0.0010	-		0.0010	mg/L	-		10-AUG-14	R2908774

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496613-3 16053140803012									
Sampled By: GULLED/JEREMY/BOBBY on 03-AUG-14 @ 13:00									
Matrix: H2O									
BTEX, Styrene and F1 (C6-C10)									
F1(C6-C10)	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908774
F1-BTEX	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908774
Xylenes	<0.00071	-		0.00071	mg/L	-		10-AUG-14	R2908774
Surr: 1,4-Difluorobenzene (SS)	99.9	-		N/A	%	-		10-AUG-14	R2908774
Surr: 4-Bromofluorobenzene (SS)	84.8	-		N/A	%	-		10-AUG-14	R2908774
Surr: 3,4-Dichlorotoluene (SS)	87.5	-		N/A	%	-		10-AUG-14	R2908774
F2, F3, F4									
F2 (>C10-C16)	0.68	+/-0.18		0.25	mg/L	0	07-AUG-14	07-AUG-14	R2912224
F3 (C16-C34)	3.29	+/-0.77		0.25	mg/L	0	07-AUG-14	07-AUG-14	R2912224
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	07-AUG-14	07-AUG-14	R2912224
Surr: 2-Bromobenzotrifluoride	117.5	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912224
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		16-AUG-14	R2919287
				0					
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.022	+/-0.004	DLM	0.015	mg/L	0		10-AUG-14	R2912618
Antimony (Sb)-Total	<0.00050	-	DLM	0.00050	mg/L	-		10-AUG-14	R2912618
Arsenic (As)-Total	<0.00050	-	DLM	0.00050	mg/L	-		10-AUG-14	R2912618
Barium (Ba)-Total	0.127	+/-0.014	DLM	0.0050	mg/L	0		10-AUG-14	R2912618
Boron (B)-Total	1.38	+/-0.22	DLM	0.050	mg/L	0		10-AUG-14	R2912618
Cadmium (Cd)-Total	<0.00020	-	DLM	0.00020	mg/L	-		10-AUG-14	R2912618
Calcium (Ca)-Total	38.0	+/-4.5	DLM	0.50	mg/L	0		10-AUG-14	R2912618
Chromium (Cr)-Total	<0.0050	-	DLM	0.0050	mg/L	-		10-AUG-14	R2912618
Copper (Cu)-Total	0.0012	+/-0.0002	DLM	0.0010	mg/L	0		10-AUG-14	R2912618
Iron (Fe)-Total	0.624	+/-0.099	DLM	0.050	mg/L	0		10-AUG-14	R2912618
Lead (Pb)-Total	0.00133	+/-0.00021	DLM	0.00025	mg/L	0		10-AUG-14	R2912618
Magnesium (Mg)-Total	32.0	+/-3.9	DLM	0.10	mg/L	0		10-AUG-14	R2912618
Manganese (Mn)-Total	0.0313	+/-0.0032	DLM	0.0020	mg/L	0		10-AUG-14	R2912618
Nickel (Ni)-Total	0.0063	+/-0.0007	DLM	0.0020	mg/L	0		10-AUG-14	R2912618
Potassium (K)-Total	24.9	+/-3.1	DLM	0.25	mg/L	0		10-AUG-14	R2912618
Selenium (Se)-Total	<0.00050	-	DLM	0.00050	mg/L	-		10-AUG-14	R2912618
Silicon (Si)-Total	2.84	+/-0.56	DLM	0.25	mg/L	0		10-AUG-14	R2912618
Silver (Ag)-Total	<0.00040	-	DLM	0.00040	mg/L	-		10-AUG-14	R2912618
Sodium (Na)-Total	613	+/-75	DLM	1.0	mg/L	0		10-AUG-14	R2912618
Uranium (U)-Total	<0.00010	-	DLM	0.00010	mg/L	-		10-AUG-14	R2912618
Zinc (Zn)-Total	0.033	+/-0.006	DLM	0.015	mg/L	0		10-AUG-14	R2912618
Miscellaneous Parameters									
Ammonia, Total (as N)	3.50	-		0.050	mg/L	-		14-AUG-14	R2918088
Dissolved Organic Carbon	18.2	+/-2.0		1.0	mg/L	0		13-AUG-14	R2916939
Iron Bacteria	See Attached	-				-		05-AUG-14	R2922158
Naphthenic Acids	13.5	+/-2.4		1.0	mg/L	0	15-AUG-14	25-AUG-14	R2927877
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		14-AUG-14	R2918451
Sulphate Reducing Bacteria	See Attached	-				-		05-AUG-14	R2922158
Total Dissolved Solids	1700	+/-110		10	mg/L	0		08-AUG-14	R2912810
Silicon (as SiO2)-Total	6.07	-		0.53	mg/L	-		10-AUG-14	
Turbidity	2.07	+/-0.16		0.10	NTU	0		05-AUG-14	R2908422
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Anthracene	<0.000010	-		0.000010	mg/L	-	11-AUG-14	11-AUG-14	R2915900

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496613-3 16053140803012									
Sampled By: GULLED/JEREMY/BOBBY on 03-AUG-14 @ 13:00									
Matrix: H2O									
PAH & Carcinogenic PAH List									
Fluoranthene	<0.000020	-		0.000020	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Fluorene	<0.000020	-		0.000020	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Naphthalene	<0.000050	-		0.000050	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Phenanthrene	<0.000050	-		0.000050	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Pyrene	<0.000010	-		0.000010	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Benzo(a)pyrene	<0.000050	-		0.000050	mg/L	-	11-AUG-14	11-AUG-14	R2915900
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Dibenzo(a,h)anthracene	<0.000050	-		0.000050	mg/L	-	11-AUG-14	11-AUG-14	R2915900
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	11-AUG-14	11-AUG-14	R2915900
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Surr: d10-Acenaphthene	83.3	-		N/A	%	-	11-AUG-14	11-AUG-14	R2915900
Surr: d10-Phenanthrene	89.5	-		N/A	%	-	11-AUG-14	11-AUG-14	R2915900
Surr: d12-Chrysene	75.6	-		N/A	%	-	11-AUG-14	11-AUG-14	R2915900
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	310	+/-17		0.50	mg/L	0		07-AUG-14	R2911916
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	0.0119	+/-0.0019	DLM	0.0050	mg/L	0		17-AUG-14	R2921196
Antimony (Sb)-Dissolved	<0.00050	-	DLM	0.00050	mg/L	-		17-AUG-14	R2921196
Arsenic (As)-Dissolved	<0.00050	-	DLM	0.00050	mg/L	-		17-AUG-14	R2921196
Barium (Ba)-Dissolved	0.128	+/-0.011	DLM	0.0050	mg/L	0		17-AUG-14	R2921196
Boron (B)-Dissolved	1.54	+/-0.19	DLM	0.050	mg/L	0		17-AUG-14	R2921196
Cadmium (Cd)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		17-AUG-14	R2921196
Calcium (Ca)-Dissolved	35.8	+/-4.9	DLM	0.50	mg/L	0		17-AUG-14	R2921196
Chromium (Cr)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		17-AUG-14	R2921196
Copper (Cu)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		17-AUG-14	R2921196
Iron (Fe)-Dissolved	<0.050	-	DLM	0.050	mg/L	-		17-AUG-14	R2921196
Lead (Pb)-Dissolved	<0.00025	-	DLM	0.00025	mg/L	-		17-AUG-14	R2921196
Magnesium (Mg)-Dissolved	32.3	+/-2.5	DLM	0.10	mg/L	0		17-AUG-14	R2921196
Manganese (Mn)-Dissolved	0.0272	+/-0.0019	DLM	0.0020	mg/L	0		17-AUG-14	R2921196
Nickel (Ni)-Dissolved	0.0067	+/-0.0006	DLM	0.0020	mg/L	0		17-AUG-14	R2921196
Potassium (K)-Dissolved	23.8	+/-1.9	DLM	0.25	mg/L	0		17-AUG-14	R2921196
Selenium (Se)-Dissolved	<0.00050	-	DLM	0.00050	mg/L	-		17-AUG-14	R2921196
Silicon (Si)-Dissolved	2.67	+/-0.23	DLM	0.25	mg/L	0		17-AUG-14	R2921196
Silver (Ag)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		17-AUG-14	R2921196
Sodium (Na)-Dissolved	560	+/-39	DLM	1.0	mg/L	0		17-AUG-14	R2921196
Uranium (U)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		17-AUG-14	R2921196
Zinc (Zn)-Dissolved	0.0103	+/-0.0012	DLM	0.0050	mg/L	0		17-AUG-14	R2921196
Ion Balance Calculation									
Ion Balance	95.6	-			%	-		18-AUG-14	
TDS (Calculated)	1630	-			mg/L	-		18-AUG-14	
Hardness (as CaCO3)	222	-			mg/L	-		18-AUG-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.000050	-		0.000050	mg/L	-		16-AUG-14	R2919287
				0					
Nitrate as N by IC									

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496613-3 16053140803012 Sampled By: GULLED/JEREMY/BOBBY on 03-AUG-14 @ 13:00 Matrix: H2O									
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		07-AUG-14	R2911916
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		11-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		07-AUG-14	R2911916
Sulfate by IC									
Sulfate (SO4)	<0.50	-		0.50	mg/L	-		07-AUG-14	R2911916
pH, Conductivity and Total Alkalinity									
pH	8.09	+/-0.04		0.10	pH	0		05-AUG-14	R2907479
Conductivity (EC)	2850	+/-95		0.20	uS/cm	0		05-AUG-14	R2907479
Bicarbonate (HCO3)	1360	-		5.0	mg/L	-		05-AUG-14	R2907479
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		05-AUG-14	R2907479
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		05-AUG-14	R2907479
Alkalinity, Total (as CaCO3)	1110	+/-39		2.0	mg/L	0		05-AUG-14	R2907479
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	5.71	-		0.53	mg/L	-		18-AUG-14	
L1496613-4 16053140803013 Sampled By: GULLED/JEREMY/BOBBY on 03-AUG-14 @ 14:15 Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	0.00055	-	RRV	0.00050	mg/L	-		10-AUG-14	R2908774
Toluene	0.00105	-	RRV	0.00050	mg/L	-		10-AUG-14	R2908774
EthylBenzene	<0.00050	-	RRV	0.00050	mg/L	-		10-AUG-14	R2908774
o-Xylene	<0.00050	-	RRV	0.00050	mg/L	-		10-AUG-14	R2908774
m+p-Xylene	0.00082	-	RRV	0.00050	mg/L	-		10-AUG-14	R2908774
Styrene	<0.0010	-	RRV	0.0010	mg/L	-		10-AUG-14	R2908774
F1(C6-C10)	<0.10	-	RRV	0.10	mg/L	-		10-AUG-14	R2908774
F1-BTEX	<0.10	-	RRV	0.10	mg/L	-		10-AUG-14	R2908774
Xylenes	0.00082	-	RRV	0.00071	mg/L	-		10-AUG-14	R2908774
Surr:	1,4-Difluorobenzene (SS)	98.1	-	N/A	%	-		10-AUG-14	R2908774
Surr:	4-Bromofluorobenzene (SS)	85.8	-	N/A	%	-		10-AUG-14	R2908774
Surr:	3,4-Dichlorotoluene (SS)	89.6	-	N/A	%	-		10-AUG-14	R2908774
F2, F3, F4									
F2 (>C10-C16)	0.35	+/-0.10		0.25	mg/L	0	07-AUG-14	07-AUG-14	R2912224
F3 (C16-C34)	1.05	+/-0.27		0.25	mg/L	0	07-AUG-14	07-AUG-14	R2912224
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	07-AUG-14	07-AUG-14	R2912224
Surr:	2-Bromobenzotrifluoride	116.2	-	N/A	%	-	07-AUG-14	07-AUG-14	R2912224
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		16-AUG-14	R2919287
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	<0.30	-	DLM	0.30	mg/L	-		10-AUG-14	R2912618
Antimony (Sb)-Total	<0.010	-	DLM	0.010	mg/L	-		10-AUG-14	R2912618
Arsenic (As)-Total	<0.010	-	DLM	0.010	mg/L	-		10-AUG-14	R2912618
Barium (Ba)-Total	0.0903	+/-0.010	DLM	0.0050	mg/L	0		10-AUG-14	R2912618
Boron (B)-Total	4.4	+/-0.7	DLM	1.0	mg/L	0		10-AUG-14	R2912618
Cadmium (Cd)-Total	<0.0010	-	DLM	0.0010	mg/L	-		10-AUG-14	R2912618
Calcium (Ca)-Total	226	+/-27	DLM	2.0	mg/L	0		10-AUG-14	R2912618
Chromium (Cr)-Total	<0.010	-	DLM	0.010	mg/L	-		10-AUG-14	R2912618

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496613-4 16053140803013									
Sampled By: GULLED/JEREMY/BOBBY on 03-AUG-14 @ 14:15									
Matrix: H2O									
Total Metals in Water by CRC ICPMS									
Copper (Cu)-Total	0.037	+/-0.004	DLM	0.010	mg/L	0		10-AUG-14	R2912618
Iron (Fe)-Total	11.4	+/-1.8	DLM	1.0	mg/L	0		10-AUG-14	R2912618
Lead (Pb)-Total	0.0052	+/-0.0008	DLM	0.0050	mg/L	0		10-AUG-14	R2912618
Magnesium (Mg)-Total	253	+/-31	DLM	0.50	mg/L	0		10-AUG-14	R2912618
Manganese (Mn)-Total	0.241	+/-0.024	DLM	0.0050	mg/L	0		10-AUG-14	R2912618
Nickel (Ni)-Total	0.016	+/-0.002	DLM	0.010	mg/L	0		10-AUG-14	R2912618
Potassium (K)-Total	156	+/-19	DLM	5.0	mg/L	0		10-AUG-14	R2912618
Selenium (Se)-Total	<0.010	-	DLM	0.010	mg/L	-		10-AUG-14	R2912618
Silicon (Si)-Total	<5.0	-	DLM	5.0	mg/L	-		10-AUG-14	R2912618
Silver (Ag)-Total	<0.0010	-	DLM	0.0010	mg/L	-		10-AUG-14	R2912618
Sodium (Na)-Total	1970	+/-240	DLM	5.0	mg/L	0		10-AUG-14	R2912618
Uranium (U)-Total	<0.0010	-	DLM	0.0010	mg/L	-		10-AUG-14	R2912618
Zinc (Zn)-Total	<0.30	-	DLM	0.30	mg/L	-		10-AUG-14	R2912618
Miscellaneous Parameters									
Ammonia, Total (as N)	16.2	-		0.050	mg/L	-		14-AUG-14	R2918088
Dissolved Organic Carbon	10.5	+/-1.3		1.0	mg/L	0		13-AUG-14	R2916939
Iron Bacteria	See Attached	-				-		05-AUG-14	R2922158
Naphthenic Acids	3.5	+/-0.7		1.0	mg/L	0	15-AUG-14	25-AUG-14	R2927877
Phenols (4AAP)	0.0119	+/-0.0017		0.0010	mg/L	-7.4%		15-AUG-14	R2920049
Sulphate Reducing Bacteria	See Attached	-				-		05-AUG-14	R2922158
Total Dissolved Solids	7790	+/-520		10	mg/L	0		08-AUG-14	R2912810
Silicon (as SiO2)-Total	<11	-		11	mg/L	-		10-AUG-14	
Turbidity	46.6	+/-2.6		0.10	NTU	0		05-AUG-14	R2908422
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Anthracene	<0.000010	-		0.000010	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Fluoranthene	<0.000020	-		0.000020	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Fluorene	<0.000020	-		0.000020	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Naphthalene	0.00164	-		0.000050	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Phenanthrene	<0.000050	-		0.000050	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Pyrene	<0.000010	-		0.000010	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Benzo(a)pyrene	<0.000050	-		0.000050	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Chrysene	<0.000020	-		0.000020	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Dibenzo(a,h)anthracene	<0.000050	-		0.000050	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	11-AUG-14	11-AUG-14	R2915900
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	11-AUG-14	11-AUG-14	R2915900
Surr: d10-Acenaphthene	71.5	-		N/A	%	-	11-AUG-14	11-AUG-14	R2915900
Surr: d10-Phenanthrene	80.0	-		N/A	%	-	11-AUG-14	11-AUG-14	R2915900
Surr: d12-Chrysene	61.7	-		N/A	%	-	11-AUG-14	11-AUG-14	R2915900
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	3060	+/-170	DLM	10	mg/L	0		07-AUG-14	R2911916
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.10	-	DLM	0.10	mg/L	-		17-AUG-14	R2921196

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496613-4 16053140803013 Sampled By: GULLED/JEREMY/BOBBY on 03-AUG-14 @ 14:15 Matrix: H2O									
Dissolved Metals in Water by CRC ICPMS									
Antimony (Sb)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		17-AUG-14	R2921196
Arsenic (As)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		17-AUG-14	R2921196
Barium (Ba)-Dissolved	0.0395	+/-0.0034	DLM	0.0050	mg/L	0		17-AUG-14	R2921196
Boron (B)-Dissolved	4.5	+/-0.5	DLM	1.0	mg/L	0		17-AUG-14	R2921196
Cadmium (Cd)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		17-AUG-14	R2921196
Calcium (Ca)-Dissolved	251	+/-34	DLM	2.0	mg/L	0		17-AUG-14	R2921196
Chromium (Cr)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		17-AUG-14	R2921196
Copper (Cu)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		17-AUG-14	R2921196
Iron (Fe)-Dissolved	<1.0	-	DLM	1.0	mg/L	-		17-AUG-14	R2921196
Lead (Pb)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		17-AUG-14	R2921196
Magnesium (Mg)-Dissolved	232	+/-18	DLM	0.50	mg/L	0		17-AUG-14	R2921196
Manganese (Mn)-Dissolved	0.116	+/-0.0079	DLM	0.0050	mg/L	0		17-AUG-14	R2921196
Nickel (Ni)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		17-AUG-14	R2921196
Potassium (K)-Dissolved	156	+/-12	DLM	5.0	mg/L	0		17-AUG-14	R2921196
Selenium (Se)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		17-AUG-14	R2921196
Silicon (Si)-Dissolved	<5.0	-	DLM	5.0	mg/L	-		17-AUG-14	R2921196
Silver (Ag)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		17-AUG-14	R2921196
Sodium (Na)-Dissolved	1710	+/-120	DLM	5.0	mg/L	0		17-AUG-14	R2921196
Uranium (U)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		17-AUG-14	R2921196
Zinc (Zn)-Dissolved	<0.10	-	DLM	0.10	mg/L	-		17-AUG-14	R2921196
Ion Balance Calculation									
Ion Balance	97.9	-			%	-		18-AUG-14	
TDS (Calculated)	6700	-			mg/L	-		18-AUG-14	
Hardness (as CaCO3)	1580	-			mg/L	-		18-AUG-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		16-AUG-14	R2919287
Nitrate as N by IC									
Nitrate (as N)	<1.0	-	DLM	1.0	mg/L	-		07-AUG-14	R2911916
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<1.1	-		1.1	mg/L	-		11-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.40	-	DLM	0.40	mg/L	-		07-AUG-14	R2911916
Sulfate by IC									
Sulfate (SO4)	1260	+/-71	DLM	10	mg/L	0		07-AUG-14	R2911916
pH, Conductivity and Total Alkalinity									
pH	8.88	+/-0.04		0.10	pH	0		05-AUG-14	R2907479
Conductivity (EC)	11300	+/-380		0.20	uS/cm	0		05-AUG-14	R2907479
Bicarbonate (HCO3)	16.8	-		5.0	mg/L	-		05-AUG-14	R2907479
Carbonate (CO3)	21.2	-		5.0	mg/L	-		05-AUG-14	R2907479
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		05-AUG-14	R2907479
Alkalinity, Total (as CaCO3)	49.2	+/-3.1		2.0	mg/L	0		05-AUG-14	R2907479
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	<11	-		11	mg/L	-		18-AUG-14	
L1496613-5 16053140803014 Sampled By: GULLED/JEREMY/BOBBY on 03-AUG-14 @ 15:15 Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
Toluene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496613-5 16053140803014									
Sampled By: GULLED/JEREMY/BOBBY on 03-AUG-14 @ 15:15									
Matrix: H2O									
BTEX, Styrene and F1 (C6-C10)									
EthylBenzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
o-Xylene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
Styrene	<0.0010	-		0.0010	mg/L	-		10-AUG-14	R2908774
F1(C6-C10)	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908774
F1-BTEX	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908774
Xylenes	<0.00071	-		0.00071	mg/L	-		10-AUG-14	R2908774
Surr: 1,4-Difluorobenzene (SS)	96.9	-		N/A	%	-		10-AUG-14	R2908774
Surr: 4-Bromofluorobenzene (SS)	84.4	-		N/A	%	-		10-AUG-14	R2908774
Surr: 3,4-Dichlorotoluene (SS)	87.2	-		N/A	%	-		10-AUG-14	R2908774
F2, F3, F4									
F2 (>C10-C16)	0.78	+/-0.20		0.25	mg/L	0	07-AUG-14	07-AUG-14	R2912224
F3 (C16-C34)	7.70	+/-1.8		0.25	mg/L	0	07-AUG-14	07-AUG-14	R2912224
F4 (C34-C50)	4.64	+/-1.1		0.25	mg/L	0	07-AUG-14	07-AUG-14	R2912224
Surr: 2-Bromobenzotrifluoride	115.9	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912224
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	0.0000104	+/-0.0000044		0.0000050	mg/L	0		16-AUG-14	R2919287
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	53.8	+/-8.5		0.0030	mg/L	0		10-AUG-14	R2912618
Antimony (Sb)-Total	<0.00040	-		0.00040	mg/L	-		10-AUG-14	R2912618
Arsenic (As)-Total	0.0227	+/-0.0026		0.00040	mg/L	0		10-AUG-14	R2912618
Barium (Ba)-Total	1.64	+/-0.18		0.0050	mg/L	0		10-AUG-14	R2912618
Boron (B)-Total	0.104	+/-0.017		0.050	mg/L	0		10-AUG-14	R2912618
Cadmium (Cd)-Total	0.00048	+/-0.00009		0.00020	mg/L	0		10-AUG-14	R2912618
Calcium (Ca)-Total	383	+/-45		0.50	mg/L	0		10-AUG-14	R2912618
Chromium (Cr)-Total	0.118	+/-0.017		0.0050	mg/L	0		10-AUG-14	R2912618
Copper (Cu)-Total	0.193	+/-0.022		0.0010	mg/L	0		10-AUG-14	R2912618
Iron (Fe)-Total	345	+/-55		0.010	mg/L	0		11-AUG-14	R2914191
Lead (Pb)-Total	0.0916	+/-0.014		0.00010	mg/L	0		10-AUG-14	R2912618
Magnesium (Mg)-Total	76.9	+/-9.3		0.10	mg/L	0		10-AUG-14	R2912618
Manganese (Mn)-Total	5.23	+/-0.53		0.0020	mg/L	0		11-AUG-14	R2914191
Nickel (Ni)-Total	0.341	+/-0.037		0.0020	mg/L	0		10-AUG-14	R2912618
Potassium (K)-Total	9.96	+/-1.2		0.10	mg/L	0		10-AUG-14	R2912618
Selenium (Se)-Total	0.00050	+/-0.00007		0.00040	mg/L	0		10-AUG-14	R2912618
Silicon (Si)-Total	87.5	+/-17		0.050	mg/L	0		10-AUG-14	R2912618
Silver (Ag)-Total	0.00053	+/-0.00011		0.00040	mg/L	0		10-AUG-14	R2912618
Sodium (Na)-Total	10.1	+/-1.2		1.0	mg/L	0		10-AUG-14	R2912618
Uranium (U)-Total	0.00684	+/-0.00096		0.00010	mg/L	0		10-AUG-14	R2912618
Zinc (Zn)-Total	0.466	+/-0.071		0.0040	mg/L	0		10-AUG-14	R2912618
Miscellaneous Parameters									
Ammonia, Total (as N)	0.243	-		0.050	mg/L	-		14-AUG-14	R2918088
Dissolved Organic Carbon	6.7	+/-0.9		1.0	mg/L	0		13-AUG-14	R2916939
Iron Bacteria	See Attached	-				-		05-AUG-14	R2922158
Naphthenic Acids	<1.0	-		1.0	mg/L	-	15-AUG-14	25-AUG-14	R2927877
Phenols (4AAP)	0.0462	+/-0.0060		0.0010	mg/L	-7.4%		15-AUG-14	R2920049
Sulphate Reducing Bacteria	See Attached	-				-		05-AUG-14	R2922158
Total Dissolved Solids	268	+/-18	DLA	20	mg/L	0		18-AUG-14	R2923484
Silicon (as SiO2)-Total	187	-		0.11	mg/L	-		12-AUG-14	
Turbidity	>4000	-		0.10	NTU	-		05-AUG-14	R2908422

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496613-5 16053140803014 Sampled By: GULLED/JEREMY/BOBBY on 03-AUG-14 @ 15:15 Matrix: H2O									
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		16-AUG-14	R2919287
				0					
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		07-AUG-14	R2911916
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		11-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		07-AUG-14	R2911916
Sulfate by IC									
Sulfate (SO4)	2.33	+/-0.17		0.50	mg/L	0		07-AUG-14	R2911916
pH, Conductivity and Total Alkalinity									
pH	8.07	+/-0.04		0.10	pH	0		05-AUG-14	R2907479
Conductivity (EC)	530	+/-18		0.20	uS/cm	0		05-AUG-14	R2907479
Bicarbonate (HCO3)	342	-		5.0	mg/L	-		05-AUG-14	R2907479
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		05-AUG-14	R2907479
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		05-AUG-14	R2907479
Alkalinity, Total (as CaCO3)	281	+/-11		2.0	mg/L	0		05-AUG-14	R2907479
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	6.62	-		0.11	mg/L	-		18-AUG-14	
L1496613-6 16053140803015 Sampled By: GULLED/JEREMY/BOBBY on 03-AUG-14 @ 15:20 Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
Toluene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
EthylBenzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
o-Xylene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
Styrene	<0.0010	-		0.0010	mg/L	-		10-AUG-14	R2908774
F1(C6-C10)	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908774
F1-BTEX	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908774
Xylenes	<0.00071	-		0.00071	mg/L	-		10-AUG-14	R2908774
Surr: 1,4-Difluorobenzene (SS)	98.2	-		N/A	%	-		10-AUG-14	R2908774
Surr: 4-Bromofluorobenzene (SS)	85.1	-		N/A	%	-		10-AUG-14	R2908774
Surr: 3,4-Dichlorotoluene (SS)	88.9	-		N/A	%	-		10-AUG-14	R2908774
F2, F3, F4									
F2 (>C10-C16)	1.32	+/-0.33		0.25	mg/L	0	07-AUG-14	07-AUG-14	R2912224
F3 (C16-C34)	6.58	+/-1.5		0.25	mg/L	0	07-AUG-14	07-AUG-14	R2912224
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	07-AUG-14	07-AUG-14	R2912224
Surr: 2-Bromobenzotrifluoride	115.7	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912224
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		16-AUG-14	R2919287
				0					
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.0642	+/-0.011		0.0030	mg/L	0		10-AUG-14	R2912618
Antimony (Sb)-Total	0.00062	+/-0.00010		0.00040	mg/L	0		10-AUG-14	R2912618
Arsenic (As)-Total	0.00148	+/-0.00018		0.00040	mg/L	0		10-AUG-14	R2912618
Barium (Ba)-Total	0.0054	+/-0.0006		0.0050	mg/L	0		10-AUG-14	R2912618
Boron (B)-Total	1.07	+/-0.17		0.050	mg/L	0		10-AUG-14	R2912618

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496613-7 16053140803016									
Sampled By: GULLED/JEREMY/BOBBY on 03-AUG-14 @ 16:29									
Matrix: H2O									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-	RRV	0.00050	mg/L	-		10-AUG-14	R2908774
Toluene	0.00089	-	RRV	0.00050	mg/L	-		10-AUG-14	R2908774
EthylBenzene	<0.00050	-	RRV	0.00050	mg/L	-		10-AUG-14	R2908774
o-Xylene	<0.00050	-	RRV	0.00050	mg/L	-		10-AUG-14	R2908774
m+p-Xylene	<0.00050	-	RRV	0.00050	mg/L	-		10-AUG-14	R2908774
Styrene	<0.0010	-	RRV	0.0010	mg/L	-		10-AUG-14	R2908774
F1(C6-C10)	<0.10	-	RRV	0.10	mg/L	-		10-AUG-14	R2908774
F1-BTEX	<0.10	-	RRV	0.10	mg/L	-		10-AUG-14	R2908774
Xylenes	<0.00071	-	RRV	0.00071	mg/L	-		10-AUG-14	R2908774
Surr: 1,4-Difluorobenzene (SS)	96.1	-		N/A	%	-		10-AUG-14	R2908774
Surr: 4-Bromofluorobenzene (SS)	84.2	-		N/A	%	-		10-AUG-14	R2908774
Surr: 3,4-Dichlorotoluene (SS)	88.1	-		N/A	%	-		10-AUG-14	R2908774
F2, F3, F4									
F2 (>C10-C16)	0.63	+/-0.16		0.25	mg/L	0	07-AUG-14	07-AUG-14	R2912224
F3 (C16-C34)	1.63	+/-0.40		0.25	mg/L	0	07-AUG-14	07-AUG-14	R2912224
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	07-AUG-14	07-AUG-14	R2912224
Surr: 2-Bromobenzotrifluoride	119.9	-		N/A	%	-	07-AUG-14	07-AUG-14	R2912224
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		16-AUG-14	R2919287
				0					
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.027	+/-0.005	DLM	0.015	mg/L	0		11-AUG-14	R2914191
Antimony (Sb)-Total	<0.00050	-	DLM	0.00050	mg/L	-		10-AUG-14	R2912618
Arsenic (As)-Total	0.00240	+/-0.00029	DLM	0.00050	mg/L	0		10-AUG-14	R2912618
Barium (Ba)-Total	0.0548	+/-0.0061	DLM	0.0050	mg/L	0		10-AUG-14	R2912618
Boron (B)-Total	0.182	+/-0.029	DLM	0.050	mg/L	0		10-AUG-14	R2912618
Cadmium (Cd)-Total	0.00023	+/-0.00004	DLM	0.00020	mg/L	0		10-AUG-14	R2912618
Calcium (Ca)-Total	211	+/-25	DLM	0.50	mg/L	0		10-AUG-14	R2912618
Chromium (Cr)-Total	<0.0050	-	DLM	0.0050	mg/L	-		10-AUG-14	R2912618
Copper (Cu)-Total	0.0103	+/-0.0012	DLM	0.0010	mg/L	0		10-AUG-14	R2912618
Iron (Fe)-Total	5.02	+/-0.80	DLM	0.050	mg/L	0		10-AUG-14	R2912618
Lead (Pb)-Total	0.00739	+/-0.0012	DLM	0.00025	mg/L	0		10-AUG-14	R2912618
Magnesium (Mg)-Total	0.20	+/-0.02	DLM	0.10	mg/L	0		10-AUG-14	R2912618
Manganese (Mn)-Total	0.0479	+/-0.0048	DLM	0.0020	mg/L	0		10-AUG-14	R2912618
Nickel (Ni)-Total	0.0277	+/-0.0030	DLM	0.0020	mg/L	0		10-AUG-14	R2912618
Potassium (K)-Total	112	+/-14	DLM	0.25	mg/L	0		10-AUG-14	R2912618
Selenium (Se)-Total	<0.00050	-	DLM	0.00050	mg/L	-		10-AUG-14	R2912618
Silicon (Si)-Total	<0.25	-	DLM	0.25	mg/L	-		10-AUG-14	R2912618
Silver (Ag)-Total	<0.00040	-	DLM	0.00040	mg/L	-		10-AUG-14	R2912618
Sodium (Na)-Total	328	+/-40	DLM	1.0	mg/L	0		10-AUG-14	R2912618
Uranium (U)-Total	<0.00010	-	DLM	0.00010	mg/L	-		10-AUG-14	R2912618
Zinc (Zn)-Total	0.030	+/-0.005	DLM	0.015	mg/L	0		10-AUG-14	R2912618
Miscellaneous Parameters									
Ammonia, Total (as N)	3.89	-		0.050	mg/L	-		14-AUG-14	R2918088
Dissolved Organic Carbon	19.1	+/-2.1		1.0	mg/L	0		13-AUG-14	R2916939
Iron Bacteria	See Attached	-				-		05-AUG-14	R2922158
Naphthenic Acids	4.9	+/-0.9		1.0	mg/L	0	15-AUG-14	25-AUG-14	R2927877
Phenols (4AAP)	0.0677	+/-0.0087		0.0010	mg/L	-7.4%		15-AUG-14	R2920049
Sulphate Reducing Bacteria	See Attached	-				-		05-AUG-14	R2922158
Total Dissolved Solids	1610	+/-110		10	mg/L	0		08-AUG-14	R2912810

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496613-7 16053140803016									
Sampled By: GULLED/JEREMY/BOBBY on 03-AUG-14 @ 16:29									
Matrix: H2O									
Silicon (as SiO2)-Total	<0.53	-		0.53	mg/L	-		18-AUG-14	
Turbidity	7.49	+/-0.46		0.10	NTU	0		05-AUG-14	R2908422
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	12-AUG-14	12-AUG-14	R2918273
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	12-AUG-14	12-AUG-14	R2918273
Anthracene	<0.000010	-		0.000010	mg/L	-	12-AUG-14	12-AUG-14	R2918273
Fluoranthene	<0.000020	-		0.000020	mg/L	-	12-AUG-14	12-AUG-14	R2918273
Fluorene	<0.000020	-		0.000020	mg/L	-	12-AUG-14	12-AUG-14	R2918273
Naphthalene	0.000911	-		0.000050	mg/L	-	12-AUG-14	12-AUG-14	R2918273
Phenanthrene	<0.000050	-		0.000050	mg/L	-	12-AUG-14	12-AUG-14	R2918273
Pyrene	<0.000010	-		0.000010	mg/L	-	12-AUG-14	12-AUG-14	R2918273
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	12-AUG-14	12-AUG-14	R2918273
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	12-AUG-14	12-AUG-14	R2918273
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	12-AUG-14	12-AUG-14	R2918273
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	12-AUG-14	12-AUG-14	R2918273
Benzo(a)pyrene	<0.0000050	-		0.000005	mg/L	-	12-AUG-14	12-AUG-14	R2918273
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	12-AUG-14	12-AUG-14	R2918273
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	12-AUG-14	12-AUG-14	R2918273
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	12-AUG-14	12-AUG-14	R2918273
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	12-AUG-14	12-AUG-14	R2918273
Surr: d10-Acenaphthene	85.4	-		N/A	%	-	12-AUG-14	12-AUG-14	R2918273
Surr: d10-Phenanthrene	87.6	-		N/A	%	-	12-AUG-14	12-AUG-14	R2918273
Surr: d12-Chrysene	85.0	-		N/A	%	-	12-AUG-14	12-AUG-14	R2918273
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	202	+/-11	DLM	2.5	mg/L	0		07-AUG-14	R2911916
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	0.0163	+/-0.0025	DLM	0.0050	mg/L	0		17-AUG-14	R2921196
Antimony (Sb)-Dissolved	<0.00050	-	DLM	0.00050	mg/L	-		17-AUG-14	R2921196
Arsenic (As)-Dissolved	0.00198	+/-0.00021	DLM	0.00050	mg/L	0		17-AUG-14	R2921196
Barium (Ba)-Dissolved	0.0494	+/-0.0043	DLM	0.0050	mg/L	0		17-AUG-14	R2921196
Boron (B)-Dissolved	0.229	+/-0.028	DLM	0.050	mg/L	0		17-AUG-14	R2921196
Cadmium (Cd)-Dissolved	0.00020	+/-0.00002	DLM	0.00010	mg/L	0		17-AUG-14	R2921196
Calcium (Ca)-Dissolved	195	+/-27	DLM	0.50	mg/L	0		17-AUG-14	R2921196
Chromium (Cr)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		17-AUG-14	R2921196
Copper (Cu)-Dissolved	0.0018	+/-0.0001	DLM	0.0010	mg/L	0		17-AUG-14	R2921196
Iron (Fe)-Dissolved	<0.050	-	DLM	0.050	mg/L	-		17-AUG-14	R2921196
Lead (Pb)-Dissolved	0.00535	+/-0.00050	DLM	0.00025	mg/L	0		17-AUG-14	R2921196
Magnesium (Mg)-Dissolved	<0.10	-	DLM	0.10	mg/L	-		17-AUG-14	R2921196
Manganese (Mn)-Dissolved	<0.0020	-	DLM	0.0020	mg/L	-		17-AUG-14	R2921196
Nickel (Ni)-Dissolved	0.0211	+/-0.0017	DLM	0.0020	mg/L	0		17-AUG-14	R2921196
Potassium (K)-Dissolved	114	+/-8.9	DLM	0.25	mg/L	0		17-AUG-14	R2921196
Selenium (Se)-Dissolved	<0.00050	-	DLM	0.00050	mg/L	-		17-AUG-14	R2921196
Silicon (Si)-Dissolved	<0.25	-	DLM	0.25	mg/L	-		17-AUG-14	R2921196
Silver (Ag)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		17-AUG-14	R2921196
Sodium (Na)-Dissolved	264	+/-19	DLM	1.0	mg/L	0		17-AUG-14	R2921196
Uranium (U)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		17-AUG-14	R2921196
Zinc (Zn)-Dissolved	0.0079	+/-0.0010	DLM	0.0050	mg/L	0		17-AUG-14	R2921196
Ion Balance Calculation									
Ion Balance	102	-			%	-		18-AUG-14	
TDS (Calculated)	1450	-			mg/L	-		18-AUG-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496613-7 16053140803016									
Sampled By: GULLED/JEREMY/BOBBY on 03-AUG-14 @ 16:29									
Matrix: H2O									
Ion Balance Calculation									
Hardness (as CaCO3)	487	-			mg/L	-		18-AUG-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		16-AUG-14	R2919287
Nitrate as N by IC									
Nitrate (as N)	<0.25	-	DLM	0.25	mg/L	-		07-AUG-14	R2911916
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.27	-		0.27	mg/L	-		11-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.10	-	DLM	0.10	mg/L	-		07-AUG-14	R2911916
Sulfate by IC									
Sulfate (SO4)	333	+/-19	DLM	2.5	mg/L	0		07-AUG-14	R2911916
pH, Conductivity and Total Alkalinity									
pH	11.72	+/-0.04		0.10	pH	0		05-AUG-14	R2907479
Conductivity (EC)	3730	+/-120		0.20	uS/cm	0		05-AUG-14	R2907479
Bicarbonate (HCO3)	<5.0	-		5.0	mg/L	-		05-AUG-14	R2907479
Carbonate (CO3)	28.8	-		5.0	mg/L	-		05-AUG-14	R2907479
Hydroxide (OH)	175	-		5.0	mg/L	-		05-AUG-14	R2907479
Alkalinity, Total (as CaCO3)	563	+/-20		2.0	mg/L	0		05-AUG-14	R2907479
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	<0.53	-		0.53	mg/L	-		18-AUG-14	
* Refer to Referenced Information for Qualifiers (if any) and Methodology.									

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Total Dissolved Solids	B	
Comments:	MB was outside of acceptable limits.		
Duplicate	Antimony (Sb)-Total	DLM	
Duplicate	Arsenic (As)-Total	DLM	
Duplicate	Barium (Ba)-Total	DLM	
Duplicate	Boron (B)-Total	DLM	
Duplicate	Cadmium (Cd)-Total	DLM	
Duplicate	Calcium (Ca)-Total	DLM	
Duplicate	Chromium (Cr)-Total	DLM	
Duplicate	Copper (Cu)-Total	DLM	
Duplicate	Iron (Fe)-Total	DLM	
Duplicate	Lead (Pb)-Total	DLM	
Duplicate	Magnesium (Mg)-Total	DLM	
Duplicate	Manganese (Mn)-Total	DLM	
Duplicate	Nickel (Ni)-Total	DLM	
Duplicate	Potassium (K)-Total	DLM	
Duplicate	Selenium (Se)-Total	DLM	
Duplicate	Silicon (Si)-Total	DLM	
Duplicate	Silver (Ag)-Total	DLM	
Duplicate	Sodium (Na)-Total	DLM	
Duplicate	Uranium (U)-Total	DLM	
Duplicate	Zinc (Zn)-Total	DLM	
Duplicate	Aluminum (Al)-Total	DLM	
Duplicate	Antimony (Sb)-Total	DLM	
Duplicate	Arsenic (As)-Total	DLM	
Duplicate	Barium (Ba)-Total	DLM	
Duplicate	Boron (B)-Total	DLM	
Duplicate	Cadmium (Cd)-Total	DLM	
Duplicate	Calcium (Ca)-Total	DLM	
Duplicate	Chromium (Cr)-Total	DLM	
Duplicate	Copper (Cu)-Total	DLM	
Duplicate	Iron (Fe)-Total	DLM	
Duplicate	Lead (Pb)-Total	DLM	
Duplicate	Magnesium (Mg)-Total	DLM	
Duplicate	Manganese (Mn)-Total	DLM	
Duplicate	Nickel (Ni)-Total	DLM	
Duplicate	Potassium (K)-Total	DLM	
Duplicate	Selenium (Se)-Total	DLM	
Duplicate	Silicon (Si)-Total	DLM	
Duplicate	Silver (Ag)-Total	DLM	
Duplicate	Sodium (Na)-Total	DLM	
Duplicate	Uranium (U)-Total	DLM	
Duplicate	Zinc (Zn)-Total	DLM	
Matrix Spike	Chloride (Cl)	MS-B	
Matrix Spike	Sulfate (SO4)	MS-B	
Matrix Spike	Dissolved Organic Carbon	MS-B	

Sample Parameter Qualifier Key:

Qualifier	Description
B	Method Blank exceeds ALS DQO. All associated sample results are at least 5 times greater than blank levels and are considered reliable.
DLA	Detection Limit adjusted for required dilution
DLM	Detection Limit Adjusted due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
BTXS,F1-ED	Water	BTEX, Styrene and F1 (C6-C10)		EPA 5021/8015&8260 GC-MS & FID
C-DIS-ORG-ED	Water	Dissolved Organic Carbon		APHA 5310 B-Instrumental
CL-IC-ED	Water	Chloride by IC		APHA 4110 B-ION CHROMATOGRAPHY
F2,F3,F4-ED	Water	F2, F3, F4		EPA 3510/CCME PHC CWS-GC-FID
HG-D-L-CVAA-ED	Water	Mercury (Hg) - Dissolved		EPA 245.7 / EPA 245.1
HG-T-L-CVAA-ED	Water	Mercury (Hg)		EPA 245.7 / EPA 245.1
IB-BART-PB	Water	Iron Bacteria		BART Test Kit
BART Test Kit Analysis performed at PBR Laboratories Inc., Edmonton.				
IONBALANCE-ED	Water	Ion Balance Calculation		APHA 1030E
MET-D-CCMS-ED	Water	Dissolved Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
NAPHTHENIC-ACID-FM	Water	Naphthenic Acids by FTIR		Naphthenic Acids by FTIR, Syncrude, 1994
Dissolved naphthenic acids are solvent extracted from acidified aqueous samples using Dichloromethane prior to quantitation by Fourier Transform Infra-Red spectroscopy. Note that FTIR is not uniquely selective to naphthenic acids. If present, other carboxylic acids (e.g. humic acids, fulvic acids) may also be detected by this method.				
NH3-CFA-ED	Water	Ammonia in Water by Colour		APHA 4500 NH3-NITROGEN (AMMONIA)
This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.				
NO2+NO3-CALC-ED	Water	Nitrate+Nitrite		CALCULATION
NO2-IC-ED	Water	Nitrite as N by IC		APHA 4110 B-ION CHROMATOGRAPHY
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
NO3-IC-ED	Water	Nitrate as N by IC		APHA 4110 B-ION CHROMATOGRAPHY
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
PAH-ABT1-CL	Water	PAH & Carcinogenic PAH List		EPA 3510/8270-GC/MS
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity		APHA 4500-H, 2510, 2320
All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)				
PHENOLS-4AAP-ED	Water	Phenols (4AAP)		AB ENV.06537-COLORIMETRIC
This analysis is carried out using procedures adapted from ENVIRODAT VMV 06537 689, Method Code 154, in "Methods Manual for Chemical Analysis of Water and Wastes" published by the Alberta Environmental Centre. This automated method is based on the distillation of phenol and subsequent reaction of the distillate with alkaline ferricyanide and 4-aminoantipyrine to form a red complex which is measured at 505 nm.				
SIO2-D-CALC-ED	Water	Dissolved Silicon (reported as Silica)		CALCULATION
SIO2-T-CALC-ED	Water	Total Silicon (reported as Silica)		CALCULATION
SO4-IC-ED	Water	Sulfate by IC		APHA 4110 B-ION CHROMATOGRAPHY
SOLIDS-TDS-ED	Water	Total Dissolved Solids		APHA 2540 C
SRB-BART-PB	Water	Sulphate Reducing Bacteria / BART method		BART TEST KIT
BART Test Kit				
TURBIDITY-ED	Water	Turbidity		APHA 2130 B-Nephelometer

** The indicated Method Reference is the closest nationally or internationally recognized reference for the applicable ALS test method. ALS methods may incorporate modifications from the specified reference to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
----------------------------	---------------------

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
Laboratory Definition Code	Laboratory Location			
ED		ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA		
PB		PBR LABORATORIES		
FM		ALS ENVIRONMENTAL - FORT MCMURRAY, ALBERTA, CANADA		
CL		ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA		

Chain of Custody Numbers:

M076073

GLOSSARY OF REPORT TERMS

Surr - Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

MU: Measurement Uncertainty. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 which gives a level of confidence of approximately 95%.

Bias: The reported method bias is the average long term deviation from the target value for a long term reference or control sample, measured in percent.

Zero values indicate no detectable method bias.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Environmental

Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 1 of 31

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R2908774							
WG1926028-4	DUP	L1496774-1						
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
EthylBenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
o-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	10-AUG-14
m+p-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	10-AUG-14
Styrene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	50	10-AUG-14
F1(C6-C10)		<0.10	<0.10	RPD-NA	mg/L	N/A	30	10-AUG-14
WG1926028-8	DUP	L1497207-3						
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
EthylBenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
o-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	10-AUG-14
m+p-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	10-AUG-14
Styrene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	50	10-AUG-14
F1(C6-C10)		<0.10	<0.10	RPD-NA	mg/L	N/A	30	10-AUG-14
WG1926028-2	LCS							
Benzene			94.2		%		70-130	10-AUG-14
Toluene			91.5		%		70-130	10-AUG-14
EthylBenzene			88.0		%		70-130	10-AUG-14
o-Xylene			90.3		%		70-130	10-AUG-14
m+p-Xylene			95.6		%		70-130	10-AUG-14
Styrene			89.0		%		70-130	10-AUG-14
WG1926028-3	LCS							
F1(C6-C10)			96.9		%		70-130	10-AUG-14
WG1926028-6	LCS							
Benzene			101.3		%		70-130	10-AUG-14
Toluene			88.1		%		70-130	10-AUG-14
EthylBenzene			94.6		%		70-130	10-AUG-14
o-Xylene			97.2		%		70-130	10-AUG-14
m+p-Xylene			100.9		%		70-130	10-AUG-14
Styrene			97.0		%		70-130	10-AUG-14
WG1926028-7	LCS							
F1(C6-C10)			93.2		%		70-130	10-AUG-14
WG1926028-1	MB							



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 2 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R2908774							
WG1926028-1	MB							
Benzene			<0.00050		mg/L		0.0005	10-AUG-14
Toluene			<0.00050		mg/L		0.0005	10-AUG-14
EthylBenzene			<0.00050		mg/L		0.0005	10-AUG-14
o-Xylene			<0.00050		mg/L		0.0005	10-AUG-14
m+p-Xylene			<0.00050		mg/L		0.0005	10-AUG-14
Styrene			<0.0010		mg/L		0.001	10-AUG-14
F1(C6-C10)			<0.10		mg/L		0.1	10-AUG-14
Surrogate: 1,4-Difluorobenzene (SS)			97.8		%		70-130	10-AUG-14
Surrogate: 4-Bromofluorobenzene (SS)			83.1		%		70-130	10-AUG-14
Surrogate: 3,4-Dichlorotoluene (SS)			93.2		%		70-130	10-AUG-14
WG1926028-5	MB							
Benzene			<0.00050		mg/L		0.0005	10-AUG-14
Toluene			<0.00050		mg/L		0.0005	10-AUG-14
EthylBenzene			<0.00050		mg/L		0.0005	10-AUG-14
o-Xylene			<0.00050		mg/L		0.0005	10-AUG-14
m+p-Xylene			<0.00050		mg/L		0.0005	10-AUG-14
Styrene			<0.0010		mg/L		0.001	10-AUG-14
F1(C6-C10)			<0.10		mg/L		0.1	10-AUG-14
Surrogate: 1,4-Difluorobenzene (SS)			96.6		%		70-130	10-AUG-14
Surrogate: 4-Bromofluorobenzene (SS)			80.6		%		70-130	10-AUG-14
Surrogate: 3,4-Dichlorotoluene (SS)			89.6		%		70-130	10-AUG-14
C-DIS-ORG-ED		Water						
Batch	R2916939							
WG1929772-3	CVS							
Dissolved Organic Carbon			111.1		%		80-160	13-AUG-14
WG1929772-10	DUP	L1500452-18						
Dissolved Organic Carbon		<1.0	<1.0	RPD-NA	mg/L	N/A	20	14-AUG-14
WG1929772-6	DUP	L1496613-7						
Dissolved Organic Carbon		19.1	19.1		mg/L	0.2	20	13-AUG-14
WG1929772-8	DUP	L1496774-5						
Dissolved Organic Carbon		8.3	8.4		mg/L	1.3	20	14-AUG-14
WG1929772-2	LCS							
Dissolved Organic Carbon			94.4		%		80-120	13-AUG-14
WG1929772-1	MB							
Dissolved Organic Carbon			<1.0		mg/L		1	13-AUG-14



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 3 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-ED		Water						
Batch	R2916939							
WG1929772-11 MS		L1500452-18						
Dissolved Organic Carbon			107.8		%		70-130	14-AUG-14
WG1929772-7 MS		L1496613-7						
Dissolved Organic Carbon			N/A	MS-B	%		-	13-AUG-14
WG1929772-9 MS		L1496774-5						
Dissolved Organic Carbon			90.0		%		70-130	14-AUG-14
CL-IC-ED		Water						
Batch	R2911916							
WG1926476-3 DUP		L1496870-5						
Chloride (Cl)		434	453		mg/L	4.3	20	07-AUG-14
WG1926476-5 DUP		L1497647-8						
Chloride (Cl)		17.0	16.9		mg/L	0.4	20	07-AUG-14
WG1926476-7 DUP		L1497746-1						
Chloride (Cl)		<0.50	<0.50	RPD-NA	mg/L	N/A	20	07-AUG-14
WG1926476-11 LCS								
Chloride (Cl)			103.8		%		90-110	07-AUG-14
WG1926476-13 LCS								
Chloride (Cl)			104.6		%		90-110	07-AUG-14
WG1926476-15 LCS								
Chloride (Cl)			104.0		%		90-110	07-AUG-14
WG1926476-17 LCS								
Chloride (Cl)			105.6		%		90-110	07-AUG-14
WG1926476-2 LCS								
Chloride (Cl)			101.5		%		90-110	07-AUG-14
WG1926476-9 LCS								
Chloride (Cl)			103.8		%		90-110	07-AUG-14
WG1926476-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	07-AUG-14
WG1926476-10 MB								
Chloride (Cl)			<0.50		mg/L		0.5	07-AUG-14
WG1926476-12 MB								
Chloride (Cl)			<0.50		mg/L		0.5	07-AUG-14
WG1926476-14 MB								
Chloride (Cl)			<0.50		mg/L		0.5	07-AUG-14
WG1926476-16 MB								
Chloride (Cl)			<0.50		mg/L		0.5	07-AUG-14
WG1926476-18 MB								
Chloride (Cl)			<0.50		mg/L		0.5	07-AUG-14



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 4 of 31

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-ED								
	Water							
Batch	R2911916							
WG1926476-4	MS	L1496870-5						
Chloride (Cl)			N/A	MS-B	%		-	07-AUG-14
WG1926476-6	MS	L1497647-8						
Chloride (Cl)			101.7		%		75-125	07-AUG-14
WG1926476-8	MS	L1497746-1						
Chloride (Cl)			102.2		%		75-125	07-AUG-14
F2,F3,F4-ED								
	Water							
Batch	R2912224							
WG1925006-2	LCS							
F2 (>C10-C16)			86.1		%		65-135	07-AUG-14
F3 (C16-C34)			96.8		%		65-135	07-AUG-14
F4 (C34-C50)			88.1		%		65-135	07-AUG-14
WG1925006-5	LCS							
F2 (>C10-C16)			97.2		%		65-135	07-AUG-14
F3 (C16-C34)			95.8		%		65-135	07-AUG-14
F4 (C34-C50)			91.1		%		65-135	07-AUG-14
WG1925006-1	MB							
F2 (>C10-C16)			<0.25		mg/L		0.25	07-AUG-14
F3 (C16-C34)			<0.25		mg/L		0.25	07-AUG-14
F4 (C34-C50)			<0.25		mg/L		0.25	07-AUG-14
Surrogate: 2-Bromobenzotrifluoride			95.2		%		50-150	07-AUG-14
WG1925006-4	MB							
F2 (>C10-C16)			<0.25		mg/L		0.25	07-AUG-14
F3 (C16-C34)			<0.25		mg/L		0.25	07-AUG-14
F4 (C34-C50)			<0.25		mg/L		0.25	07-AUG-14
Surrogate: 2-Bromobenzotrifluoride			109.5		%		50-150	07-AUG-14
WG1925006-6	MS	L1496613-6						
F2 (>C10-C16)			97.8		%		50-150	07-AUG-14
F3 (C16-C34)			98.1		%		50-150	07-AUG-14
F4 (C34-C50)			93.1		%		50-150	07-AUG-14
HG-D-L-CVAA-ED								
	Water							
Batch	R2919287							
WG1930358-47	DUP	L1496580-1						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	14-AUG-14
WG1930358-46	LCS							
Mercury (Hg)-Dissolved			86.4		%		80-120	14-AUG-14



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 5 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-L-CVAA-ED								
	Water							
Batch	R2919287							
WG1930358-50	LCS							
Mercury (Hg)-Dissolved			87.2		%		80-120	14-AUG-14
WG1930358-54	LCS							
Mercury (Hg)-Dissolved			98.6		%		80-120	14-AUG-14
WG1930358-58	LCS							
Mercury (Hg)-Dissolved			94.4		%		80-120	14-AUG-14
WG1930358-45	MB							
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	14-AUG-14
WG1930358-49	MB							
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	14-AUG-14
WG1930358-53	MB							
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	14-AUG-14
WG1930358-57	MB							
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	14-AUG-14
WG1930358-48	MS	L1496580-1						
Mercury (Hg)-Dissolved			83.8		%		70-130	14-AUG-14
HG-T-L-CVAA-ED								
	Water							
Batch	R2919287							
WG1930360-3	DUP	L1494613-1						
Mercury (Hg)-Total		0.0000051	0.0000062		mg/L	19	20	14-AUG-14
WG1930360-2	LCS							
Mercury (Hg)-Total			86.3		%		80-120	14-AUG-14
WG1930360-6	LCS							
Mercury (Hg)-Total			92.3		%		80-120	14-AUG-14
WG1930360-1	MB							
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	14-AUG-14
WG1930360-5	MB							
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	14-AUG-14
WG1930360-4	MS	L1494613-1						
Mercury (Hg)-Total			83.3		%		70-130	14-AUG-14
MET-D-CCMS-ED								
	Water							
Batch	R2921196							
WG1932634-14	CRM	ED-HIGH-WATRM						
Aluminum (Al)-Dissolved			103.2		%		80-120	17-AUG-14
Antimony (Sb)-Dissolved			103.4		%		80-120	17-AUG-14
Arsenic (As)-Dissolved			101.2		%		80-120	17-AUG-14
Barium (Ba)-Dissolved			102.6		%		80-120	17-AUG-14



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 6 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2921196							
WG1932634-14 CRM	ED-HIGH-WATRM							
Boron (B)-Dissolved			119.1		%		80-120	17-AUG-14
Cadmium (Cd)-Dissolved			101.9		%		80-120	17-AUG-14
Calcium (Ca)-Dissolved			105.7		%		80-120	17-AUG-14
Chromium (Cr)-Dissolved			101.4		%		80-120	17-AUG-14
Copper (Cu)-Dissolved			101.2		%		80-120	17-AUG-14
Lead (Pb)-Dissolved			99.3		%		80-120	17-AUG-14
Magnesium (Mg)-Dissolved			108.2		%		80-120	17-AUG-14
Manganese (Mn)-Dissolved			100.3		%		80-120	17-AUG-14
Nickel (Ni)-Dissolved			102.6		%		80-120	17-AUG-14
Potassium (K)-Dissolved			98.0		%		80-120	17-AUG-14
Selenium (Se)-Dissolved			100.7		%		80-120	17-AUG-14
Silicon (Si)-Dissolved			95.0		%		80-120	17-AUG-14
Silver (Ag)-Dissolved			108.8		%		80-120	17-AUG-14
Sodium (Na)-Dissolved			116.2		%		80-120	17-AUG-14
Uranium (U)-Dissolved			93.8		%		80-120	17-AUG-14
Zinc (Zn)-Dissolved			101.5		%		80-120	17-AUG-14
WG1932634-2 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			99.6		%		80-120	17-AUG-14
Antimony (Sb)-Dissolved			99.6		%		80-120	17-AUG-14
Arsenic (As)-Dissolved			100.8		%		80-120	17-AUG-14
Barium (Ba)-Dissolved			103.8		%		80-120	17-AUG-14
Boron (B)-Dissolved			110.3		%		80-120	17-AUG-14
Cadmium (Cd)-Dissolved			99.0		%		80-120	17-AUG-14
Calcium (Ca)-Dissolved			98.8		%		80-120	17-AUG-14
Chromium (Cr)-Dissolved			101.4		%		80-120	17-AUG-14
Copper (Cu)-Dissolved			100.1		%		80-120	17-AUG-14
Lead (Pb)-Dissolved			99.1		%		80-120	17-AUG-14
Magnesium (Mg)-Dissolved			104.3		%		80-120	17-AUG-14
Manganese (Mn)-Dissolved			101.8		%		80-120	17-AUG-14
Nickel (Ni)-Dissolved			100.6		%		80-120	17-AUG-14
Potassium (K)-Dissolved			100.4		%		80-120	17-AUG-14
Selenium (Se)-Dissolved			97.7		%		80-120	17-AUG-14
Silicon (Si)-Dissolved			97.3		%		80-120	17-AUG-14
Silver (Ag)-Dissolved			99.9		%		80-120	17-AUG-14



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 7 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2921196							
WG1932634-2 CRM		ED-HIGH-WATRM						
Sodium (Na)-Dissolved			103.6		%		80-120	17-AUG-14
Uranium (U)-Dissolved			94.9		%		80-120	17-AUG-14
Zinc (Zn)-Dissolved			96.3		%		80-120	17-AUG-14
WG1932634-4 CRM		ED-HIGH-WATRM						
Aluminum (Al)-Dissolved			99.8		%		80-120	17-AUG-14
Antimony (Sb)-Dissolved			99.0		%		80-120	17-AUG-14
Arsenic (As)-Dissolved			98.6		%		80-120	17-AUG-14
Barium (Ba)-Dissolved			103.1		%		80-120	17-AUG-14
Boron (B)-Dissolved			98.8		%		80-120	17-AUG-14
Cadmium (Cd)-Dissolved			99.1		%		80-120	17-AUG-14
Calcium (Ca)-Dissolved			103.0		%		80-120	17-AUG-14
Chromium (Cr)-Dissolved			99.0		%		80-120	17-AUG-14
Copper (Cu)-Dissolved			96.7		%		80-120	17-AUG-14
Lead (Pb)-Dissolved			94.6		%		80-120	17-AUG-14
Magnesium (Mg)-Dissolved			102.2		%		80-120	17-AUG-14
Manganese (Mn)-Dissolved			103.1		%		80-120	17-AUG-14
Nickel (Ni)-Dissolved			100.4		%		80-120	17-AUG-14
Potassium (K)-Dissolved			99.5		%		80-120	17-AUG-14
Selenium (Se)-Dissolved			97.9		%		80-120	17-AUG-14
Silicon (Si)-Dissolved			103.0		%		80-120	17-AUG-14
Silver (Ag)-Dissolved			101.3		%		80-120	17-AUG-14
Sodium (Na)-Dissolved			94.1		%		80-120	17-AUG-14
Uranium (U)-Dissolved			89.7		%		80-120	17-AUG-14
Zinc (Zn)-Dissolved			103.7		%		80-120	17-AUG-14
WG1932634-6 CRM		ED-HIGH-WATRM						
Aluminum (Al)-Dissolved			100.7		%		80-120	17-AUG-14
Antimony (Sb)-Dissolved			99.3		%		80-120	17-AUG-14
Arsenic (As)-Dissolved			99.6		%		80-120	17-AUG-14
Barium (Ba)-Dissolved			103.2		%		80-120	17-AUG-14
Boron (B)-Dissolved			102.3		%		80-120	17-AUG-14
Cadmium (Cd)-Dissolved			98.8		%		80-120	17-AUG-14
Calcium (Ca)-Dissolved			103.3		%		80-120	17-AUG-14
Chromium (Cr)-Dissolved			99.3		%		80-120	17-AUG-14
Copper (Cu)-Dissolved			96.1		%		80-120	17-AUG-14



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 8 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2921196							
WG1932634-6 CRM	ED-HIGH-WATRM							
Lead (Pb)-Dissolved			94.9		%		80-120	17-AUG-14
Magnesium (Mg)-Dissolved			103.9		%		80-120	17-AUG-14
Manganese (Mn)-Dissolved			102.1		%		80-120	17-AUG-14
Nickel (Ni)-Dissolved			99.7		%		80-120	17-AUG-14
Potassium (K)-Dissolved			101.6		%		80-120	17-AUG-14
Selenium (Se)-Dissolved			96.3		%		80-120	17-AUG-14
Silicon (Si)-Dissolved			99.3		%		80-120	17-AUG-14
Silver (Ag)-Dissolved			101.8		%		80-120	17-AUG-14
Sodium (Na)-Dissolved			98.9		%		80-120	17-AUG-14
Uranium (U)-Dissolved			90.5		%		80-120	17-AUG-14
Zinc (Zn)-Dissolved			95.8		%		80-120	17-AUG-14
WG1932634-8 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			96.1		%		80-120	17-AUG-14
Antimony (Sb)-Dissolved			101.0		%		80-120	17-AUG-14
Arsenic (As)-Dissolved			98.4		%		80-120	17-AUG-14
Barium (Ba)-Dissolved			103.5		%		80-120	17-AUG-14
Boron (B)-Dissolved			99.2		%		80-120	17-AUG-14
Cadmium (Cd)-Dissolved			102.4		%		80-120	17-AUG-14
Calcium (Ca)-Dissolved			99.7		%		80-120	17-AUG-14
Chromium (Cr)-Dissolved			96.5		%		80-120	17-AUG-14
Copper (Cu)-Dissolved			96.7		%		80-120	17-AUG-14
Lead (Pb)-Dissolved			93.7		%		80-120	17-AUG-14
Magnesium (Mg)-Dissolved			101.8		%		80-120	17-AUG-14
Manganese (Mn)-Dissolved			101.6		%		80-120	17-AUG-14
Nickel (Ni)-Dissolved			100.3		%		80-120	17-AUG-14
Potassium (K)-Dissolved			99.0		%		80-120	17-AUG-14
Selenium (Se)-Dissolved			96.7		%		80-120	17-AUG-14
Silicon (Si)-Dissolved			98.3		%		80-120	17-AUG-14
Silver (Ag)-Dissolved			102.7		%		80-120	17-AUG-14
Sodium (Na)-Dissolved			96.3		%		80-120	17-AUG-14
Uranium (U)-Dissolved			89.9		%		80-120	17-AUG-14
Zinc (Zn)-Dissolved			95.0		%		80-120	17-AUG-14
WG1932634-10 DUP		L1498513-1						
Aluminum (Al)-Dissolved		0.0033	0.0038		mg/L	15	20	17-AUG-14



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 9 of 31

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2921196							
WG1932634-10 DUP		L1498513-1						
Antimony (Sb)-Dissolved		0.00013	0.00013		mg/L	2.6	20	17-AUG-14
Arsenic (As)-Dissolved		0.00084	0.00088		mg/L	4.3	20	17-AUG-14
Barium (Ba)-Dissolved		0.469	0.468		mg/L	0.2	20	17-AUG-14
Boron (B)-Dissolved		1.08	1.05		mg/L	2.7	20	17-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-AUG-14
Calcium (Ca)-Dissolved		35.8	33.8		mg/L	5.5	20	17-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-AUG-14
Copper (Cu)-Dissolved		<0.00010	0.00010	RPD-NA	mg/L	N/A	20	17-AUG-14
Iron (Fe)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	20	17-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-AUG-14
Magnesium (Mg)-Dissolved		12.0	12.0		mg/L	0.1	20	17-AUG-14
Manganese (Mn)-Dissolved		0.0456	0.0457		mg/L	0.2	20	17-AUG-14
Nickel (Ni)-Dissolved		0.00048	0.00047		mg/L	3.4	20	17-AUG-14
Potassium (K)-Dissolved		16.4	16.3		mg/L	0.3	20	17-AUG-14
Selenium (Se)-Dissolved		0.00072	0.00060		mg/L	18	20	17-AUG-14
Silicon (Si)-Dissolved		2.99	3.07		mg/L	2.5	20	17-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-AUG-14
Sodium (Na)-Dissolved		201	201		mg/L	0.1	20	17-AUG-14
Uranium (U)-Dissolved		0.00122	0.00125		mg/L	1.9	20	17-AUG-14
Zinc (Zn)-Dissolved		0.0066	0.0075		mg/L	13	20	17-AUG-14
WG1932634-11 DUP		L1498513-7						
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-AUG-14
Arsenic (As)-Dissolved		0.00016	0.00015		mg/L	7.4	20	17-AUG-14
Barium (Ba)-Dissolved		0.158	0.157		mg/L	1.1	20	17-AUG-14
Boron (B)-Dissolved		0.230	0.206		mg/L	11	20	17-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-AUG-14
Calcium (Ca)-Dissolved		117	119		mg/L	1.2	20	17-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-AUG-14
Copper (Cu)-Dissolved		0.00035	0.00041		mg/L	14	20	17-AUG-14
Iron (Fe)-Dissolved		4.23	4.21		mg/L	0.6	20	17-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-AUG-14
Magnesium (Mg)-Dissolved		23.6	23.8		mg/L	0.6	20	17-AUG-14
Manganese (Mn)-Dissolved		0.404	0.411		mg/L	1.6	20	17-AUG-14



Environmental

Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 10 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2921196							
WG1932634-11	DUP	L1498513-7						
Nickel (Ni)-Dissolved		0.00017	0.00018		mg/L	6.6	20	17-AUG-14
Potassium (K)-Dissolved		1.09	1.09		mg/L	0.1	20	17-AUG-14
Selenium (Se)-Dissolved		0.00010	0.00011		mg/L	8.1	20	17-AUG-14
Silicon (Si)-Dissolved		7.77	8.15		mg/L	4.8	20	17-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-AUG-14
Sodium (Na)-Dissolved		8.2	8.3		mg/L	0.5	20	17-AUG-14
Uranium (U)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-AUG-14
Zinc (Zn)-Dissolved		0.0100	0.0123		mg/L	20	20	17-AUG-14
WG1932634-12	DUP	L1498878-11						
Aluminum (Al)-Dissolved		0.0094	0.0101		mg/L	7.5	20	17-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-AUG-14
Arsenic (As)-Dissolved		0.00100	0.00105		mg/L	4.5	20	17-AUG-14
Barium (Ba)-Dissolved		0.0300	0.0304		mg/L	1.3	20	17-AUG-14
Boron (B)-Dissolved		0.057	0.053		mg/L	7.8	20	17-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-AUG-14
Calcium (Ca)-Dissolved		25.0	26.0		mg/L	3.8	20	17-AUG-14
Chromium (Cr)-Dissolved		0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-AUG-14
Copper (Cu)-Dissolved		0.00049	0.00048		mg/L	2.6	20	17-AUG-14
Iron (Fe)-Dissolved		0.307	0.296		mg/L	3.8	20	17-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-AUG-14
Magnesium (Mg)-Dissolved		7.15	6.94		mg/L	3.0	20	17-AUG-14
Manganese (Mn)-Dissolved		0.00346	0.00338		mg/L	2.3	20	17-AUG-14
Nickel (Ni)-Dissolved		0.00126	0.00130		mg/L	3.4	20	17-AUG-14
Potassium (K)-Dissolved		0.93	0.92		mg/L	0.4	20	17-AUG-14
Selenium (Se)-Dissolved		0.00012	0.00012		mg/L	0.1	20	17-AUG-14
Silicon (Si)-Dissolved		0.444	0.448		mg/L	0.9	20	17-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-AUG-14
Sodium (Na)-Dissolved		8.5	8.3		mg/L	1.6	20	17-AUG-14
Uranium (U)-Dissolved		0.000137	0.000134		mg/L	1.7	20	17-AUG-14
Zinc (Zn)-Dissolved		0.0016	0.0011	J	mg/L	0.0004	0.002	17-AUG-14
WG1932634-9	DUP	L1492791-1						
Aluminum (Al)-Dissolved		0.0178	0.0182		mg/L	2.0	20	17-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-AUG-14



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 11 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2921196							
WG1932634-9	DUP	L1492791-1						
Arsenic (As)-Dissolved		0.00230	0.00230		mg/L	0.3	20	17-AUG-14
Barium (Ba)-Dissolved		0.0358	0.0361		mg/L	0.9	20	17-AUG-14
Boron (B)-Dissolved		0.112	0.116		mg/L	3.2	20	17-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-AUG-14
Calcium (Ca)-Dissolved		33.2	33.4		mg/L	0.6	20	17-AUG-14
Chromium (Cr)-Dissolved		0.00026	0.00019	J	mg/L	0.00007	0.0002	17-AUG-14
Copper (Cu)-Dissolved		0.00047	0.00042		mg/L	9.7	20	17-AUG-14
Iron (Fe)-Dissolved		2.93	2.93		mg/L	0.0	20	17-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-AUG-14
Magnesium (Mg)-Dissolved		10.6	10.4		mg/L	1.3	20	17-AUG-14
Manganese (Mn)-Dissolved		0.992	1.01		mg/L	1.7	20	17-AUG-14
Nickel (Ni)-Dissolved		0.00207	0.00207		mg/L	0.1	20	17-AUG-14
Potassium (K)-Dissolved		1.52	1.50		mg/L	1.2	20	17-AUG-14
Selenium (Se)-Dissolved		0.00014	0.00015		mg/L	4.5	20	17-AUG-14
Silicon (Si)-Dissolved		4.20	4.15		mg/L	1.1	20	17-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-AUG-14
Sodium (Na)-Dissolved		17.3	17.2		mg/L	0.1	20	17-AUG-14
Uranium (U)-Dissolved		0.000095	0.000095		mg/L	0.1	20	17-AUG-14
WG1932634-1	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	17-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	17-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	17-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	17-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	17-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 12 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2921196							
WG1932634-1 MB								
Potassium (K)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	17-AUG-14
WG1932634-13 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	17-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	17-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	17-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	17-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	17-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	17-AUG-14
WG1932634-3 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	17-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 13 of 31

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2921196							
WG1932634-3	MB							
Boron (B)-Dissolved			<0.010		mg/L		0.01	17-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	17-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	17-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	17-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	17-AUG-14
WG1932634-5	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	17-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	17-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	17-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	17-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	17-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 14 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2921196							
WG1932634-5	MB							
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	17-AUG-14
WG1932634-7	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	17-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	17-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	17-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	17-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	17-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	17-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	17-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	17-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	17-AUG-14
MET-T-CCMS-ED		Water						
Batch	R2912618							
WG1925500-7	DUP	L1496613-1						
Antimony (Sb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-AUG-14
Arsenic (As)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-AUG-14
Barium (Ba)-Total		0.127	0.127		mg/L	0.1	20	10-AUG-14
Boron (B)-Total		1.36	1.38		mg/L	1.5	20	10-AUG-14



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 15 of 31

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R2912618							
WG1925500-7	DUP	L1496613-1						
Cadmium (Cd)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	10-AUG-14
Calcium (Ca)-Total		37.7	37.7		mg/L	0.2	20	10-AUG-14
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	10-AUG-14
Copper (Cu)-Total		0.0020	0.0022		mg/L	12	20	10-AUG-14
Iron (Fe)-Total		0.763	0.864		mg/L	12	20	10-AUG-14
Lead (Pb)-Total		0.00201	0.00174		mg/L	14	20	10-AUG-14
Magnesium (Mg)-Total		32.4	31.8		mg/L	2.0	20	10-AUG-14
Manganese (Mn)-Total		0.0311	0.0311		mg/L	0.1	20	10-AUG-14
Nickel (Ni)-Total		0.0066	0.0068		mg/L	2.2	20	10-AUG-14
Potassium (K)-Total		25.7	24.1		mg/L	6.6	20	10-AUG-14
Selenium (Se)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-AUG-14
Silicon (Si)-Total		2.87	2.85		mg/L	0.6	20	10-AUG-14
Silver (Ag)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	10-AUG-14
Sodium (Na)-Total		637	610		mg/L	4.2	20	10-AUG-14
Uranium (U)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-AUG-14
Zinc (Zn)-Total		0.022	0.020		mg/L	7.1	20	10-AUG-14
WG1925500-8	DUP	L1496580-3						
Aluminum (Al)-Total		0.0521	0.0486		mg/L	6.9	20	10-AUG-14
Antimony (Sb)-Total		0.00059	0.00056		mg/L	4.9	20	10-AUG-14
Arsenic (As)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	10-AUG-14
Barium (Ba)-Total		0.0699	0.0696		mg/L	0.4	20	10-AUG-14
Boron (B)-Total		0.543	0.512		mg/L	5.8	20	10-AUG-14
Cadmium (Cd)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	10-AUG-14
Calcium (Ca)-Total		13.1	12.5		mg/L	5.4	20	10-AUG-14
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	10-AUG-14
Copper (Cu)-Total		0.0025	0.0024		mg/L	6.6	20	10-AUG-14
Iron (Fe)-Total		1.07	0.998		mg/L	6.8	20	10-AUG-14
Lead (Pb)-Total		0.00155	0.00151		mg/L	2.8	20	10-AUG-14
Magnesium (Mg)-Total		3.96	3.72		mg/L	6.1	20	10-AUG-14
Manganese (Mn)-Total		0.0281	0.0266		mg/L	5.4	20	10-AUG-14
Nickel (Ni)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	10-AUG-14
Potassium (K)-Total		6.77	6.59		mg/L	2.7	20	10-AUG-14
Selenium (Se)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	10-AUG-14



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 16 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2912618							
WG1925500-8	DUP	L1496580-3						
Silicon (Si)-Total		6.50	6.42		mg/L	1.4	20	10-AUG-14
Silver (Ag)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	10-AUG-14
Sodium (Na)-Total		207	203		mg/L	2.3	20	10-AUG-14
Uranium (U)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-AUG-14
Zinc (Zn)-Total		<0.0040	<0.0040	RPD-NA	mg/L	N/A	20	10-AUG-14
WG1925500-9	DUP	L1491901-1						
Aluminum (Al)-Total		0.331	0.337		mg/L	1.9	20	10-AUG-14
Antimony (Sb)-Total		0.00050	0.00051		mg/L	1.3	20	10-AUG-14
Arsenic (As)-Total		0.337	0.343		mg/L	1.7	20	10-AUG-14
Barium (Ba)-Total		0.00698	0.00678		mg/L	2.9	20	10-AUG-14
Boron (B)-Total		0.029	0.030		mg/L	2.7	20	10-AUG-14
Cadmium (Cd)-Total		0.000014	0.000012		mg/L	12	20	10-AUG-14
Calcium (Ca)-Total		23.3	24.9		mg/L	6.7	20	10-AUG-14
Chromium (Cr)-Total		0.00069	0.00078		mg/L	13	20	10-AUG-14
Copper (Cu)-Total		0.00965	0.00972		mg/L	0.7	20	10-AUG-14
Iron (Fe)-Total		0.096	0.091		mg/L	5.1	20	10-AUG-14
Lead (Pb)-Total		0.00150	0.00153		mg/L	2.0	20	10-AUG-14
Magnesium (Mg)-Total		4.57	4.75		mg/L	3.9	20	10-AUG-14
Manganese (Mn)-Total		0.0119	0.0120		mg/L	0.9	20	10-AUG-14
Nickel (Ni)-Total		0.00228	0.00230		mg/L	1.0	20	10-AUG-14
Potassium (K)-Total		2.68	2.72		mg/L	1.3	20	10-AUG-14
Selenium (Se)-Total		0.00014	0.00014		mg/L	0.9	20	10-AUG-14
Silicon (Si)-Total		1.18	1.19		mg/L	1.4	20	10-AUG-14
Silver (Ag)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	10-AUG-14
Sodium (Na)-Total		2.95	2.99		mg/L	1.1	20	10-AUG-14
Uranium (U)-Total		0.000623	0.000639		mg/L	2.5	20	10-AUG-14
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	10-AUG-14
WG1925500-5	LCS							
Aluminum (Al)-Total			106.0		%		70-130	10-AUG-14
Antimony (Sb)-Total			105.8		%		70-130	10-AUG-14
Arsenic (As)-Total			101.5		%		70-130	10-AUG-14
Barium (Ba)-Total			101.1		%		70-130	10-AUG-14
Boron (B)-Total			90.7		%		70-130	10-AUG-14



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 17 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2912618							
WG1925500-5 LCS								
Cadmium (Cd)-Total			98.6		%		70-130	10-AUG-14
Calcium (Ca)-Total			98.2		%		70-130	10-AUG-14
Chromium (Cr)-Total			105.1		%		70-130	10-AUG-14
Copper (Cu)-Total			102.3		%		70-130	10-AUG-14
Iron (Fe)-Total			92.3		%		70-130	10-AUG-14
Lead (Pb)-Total			100.9		%		70-130	10-AUG-14
Magnesium (Mg)-Total			106.0		%		70-130	10-AUG-14
Manganese (Mn)-Total			102.4		%		70-130	10-AUG-14
Nickel (Ni)-Total			102.8		%		70-130	10-AUG-14
Potassium (K)-Total			106.7		%		70-130	10-AUG-14
Selenium (Se)-Total			99.98		%		70-130	10-AUG-14
Silicon (Si)-Total			94.0		%		70-130	10-AUG-14
Silver (Ag)-Total			104.9		%		70-130	10-AUG-14
Sodium (Na)-Total			108.0		%		70-130	10-AUG-14
Uranium (U)-Total			100.5		%		70-130	10-AUG-14
Zinc (Zn)-Total			107.6		%		70-130	10-AUG-14
WG1925500-6 LCS								
Aluminum (Al)-Total			100.8		%		70-130	10-AUG-14
Antimony (Sb)-Total			101.7		%		70-130	10-AUG-14
Arsenic (As)-Total			95.4		%		70-130	10-AUG-14
Barium (Ba)-Total			97.6		%		70-130	10-AUG-14
Boron (B)-Total			89.6		%		70-130	10-AUG-14
Cadmium (Cd)-Total			92.8		%		70-130	10-AUG-14
Calcium (Ca)-Total			94.6		%		70-130	10-AUG-14
Chromium (Cr)-Total			98.8		%		70-130	10-AUG-14
Copper (Cu)-Total			94.9		%		70-130	10-AUG-14
Iron (Fe)-Total			87.2		%		70-130	10-AUG-14
Lead (Pb)-Total			99.4		%		70-130	10-AUG-14
Magnesium (Mg)-Total			99.1		%		70-130	10-AUG-14
Manganese (Mn)-Total			97.2		%		70-130	10-AUG-14
Nickel (Ni)-Total			96.1		%		70-130	10-AUG-14
Potassium (K)-Total			99.1		%		70-130	10-AUG-14
Selenium (Se)-Total			96.0		%		70-130	10-AUG-14
Silicon (Si)-Total			89.9		%		70-130	10-AUG-14



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 18 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2912618							
WG1925500-6	LCS							
Silver (Ag)-Total			98.1		%		70-130	10-AUG-14
Sodium (Na)-Total			100.3		%		70-130	10-AUG-14
Uranium (U)-Total			95.5		%		70-130	10-AUG-14
Zinc (Zn)-Total			100.9		%		70-130	10-AUG-14
WG1925500-2	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	10-AUG-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Boron (B)-Total			<0.010		mg/L		0.01	10-AUG-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Copper (Cu)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Iron (Fe)-Total			<0.010		mg/L		0.01	10-AUG-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	10-AUG-14
Potassium (K)-Total			<0.050		mg/L		0.05	10-AUG-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Silicon (Si)-Total			<0.050		mg/L		0.05	10-AUG-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Sodium (Na)-Total			<0.050		mg/L		0.05	10-AUG-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	10-AUG-14
WG1925500-3	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	10-AUG-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Barium (Ba)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Boron (B)-Total			<0.010		mg/L		0.01	10-AUG-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Calcium (Ca)-Total			<0.020		mg/L		0.02	10-AUG-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Copper (Cu)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Iron (Fe)-Total			<0.010		mg/L		0.01	10-AUG-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	10-AUG-14



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 19 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R2912618							
WG1925500-3 MB								
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	10-AUG-14
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Nickel (Ni)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Potassium (K)-Total			<0.050		mg/L		0.05	10-AUG-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Silicon (Si)-Total			<0.050		mg/L		0.05	10-AUG-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Sodium (Na)-Total			<0.050		mg/L		0.05	10-AUG-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	10-AUG-14
Batch	R2914191							
WG1925500-7 DUP		L1496613-1						
Aluminum (Al)-Total		0.0090	0.0121	J	mg/L	0.0031	0.006	11-AUG-14
WG1925500-2 MB								
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	11-AUG-14
NAPHTHENIC-ACID-FM								
	Water							
Batch	R2927877							
WG1931595-3 DUP		L1496613-3						
Naphthenic Acids		13.5	13.6		mg/L	0.7	30	25-AUG-14
WG1931595-7 DUP		L1498878-2						
Naphthenic Acids		<1.0	<1.0	RPD-NA	mg/L	N/A	30	25-AUG-14
WG1931595-4 LCS								
Naphthenic Acids			90.0		%		70-130	25-AUG-14
WG1931595-8 LCS								
Naphthenic Acids			91.9		%		70-130	25-AUG-14
WG1931595-1 MB								
Naphthenic Acids			<1.0		mg/L		1	25-AUG-14
WG1931595-5 MB								
Naphthenic Acids			<1.0		mg/L		1	25-AUG-14
WG1931595-2 MS		L1496613-1						
Naphthenic Acids			100.4		%		50-150	25-AUG-14
WG1931595-6 MS		L1498878-1						
Naphthenic Acids			93.5		%		50-150	25-AUG-14
NH3-CFA-ED	Water							



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 20 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-CFA-ED		Water						
Batch	R2918088							
WG1930533-10	DUP	L1500452-18						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	14-AUG-14
WG1930533-6	DUP	L1498824-1						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	14-AUG-14
WG1930533-7	DUP	L1501996-1						
Ammonia, Total (as N)		0.443	0.451		mg/L	1.8	20	14-AUG-14
WG1930533-2	LCS							
Ammonia, Total (as N)			97.4		%		85-115	14-AUG-14
WG1930533-1	MB							
Ammonia, Total (as N)			<0.050		mg/L		0.05	14-AUG-14
WG1930533-11	MS	L1499744-2						
Ammonia, Total (as N)			99.5		%		75-125	14-AUG-14
WG1930533-5	MS	L1498878-11						
Ammonia, Total (as N)			101.1		%		75-125	14-AUG-14
WG1930533-9	MS	L1500452-11						
Ammonia, Total (as N)			104.6		%		75-125	14-AUG-14
NO2-IC-ED		Water						
Batch	R2911916							
WG1926476-5	DUP	L1497647-8						
Nitrite (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	07-AUG-14
WG1926476-7	DUP	L1497746-1						
Nitrite (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	07-AUG-14
WG1926476-11	LCS							
Nitrite (as N)			98.4		%		90-110	07-AUG-14
WG1926476-13	LCS							
Nitrite (as N)			105.5		%		90-110	07-AUG-14
WG1926476-15	LCS							
Nitrite (as N)			104.9		%		90-110	07-AUG-14
WG1926476-17	LCS							
Nitrite (as N)			99.4		%		90-110	07-AUG-14
WG1926476-2	LCS							
Nitrite (as N)			106.2		%		90-110	07-AUG-14
WG1926476-9	LCS							
Nitrite (as N)			91.9		%		90-110	07-AUG-14
WG1926476-1	MB							
Nitrite (as N)			<0.020		mg/L		0.02	07-AUG-14
WG1926476-10	MB							
Nitrite (as N)			<0.020		mg/L		0.02	07-AUG-14



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 21 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-ED		Water						
Batch	R2911916							
WG1926476-12	MB							
Nitrite (as N)			<0.020		mg/L		0.02	07-AUG-14
WG1926476-14	MB							
Nitrite (as N)			<0.020		mg/L		0.02	07-AUG-14
WG1926476-16	MB							
Nitrite (as N)			<0.020		mg/L		0.02	07-AUG-14
WG1926476-18	MB							
Nitrite (as N)			<0.020		mg/L		0.02	07-AUG-14
WG1926476-6	MS	L1497647-8						
Nitrite (as N)			104.4		%		75-125	07-AUG-14
WG1926476-8	MS	L1497746-1						
Nitrite (as N)			91.1		%		75-125	07-AUG-14
NO3-IC-ED		Water						
Batch	R2911916							
WG1926476-5	DUP	L1497647-8						
Nitrate (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	07-AUG-14
WG1926476-7	DUP	L1497746-1						
Nitrate (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	07-AUG-14
WG1926476-11	LCS							
Nitrate (as N)			100.4		%		90-110	07-AUG-14
WG1926476-13	LCS							
Nitrate (as N)			101.4		%		90-110	07-AUG-14
WG1926476-15	LCS							
Nitrate (as N)			100.2		%		90-110	07-AUG-14
WG1926476-17	LCS							
Nitrate (as N)			102.1		%		90-110	07-AUG-14
WG1926476-2	LCS							
Nitrate (as N)			98.2		%		90-110	07-AUG-14
WG1926476-9	LCS							
Nitrate (as N)			100.5		%		90-110	07-AUG-14
WG1926476-1	MB							
Nitrate (as N)			<0.050		mg/L		0.05	07-AUG-14
WG1926476-10	MB							
Nitrate (as N)			<0.050		mg/L		0.05	07-AUG-14
WG1926476-12	MB							
Nitrate (as N)			<0.050		mg/L		0.05	07-AUG-14
WG1926476-14	MB							
Nitrate (as N)			<0.050		mg/L		0.05	07-AUG-14



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 22 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-ED								
	Water							
Batch	R2911916							
WG1926476-16 MB								
Nitrate (as N)			<0.050		mg/L		0.05	07-AUG-14
WG1926476-18 MB								
Nitrate (as N)			<0.050		mg/L		0.05	07-AUG-14
WG1926476-6 MS		L1497647-8						
Nitrate (as N)			94.0		%		75-125	07-AUG-14
WG1926476-8 MS		L1497746-1						
Nitrate (as N)			94.2		%		75-125	07-AUG-14
PAH-ABT1-CL								
	Water							
Batch	R2915900							
WG1929301-2 LCS								
Acenaphthene			83.7		%		60-130	11-AUG-14
Acenaphthylene			94.5		%		60-130	11-AUG-14
Anthracene			95.1		%		60-130	11-AUG-14
Fluoranthene			93.9		%		60-130	11-AUG-14
Fluorene			89.9		%		60-130	11-AUG-14
Naphthalene			82.3		%		50-130	11-AUG-14
Phenanthrene			94.9		%		60-130	11-AUG-14
Pyrene			102.5		%		60-130	11-AUG-14
Benzo(a)anthracene			103.6		%		60-130	11-AUG-14
Benzo(k)fluoranthene			97.4		%		60-130	11-AUG-14
Benzo(b&j)fluoranthene			98.4		%		60-130	11-AUG-14
Benzo(g,h,i)perylene			80.9		%		60-130	11-AUG-14
Benzo(a)pyrene			102.3		%		60-130	11-AUG-14
Chrysene			99.4		%		60-130	11-AUG-14
Dibenzo(a,h)anthracene			97.7		%		60-130	11-AUG-14
Indeno(1,2,3-cd)pyrene			111.1		%		60-130	11-AUG-14
WG1929301-1 MB								
Acenaphthene			<0.000020		mg/L		0.00002	11-AUG-14
Acenaphthylene			<0.000020		mg/L		0.00002	11-AUG-14
Anthracene			<0.000010		mg/L		0.00001	11-AUG-14
Fluoranthene			<0.000020		mg/L		0.00002	11-AUG-14
Fluorene			<0.000020		mg/L		0.00002	11-AUG-14
Naphthalene			<0.000050		mg/L		0.00005	11-AUG-14
Phenanthrene			<0.000050		mg/L		0.00005	11-AUG-14
							0.00001	



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 23 of 31

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch	R2915900							
WG1929301-1	MB							
Pyrene			<0.000010		mg/L		0.00001	11-AUG-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	11-AUG-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	11-AUG-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	11-AUG-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	11-AUG-14
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	11-AUG-14
Chrysene			<0.000020		mg/L		0.00002	11-AUG-14
Dibenzo(a,h)anthracene			<0.0000050		mg/L		0.000005	11-AUG-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	11-AUG-14
Surrogate: d10-Acenaphthene			89.6		%		60-130	11-AUG-14
Surrogate: d10-Phenanthrene			94.2		%		60-130	11-AUG-14
Surrogate: d12-Chrysene			96.1		%		60-130	11-AUG-14
Batch	R2918273							
WG1930359-2	LCS							
Acenaphthene			85.8		%		60-130	12-AUG-14
Acenaphthylene			93.1		%		60-130	12-AUG-14
Anthracene			94.5		%		60-130	12-AUG-14
Fluoranthene			88.8		%		60-130	12-AUG-14
Fluorene			86.3		%		60-130	12-AUG-14
Naphthalene			90.3		%		50-130	12-AUG-14
Phenanthrene			91.9		%		60-130	12-AUG-14
Pyrene			96.1		%		60-130	12-AUG-14
Benzo(a)anthracene			87.2		%		60-130	12-AUG-14
Benzo(k)fluoranthene			77.5		%		60-130	12-AUG-14
Benzo(b&j)fluoranthene			78.9		%		60-130	12-AUG-14
Benzo(g,h,i)perylene			107.4		%		60-130	12-AUG-14
Benzo(a)pyrene			79.4		%		60-130	12-AUG-14
Chrysene			87.0		%		60-130	12-AUG-14
Dibenzo(a,h)anthracene			89.0		%		60-130	12-AUG-14
Indeno(1,2,3-cd)pyrene			70.8		%		60-130	12-AUG-14
WG1930359-5	LCS							
Acenaphthene			90.4		%		60-130	14-AUG-14
Acenaphthylene			97.8		%		60-130	14-AUG-14
Anthracene			103.0		%		60-130	14-AUG-14



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 24 of 31

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL	Water							
Batch	R2918273							
WG1930359-5	LCS							
Fluoranthene			101.9		%		60-130	14-AUG-14
Fluorene			93.5		%		60-130	14-AUG-14
Naphthalene			92.2		%		50-130	14-AUG-14
Phenanthrene			99.7		%		60-130	14-AUG-14
Pyrene			111.1		%		60-130	14-AUG-14
Benzo(a)anthracene			107.1		%		60-130	14-AUG-14
Benzo(k)fluoranthene			100.1		%		60-130	14-AUG-14
Benzo(b&j)fluoranthene			99.2		%		60-130	14-AUG-14
Benzo(g,h,i)perylene			102.2		%		60-130	14-AUG-14
Benzo(a)pyrene			104.0		%		60-130	14-AUG-14
Chrysene			106.0		%		60-130	14-AUG-14
Dibenzo(a,h)anthracene			103.8		%		60-130	14-AUG-14
Indeno(1,2,3-cd)pyrene			101.7		%		60-130	14-AUG-14
WG1930359-1	MB							
Acenaphthene			<0.000020		mg/L		0.00002	14-AUG-14
Acenaphthylene			<0.000020		mg/L		0.00002	14-AUG-14
Anthracene			<0.000010		mg/L		0.00001	14-AUG-14
Fluoranthene			<0.000020		mg/L		0.00002	14-AUG-14
Fluorene			<0.000020		mg/L		0.00002	14-AUG-14
Naphthalene			<0.000050		mg/L		0.00005	14-AUG-14
Phenanthrene			<0.000050		mg/L		0.00005	14-AUG-14
Pyrene			<0.000010		mg/L		0.00001	14-AUG-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	14-AUG-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	14-AUG-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	14-AUG-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	14-AUG-14
Benzo(a)pyrene			<0.000050		mg/L		0.00005	14-AUG-14
Chrysene			<0.000020		mg/L		0.00002	14-AUG-14
Dibenzo(a,h)anthracene			<0.000050		mg/L		0.00005	14-AUG-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	14-AUG-14
Surrogate: d10-Acenaphthene			115.1		%		60-130	14-AUG-14
Surrogate: d10-Phenanthrene			117.7		%		60-130	14-AUG-14
Surrogate: d12-Chrysene			115.1		%		60-130	14-AUG-14
WG1930359-3	MB							



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 25 of 31

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch	R2918273							
WG1930359-3	MB							
Acenaphthene			<0.000020		mg/L		0.00002	14-AUG-14
Acenaphthylene			<0.000020		mg/L		0.00002	14-AUG-14
Anthracene			<0.000010		mg/L		0.00001	14-AUG-14
Fluoranthene			<0.000020		mg/L		0.00002	14-AUG-14
Fluorene			<0.000020		mg/L		0.00002	14-AUG-14
Naphthalene			<0.000050		mg/L		0.00005	14-AUG-14
Phenanthrene			<0.000050		mg/L		0.00005	14-AUG-14
Pyrene			<0.000010		mg/L		0.00001	14-AUG-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	14-AUG-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	14-AUG-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	14-AUG-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	14-AUG-14
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	14-AUG-14
Chrysene			<0.000020		mg/L		0.00002	14-AUG-14
Dibenzo(a,h)anthracene			<0.0000050		mg/L		0.000005	14-AUG-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	14-AUG-14
Surrogate: d10-Acenaphthene			90.3		%		60-130	14-AUG-14
Surrogate: d10-Phenanthrene			95.5		%		60-130	14-AUG-14
Surrogate: d12-Chrysene			97.2		%		60-130	14-AUG-14
PH/EC/ALK-ED		Water						
Batch	R2907479							
WG1924156-6	DUP	L1494448-1						
pH		7.00	7.03	J	pH	0.03	0.3	05-AUG-14
Conductivity (EC)		5210	5150		uS/cm	1.0	10	05-AUG-14
Bicarbonate (HCO3)		316	315		mg/L	0.1	25	05-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	05-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	05-AUG-14
Alkalinity, Total (as CaCO3)		259	258		mg/L	0.1	20	05-AUG-14
WG1924156-7	DUP	L1496560-2						
pH		7.54	7.57	J	pH	0.02	0.3	05-AUG-14
Conductivity (EC)		2450	2460		uS/cm	0.4	10	05-AUG-14
Bicarbonate (HCO3)		479	481		mg/L	0.4	25	05-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	05-AUG-14
Hydroxide (OH)		<5.0	<5.0					



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 26 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R2907479							
WG1924156-7	DUP	L1496560-2						
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	05-AUG-14
Alkalinity, Total (as CaCO3)		393	394		mg/L	0.4	20	05-AUG-14
WG1924156-8	DUP	L1496870-5						
pH		7.75	7.76	J	pH	0.01	0.3	05-AUG-14
Conductivity (EC)		3230	3240		uS/cm	0.3	10	05-AUG-14
Bicarbonate (HCO3)		127	126		mg/L	0.3	25	05-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	05-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	05-AUG-14
Alkalinity, Total (as CaCO3)		104	104		mg/L	0.3	20	05-AUG-14
WG1924156-10	LCS							
Conductivity (EC)			99.4		%		90-110	05-AUG-14
WG1924156-11	LCS							
pH			6.99		pH		6.7-7.3	05-AUG-14
WG1924156-12	LCS							
Alkalinity, Total (as CaCO3)			99.1		%		85-115	05-AUG-14
WG1924156-13	LCS							
Conductivity (EC)			97.5		%		90-110	05-AUG-14
WG1924156-2	LCS							
Conductivity (EC)			100.4		%		90-110	05-AUG-14
WG1924156-3	LCS							
pH			7.00		pH		6.7-7.3	05-AUG-14
WG1924156-4	LCS							
Alkalinity, Total (as CaCO3)			98.7		%		85-115	05-AUG-14
WG1924156-5	LCS							
Conductivity (EC)			98.3		%		90-110	05-AUG-14
WG1924156-1	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	05-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	05-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	05-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	05-AUG-14
WG1924156-9	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	05-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	05-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	05-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	05-AUG-14
PHENOLS-4AAP-ED		Water						



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 27 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PHENOLS-4AAP-ED		Water						
Batch	R2918451							
WG1931047-3	DUP	L1498240-6						
Phenols (4AAP)		0.0159	0.0169		mg/L	6.1	15	14-AUG-14
WG1931047-4	DUP	L1492147-2						
Phenols (4AAP)		0.0039	0.0032	J	mg/L	0.0007	0.002	14-AUG-14
WG1931047-5	DUP	L1495055-1						
Phenols (4AAP)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	15	14-AUG-14
WG1931047-2	LCS							
Phenols (4AAP)			100.0		%		85-115	14-AUG-14
WG1931047-1	MB							
Phenols (4AAP)			<0.0010		mg/L		0.001	14-AUG-14
WG1931047-6	MS	L1495055-1						
Phenols (4AAP)			97.0		%		75-125	14-AUG-14
Batch		R2920049						
WG1931763-3	DUP	L1496514-2						
Phenols (4AAP)		0.0034	0.0040	J	mg/L	0.0006	0.002	15-AUG-14
WG1931763-2	LCS							
Phenols (4AAP)			99.0		%		85-115	15-AUG-14
WG1931763-1	MB							
Phenols (4AAP)			<0.0010		mg/L		0.001	15-AUG-14
WG1931763-4	MS	L1496514-2						
Phenols (4AAP)			105.0		%		75-125	15-AUG-14
SO4-IC-ED		Water						
Batch	R2911916							
WG1926476-5	DUP	L1497647-8						
Sulfate (SO4)		176	176		mg/L	0.3	20	07-AUG-14
WG1926476-7	DUP	L1497746-1						
Sulfate (SO4)		3.86	3.88		mg/L	0.6	20	07-AUG-14
WG1926476-11	LCS							
Sulfate (SO4)			102.3		%		90-110	07-AUG-14
WG1926476-13	LCS							
Sulfate (SO4)			103.3		%		90-110	07-AUG-14
WG1926476-15	LCS							
Sulfate (SO4)			102.4		%		90-110	07-AUG-14
WG1926476-17	LCS							
Sulfate (SO4)			105.2		%		90-110	07-AUG-14
WG1926476-2	LCS							
Sulfate (SO4)			99.9		%		90-110	07-AUG-14
WG1926476-9	LCS							



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 28 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-ED		Water						
Batch	R2911916							
WG1926476-9	LCS							
Sulfate (SO4)			102.7		%		90-110	07-AUG-14
WG1926476-1	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	07-AUG-14
WG1926476-10	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	07-AUG-14
WG1926476-12	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	07-AUG-14
WG1926476-14	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	07-AUG-14
WG1926476-16	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	07-AUG-14
WG1926476-18	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	07-AUG-14
WG1926476-6	MS	L1497647-8						
Sulfate (SO4)			N/A	MS-B	%		-	07-AUG-14
WG1926476-8	MS	L1497746-1						
Sulfate (SO4)			98.8		%		75-125	07-AUG-14
SOLIDS-TDS-ED		Water						
Batch	R2912810							
WG1926634-3	DUP	L1497207-3						
Total Dissolved Solids		1210	1200		mg/L	0.7	20	08-AUG-14
WG1926634-2	LCS							
Total Dissolved Solids			99.5		%		85-115	08-AUG-14
WG1926634-1	MB							
Total Dissolved Solids			<10		mg/L		10	08-AUG-14
Batch	R2923484							
WG1933016-3	DUP	L1502799-13						
Total Dissolved Solids		781	768		mg/L	1.7	20	18-AUG-14
WG1933016-2	LCS							
Total Dissolved Solids			105.9		%		85-115	18-AUG-14
WG1933016-1	MB							
Total Dissolved Solids			25	B	mg/L		10	18-AUG-14

COMMENTS: MB was outside of acceptable limits.

TURBIDITY-ED **Water**



Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Page 29 of 31

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-ED		Water						
Batch	R2908422							
WG1924244-6	DUP	L1496613-1						
Turbidity		1.82	1.89		NTU	3.8	15	05-AUG-14
WG1924244-7	DUP	L1496849-1						
Turbidity		1.27	1.21		NTU	4.8	15	05-AUG-14
WG1924244-5	LCS							
Turbidity			98.6		%		70-130	05-AUG-14
WG1924244-4	MB							
Turbidity			<0.10		NTU		0.1	05-AUG-14

Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2
Contact: AKIN OWOJORI

Page 30 of 31

Legend:

Limit ALS Control Limit (Data Quality Objectives)
DUP Duplicate
RPD Relative Percent Difference
N/A Not Available
LCS Laboratory Control Sample
SRM Standard Reference Material
MS Matrix Spike
MSD Matrix Spike Duplicate
ADE Average Desorption Efficiency
MB Method Blank
IRM Internal Reference Material
CRM Certified Reference Material
CCV Continuing Calibration Verification
CVS Calibration Verification Standard
LCSD Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
B	Method Blank exceeds ALS DQO. All associated sample results are at least 5 times greater than blank levels and are considered reliable.
DLM	Detection Limit Adjusted due to sample matrix effects.
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L1496613

Report Date: 26-AUG-14

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Page 31 of 31

Contact: AKIN OWOJORI

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Total Dissolved Solids	5	03-AUG-14 15:15	18-AUG-14 00:00	7	14	days	EHT
Anions and Nutrients							
Nitrate as N by IC	1	03-AUG-14 13:00	07-AUG-14 08:00	48	91	hours	EHTL
	3	03-AUG-14 13:00	07-AUG-14 08:00	48	91	hours	EHTL
	4	03-AUG-14 14:15	07-AUG-14 08:00	48	90	hours	EHT
	5	03-AUG-14 15:15	07-AUG-14 08:00	48	89	hours	EHT
	6	03-AUG-14 15:20	07-AUG-14 08:00	48	89	hours	EHT
	7	03-AUG-14 16:29	07-AUG-14 08:00	48	88	hours	EHT
Nitrite as N by IC	1	03-AUG-14 13:00	07-AUG-14 08:00	48	91	hours	EHTL
	3	03-AUG-14 13:00	07-AUG-14 08:00	48	91	hours	EHTL
	4	03-AUG-14 14:15	07-AUG-14 08:00	48	90	hours	EHT
	5	03-AUG-14 15:15	07-AUG-14 08:00	48	89	hours	EHT
	6	03-AUG-14 15:20	07-AUG-14 08:00	48	89	hours	EHT
	7	03-AUG-14 16:29	07-AUG-14 08:00	48	88	hours	EHT

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1496613 were received on 04-AUG-14 13:49.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



ALS 140815-01 (14-CDT)

CONFIDENTIAL ANALYSIS REPORT

REPORT #: 140815-01

WO #: 14-CDT

PO #: L1496613

CLIENT: ALS Laboratory Group - Edmonton
9936-67 Avenue
Edmonton, AB
T6E 0P5

ATTENTION: ALSED Reporting
Tel: (780) 413-5227
Fax: (780) 437-2311

SAMPLE DESCRIPTION: Water Samples

DATE AND TIME OF SAMPLE COLLECTION: Not Provided

DATE AND TIME OF SAMPLE RECEIPT: August 05, 2014/12:09

SAMPLE TEMPERATURE WHEN RECEIVED: 9.9° Celsius

TEST PERFORMED:

Iron Related Bacteria
Sulfate Reducing Bacteria
Sulfate Reducing Bacteria [P/A]
Iron Related Bacteria [P/A]

TEST START DATE: August 05, 2014/01:09

DATE COMPLETED: August 14, 2014

CERTIFICATE OF ANALYSIS: See Page 2

QUALITY CONTROL DATA: See Attached Appendix 1

The report shall not be reproduced, except in full, without the written authority of PBR Laboratories Inc.

Certificate of Analysis

PBR ID	Sample #	Client ID	Lot #	Test	Protocol	Quantity Analyzed	*DF	Result	Units	Note
14-CDT-01	L1496613-1	16053140803010		Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		200	CFU/ml	1
14-CDT-02	L1496613-3	16053140803012		Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		5.0×10^3	CFU/ml	1
14-CDT-03	L1496613-4	16053140803013		Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	
				Sulfate Reducing Bacteria [P/A]	BART	15 ml		Absent		
14-CDT-04	L1496613-5	16053140803014		Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		1.8×10^4	CFU/ml	1
14-CDT-05	L1496613-6	16053140803015		Iron Related Bacteria	BART	15 ml		2.3×10^3	CFU/ml	
				Sulfate Reducing Bacteria [P/A]	BART	15 ml		Absent		
14-CDT-06	L1496613-7	16053140803016		Iron Related Bacteria [P/A]	BART	15 ml		Absent		
				Sulfate Reducing Bacteria [P/A]	BART	15 ml		Absent		

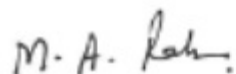
*DF - Dilution Factor used for analysis

Notes

1 CFU = Colony Forming Unit.

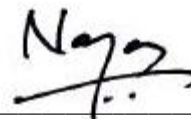
BART results represent the Approximate Population only.

The reported results apply only to the items tested.



Abdul Rahman Mohammed (Analyst)
Date: Aug 15 2014

Approved By:



Narayan Pokharel, Ph.D.
Date: Aug 15 2014





APPENDIX 1

Quality Control Data for Iron Related Bacteria (BART)

Controls	Organism/Medium	Result
Sterility (media blank)	BART medium	Pass
Positive	Acidithiobacillus ferrooxidans	Pass
Negative	D/W Sterile	Pass

Quality Control Data for Sulfate Reducing Bacteria (BART)

Controls	Organism/Medium	Result
Sterility	BART medium	Pass
Positive	SRB	Pass
Negative	D/W Sterile	Pass

Quality Control Data for Sulfate Reducing Bacteria [P/A] (BART)

Controls	Organism/Medium	Result
Sterility	BART medium	Pass
Positive	SRB	Pass
Negative	D/W sterile	Pass

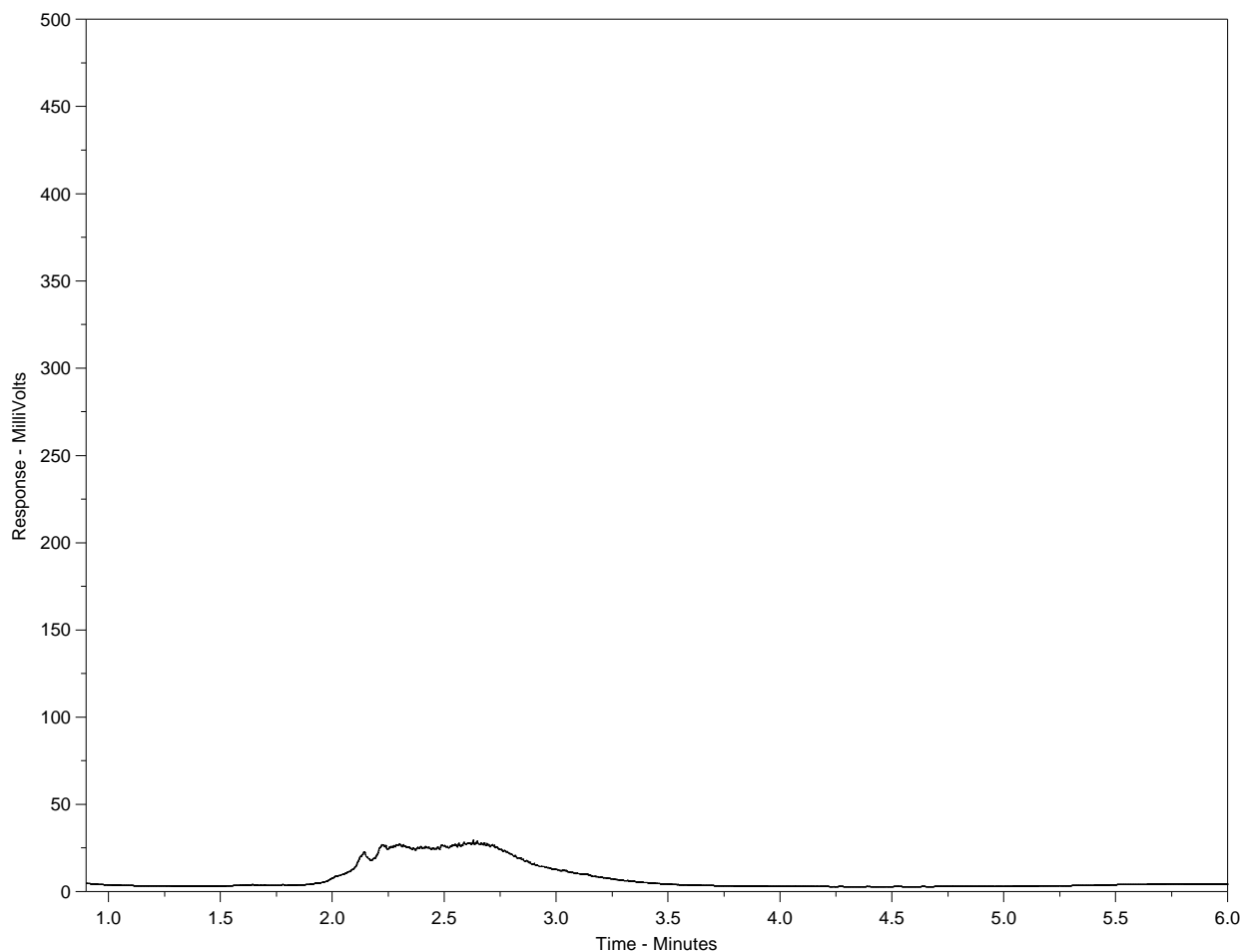
Quality Control Data for Iron Related Bacteria [P/A] (BART)

Controls	Organism/Medium	Result
Sterility	BART Medium	Pass
Positive	Acidithiobacillus ferrooxidans	Pass
Negative	D/W sterile	Pass

Hydrocarbon Distribution Report



ALS Sample ID: L1496613-1
Client ID: 16053140803010



F2		F3		F4		F4	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	1067°F				
Gasoline				Motor Oils/ Lube Oils/ Grease			
Diesel/ Jet Fuels							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

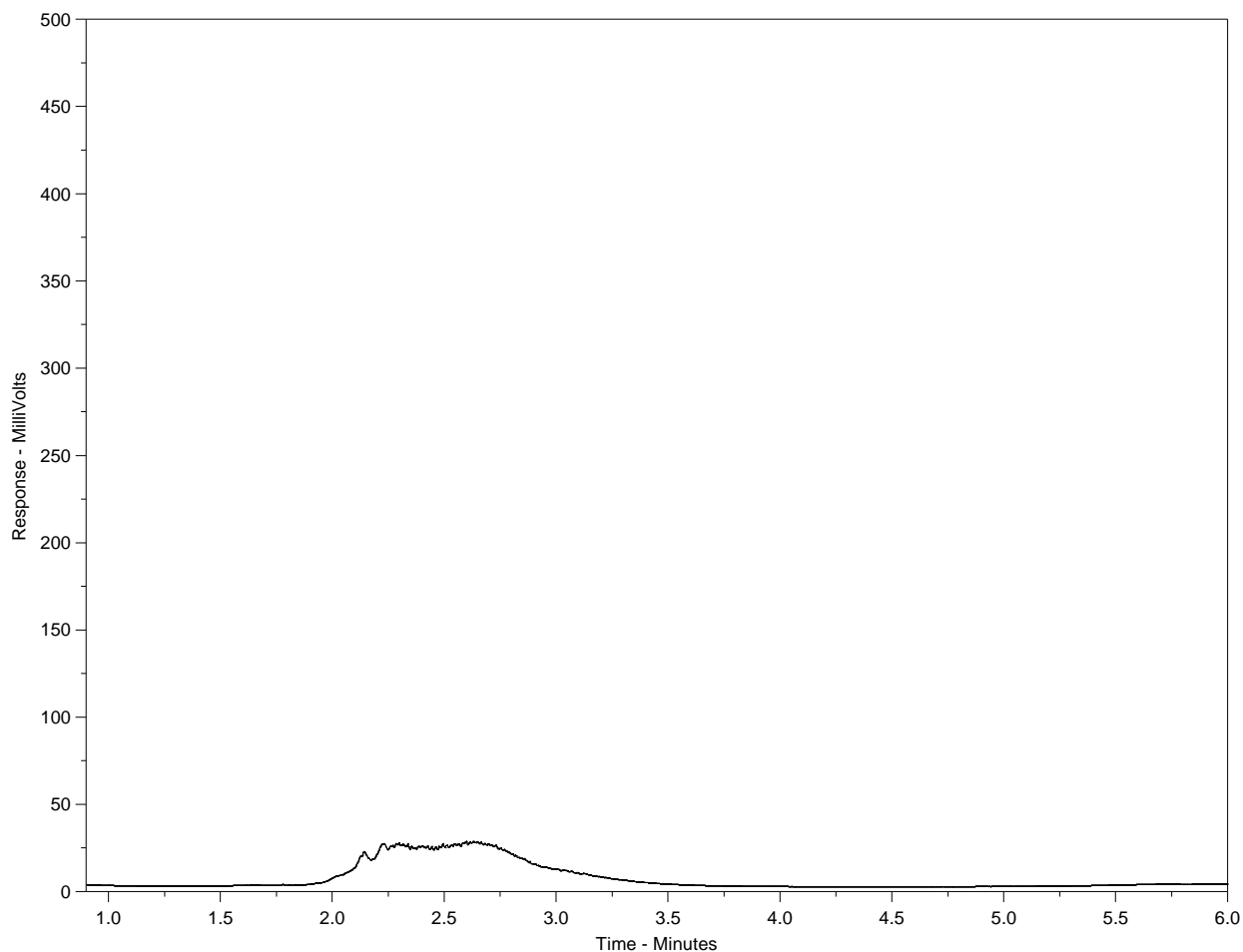
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1496613-3
 Client ID: 16053140803012



F2		F3		F4		F4	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	1067°F				
Gasoline				Motor Oils/ Lube Oils/ Grease			
Diesel/ Jet Fuels							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

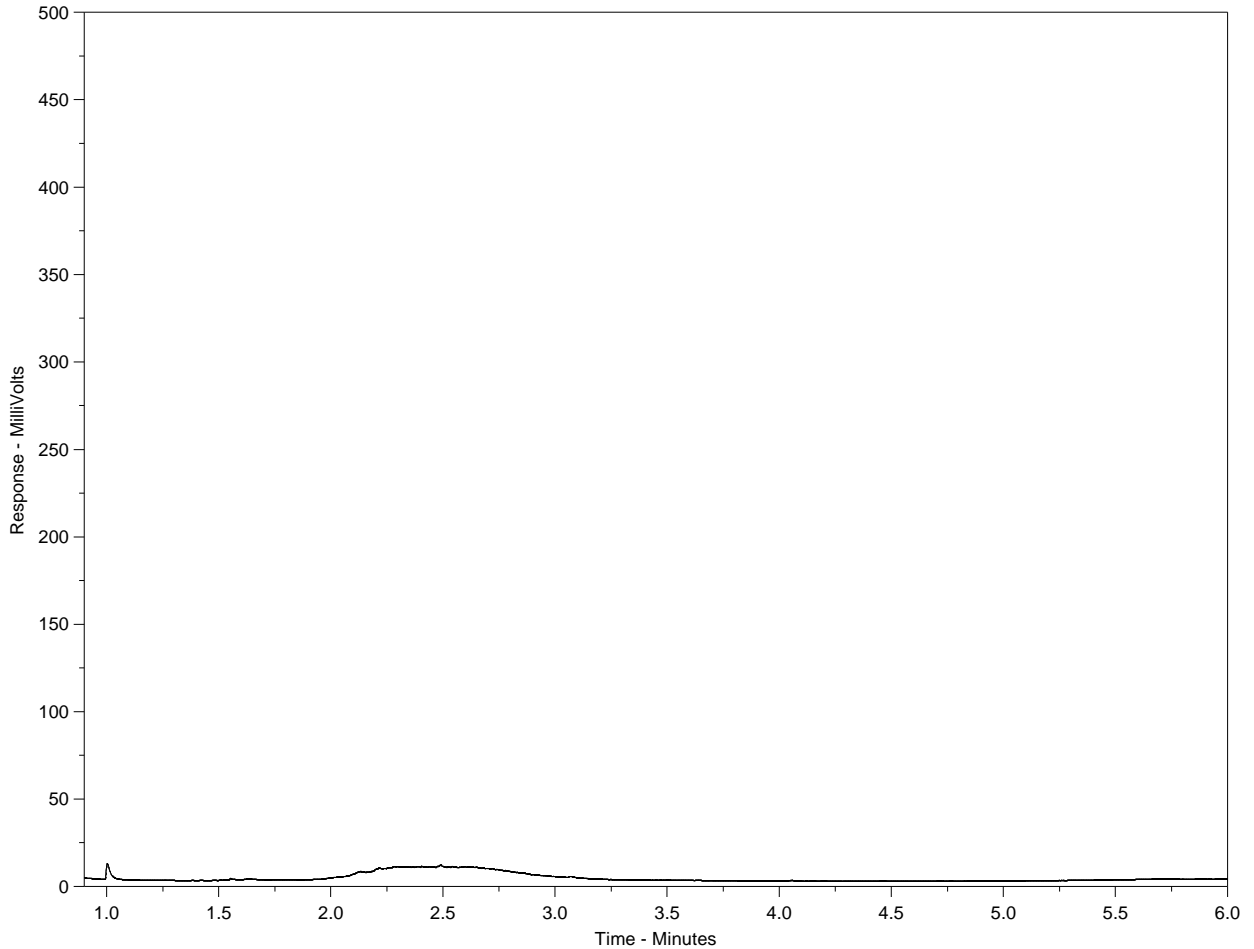
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1496613-4
 Client ID: 16053140803013



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	1067°F				
← Gasoline →			← Motor Oils/ Lube Oils/ Grease →				
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

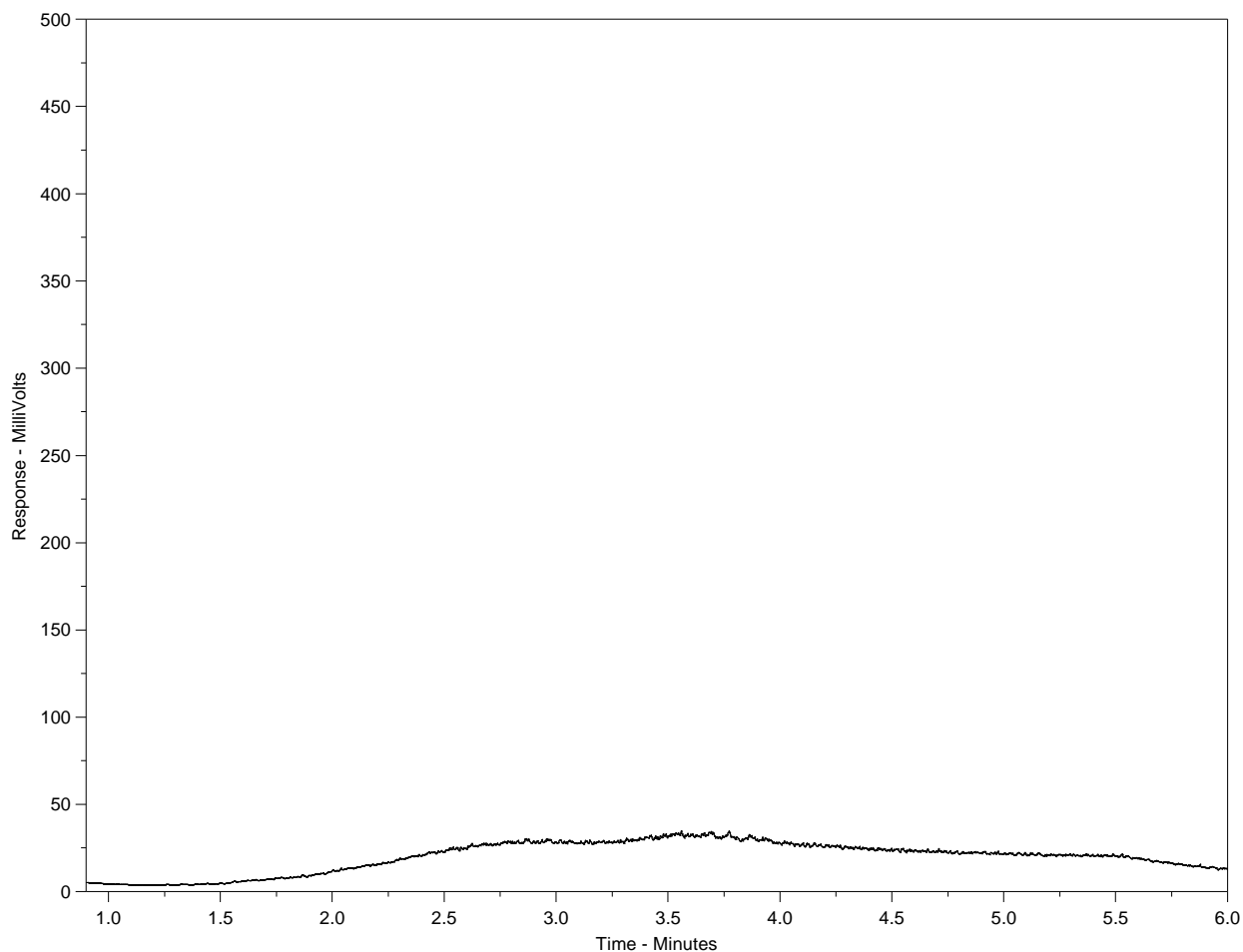
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note:
 This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1496613-5
 Client ID: 16053140803014



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	1067°F				
← Gasoline →			← Motor Oils/ Lube Oils/ Grease →				
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

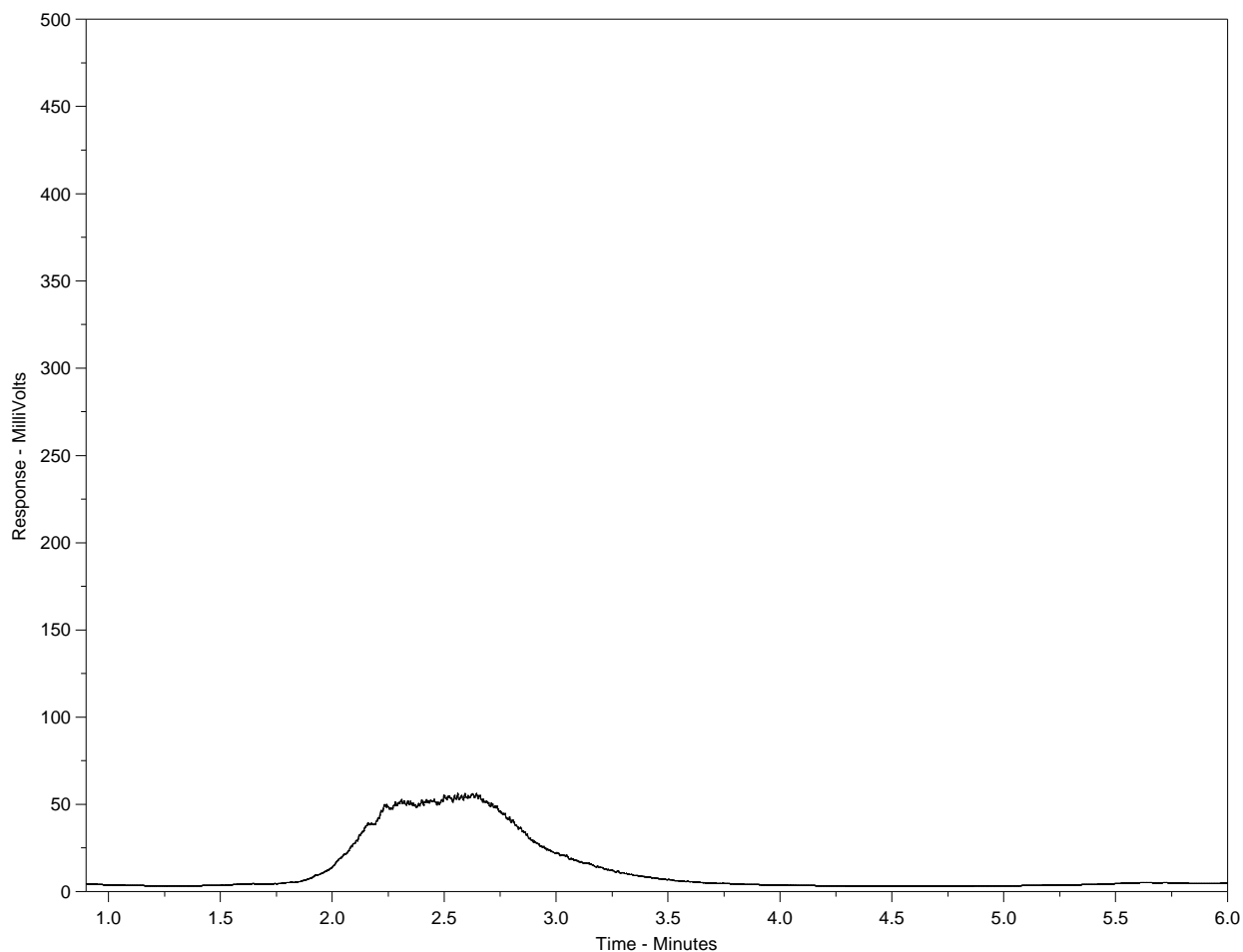
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1496613-6
Client ID: 16053140803015



← F2 →		← F3 →		← F4 →		← F4 →	
nC10		nC16		nC34		nC50	
174°C		287°C		481°C		575°C	
346°F		549°F		898°F		1067°F	
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

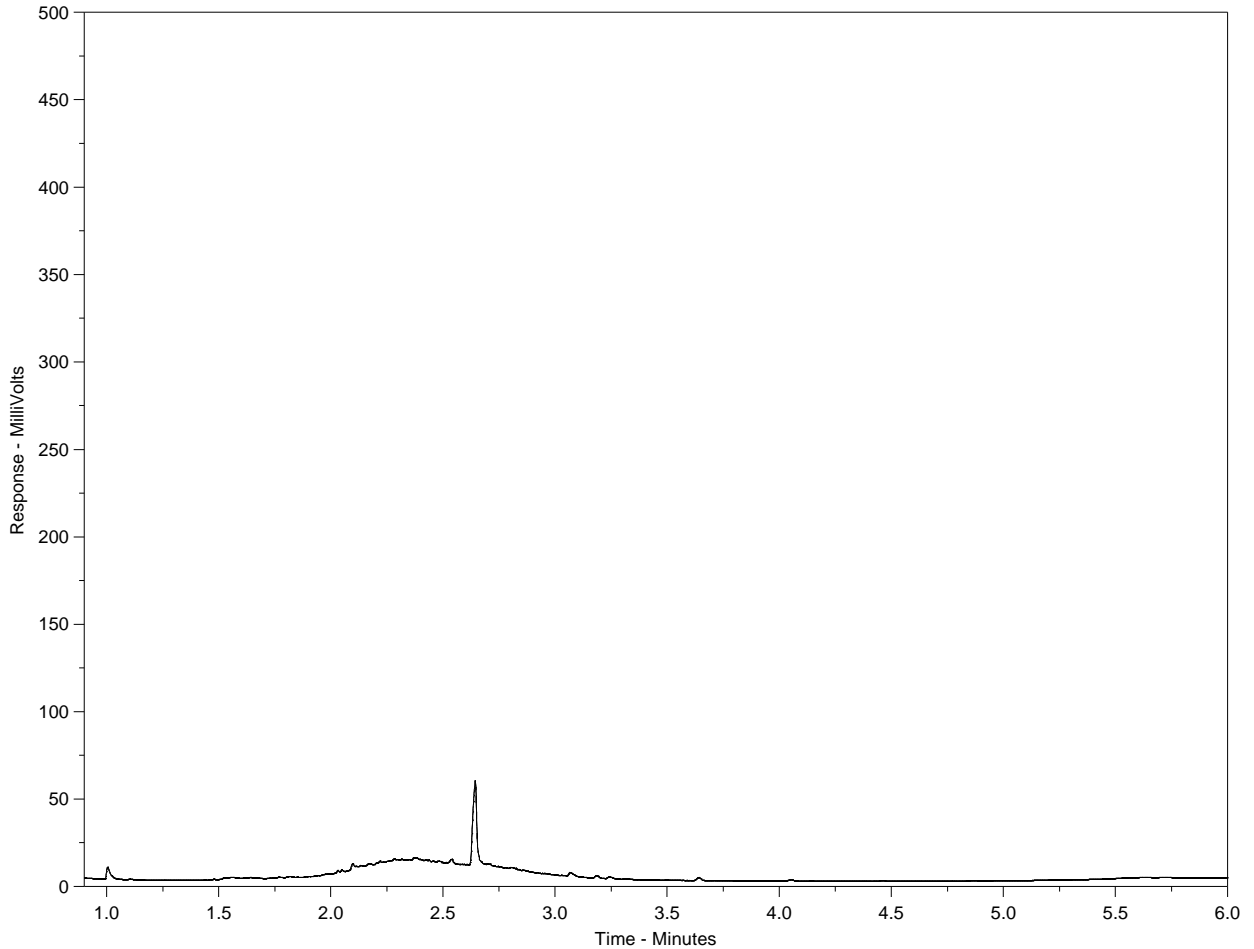
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1496613-7
 Client ID: 16053140803016



← F2 →		← F3 →		← F4 →		← F4 →	
nC10		nC16		nC34		nC50	
174°C		287°C		481°C		575°C	
346°F		549°F		898°F		1067°F	
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.



Matrix Solutions Inc.
ATTN: AKIN OWOJORI
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Date Received: 05-AUG-14
Report Date: 27-AUG-14 16:34 (MT)
Version: FINAL

Client Phone: 403-513-2275

Certificate of Analysis

Lab Work Order #: L1496774
Project P.O. #: NOT SUBMITTED
Job Reference: 16053-502 NAOS
C of C Numbers: M061307
Legal Site Desc:

Nicole Thibault
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 9936-67 Avenue, Edmonton, AB T6E 0P5 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496774-1 16053140804017									
Sampled By: gulled/bobby/jeremy on 04-AUG-14 @ 11:30									
Matrix: h20									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
Toluene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
EthylBenzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
o-Xylene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
Styrene	<0.0010	-		0.0010	mg/L	-		10-AUG-14	R2908774
F1(C6-C10)	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908774
F1-BTEX	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908774
Xylenes	<0.00071	-		0.00071	mg/L	-		10-AUG-14	R2908774
Surr: 1,4-Difluorobenzene (SS)	96.2	-		N/A	%	-		10-AUG-14	R2908774
Surr: 4-Bromofluorobenzene (SS)	80.5	-		N/A	%	-		10-AUG-14	R2908774
Surr: 3,4-Dichlorotoluene (SS)	89.1	-		N/A	%	-		10-AUG-14	R2908774
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	08-AUG-14	08-AUG-14	R2912766
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	08-AUG-14	08-AUG-14	R2912766
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	08-AUG-14	08-AUG-14	R2912766
Surr: 2-Bromobenzotrifluoride	101.2	-		N/A	%	-	08-AUG-14	08-AUG-14	R2912766
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		19-AUG-14	R2923482
				0					
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.075	+/-0.013	DLM	0.030	mg/L	0		10-AUG-14	R2912775
Antimony (Sb)-Total	<0.0010	-	DLM	0.0010	mg/L	-		10-AUG-14	R2912775
Arsenic (As)-Total	<0.0010	-	DLM	0.0010	mg/L	-		10-AUG-14	R2912775
Barium (Ba)-Total	0.542	+/-0.061	DLM	0.0050	mg/L	0		10-AUG-14	R2912775
Boron (B)-Total	3.37	+/-0.54	DLM	0.10	mg/L	0		10-AUG-14	R2912775
Cadmium (Cd)-Total	<0.00020	-	DLM	0.00020	mg/L	-		10-AUG-14	R2912775
Calcium (Ca)-Total	5.85	+/-0.70	DLM	0.50	mg/L	0		10-AUG-14	R2912775
Chromium (Cr)-Total	<0.0050	-	DLM	0.0050	mg/L	-		10-AUG-14	R2912775
Copper (Cu)-Total	0.0102	+/-0.0012	DLM	0.0010	mg/L	0		10-AUG-14	R2912775
Iron (Fe)-Total	3.09	+/-0.49	DLM	0.10	mg/L	0		11-AUG-14	R2914191
Lead (Pb)-Total	0.0128	+/-0.0020	DLM	0.00050	mg/L	0		10-AUG-14	R2912775
Magnesium (Mg)-Total	6.17	+/-0.75	DLM	0.10	mg/L	0		10-AUG-14	R2912775
Manganese (Mn)-Total	0.0553	+/-0.0056	DLM	0.0020	mg/L	0		10-AUG-14	R2912775
Nickel (Ni)-Total	<0.0020	-	DLM	0.0020	mg/L	-		10-AUG-14	R2912775
Potassium (K)-Total	8.34	+/-1.0	DLM	0.50	mg/L	0		10-AUG-14	R2912775
Selenium (Se)-Total	<0.0010	-	DLM	0.0010	mg/L	-		10-AUG-14	R2912775
Silicon (Si)-Total	2.35	+/-0.47	DLM	0.50	mg/L	0		10-AUG-14	R2912775
Silver (Ag)-Total	<0.00040	-	DLM	0.00040	mg/L	-		10-AUG-14	R2912775
Sodium (Na)-Total	1440	+/-180	DLM	1.0	mg/L	0		10-AUG-14	R2912775
Uranium (U)-Total	<0.00010	-	DLM	0.00010	mg/L	-		10-AUG-14	R2912775
Zinc (Zn)-Total	0.063	+/-0.010	DLM	0.030	mg/L	0		10-AUG-14	R2912775
Miscellaneous Parameters									
Ammonia, Total (as N)	6.06	-		0.050	mg/L	-		14-AUG-14	R2918088
Dissolved Organic Carbon	3.6	+/-0.7		1.0	mg/L	0		13-AUG-14	R2916939
Iron Bacteria	See Attached	-				-		06-AUG-14	R2913448
Naphthenic Acids	<1.0	-		1.0	mg/L	-	16-AUG-14	27-AUG-14	R2930372
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		19-AUG-14	R2923340
Sulphate Reducing Bacteria	See Attached	-				-		06-AUG-14	R2913448

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496774-1 16053140804017									
Sampled By: gulled/bobby/jeremy on 04-AUG-14 @ 11:30									
Matrix: h20									
Total Dissolved Solids	3540	+/-240		10	mg/L	0		08-AUG-14	R2912810
Silicon (as SiO2)-Total	5.0	-		1.1	mg/L	-		12-AUG-14	
Turbidity	17.7	+/-1.0		0.10	NTU	0		06-AUG-14	R2909764
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Anthracene	<0.000010	-		0.000010	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Fluoranthene	<0.000020	-		0.000020	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Fluorene	<0.000020	-		0.000020	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Naphthalene	<0.000050	-		0.000050	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Phenanthrene	<0.000050	-		0.000050	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Pyrene	<0.000010	-		0.000010	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Benzo(a)pyrene	<0.0000050	-		0.000005	mg/L	-	13-AUG-14	13-AUG-14	R2920176
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	13-AUG-14	13-AUG-14	R2920176
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	13-AUG-14	13-AUG-14	R2920176
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Surr: d10-Acenaphthene	87.1	-		N/A	%	-	13-AUG-14	13-AUG-14	R2920176
Surr: d10-Phenanthrene	93.3	-		N/A	%	-	13-AUG-14	13-AUG-14	R2920176
Surr: d12-Chrysene	95.7	-		N/A	%	-	13-AUG-14	13-AUG-14	R2920176
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	1190	+/-67	DLM	2.5	mg/L	0		06-AUG-14	R2909698
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	0.019	+/-0.003	DLM	0.010	mg/L	0		19-AUG-14	R2922376
Antimony (Sb)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		19-AUG-14	R2922376
Arsenic (As)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		19-AUG-14	R2922376
Barium (Ba)-Dissolved	0.469	+/-0.041	DLM	0.0050	mg/L	0		19-AUG-14	R2922376
Boron (B)-Dissolved	0.66	+/-0.08	DLM	0.10	mg/L	0		19-AUG-14	R2922376
Cadmium (Cd)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		19-AUG-14	R2922376
Calcium (Ca)-Dissolved	5.21	+/-0.71	DLM	0.50	mg/L	0		19-AUG-14	R2922376
Chromium (Cr)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		19-AUG-14	R2922376
Copper (Cu)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		19-AUG-14	R2922376
Iron (Fe)-Dissolved	<0.10	-	DLM	0.10	mg/L	-		19-AUG-14	R2922376
Lead (Pb)-Dissolved	<0.00050	-	DLM	0.00050	mg/L	-		19-AUG-14	R2922376
Magnesium (Mg)-Dissolved	5.53	+/-0.43	DLM	0.10	mg/L	0		19-AUG-14	R2922376
Manganese (Mn)-Dissolved	0.0074	+/-0.0005	DLM	0.0020	mg/L	0		19-AUG-14	R2922376
Nickel (Ni)-Dissolved	<0.0020	-	DLM	0.0020	mg/L	-		19-AUG-14	R2922376
Potassium (K)-Dissolved	7.99	+/-0.62	DLM	0.50	mg/L	0		19-AUG-14	R2922376
Selenium (Se)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		19-AUG-14	R2922376
Silicon (Si)-Dissolved	2.02	+/-0.17	DLM	0.50	mg/L	0		19-AUG-14	R2922376
Silver (Ag)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		19-AUG-14	R2922376
Sodium (Na)-Dissolved	1380	+/-97	DLM	1.0	mg/L	0		19-AUG-14	R2922376
Uranium (U)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		19-AUG-14	R2922376
Zinc (Zn)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		19-AUG-14	R2922376
Ion Balance Calculation									
Ion Balance	94.3	-			%	-		19-AUG-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496774-1 16053140804017									
Sampled By: gulled/bobby/jeremy on 04-AUG-14 @ 11:30									
Matrix: h20									
Ion Balance Calculation									
TDS (Calculated)	3540	-			mg/L	-		19-AUG-14	
Hardness (as CaCO3)	35.8	-			mg/L	-		19-AUG-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		19-AUG-14	R2923482
Nitrate as N by IC									
Nitrate (as N)	<0.25	-	DLM	0.25	mg/L	-		06-AUG-14	R2909698
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.27	-		0.27	mg/L	-		11-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.10	-	DLM	0.10	mg/L	-		06-AUG-14	R2909698
Sulfate by IC									
Sulfate (SO4)	<2.5	-	DLM	2.5	mg/L	-		06-AUG-14	R2909698
pH, Conductivity and Total Alkalinity									
pH	9.17	+/-0.04		0.10	pH	0		07-AUG-14	R2910608
Conductivity (EC)	6280	+/-210		0.20	uS/cm	0		07-AUG-14	R2910608
Bicarbonate (HCO3)	1410	-		5.0	mg/L	-		07-AUG-14	R2910608
Carbonate (CO3)	252	-		5.0	mg/L	-		07-AUG-14	R2910608
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		07-AUG-14	R2910608
Alkalinity, Total (as CaCO3)	1580	+/-55		2.0	mg/L	0		07-AUG-14	R2910608
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	4.3	-		1.1	mg/L	-		19-AUG-14	
L1496774-2 16053140804018									
Sampled By: gulled/bobby/jeremy on 04-AUG-14 @ 12:30									
Matrix: h20									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
Toluene	0.00219	-		0.00050	mg/L	-		10-AUG-14	R2908774
EthylBenzene	0.00096	-		0.00050	mg/L	-		10-AUG-14	R2908774
o-Xylene	0.00445	-		0.00050	mg/L	-		10-AUG-14	R2908774
m+p-Xylene	0.00557	-		0.00050	mg/L	-		10-AUG-14	R2908774
Styrene	<0.0010	-		0.0010	mg/L	-		10-AUG-14	R2908774
F1(C6-C10)	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908774
F1-BTEX	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908774
Xylenes	0.0100	-		0.00071	mg/L	-		10-AUG-14	R2908774
Surr: 1,4-Difluorobenzene (SS)	96.6	-		N/A	%	-		10-AUG-14	R2908774
Surr: 4-Bromofluorobenzene (SS)	84.2	-		N/A	%	-		10-AUG-14	R2908774
Surr: 3,4-Dichlorotoluene (SS)	92.6	-		N/A	%	-		10-AUG-14	R2908774
F2, F3, F4									
F2 (>C10-C16)	0.31	+/-0.09		0.25	mg/L	0	08-AUG-14	08-AUG-14	R2912766
F3 (C16-C34)	1.84	+/-0.44		0.25	mg/L	0	08-AUG-14	08-AUG-14	R2912766
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	08-AUG-14	08-AUG-14	R2912766
Surr: 2-Bromobenzotrifluoride	98.5	-		N/A	%	-	08-AUG-14	08-AUG-14	R2912766
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		19-AUG-14	R2923482
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	<0.30	-	DLM	0.30	mg/L	-		10-AUG-14	R2912775
Antimony (Sb)-Total	<0.010	-	DLM	0.010	mg/L	-		10-AUG-14	R2912775

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496774-2 16053140804018									
Sampled By: gulled/bobby/jeremy on 04-AUG-14 @ 12:30									
Matrix: h20									
Total Metals in Water by CRC ICPMS									
Arsenic (As)-Total	<0.010	-	DLM	0.010	mg/L	-		10-AUG-14	R2912775
Barium (Ba)-Total	0.190	+/-0.021	DLM	0.0050	mg/L	0		10-AUG-14	R2912775
Boron (B)-Total	5.3	+/-0.8	DLM	1.0	mg/L	0		10-AUG-14	R2912775
Cadmium (Cd)-Total	<0.0010	-	DLM	0.0010	mg/L	-		10-AUG-14	R2912775
Calcium (Ca)-Total	20.4	+/-2.4	DLM	2.0	mg/L	0		10-AUG-14	R2912775
Chromium (Cr)-Total	<0.010	-	DLM	0.010	mg/L	-		10-AUG-14	R2912775
Copper (Cu)-Total	<0.010	-	DLM	0.010	mg/L	-		10-AUG-14	R2912775
Iron (Fe)-Total	20.3	+/-3.2	DLM	1.0	mg/L	0		10-AUG-14	R2912775
Lead (Pb)-Total	0.0146	+/-0.0023	DLM	0.0050	mg/L	0		10-AUG-14	R2912775
Magnesium (Mg)-Total	200	+/-24	DLM	0.50	mg/L	0		10-AUG-14	R2912775
Manganese (Mn)-Total	0.270	+/-0.027	DLM	0.0050	mg/L	0		10-AUG-14	R2912775
Nickel (Ni)-Total	<0.010	-	DLM	0.010	mg/L	-		10-AUG-14	R2912775
Potassium (K)-Total	43.4	+/-5.3	DLM	5.0	mg/L	0		10-AUG-14	R2912775
Selenium (Se)-Total	<0.010	-	DLM	0.010	mg/L	-		10-AUG-14	R2912775
Silicon (Si)-Total	<5.0	-	DLM	5.0	mg/L	-		10-AUG-14	R2912775
Silver (Ag)-Total	<0.0010	-	DLM	0.0010	mg/L	-		10-AUG-14	R2912775
Sodium (Na)-Total	8070	+/-990	DLM	5.0	mg/L	0		10-AUG-14	R2912775
Uranium (U)-Total	<0.0010	-	DLM	0.0010	mg/L	-		10-AUG-14	R2912775
Zinc (Zn)-Total	<0.30	-	DLM	0.30	mg/L	-		10-AUG-14	R2912775
Miscellaneous Parameters									
Ammonia, Total (as N)	10.3	-		0.050	mg/L	-		14-AUG-14	R2918088
Dissolved Organic Carbon	12.8	+/-1.5		1.0	mg/L	0		13-AUG-14	R2916939
Iron Bacteria	See Attached	-				-		06-AUG-14	R2913448
Naphthenic Acids	6.6	+/-1.2		1.0	mg/L	0	16-AUG-14	27-AUG-14	R2930372
Phenols (4AAP)	0.0054	+/-0.0010		0.0010	mg/L	-7.4%		19-AUG-14	R2923340
Sulphate Reducing Bacteria	See Attached	-				-		06-AUG-14	R2913448
Total Dissolved Solids	22600	+/-1500		10	mg/L	0		08-AUG-14	R2912810
Silicon (as SiO2)-Total	<11	-		11	mg/L	-		11-AUG-14	
Turbidity	115	+/-6.4		0.10	NTU	0		06-AUG-14	R2909764
PAH & Carcinogenic PAH List									
Acenaphthene	0.000194	-		0.000020	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Acenaphthylene	<0.000030	-	DLM	0.000030	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Anthracene	<0.000010	-		0.000010	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Fluoranthene	<0.000020	-		0.000020	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Fluorene	0.000252	-		0.000020	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Naphthalene	0.00231	-		0.000050	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Phenanthrene	0.000206	-		0.000050	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Pyrene	<0.000010	-		0.000010	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Benzo(a)pyrene	<0.0000050	-		0.000005	mg/L	-	13-AUG-14	13-AUG-14	R2920176
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	13-AUG-14	13-AUG-14	R2920176
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	13-AUG-14	13-AUG-14	R2920176
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	13-AUG-14	13-AUG-14	R2920176
Surr: d10-Acenaphthene	74.6	-		N/A	%	-	13-AUG-14	13-AUG-14	R2920176
Surr: d10-Phenanthrene	84.6	-		N/A	%	-	13-AUG-14	13-AUG-14	R2920176

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496774-2 16053140804018									
Sampled By: gulled/bobby/jeremy on 04-AUG-14 @ 12:30									
Matrix: h20									
PAH & Carcinogenic PAH List									
Surr: d12-Chrysene	83.9	-		N/A	%	-	13-AUG-14	13-AUG-14	R2920176
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	13100	+/-740	DLM	10	mg/L	0		06-AUG-14	R2909698
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	0.12	+/-0.02	DLM	0.10	mg/L	0		19-AUG-14	R2922376
Antimony (Sb)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		19-AUG-14	R2922376
Arsenic (As)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		19-AUG-14	R2922376
Barium (Ba)-Dissolved	0.155	+/-0.013	DLM	0.0050	mg/L	0		19-AUG-14	R2922376
Boron (B)-Dissolved	1.3	+/-0.2	DLM	1.0	mg/L	0		19-AUG-14	R2922376
Cadmium (Cd)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		19-AUG-14	R2922376
Calcium (Ca)-Dissolved	21.4	+/-2.9	DLM	2.0	mg/L	0		19-AUG-14	R2922376
Chromium (Cr)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		19-AUG-14	R2922376
Copper (Cu)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		19-AUG-14	R2922376
Iron (Fe)-Dissolved	<1.0	-	DLM	1.0	mg/L	-		19-AUG-14	R2922376
Lead (Pb)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		19-AUG-14	R2922376
Magnesium (Mg)-Dissolved	201	+/-16	DLM	0.50	mg/L	0		19-AUG-14	R2922376
Manganese (Mn)-Dissolved	0.188	+/-0.013	DLM	0.0050	mg/L	0		19-AUG-14	R2922376
Nickel (Ni)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		19-AUG-14	R2922376
Potassium (K)-Dissolved	41.1	+/-3.2	DLM	5.0	mg/L	0		19-AUG-14	R2922376
Selenium (Se)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		19-AUG-14	R2922376
Silicon (Si)-Dissolved	<5.0	-	DLM	5.0	mg/L	-		19-AUG-14	R2922376
Silver (Ag)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		19-AUG-14	R2922376
Sodium (Na)-Dissolved	8110	+/-570	DLM	5.0	mg/L	0		19-AUG-14	R2922376
Uranium (U)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		19-AUG-14	R2922376
Zinc (Zn)-Dissolved	0.17	+/-0.02	DLM	0.10	mg/L	0		19-AUG-14	R2922376
Ion Balance Calculation									
Ion Balance	93.3	-			%	-		19-AUG-14	
TDS (Calculated)	22300	-			mg/L	-		19-AUG-14	
Hardness (as CaCO3)	881	-			mg/L	-		19-AUG-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		19-AUG-14	R2923482
Nitrate as N by IC									
Nitrate (as N)	<1.0	-	DLM	1.0	mg/L	-		06-AUG-14	R2909698
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<1.1	-		1.1	mg/L	-		11-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.40	-	DLM	0.40	mg/L	-		06-AUG-14	R2909698
Sulfate by IC									
Sulfate (SO4)	<10	-	DLM	10	mg/L	-		06-AUG-14	R2909698
pH, Conductivity and Total Alkalinity									
pH	8.53	+/-0.04		0.10	pH	0		07-AUG-14	R2910608
Conductivity (EC)	36900	+/-1200		0.20	uS/cm	0		07-AUG-14	R2910608
Bicarbonate (HCO3)	1600	-		5.0	mg/L	-		07-AUG-14	R2910608
Carbonate (CO3)	89.6	-		5.0	mg/L	-		07-AUG-14	R2910608
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		07-AUG-14	R2910608
Alkalinity, Total (as CaCO3)	1460	+/-51		2.0	mg/L	0		07-AUG-14	R2910608
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	<11	-		11	mg/L	-		19-AUG-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496774-3 16053140804019									
Sampled By: gulled/bobby/jeremy on 04-AUG-14 @ 11:30									
Matrix: h20									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
Toluene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
EthylBenzene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
o-Xylene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		10-AUG-14	R2908774
Styrene	<0.0010	-		0.0010	mg/L	-		10-AUG-14	R2908774
F1(C6-C10)	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908774
F1-BTEX	<0.10	-		0.10	mg/L	-		10-AUG-14	R2908774
Xylenes	<0.00071	-		0.00071	mg/L	-		10-AUG-14	R2908774
Surr: 1,4-Difluorobenzene (SS)	96.8	-		N/A	%	-		10-AUG-14	R2908774
Surr: 4-Bromofluorobenzene (SS)	81.8	-		N/A	%	-		10-AUG-14	R2908774
Surr: 3,4-Dichlorotoluene (SS)	86.9	-		N/A	%	-		10-AUG-14	R2908774
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	08-AUG-14	08-AUG-14	R2912766
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	08-AUG-14	08-AUG-14	R2912766
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	08-AUG-14	08-AUG-14	R2912766
Surr: 2-Bromobenzotrifluoride	101.0	-		N/A	%	-	08-AUG-14	08-AUG-14	R2912766
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		19-AUG-14	R2923482
				0					
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.113	+/-0.019	DLM	0.030	mg/L	0		09-AUG-14	R2912618
Antimony (Sb)-Total	<0.0010	-	DLM	0.0010	mg/L	-		09-AUG-14	R2912618
Arsenic (As)-Total	<0.0010	-	DLM	0.0010	mg/L	-		09-AUG-14	R2912618
Barium (Ba)-Total	0.620	+/-0.069	DLM	0.0050	mg/L	0		09-AUG-14	R2912618
Boron (B)-Total	3.33	+/-0.53	DLM	0.10	mg/L	0		09-AUG-14	R2912618
Cadmium (Cd)-Total	<0.00020	-	DLM	0.00020	mg/L	-		09-AUG-14	R2912618
Calcium (Ca)-Total	6.69	+/-0.80	DLM	0.50	mg/L	0		09-AUG-14	R2912618
Chromium (Cr)-Total	<0.0050	-	DLM	0.0050	mg/L	-		09-AUG-14	R2912618
Copper (Cu)-Total	0.0101	+/-0.0012	DLM	0.0010	mg/L	0		09-AUG-14	R2912618
Iron (Fe)-Total	3.00	+/-0.48	DLM	0.10	mg/L	0		09-AUG-14	R2912618
Lead (Pb)-Total	0.00574	+/-0.00091	DLM	0.00050	mg/L	0		09-AUG-14	R2912618
Magnesium (Mg)-Total	7.56	+/-0.92	DLM	0.10	mg/L	0		09-AUG-14	R2912618
Manganese (Mn)-Total	0.0469	+/-0.0047	DLM	0.0020	mg/L	0		09-AUG-14	R2912618
Nickel (Ni)-Total	<0.0020	-	DLM	0.0020	mg/L	-		09-AUG-14	R2912618
Potassium (K)-Total	7.74	+/-0.95	DLM	0.50	mg/L	0		09-AUG-14	R2912618
Selenium (Se)-Total	<0.0010	-	DLM	0.0010	mg/L	-		09-AUG-14	R2912618
Silicon (Si)-Total	2.80	+/-0.56	DLM	0.50	mg/L	0		09-AUG-14	R2912618
Silver (Ag)-Total	<0.00040	-	DLM	0.00040	mg/L	-		09-AUG-14	R2912618
Sodium (Na)-Total	1470	+/-180	DLM	1.0	mg/L	0		09-AUG-14	R2912618
Uranium (U)-Total	<0.00010	-	DLM	0.00010	mg/L	-		09-AUG-14	R2912618
Zinc (Zn)-Total	0.045	+/-0.008	DLM	0.030	mg/L	0		09-AUG-14	R2912618
Miscellaneous Parameters									
Ammonia, Total (as N)	4.66	-		0.050	mg/L	-		14-AUG-14	R2918088
Dissolved Organic Carbon	3.4	+/-0.6		1.0	mg/L	0		13-AUG-14	R2916939
Iron Bacteria	See Attached	-				-		06-AUG-14	R2913448
Naphthenic Acids	<1.0	-		1.0	mg/L	-	16-AUG-14	27-AUG-14	R2930372
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		19-AUG-14	R2923340
Sulphate Reducing Bacteria	See Attached	-				-		06-AUG-14	R2913448

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496774-3 16053140804019									
Sampled By: gulled/bobby/jeremy on 04-AUG-14 @ 11:30									
Matrix: h20									
Total Dissolved Solids	3700	+/-250		10	mg/L	0		08-AUG-14	R2912810
Silicon (as SiO2)-Total	6.0	-		1.1	mg/L	-		09-AUG-14	
Turbidity	20.1	+/-1.2		0.10	NTU	0		06-AUG-14	R2909764
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	15-AUG-14	15-AUG-14	R2922480
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	15-AUG-14	15-AUG-14	R2922480
Anthracene	<0.000010	-		0.000010	mg/L	-	15-AUG-14	15-AUG-14	R2922480
Fluoranthene	<0.000020	-		0.000020	mg/L	-	15-AUG-14	15-AUG-14	R2922480
Fluorene	<0.000020	-		0.000020	mg/L	-	15-AUG-14	15-AUG-14	R2922480
Naphthalene	<0.000050	-		0.000050	mg/L	-	15-AUG-14	15-AUG-14	R2922480
Phenanthrene	<0.000050	-		0.000050	mg/L	-	15-AUG-14	15-AUG-14	R2922480
Pyrene	<0.000010	-		0.000010	mg/L	-	15-AUG-14	15-AUG-14	R2922480
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	15-AUG-14	15-AUG-14	R2922480
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	15-AUG-14	15-AUG-14	R2922480
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	15-AUG-14	15-AUG-14	R2922480
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	15-AUG-14	15-AUG-14	R2922480
Benzo(a)pyrene	<0.000050	-		0.000005	mg/L	-	15-AUG-14	15-AUG-14	R2922480
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	15-AUG-14	15-AUG-14	R2922480
Dibenzo(a,h)anthracene	<0.000050	-		0.000005	mg/L	-	15-AUG-14	15-AUG-14	R2922480
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	15-AUG-14	15-AUG-14	R2922480
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	15-AUG-14	15-AUG-14	R2922480
Surr: d10-Acenaphthene	97.6	-		N/A	%	-	15-AUG-14	15-AUG-14	R2922480
Surr: d10-Phenanthrene	98.6	-		N/A	%	-	15-AUG-14	15-AUG-14	R2922480
Surr: d12-Chrysene	95.7	-		N/A	%	-	15-AUG-14	15-AUG-14	R2922480
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	1180	+/-67	DLM	2.5	mg/L	0		06-AUG-14	R2909698
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	0.032	+/-0.005	DLM	0.010	mg/L	0		19-AUG-14	R2922376
Antimony (Sb)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		19-AUG-14	R2922376
Arsenic (As)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		19-AUG-14	R2922376
Barium (Ba)-Dissolved	0.481	+/-0.042	DLM	0.0050	mg/L	0		19-AUG-14	R2922376
Boron (B)-Dissolved	0.69	+/-0.08	DLM	0.10	mg/L	0		19-AUG-14	R2922376
Cadmium (Cd)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		19-AUG-14	R2922376
Calcium (Ca)-Dissolved	5.52	+/-0.75	DLM	0.50	mg/L	0		19-AUG-14	R2922376
Chromium (Cr)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		19-AUG-14	R2922376
Copper (Cu)-Dissolved	0.0011	+/-0.00009	DLM	0.0010	mg/L	0		19-AUG-14	R2923365
Iron (Fe)-Dissolved	<0.10	-	DLM	0.10	mg/L	-		19-AUG-14	R2922376
Lead (Pb)-Dissolved	<0.00050	-	DLM	0.00050	mg/L	-		19-AUG-14	R2922376
Magnesium (Mg)-Dissolved	5.67	+/-0.44	DLM	0.10	mg/L	0		19-AUG-14	R2922376
Manganese (Mn)-Dissolved	0.0081	+/-0.0006	DLM	0.0020	mg/L	0		19-AUG-14	R2922376
Nickel (Ni)-Dissolved	<0.0020	-	DLM	0.0020	mg/L	-		19-AUG-14	R2922376
Potassium (K)-Dissolved	7.99	+/-0.62	DLM	0.50	mg/L	0		19-AUG-14	R2922376
Selenium (Se)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		19-AUG-14	R2922376
Silicon (Si)-Dissolved	2.06	+/-0.17	DLM	0.50	mg/L	0		19-AUG-14	R2922376
Silver (Ag)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		19-AUG-14	R2922376
Sodium (Na)-Dissolved	1390	+/-98	DLM	1.0	mg/L	0		19-AUG-14	R2922376
Uranium (U)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		19-AUG-14	R2922376
Zinc (Zn)-Dissolved	0.028	+/-0.003	DLM	0.010	mg/L	0		19-AUG-14	R2922376
Ion Balance Calculation									
Ion Balance	93.3	-			%	-		19-AUG-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496774-3 16053140804019									
Sampled By: gulled/bobby/jeremy on 04-AUG-14 @ 11:30									
Matrix: h20									
Ion Balance Calculation									
TDS (Calculated)	3580	-			mg/L	-		19-AUG-14	
Hardness (as CaCO3)	37.1	-			mg/L	-		19-AUG-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		19-AUG-14	R2923482
Nitrate as N by IC									
Nitrate (as N)	<0.25	-	DLM	0.25	mg/L	-		06-AUG-14	R2909698
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.27	-		0.27	mg/L	-		11-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.10	-	DLM	0.10	mg/L	-		06-AUG-14	R2909698
Sulfate by IC									
Sulfate (SO4)	<2.5	-	DLM	2.5	mg/L	-		06-AUG-14	R2909698
pH, Conductivity and Total Alkalinity									
pH	8.92	+/-0.04		0.10	pH	0		07-AUG-14	R2910608
Conductivity (EC)	6370	+/-210		0.20	uS/cm	0		07-AUG-14	R2910608
Bicarbonate (HCO3)	1680	-		5.0	mg/L	-		07-AUG-14	R2910608
Carbonate (CO3)	161	-		5.0	mg/L	-		07-AUG-14	R2910608
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		07-AUG-14	R2910608
Alkalinity, Total (as CaCO3)	1650	+/-57		2.0	mg/L	0		07-AUG-14	R2910608
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	4.4	-		1.1	mg/L	-		19-AUG-14	
L1496774-4 16053140804020									
Sampled By: gulled/bobby/jeremy on 04-AUG-14 @ 13:30									
Matrix: h20									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-	07-AUG-14	19-AUG-14	R2908774
Toluene	0.00098	-		0.00050	mg/L	-	07-AUG-14	19-AUG-14	R2908774
EthylBenzene	0.00443	-		0.00050	mg/L	-	07-AUG-14	19-AUG-14	R2908774
o-Xylene	0.0294	-		0.00050	mg/L	-	07-AUG-14	19-AUG-14	R2908774
m+p-Xylene	0.124	-		0.00050	mg/L	-	07-AUG-14	19-AUG-14	R2908774
Styrene	<0.0010	-		0.0010	mg/L	-	07-AUG-14	19-AUG-14	R2908774
F1(C6-C10)	56.3	-		0.10	mg/L	-	07-AUG-14	19-AUG-14	R2908774
F1-BTEX	56.1	-		0.10	mg/L	-	07-AUG-14	19-AUG-14	R2908774
Xylenes	0.154	-		0.00071	mg/L	-	07-AUG-14	19-AUG-14	R2908774
Surr: 1,4-Difluorobenzene (SS)	102.0	-		N/A	%	-	07-AUG-14	19-AUG-14	R2908774
Surr: 4-Bromofluorobenzene (SS)	89.0	-		N/A	%	-	07-AUG-14	19-AUG-14	R2908774
Surr: 3,4-Dichlorotoluene (SS)	N/A	-	SMI	N/A	%	-	07-AUG-14	19-AUG-14	R2908774
F2, F3, F4									
F2 (>C10-C16)	678	+/-170		0.25	mg/L	0	08-AUG-14	08-AUG-14	R2912766
F3 (C16-C34)	21.0	+/-4.9		0.25	mg/L	0	08-AUG-14	08-AUG-14	R2912766
F4 (C34-C50)	1.41	+/-0.34		0.25	mg/L	0	08-AUG-14	08-AUG-14	R2912766
Surr: 2-Bromobenzotrifluoride	251.5	-	SMI	N/A	%	-	08-AUG-14	08-AUG-14	R2912766
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	0.0000156	+/-0.0000048		0.0000050	mg/L	0		19-AUG-14	R2923482
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.080	+/-0.013	DLM	0.015	mg/L	0		19-AUG-14	R2912775
Antimony (Sb)-Total	<0.00050	-	DLM	0.00050	mg/L	-		19-AUG-14	R2912775

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496774-5 16053140804021									
Sampled By: gulled/bobby/jeremy on 04-AUG-14 @ 13:40									
Matrix: h20									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-	07-AUG-14	19-AUG-14	R2908774
Toluene	0.00081	-		0.00050	mg/L	-	07-AUG-14	19-AUG-14	R2908774
EthylBenzene	0.00165	-		0.00050	mg/L	-	07-AUG-14	19-AUG-14	R2908774
o-Xylene	0.00292	-		0.00050	mg/L	-	07-AUG-14	19-AUG-14	R2908774
m+p-Xylene	0.00627	-		0.00050	mg/L	-	07-AUG-14	19-AUG-14	R2908774
Styrene	<0.0010	-		0.0010	mg/L	-	07-AUG-14	19-AUG-14	R2908774
F1(C6-C10)	0.70	-		0.10	mg/L	-	07-AUG-14	19-AUG-14	R2908774
F1-BTEX	0.68	-		0.10	mg/L	-	07-AUG-14	19-AUG-14	R2908774
Xylenes	0.00919	-		0.00071	mg/L	-	07-AUG-14	19-AUG-14	R2908774
Surr: 1,4-Difluorobenzene (SS)	100.0	-		N/A	%	-	07-AUG-14	19-AUG-14	R2908774
Surr: 4-Bromofluorobenzene (SS)	94.0	-		N/A	%	-	07-AUG-14	19-AUG-14	R2908774
Surr: 3,4-Dichlorotoluene (SS)	N/A	-	SMI	N/A	%	-	07-AUG-14	19-AUG-14	R2908774
F2, F3, F4									
F2 (>C10-C16)	728	+/-180		0.25	mg/L	0	08-AUG-14	08-AUG-14	R2912766
F3 (C16-C34)	154	+/-36		0.25	mg/L	0	08-AUG-14	08-AUG-14	R2912766
F4 (C34-C50)	5.12	+/-1.2		0.25	mg/L	0	08-AUG-14	08-AUG-14	R2912766
Surr: 2-Bromobenzotrifluoride	493.5	-	SMI	N/A	%	-	08-AUG-14	08-AUG-14	R2912766
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.000005 0	mg/L	-		19-AUG-14	R2923482
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	28.0	+/-4.4	DLM	0.30	mg/L	0		19-AUG-14	R2912775
Antimony (Sb)-Total	<0.010	-	DLM	0.010	mg/L	-		19-AUG-14	R2912775
Arsenic (As)-Total	0.026	+/-0.003	DLM	0.010	mg/L	0		19-AUG-14	R2912775
Barium (Ba)-Total	0.592	+/-0.066	DLM	0.0050	mg/L	0		19-AUG-14	R2912775
Boron (B)-Total	<1.0	-	DLM	1.0	mg/L	-		19-AUG-14	R2912775
Cadmium (Cd)-Total	0.0011	+/-0.0002	DLM	0.0010	mg/L	0		19-AUG-14	R2912775
Calcium (Ca)-Total	302	+/-36	DLM	2.0	mg/L	0		19-AUG-14	R2912775
Chromium (Cr)-Total	0.099	+/-0.014	DLM	0.010	mg/L	0		19-AUG-14	R2912775
Copper (Cu)-Total	0.231	+/-0.027	DLM	0.010	mg/L	0		19-AUG-14	R2912775
Iron (Fe)-Total	721	+/-110	DLM	1.0	mg/L	0		19-AUG-14	R2912775
Lead (Pb)-Total	0.679	+/-0.11	DLM	0.0050	mg/L	0		19-AUG-14	R2912775
Magnesium (Mg)-Total	153	+/-19	DLM	0.50	mg/L	0		19-AUG-14	R2912775
Manganese (Mn)-Total	5.12	+/-0.52	DLM	0.0050	mg/L	0		19-AUG-14	R2912775
Nickel (Ni)-Total	0.156	+/-0.017	DLM	0.010	mg/L	0		19-AUG-14	R2912775
Potassium (K)-Total	9.8	+/-1.2	DLM	5.0	mg/L	0		19-AUG-14	R2912775
Selenium (Se)-Total	<0.010	-	DLM	0.010	mg/L	-		19-AUG-14	R2912775
Silicon (Si)-Total	61.6	+/-12	DLM	5.0	mg/L	0		19-AUG-14	R2912775
Silver (Ag)-Total	<0.0010	-	DLM	0.0010	mg/L	-		19-AUG-14	R2912775
Sodium (Na)-Total	200	+/-25	DLM	5.0	mg/L	0		19-AUG-14	R2912775
Uranium (U)-Total	0.0048	+/-0.0007	DLM	0.0010	mg/L	0		19-AUG-14	R2912775
Zinc (Zn)-Total	2.61	+/-0.40	DLM	0.30	mg/L	0		19-AUG-14	R2912775
Miscellaneous Parameters									
Ammonia, Total (as N)	7.24	-		0.050	mg/L	-		14-AUG-14	R2918088
Dissolved Organic Carbon	8.3	+/-1.1		1.0	mg/L	0		14-AUG-14	R2916939
Iron Bacteria	See Attached	-				-		06-AUG-14	R2913448
Naphthenic Acids	46.7	+/-8.1	D	1.0	mg/L	0	16-AUG-14	27-AUG-14	R2930372
Phenols (4AAP)	0.040	+/-0.005	DLM	0.010	mg/L	-7.4%		19-AUG-14	R2923340
Sulphate Reducing Bacteria	See Attached	-				-		06-AUG-14	R2913448

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496774-5 16053140804021									
Sampled By: gulled/bobby/jeremy on 04-AUG-14 @ 13:40									
Matrix: h20									
Total Dissolved Solids	2260	+/-150	DLA	10	mg/L	0		08-AUG-14	R2912810
Silicon (as SiO2)-Total	132	-		11	mg/L	-		19-AUG-14	
Turbidity	>4000	-		0.10	NTU	-		07-AUG-14	R2911021
PAH & Carcinogenic PAH List									
Acenaphthene	0.0652	-	DLA	0.0020	mg/L	-	15-AUG-14	18-AUG-14	R2922480
Acenaphthylene	<0.017	-	DLM	0.017	mg/L	-	15-AUG-14	18-AUG-14	R2922480
Anthracene	<0.0030	-	DLM	0.0030	mg/L	-	15-AUG-14	18-AUG-14	R2922480
Fluoranthene	<0.0020	-	DLA	0.0020	mg/L	-	15-AUG-14	18-AUG-14	R2922480
Fluorene	0.112	-	DLA	0.0020	mg/L	-	15-AUG-14	18-AUG-14	R2922480
Naphthalene	0.127	-	DLA	0.0050	mg/L	-	15-AUG-14	18-AUG-14	R2922480
Phenanthrene	0.106	-	DLA	0.0050	mg/L	-	15-AUG-14	18-AUG-14	R2922480
Pyrene	<0.0010	-	DLA	0.0010	mg/L	-	15-AUG-14	18-AUG-14	R2922480
Benzo(a)anthracene	<0.0010	-	DLA	0.0010	mg/L	-	15-AUG-14	18-AUG-14	R2922480
Benzo(k)fluoranthene	<0.0010	-	DLA	0.0010	mg/L	-	15-AUG-14	18-AUG-14	R2922480
Benzo(b&j)fluoranthene	<0.0010	-	DLA	0.0010	mg/L	-	15-AUG-14	18-AUG-14	R2922480
Benzo(g,h,i)perylene	<0.0020	-	DLA	0.0020	mg/L	-	15-AUG-14	18-AUG-14	R2922480
Benzo(a)pyrene	<0.00050	-	DLA	0.00050	mg/L	-	15-AUG-14	18-AUG-14	R2922480
Chrysene	<0.0020	-	DLA	0.0020	mg/L	-	15-AUG-14	18-AUG-14	R2922480
Dibenzo(a,h)anthracene	<0.00050	-	DLA	0.00050	mg/L	-	15-AUG-14	18-AUG-14	R2922480
Indeno(1,2,3-cd)pyrene	<0.0010	-	DLA	0.0010	mg/L	-	15-AUG-14	18-AUG-14	R2922480
B(A)P Total Potency Equivalent	<0.00072	-		0.00072	mg/L	-	15-AUG-14	18-AUG-14	R2922480
Surr: d10-Acenaphthene	N/A	-	SDO:RNA	N/A	%	-	15-AUG-14	18-AUG-14	R2922480
Surr: d10-Phenanthrene	N/A	-	SDO:RNA	N/A	%	-	15-AUG-14	18-AUG-14	R2922480
Surr: d12-Chrysene	N/A	-	SDO:RNA	N/A	%	-	15-AUG-14	18-AUG-14	R2922480
Note: sample diluted due to sample matrix interference									
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	580	+/-33	RRV	0.50	mg/L	0		10-AUG-14	R2912741
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	0.18	+/-0.03	DLM	0.10	mg/L	0		19-AUG-14	R2922376
Antimony (Sb)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		19-AUG-14	R2922376
Arsenic (As)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		19-AUG-14	R2922376
Barium (Ba)-Dissolved	0.202	+/-0.018	DLM	0.0050	mg/L	0		19-AUG-14	R2922376
Boron (B)-Dissolved	<1.0	-	DLM	1.0	mg/L	-		19-AUG-14	R2922376
Cadmium (Cd)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		19-AUG-14	R2922376
Calcium (Ca)-Dissolved	186	+/-25	DLM	2.0	mg/L	0		19-AUG-14	R2922376
Chromium (Cr)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		19-AUG-14	R2922376
Copper (Cu)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		19-AUG-14	R2922376
Iron (Fe)-Dissolved	14.8	+/-1.3	DLM	1.0	mg/L	0		19-AUG-14	R2922376
Lead (Pb)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		19-AUG-14	R2922376
Magnesium (Mg)-Dissolved	105	+/-8.2	DLM	0.50	mg/L	0		19-AUG-14	R2922376
Manganese (Mn)-Dissolved	0.793	+/-0.054	DLM	0.0050	mg/L	0		19-AUG-14	R2922376
Nickel (Ni)-Dissolved	0.013	+/-0.001	DLM	0.010	mg/L	0		19-AUG-14	R2922376
Potassium (K)-Dissolved	5.4	+/-0.4	DLM	5.0	mg/L	0		19-AUG-14	R2922376
Selenium (Se)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		19-AUG-14	R2922376
Silicon (Si)-Dissolved	<5.0	-	DLM	5.0	mg/L	-		19-AUG-14	R2922376
Silver (Ag)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		19-AUG-14	R2922376
Sodium (Na)-Dissolved	219	+/-15	DLM	5.0	mg/L	0		19-AUG-14	R2922376
Uranium (U)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		19-AUG-14	R2922376
Zinc (Zn)-Dissolved	<0.10	-	DLM	0.10	mg/L	-		19-AUG-14	R2922376
Ion Balance Calculation									
Ion Balance	101	-			%	-		19-AUG-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1496774-5 16053140804021									
Sampled By: gulled/bobby/jeremy on 04-AUG-14 @ 13:40									
Matrix: h20									
Ion Balance Calculation									
TDS (Calculated)	1530	-			mg/L	-		19-AUG-14	
Hardness (as CaCO3)	897	-			mg/L	-		19-AUG-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.000005 0	mg/L	-		19-AUG-14	R2923482
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		10-AUG-14	R2912741
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		15-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		10-AUG-14	R2912741
Sulfate by IC									
Sulfate (SO4)	226	+/-13	RRV	0.50	mg/L	0		10-AUG-14	R2912741
pH, Conductivity and Total Alkalinity									
pH	7.83	+/-0.04		0.10	pH	0		07-AUG-14	R2910608
Conductivity (EC)	2730	+/-91		0.20	uS/cm	0		07-AUG-14	R2910608
Bicarbonate (HCO3)	415	-		5.0	mg/L	-		07-AUG-14	R2910608
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		07-AUG-14	R2910608
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		07-AUG-14	R2910608
Alkalinity, Total (as CaCO3)	340	+/-13		2.0	mg/L	0		07-AUG-14	R2910608
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	<11	-		11	mg/L	-		19-AUG-14	
* Refer to Referenced Information for Qualifiers (if any) and Methodology.									

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Iron (Fe)-Total	DUP-H	
Matrix Spike	Chloride (Cl)	MS-B	
Matrix Spike	Chloride (Cl)	MS-B	
Matrix Spike	Sulfate (SO4)	MS-B	
Matrix Spike	Dissolved Organic Carbon	MS-B	
Matrix Spike	Chloride (Cl)	MS-B	
Matrix Spike	Nitrate (as N)	MS-B	
Matrix Spike	Sulfate (SO4)	MS-B	

Sample Parameter Qualifier Key:

Qualifier	Description
D	The analyte has been reported from a dilution of the original extract.
DLA	Detection Limit adjusted for required dilution
DLM	Detection Limit Adjusted due to sample matrix effects.
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis
SDO:RNA	Surrogate diluted out:% recovery not available
SMI	Surrogate recovery could not be measured due to sample matrix interference.

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
BTXS,F1-ED	Water	BTEX, Styrene and F1 (C6-C10)		EPA 5021/8015&8260 GC-MS & FID
C-DIS-ORG-ED	Water	Dissolved Organic Carbon		APHA 5310 B-Instrumental
CL-IC-ED	Water	Chloride by IC		APHA 4110 B-ION CHROMATOGRAPHY
F2,F3,F4-ED	Water	F2, F3, F4		EPA 3510/CCME PHC CWS-GC-FID
HG-D-L-CVAA-ED	Water	Mercury (Hg) - Dissolved		EPA 245.7 / EPA 245.1
HG-T-L-CVAA-ED	Water	Mercury (Hg)		EPA 245.7 / EPA 245.1
IB-BART-PB	Water	Iron Bacteria		BART Test Kit
BART Test Kit Analysis performed at PBR Laboratories Inc., Edmonton.				
IONBALANCE-ED	Water	Ion Balance Calculation		APHA 1030E
MET-D-CCMS-ED	Water	Dissolved Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
NAPHTHENIC-ACID-FM	Water	Naphthenic Acids by FTIR		Naphthenic Acids by FTIR,Syncrude,1994
Dissolved naphthenic acids are solvent extracted from acidified aqueous samples using Dichloromethane prior to quantitation by Fourier Transform Infra-Red spectroscopy. Note that FTIR is not uniquely selective to naphthenic acids. If present, other carboxylic acids (e.g. humic acids, fulvic acids) may also be detected by this method.				
NH3-CFA-ED	Water	Ammonia in Water by Colour		APHA 4500 NH3-NITROGEN (AMMONIA)
This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.				
NO2+NO3-CALC-ED	Water	Nitrate+Nitrite		CALCULATION
NO2-IC-ED	Water	Nitrite as N by IC		APHA 4110 B-ION CHROMATOGRAPHY
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
NO3-IC-ED	Water	Nitrate as N by IC		APHA 4110 B-ION CHROMATOGRAPHY
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
PAH-ABT1-CL	Water	PAH & Carcinogenic PAH List		EPA 3510/8270-GC/MS

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity		APHA 4500-H, 2510, 2320
All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)				
PHENOLS-4AAP-ED	Water	Phenols (4AAP)		AB ENV.06537-COLORIMETRIC
This analysis is carried out using procedures adapted from ENVIRODAT VMV 06537 689, Method Code 154, in "Methods Manual for Chemical Analysis of Water and Wastes" published by the Alberta Environmental Centre. This automated method is based on the distillation of phenol and subsequent reaction of the distillate with alkaline ferricyanide and 4-aminoantipyrine to form a red complex which is measured at 505 nm.				
SIO2-D-CALC-ED	Water	Dissolved Silicon (reported as Silica)		CALCULATION
SIO2-T-CALC-ED	Water	Total Silicon (reported as Silica)		CALCULATION
SO4-IC-ED	Water	Sulfate by IC		APHA 4110 B-ION CHROMATOGRAPHY
SOLIDS-TDS-ED	Water	Total Dissolved Solids		APHA 2540 C
SRB-BART-PB	Water	Sulphate Reducing Bacteria / BART method		BART TEST KIT
BART Test Kit				
TURBIDITY-ED	Water	Turbidity		APHA 2130 B-Nephelometer

** The indicated Method Reference is the closest nationally or internationally recognized reference for the applicable ALS test method. ALS methods may incorporate modifications from the specified reference to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
PB	PBR LABORATORIES
FM	ALS ENVIRONMENTAL - FORT MCMURRAY, ALBERTA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

M061307

GLOSSARY OF REPORT TERMS

Surr - Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

MU: Measurement Uncertainty. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 which gives a level of confidence of approximately 95%.

Bias: The reported method bias is the average long term deviation from the target value for a long term reference or control sample, measured in percent.

Zero values indicate no detectable method bias.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 1 of 38

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R2908774							
WG1926028-4	DUP	L1496774-1						
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
EthylBenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
o-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	10-AUG-14
m+p-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	10-AUG-14
Styrene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	50	10-AUG-14
F1(C6-C10)		<0.10	<0.10	RPD-NA	mg/L	N/A	30	10-AUG-14
WG1926028-8	DUP	L1497207-3						
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
EthylBenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	10-AUG-14
o-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	10-AUG-14
m+p-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	10-AUG-14
Styrene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	50	10-AUG-14
F1(C6-C10)		<0.10	<0.10	RPD-NA	mg/L	N/A	30	10-AUG-14
WG1926028-2	LCS							
Benzene			94.2		%		70-130	10-AUG-14
Toluene			91.5		%		70-130	10-AUG-14
EthylBenzene			88.0		%		70-130	10-AUG-14
o-Xylene			90.3		%		70-130	10-AUG-14
m+p-Xylene			95.6		%		70-130	10-AUG-14
Styrene			89.0		%		70-130	10-AUG-14
WG1926028-3	LCS							
F1(C6-C10)			96.9		%		70-130	10-AUG-14
WG1926028-6	LCS							
Benzene			101.3		%		70-130	10-AUG-14
Toluene			88.1		%		70-130	10-AUG-14
EthylBenzene			94.6		%		70-130	10-AUG-14
o-Xylene			97.2		%		70-130	10-AUG-14
m+p-Xylene			100.9		%		70-130	10-AUG-14
Styrene			97.0		%		70-130	10-AUG-14
WG1926028-7	LCS							
F1(C6-C10)			93.2		%		70-130	10-AUG-14
WG1926028-1	MB							



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 2 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R2908774							
WG1926028-1	MB							
Benzene			<0.00050		mg/L		0.0005	10-AUG-14
Toluene			<0.00050		mg/L		0.0005	10-AUG-14
EthylBenzene			<0.00050		mg/L		0.0005	10-AUG-14
o-Xylene			<0.00050		mg/L		0.0005	10-AUG-14
m+p-Xylene			<0.00050		mg/L		0.0005	10-AUG-14
Styrene			<0.0010		mg/L		0.001	10-AUG-14
F1(C6-C10)			<0.10		mg/L		0.1	10-AUG-14
Surrogate: 1,4-Difluorobenzene (SS)			97.8		%		70-130	10-AUG-14
Surrogate: 4-Bromofluorobenzene (SS)			83.1		%		70-130	10-AUG-14
Surrogate: 3,4-Dichlorotoluene (SS)			93.2		%		70-130	10-AUG-14
WG1926028-5	MB							
Benzene			<0.00050		mg/L		0.0005	10-AUG-14
Toluene			<0.00050		mg/L		0.0005	10-AUG-14
EthylBenzene			<0.00050		mg/L		0.0005	10-AUG-14
o-Xylene			<0.00050		mg/L		0.0005	10-AUG-14
m+p-Xylene			<0.00050		mg/L		0.0005	10-AUG-14
Styrene			<0.0010		mg/L		0.001	10-AUG-14
F1(C6-C10)			<0.10		mg/L		0.1	10-AUG-14
Surrogate: 1,4-Difluorobenzene (SS)			96.6		%		70-130	10-AUG-14
Surrogate: 4-Bromofluorobenzene (SS)			80.6		%		70-130	10-AUG-14
Surrogate: 3,4-Dichlorotoluene (SS)			89.6		%		70-130	10-AUG-14
C-DIS-ORG-ED		Water						
Batch	R2916939							
WG1929772-3	CVS							
Dissolved Organic Carbon			111.1		%		80-160	13-AUG-14
WG1929772-10	DUP	L1500452-18						
Dissolved Organic Carbon		<1.0	<1.0	RPD-NA	mg/L	N/A	20	14-AUG-14
WG1929772-6	DUP	L1496613-7						
Dissolved Organic Carbon		19.1	19.1		mg/L	0.2	20	13-AUG-14
WG1929772-8	DUP	L1496774-5						
Dissolved Organic Carbon		8.3	8.4		mg/L	1.3	20	14-AUG-14
WG1929772-2	LCS							
Dissolved Organic Carbon			94.4		%		80-120	13-AUG-14
WG1929772-1	MB							
Dissolved Organic Carbon			<1.0		mg/L		1	13-AUG-14



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 3 of 38

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-ED								
	Water							
Batch	R2916939							
WG1929772-11 MS		L1500452-18						
Dissolved Organic Carbon			107.8		%		70-130	14-AUG-14
WG1929772-7 MS		L1496613-7						
Dissolved Organic Carbon			N/A	MS-B	%		-	13-AUG-14
WG1929772-9 MS		L1496774-5						
Dissolved Organic Carbon			90.0		%		70-130	14-AUG-14
CL-IC-ED								
	Water							
Batch	R2909698							
WG1925549-3 DUP		L1496706-1						
Chloride (Cl)		454	457		mg/L	0.8	20	06-AUG-14
WG1925549-5 DUP		L1497205-9						
Chloride (Cl)		470	466		mg/L	0.9	20	06-AUG-14
WG1925549-11 LCS								
Chloride (Cl)			101.7		%		90-110	06-AUG-14
WG1925549-13 LCS								
Chloride (Cl)			102.0		%		90-110	06-AUG-14
WG1925549-15 LCS								
Chloride (Cl)			101.5		%		90-110	06-AUG-14
WG1925549-17 LCS								
Chloride (Cl)			102.9		%		90-110	06-AUG-14
WG1925549-19 LCS								
Chloride (Cl)			102.3		%		90-110	06-AUG-14
WG1925549-2 LCS								
Chloride (Cl)			102.0		%		90-110	06-AUG-14
WG1925549-21 LCS								
Chloride (Cl)			101.4		%		90-110	06-AUG-14
WG1925549-9 LCS								
Chloride (Cl)			101.9		%		90-110	06-AUG-14
WG1925549-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	06-AUG-14
WG1925549-10 MB								
Chloride (Cl)			<0.50		mg/L		0.5	06-AUG-14
WG1925549-12 MB								
Chloride (Cl)			<0.50		mg/L		0.5	06-AUG-14
WG1925549-14 MB								
Chloride (Cl)			<0.50		mg/L		0.5	06-AUG-14
WG1925549-16 MB								
Chloride (Cl)			<0.50		mg/L		0.5	06-AUG-14



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 4 of 38

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-ED		Water						
Batch	R2909698							
WG1925549-18	MB							
Chloride (Cl)			<0.50		mg/L		0.5	06-AUG-14
WG1925549-20	MB							
Chloride (Cl)			<0.50		mg/L		0.5	06-AUG-14
WG1925549-22	MB							
Chloride (Cl)			<0.50		mg/L		0.5	06-AUG-14
WG1925549-4	MS	L1496706-1						
Chloride (Cl)			N/A	MS-B	%		-	06-AUG-14
WG1925549-6	MS	L1497205-9						
Chloride (Cl)			N/A	MS-B	%		-	06-AUG-14
Batch	R2912741							
WG1927719-17	DUP	L1499670-6						
Chloride (Cl)		41.4	41.2		mg/L	0.5	20	09-AUG-14
WG1927719-5	DUP	L1499575-5						
Chloride (Cl)		1.83	1.68		mg/L	8.4	20	09-AUG-14
WG1927719-9	DUP	L1499564-3						
Chloride (Cl)		133	134		mg/L	0.9	20	09-AUG-14
WG1927719-11	LCS							
Chloride (Cl)			103.1		%		90-110	09-AUG-14
WG1927719-15	LCS							
Chloride (Cl)			102.1		%		90-110	09-AUG-14
WG1927719-19	LCS							
Chloride (Cl)			101.7		%		90-110	09-AUG-14
WG1927719-2	LCS							
Chloride (Cl)			101.5		%		90-110	09-AUG-14
WG1927719-21	LCS							
Chloride (Cl)			101.3		%		90-110	09-AUG-14
WG1927719-3	LCS							
Chloride (Cl)			101.9		%		90-110	09-AUG-14
WG1927719-7	LCS							
Chloride (Cl)			102.7		%		90-110	09-AUG-14
WG1927719-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-12	MB							
Chloride (Cl)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-16	MB							
Chloride (Cl)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-20	MB							



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 5 of 38

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-ED		Water						
Batch	R2912741							
WG1927719-20	MB							
Chloride (Cl)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-22	MB							
Chloride (Cl)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-4	MB							
Chloride (Cl)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-8	MB							
Chloride (Cl)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-10	MS	L1499564-3						
Chloride (Cl)			N/A	MS-B	%		-	09-AUG-14
WG1927719-18	MS	L1499670-6						
Chloride (Cl)			101.7		%		75-125	09-AUG-14
WG1927719-6	MS	L1499575-5						
Chloride (Cl)			99.7		%		75-125	09-AUG-14
F2,F3,F4-ED		Water						
Batch	R2912766							
WG1925826-2	LCS							
F2 (>C10-C16)			100.4		%		65-135	08-AUG-14
F3 (C16-C34)			99.3		%		65-135	08-AUG-14
F4 (C34-C50)			94.3		%		65-135	08-AUG-14
WG1925826-5	LCS							
F2 (>C10-C16)			102.6		%		65-135	08-AUG-14
F3 (C16-C34)			102.7		%		65-135	08-AUG-14
F4 (C34-C50)			96.3		%		65-135	08-AUG-14
WG1925826-1	MB							
F2 (>C10-C16)			<0.25		mg/L		0.25	08-AUG-14
F3 (C16-C34)			<0.25		mg/L		0.25	08-AUG-14
F4 (C34-C50)			<0.25		mg/L		0.25	08-AUG-14
Surrogate: 2-Bromobenzotrifluoride			99.3		%		50-150	08-AUG-14
WG1925826-4	MB							
F2 (>C10-C16)			<0.25		mg/L		0.25	08-AUG-14
F3 (C16-C34)			<0.25		mg/L		0.25	08-AUG-14
F4 (C34-C50)			<0.25		mg/L		0.25	08-AUG-14
Surrogate: 2-Bromobenzotrifluoride			101.4		%		50-150	08-AUG-14
WG1925826-3	MS	L1496774-1						
F2 (>C10-C16)			95.3		%		50-150	08-AUG-14
F3 (C16-C34)			95.2		%		50-150	08-AUG-14



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 6 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F2,F3,F4-ED								
	Water							
Batch	R2912766							
WG1925826-3	MS	L1496774-1						
F4 (C34-C50)			92.4		%		50-150	08-AUG-14
HG-D-L-CVAA-ED								
	Water							
Batch	R2923482							
WG1933778-3	DUP	L1496774-1						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	19-AUG-14
WG1933778-7	DUP	L1499730-1						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	19-AUG-14
WG1933778-2	LCS							
Mercury (Hg)-Dissolved			92.7		%		80-120	19-AUG-14
WG1933778-6	LCS							
Mercury (Hg)-Dissolved			88.0		%		80-120	19-AUG-14
WG1933778-1	MB							
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	19-AUG-14
WG1933778-5	MB							
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	19-AUG-14
WG1933778-4	MS	L1496774-1						
Mercury (Hg)-Dissolved			77.0		%		70-130	19-AUG-14
WG1933778-8	MS	L1499730-1						
Mercury (Hg)-Dissolved			95.6		%		70-130	19-AUG-14
HG-T-L-CVAA-ED								
	Water							
Batch	R2923482							
WG1933780-12	DUP	L1500733-20						
Mercury (Hg)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	19-AUG-14
WG1933780-3	DUP	L1496849-1						
Mercury (Hg)-Total		<0.020	<0.0000050	RPD-NA	mg/L	N/A	20	19-AUG-14
WG1933780-7	DUP	L1500733-1						
Mercury (Hg)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	19-AUG-14
WG1933780-10	LCS							
Mercury (Hg)-Total			87.1		%		80-120	19-AUG-14
WG1933780-2	LCS							
Mercury (Hg)-Total			101.1		%		80-120	19-AUG-14
WG1933780-6	LCS							
Mercury (Hg)-Total			103.2		%		80-120	20-AUG-14
WG1933780-1	MB							
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	19-AUG-14
WG1933780-5	MB							



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 7 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-L-CVAA-ED								
	Water							
Batch	R2923482							
WG1933780-5 MB								
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	19-AUG-14
WG1933780-9 MB								
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	19-AUG-14
WG1933780-11 MS		L1500733-20						
Mercury (Hg)-Total			92.7		%		70-130	19-AUG-14
WG1933780-4 MS		L1496849-1						
Mercury (Hg)-Total			97.0		%		70-130	19-AUG-14
WG1933780-8 MS		L1500733-1						
Mercury (Hg)-Total			86.6		%		70-130	19-AUG-14
MET-D-CCMS-ED								
	Water							
Batch	R2922376							
WG1933064-11 CRM		ED-HIGH-WATRM						
Aluminum (Al)-Dissolved			100.3		%		80-120	18-AUG-14
Antimony (Sb)-Dissolved			102.9		%		80-120	18-AUG-14
Arsenic (As)-Dissolved			99.2		%		80-120	18-AUG-14
Barium (Ba)-Dissolved			101.3		%		80-120	18-AUG-14
Boron (B)-Dissolved			103.4		%		80-120	18-AUG-14
Cadmium (Cd)-Dissolved			96.5		%		80-120	18-AUG-14
Calcium (Ca)-Dissolved			96.4		%		80-120	18-AUG-14
Chromium (Cr)-Dissolved			101.7		%		80-120	18-AUG-14
Copper (Cu)-Dissolved			99.5		%		80-120	18-AUG-14
Lead (Pb)-Dissolved			94.5		%		80-120	18-AUG-14
Magnesium (Mg)-Dissolved			105.0		%		80-120	18-AUG-14
Manganese (Mn)-Dissolved			102.9		%		80-120	18-AUG-14
Nickel (Ni)-Dissolved			97.3		%		80-120	18-AUG-14
Potassium (K)-Dissolved			102.8		%		80-120	18-AUG-14
Selenium (Se)-Dissolved			99.1		%		80-120	18-AUG-14
Silicon (Si)-Dissolved			112.5		%		80-120	18-AUG-14
Silver (Ag)-Dissolved			99.5		%		80-120	18-AUG-14
Sodium (Na)-Dissolved			105.4		%		80-120	18-AUG-14
Uranium (U)-Dissolved			90.0		%		80-120	18-AUG-14
Zinc (Zn)-Dissolved			102.6		%		80-120	18-AUG-14
WG1933064-2 CRM		ED-HIGH-WATRM						
Aluminum (Al)-Dissolved			103.8		%		80-120	18-AUG-14
Antimony (Sb)-Dissolved			103.2		%		80-120	18-AUG-14



Environmental

Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 8 of 38

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2922376							
WG1933064-2 CRM	ED-HIGH-WATRM							
Arsenic (As)-Dissolved			102.6		%		80-120	18-AUG-14
Barium (Ba)-Dissolved			100.5		%		80-120	18-AUG-14
Boron (B)-Dissolved			90.4		%		80-120	18-AUG-14
Cadmium (Cd)-Dissolved			98.7		%		80-120	18-AUG-14
Calcium (Ca)-Dissolved			98.7		%		80-120	18-AUG-14
Chromium (Cr)-Dissolved			103.8		%		80-120	18-AUG-14
Copper (Cu)-Dissolved			99.3		%		80-120	18-AUG-14
Lead (Pb)-Dissolved			98.2		%		80-120	18-AUG-14
Magnesium (Mg)-Dissolved			108.9		%		80-120	18-AUG-14
Manganese (Mn)-Dissolved			103.3		%		80-120	18-AUG-14
Nickel (Ni)-Dissolved			100.8		%		80-120	18-AUG-14
Potassium (K)-Dissolved			106.5		%		80-120	18-AUG-14
Selenium (Se)-Dissolved			101.5		%		80-120	18-AUG-14
Silicon (Si)-Dissolved			98.2		%		80-120	18-AUG-14
Silver (Ag)-Dissolved			103.3		%		80-120	18-AUG-14
Sodium (Na)-Dissolved			104.1		%		80-120	18-AUG-14
Uranium (U)-Dissolved			93.7		%		80-120	18-AUG-14
Zinc (Zn)-Dissolved			101.5		%		80-120	18-AUG-14
WG1933064-5 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			102.5		%		80-120	18-AUG-14
Antimony (Sb)-Dissolved			102.5		%		80-120	18-AUG-14
Arsenic (As)-Dissolved			99.4		%		80-120	18-AUG-14
Barium (Ba)-Dissolved			100.7		%		80-120	18-AUG-14
Boron (B)-Dissolved			101.5		%		80-120	18-AUG-14
Cadmium (Cd)-Dissolved			98.4		%		80-120	18-AUG-14
Calcium (Ca)-Dissolved			96.7		%		80-120	18-AUG-14
Chromium (Cr)-Dissolved			101.8		%		80-120	18-AUG-14
Copper (Cu)-Dissolved			98.3		%		80-120	18-AUG-14
Lead (Pb)-Dissolved			95.6		%		80-120	18-AUG-14
Magnesium (Mg)-Dissolved			103.6		%		80-120	18-AUG-14
Manganese (Mn)-Dissolved			103.1		%		80-120	18-AUG-14
Nickel (Ni)-Dissolved			97.9		%		80-120	18-AUG-14
Potassium (K)-Dissolved			106.0		%		80-120	18-AUG-14
Selenium (Se)-Dissolved			99.6		%		80-120	18-AUG-14



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 9 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2922376							
WG1933064-5 CRM		ED-HIGH-WATRM						
Silicon (Si)-Dissolved			106.2		%		80-120	18-AUG-14
Silver (Ag)-Dissolved			98.2		%		80-120	18-AUG-14
Sodium (Na)-Dissolved			108.1		%		80-120	18-AUG-14
Uranium (U)-Dissolved			89.6		%		80-120	18-AUG-14
Zinc (Zn)-Dissolved			103.5		%		80-120	18-AUG-14
WG1933064-12 DUP		L1500452-18						
Aluminum (Al)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	18-AUG-14
Antimony (Sb)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	18-AUG-14
Arsenic (As)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	18-AUG-14
Barium (Ba)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	18-AUG-14
Boron (B)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	18-AUG-14
Cadmium (Cd)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	18-AUG-14
Calcium (Ca)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	18-AUG-14
Chromium (Cr)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	18-AUG-14
Copper (Cu)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	18-AUG-14
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	18-AUG-14
Lead (Pb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	18-AUG-14
Magnesium (Mg)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	20	18-AUG-14
Manganese (Mn)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	18-AUG-14
Nickel (Ni)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	18-AUG-14
Potassium (K)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	18-AUG-14
Selenium (Se)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	18-AUG-14
Silicon (Si)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	18-AUG-14
Silver (Ag)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	18-AUG-14
Sodium (Na)-Dissolved		<1.0	<1.0	RPD-NA	mg/L	N/A	20	18-AUG-14
Uranium (U)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	18-AUG-14
Zinc (Zn)-Dissolved		0.0032	0.0032		mg/L	0.0	20	18-AUG-14
WG1933064-3 DUP		L1498571-1						
Aluminum (Al)-Dissolved		0.0024	0.0024		mg/L	2.6	20	18-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	18-AUG-14
Arsenic (As)-Dissolved		0.00013	0.00016		mg/L	15	20	18-AUG-14
Barium (Ba)-Dissolved		0.0499	0.0501		mg/L	0.5	20	18-AUG-14
Boron (B)-Dissolved		0.348	0.338		mg/L	3.0	20	18-AUG-14



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 10 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2922376							
WG1933064-3	DUP	L1498571-1						
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	18-AUG-14
Calcium (Ca)-Dissolved		102	98.2		mg/L	3.6	20	18-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	18-AUG-14
Copper (Cu)-Dissolved		0.00047	0.00046		mg/L	2.0	20	18-AUG-14
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	18-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	18-AUG-14
Magnesium (Mg)-Dissolved		33.6	33.5		mg/L	0.3	20	18-AUG-14
Manganese (Mn)-Dissolved		0.144	0.144		mg/L	0.0	20	18-AUG-14
Nickel (Ni)-Dissolved		0.00143	0.00153		mg/L	6.7	20	18-AUG-14
Potassium (K)-Dissolved		5.59	5.58		mg/L	0.2	20	18-AUG-14
Selenium (Se)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	18-AUG-14
Silicon (Si)-Dissolved		8.70	8.87		mg/L	2.0	20	18-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	18-AUG-14
Sodium (Na)-Dissolved		79.7	81.7		mg/L	2.5	20	18-AUG-14
Uranium (U)-Dissolved		0.000119	0.000116		mg/L	2.4	20	18-AUG-14
Zinc (Zn)-Dissolved		0.0018	0.0017		mg/L	4.0	20	18-AUG-14
WG1933064-6	DUP	L1501888-1						
Aluminum (Al)-Dissolved		0.382	0.377		mg/L	1.4	20	19-AUG-14
Antimony (Sb)-Dissolved		0.00946	0.00947		mg/L	0.1	20	19-AUG-14
Arsenic (As)-Dissolved		0.0216	0.0213		mg/L	1.7	20	19-AUG-14
Barium (Ba)-Dissolved		0.439	0.442		mg/L	0.7	20	19-AUG-14
Boron (B)-Dissolved		0.798	0.856		mg/L	7.0	20	19-AUG-14
Cadmium (Cd)-Dissolved		0.000232	0.000245		mg/L	5.5	20	19-AUG-14
Calcium (Ca)-Dissolved		57.9	60.5		mg/L	4.3	20	19-AUG-14
Chromium (Cr)-Dissolved		0.0123	0.0123		mg/L	0.0	20	19-AUG-14
Copper (Cu)-Dissolved		0.00091	0.00088		mg/L	3.0	20	19-AUG-14
Iron (Fe)-Dissolved		0.026	0.026		mg/L	1.2	20	19-AUG-14
Lead (Pb)-Dissolved		0.000061	0.000063		mg/L	3.0	20	19-AUG-14
Magnesium (Mg)-Dissolved		8.04	8.02		mg/L	0.3	20	19-AUG-14
Manganese (Mn)-Dissolved		0.543	0.545		mg/L	0.3	20	19-AUG-14
Nickel (Ni)-Dissolved		0.00097	0.00094		mg/L	3.3	20	19-AUG-14
Potassium (K)-Dissolved		14.1	13.9		mg/L	1.7	20	19-AUG-14
Selenium (Se)-Dissolved		0.0109	0.0110		mg/L	1.4	20	19-AUG-14



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 11 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2922376							
WG1933064-6	DUP	L1501888-1						
Silicon (Si)-Dissolved		4.17	4.21		mg/L	1.0	20	19-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	19-AUG-14
Sodium (Na)-Dissolved		108	109		mg/L	0.7	20	19-AUG-14
Uranium (U)-Dissolved		0.00626	0.00617		mg/L	1.4	20	19-AUG-14
Zinc (Zn)-Dissolved		0.0027	0.0029		mg/L	8.9	20	19-AUG-14
WG1933064-9	DUP	L1499701-6						
Aluminum (Al)-Dissolved		0.0021	0.0027	J	mg/L	0.0006	0.002	19-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	19-AUG-14
Arsenic (As)-Dissolved		0.00033	0.00031		mg/L	3.6	20	19-AUG-14
Barium (Ba)-Dissolved		0.0776	0.0803		mg/L	3.5	20	19-AUG-14
Boron (B)-Dissolved		0.277	0.280		mg/L	1.1	20	19-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	19-AUG-14
Calcium (Ca)-Dissolved		86.2	87.6		mg/L	1.7	20	19-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	19-AUG-14
Copper (Cu)-Dissolved		<0.00010	0.00017	RPD-NA	mg/L	N/A	20	19-AUG-14
Iron (Fe)-Dissolved		5.33	5.14		mg/L	3.6	20	19-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	19-AUG-14
Magnesium (Mg)-Dissolved		25.2	24.4		mg/L	3.1	20	19-AUG-14
Manganese (Mn)-Dissolved		0.0897	0.0881		mg/L	1.8	20	19-AUG-14
Nickel (Ni)-Dissolved		<0.00010	0.00015	RPD-NA	mg/L	N/A	20	19-AUG-14
Potassium (K)-Dissolved		3.99	3.94		mg/L	1.2	20	19-AUG-14
Selenium (Se)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	19-AUG-14
Silicon (Si)-Dissolved		9.35	9.25		mg/L	1.1	20	19-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	19-AUG-14
Sodium (Na)-Dissolved		159	153		mg/L	4.2	20	19-AUG-14
Uranium (U)-Dissolved		0.000027	0.000028		mg/L	3.9	20	19-AUG-14
Zinc (Zn)-Dissolved		<0.0010	0.0019	RPD-NA	mg/L	N/A	20	19-AUG-14
WG1933064-1	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	18-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	18-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	18-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	18-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	18-AUG-14



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 12 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2922376							
WG1933064-1 MB								
	Cadmium (Cd)-Dissolved		<0.000010		mg/L		0.00001	18-AUG-14
	Calcium (Ca)-Dissolved		<0.020		mg/L		0.02	18-AUG-14
	Chromium (Cr)-Dissolved		<0.00010		mg/L		0.0001	18-AUG-14
	Copper (Cu)-Dissolved		<0.00010		mg/L		0.0001	18-AUG-14
	Iron (Fe)-Dissolved		<0.010		mg/L		0.01	18-AUG-14
	Lead (Pb)-Dissolved		<0.000050		mg/L		0.00005	18-AUG-14
	Magnesium (Mg)-Dissolved		<0.0050		mg/L		0.005	18-AUG-14
	Manganese (Mn)-Dissolved		<0.000050		mg/L		0.00005	18-AUG-14
	Nickel (Ni)-Dissolved		<0.00010		mg/L		0.0001	18-AUG-14
	Potassium (K)-Dissolved		<0.050		mg/L		0.05	18-AUG-14
	Selenium (Se)-Dissolved		<0.00010		mg/L		0.0001	18-AUG-14
	Silicon (Si)-Dissolved		<0.050		mg/L		0.05	18-AUG-14
	Silver (Ag)-Dissolved		<0.000010		mg/L		0.00001	18-AUG-14
	Sodium (Na)-Dissolved		<0.050		mg/L		0.05	18-AUG-14
	Uranium (U)-Dissolved		<0.000010		mg/L		0.00001	18-AUG-14
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	18-AUG-14
WG1933064-10 MB								
	Aluminum (Al)-Dissolved		<0.0010		mg/L		0.001	18-AUG-14
	Antimony (Sb)-Dissolved		<0.00010		mg/L		0.0001	18-AUG-14
	Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	18-AUG-14
	Barium (Ba)-Dissolved		<0.000050		mg/L		0.00005	18-AUG-14
	Boron (B)-Dissolved		<0.010		mg/L		0.01	18-AUG-14
	Cadmium (Cd)-Dissolved		<0.000010		mg/L		0.00001	18-AUG-14
	Calcium (Ca)-Dissolved		<0.020		mg/L		0.02	18-AUG-14
	Chromium (Cr)-Dissolved		<0.00010		mg/L		0.0001	18-AUG-14
	Copper (Cu)-Dissolved		<0.00010		mg/L		0.0001	18-AUG-14
	Iron (Fe)-Dissolved		<0.010		mg/L		0.01	18-AUG-14
	Lead (Pb)-Dissolved		<0.000050		mg/L		0.00005	18-AUG-14
	Magnesium (Mg)-Dissolved		<0.0050		mg/L		0.005	18-AUG-14
	Manganese (Mn)-Dissolved		<0.000050		mg/L		0.00005	18-AUG-14
	Nickel (Ni)-Dissolved		<0.00010		mg/L		0.0001	18-AUG-14
	Potassium (K)-Dissolved		<0.050		mg/L		0.05	18-AUG-14
	Selenium (Se)-Dissolved		<0.00010		mg/L		0.0001	18-AUG-14
	Silicon (Si)-Dissolved		<0.050		mg/L		0.05	18-AUG-14



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 13 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2922376							
WG1933064-10 MB								
	Silver (Ag)-Dissolved		<0.000010		mg/L		0.00001	18-AUG-14
	Sodium (Na)-Dissolved		<0.050		mg/L		0.05	18-AUG-14
	Uranium (U)-Dissolved		<0.000010		mg/L		0.00001	18-AUG-14
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	18-AUG-14
WG1933064-4 MB								
	Aluminum (Al)-Dissolved		<0.0010		mg/L		0.001	18-AUG-14
	Antimony (Sb)-Dissolved		<0.00010		mg/L		0.0001	18-AUG-14
	Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	18-AUG-14
	Barium (Ba)-Dissolved		<0.000050		mg/L		0.00005	18-AUG-14
	Boron (B)-Dissolved		<0.010		mg/L		0.01	18-AUG-14
	Cadmium (Cd)-Dissolved		<0.000010		mg/L		0.00001	18-AUG-14
	Calcium (Ca)-Dissolved		<0.020		mg/L		0.02	18-AUG-14
	Chromium (Cr)-Dissolved		<0.00010		mg/L		0.0001	18-AUG-14
	Copper (Cu)-Dissolved		<0.00010		mg/L		0.0001	18-AUG-14
	Iron (Fe)-Dissolved		<0.010		mg/L		0.01	18-AUG-14
	Lead (Pb)-Dissolved		<0.000050		mg/L		0.00005	18-AUG-14
	Magnesium (Mg)-Dissolved		<0.0050		mg/L		0.005	18-AUG-14
	Manganese (Mn)-Dissolved		<0.000050		mg/L		0.00005	18-AUG-14
	Nickel (Ni)-Dissolved		<0.00010		mg/L		0.0001	18-AUG-14
	Potassium (K)-Dissolved		<0.050		mg/L		0.05	18-AUG-14
	Selenium (Se)-Dissolved		<0.00010		mg/L		0.0001	18-AUG-14
	Silicon (Si)-Dissolved		<0.050		mg/L		0.05	18-AUG-14
	Silver (Ag)-Dissolved		<0.000010		mg/L		0.00001	18-AUG-14
	Sodium (Na)-Dissolved		<0.050		mg/L		0.05	18-AUG-14
	Uranium (U)-Dissolved		<0.000010		mg/L		0.00001	18-AUG-14
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	18-AUG-14
WG1933064-7 MB								
	Aluminum (Al)-Dissolved		<0.0010		mg/L		0.001	18-AUG-14
	Antimony (Sb)-Dissolved		<0.00010		mg/L		0.0001	18-AUG-14
	Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	18-AUG-14
	Barium (Ba)-Dissolved		<0.000050		mg/L		0.00005	18-AUG-14
	Boron (B)-Dissolved		<0.010		mg/L		0.01	18-AUG-14
	Cadmium (Cd)-Dissolved		<0.000010		mg/L		0.00001	18-AUG-14
	Calcium (Ca)-Dissolved		<0.020		mg/L		0.02	18-AUG-14



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 14 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2922376							
WG1933064-7	MB							
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	18-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	18-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	18-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	18-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	18-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	18-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	18-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	18-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	18-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	18-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	18-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	18-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	18-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	18-AUG-14
Batch	R2923365							
WG1933789-11	CRM							
		ED-HIGH-WATRM						
Copper (Cu)-Dissolved			98.1		%		80-120	20-AUG-14
Potassium (K)-Dissolved			99.5		%		80-120	20-AUG-14
Sodium (Na)-Dissolved			102.2		%		80-120	20-AUG-14
WG1933789-14	CRM							
		ED-HIGH-WATRM						
Copper (Cu)-Dissolved			98.9		%		80-120	20-AUG-14
Potassium (K)-Dissolved			99.6		%		80-120	20-AUG-14
Sodium (Na)-Dissolved			100.7		%		80-120	20-AUG-14
WG1933789-2	CRM							
		ED-HIGH-WATRM						
Copper (Cu)-Dissolved			93.0		%		80-120	19-AUG-14
Potassium (K)-Dissolved			99.0		%		80-120	19-AUG-14
Sodium (Na)-Dissolved			102.9		%		80-120	19-AUG-14
WG1933789-8	CRM							
		ED-HIGH-WATRM						
Copper (Cu)-Dissolved			98.7		%		80-120	20-AUG-14
Potassium (K)-Dissolved			96.5		%		80-120	20-AUG-14
Sodium (Na)-Dissolved			98.8		%		80-120	20-AUG-14
WG1933789-12	DUP							
		L1501257-1						
Copper (Cu)-Dissolved		0.00120	0.00121		mg/L	0.4	20	20-AUG-14
Potassium (K)-Dissolved		3.39	3.43		mg/L	1.1	20	20-AUG-14



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 15 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2923365							
WG1933789-12	DUP	L1501257-1						
Sodium (Na)-Dissolved		71.6	72.4		mg/L	1.1	20	20-AUG-14
WG1933789-15	DUP	L1496864-1						
Copper (Cu)-Dissolved		0.00092	0.00091		mg/L	1.4	20	20-AUG-14
Potassium (K)-Dissolved		11.9	11.7		mg/L	1.2	20	20-AUG-14
Sodium (Na)-Dissolved		74.6	74.0		mg/L	0.8	20	20-AUG-14
WG1933789-3	DUP	L1491927-2						
Copper (Cu)-Dissolved		0.00522	0.00521		mg/L	0.0	20	20-AUG-14
Potassium (K)-Dissolved		2.75	2.66		mg/L	3.4	20	20-AUG-14
Sodium (Na)-Dissolved		17.3	17.2		mg/L	1.0	20	20-AUG-14
WG1933789-6	DUP	L1496870-5						
Copper (Cu)-Dissolved		0.00079	0.00079		mg/L	0.1	20	20-AUG-14
Potassium (K)-Dissolved		33.9	35.0		mg/L	3.3	20	20-AUG-14
Sodium (Na)-Dissolved		170	176		mg/L	3.6	20	20-AUG-14
WG1933789-9	DUP	L1500399-6						
Copper (Cu)-Dissolved		0.00139	0.00136		mg/L	2.5	20	20-AUG-14
Potassium (K)-Dissolved		1.06	1.05		mg/L	1.3	20	20-AUG-14
Sodium (Na)-Dissolved		7.1	6.8		mg/L	3.5	20	20-AUG-14
WG1933789-1	MB							
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	19-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	19-AUG-14
WG1933789-10	MB							
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	19-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	19-AUG-14
WG1933789-13	MB							
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	19-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	19-AUG-14
WG1933789-4	MB							
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	19-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	19-AUG-14
WG1933789-7	MB							
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 16 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch R2923365								
WG1933789-7 MB								
Potassium (K)-Dissolved			<0.050		mg/L		0.05	19-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	19-AUG-14
MET-T-CCMS-ED		Water						
Batch R2912618								
WG1927465-3 DUP		L1496774-3						
Aluminum (Al)-Total		0.113	0.107		mg/L	5.7	20	09-AUG-14
Antimony (Sb)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	09-AUG-14
Arsenic (As)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	09-AUG-14
Barium (Ba)-Total		0.620	0.628		mg/L	1.3	20	09-AUG-14
Boron (B)-Total		3.33	3.20		mg/L	4.2	20	09-AUG-14
Cadmium (Cd)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	09-AUG-14
Calcium (Ca)-Total		6.69	6.40		mg/L	4.4	20	09-AUG-14
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	09-AUG-14
Copper (Cu)-Total		0.0101	0.0105		mg/L	4.1	20	09-AUG-14
Iron (Fe)-Total		3.00	2.75		mg/L	8.9	20	09-AUG-14
Lead (Pb)-Total		0.00574	0.00560		mg/L	2.4	20	09-AUG-14
Magnesium (Mg)-Total		7.56	7.57		mg/L	0.2	20	09-AUG-14
Manganese (Mn)-Total		0.0469	0.0476		mg/L	1.4	20	09-AUG-14
Nickel (Ni)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	09-AUG-14
Potassium (K)-Total		7.74	7.79		mg/L	0.6	20	09-AUG-14
Selenium (Se)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	09-AUG-14
Silicon (Si)-Total		2.80	2.76		mg/L	1.4	20	09-AUG-14
Silver (Ag)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	09-AUG-14
Sodium (Na)-Total		1470	1490		mg/L	1.2	20	09-AUG-14
Uranium (U)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-AUG-14
Zinc (Zn)-Total		0.045	0.046		mg/L	2.6	20	09-AUG-14
WG1927465-2 LCS								
Aluminum (Al)-Total			102.8		%		80-120	09-AUG-14
Antimony (Sb)-Total			97.8		%		80-120	09-AUG-14
Arsenic (As)-Total			99.2		%		80-120	09-AUG-14
Barium (Ba)-Total			100.5		%		80-120	09-AUG-14
Boron (B)-Total			85.6		%		80-120	09-AUG-14
Cadmium (Cd)-Total			95.0		%		80-120	09-AUG-14



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 17 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2912618							
WG1927465-2 LCS								
Calcium (Ca)-Total			96.2		%		80-120	09-AUG-14
Chromium (Cr)-Total			99.0		%		80-120	09-AUG-14
Copper (Cu)-Total			97.7		%		80-120	09-AUG-14
Iron (Fe)-Total			95.0		%		80-120	09-AUG-14
Lead (Pb)-Total			101.4		%		80-120	09-AUG-14
Magnesium (Mg)-Total			103.5		%		80-120	09-AUG-14
Manganese (Mn)-Total			98.7		%		80-120	09-AUG-14
Nickel (Ni)-Total			99.6		%		80-120	09-AUG-14
Potassium (K)-Total			101.7		%		80-120	09-AUG-14
Selenium (Se)-Total			94.8		%		80-120	09-AUG-14
Silicon (Si)-Total			100.0		%		80-120	09-AUG-14
Silver (Ag)-Total			97.1		%		80-120	09-AUG-14
Sodium (Na)-Total			104.2		%		80-120	09-AUG-14
Uranium (U)-Total			99.8		%		80-120	09-AUG-14
Zinc (Zn)-Total			103.3		%		80-120	09-AUG-14
WG1927465-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	09-AUG-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	09-AUG-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	09-AUG-14
Barium (Ba)-Total			<0.000050		mg/L		0.00005	09-AUG-14
Boron (B)-Total			<0.010		mg/L		0.01	09-AUG-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	09-AUG-14
Calcium (Ca)-Total			<0.020		mg/L		0.02	09-AUG-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	09-AUG-14
Iron (Fe)-Total			<0.010		mg/L		0.01	09-AUG-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	09-AUG-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	09-AUG-14
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	09-AUG-14
Nickel (Ni)-Total			<0.00010		mg/L		0.0001	09-AUG-14
Potassium (K)-Total			<0.050		mg/L		0.05	09-AUG-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	09-AUG-14
Silicon (Si)-Total			<0.050		mg/L		0.05	09-AUG-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	09-AUG-14
Sodium (Na)-Total			<0.050		mg/L		0.05	09-AUG-14



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 18 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch R2912618								
WG1927465-1 MB								
Uranium (U)-Total			<0.000010		mg/L		0.00001	09-AUG-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	09-AUG-14
Batch R2912775								
WG1927221-3 DUP		L1498485-18						
Aluminum (Al)-Total		0.193	0.187		mg/L	3.1	20	10-AUG-14
Antimony (Sb)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	10-AUG-14
Arsenic (As)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	10-AUG-14
Barium (Ba)-Total		0.0538	0.0543		mg/L	1.0	20	10-AUG-14
Boron (B)-Total		15.1	16.1		mg/L	6.7	20	10-AUG-14
Cadmium (Cd)-Total		0.00022	0.00022		mg/L	0.0	20	10-AUG-14
Calcium (Ca)-Total		203	207		mg/L	2.1	20	10-AUG-14
Chromium (Cr)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	10-AUG-14
Copper (Cu)-Total		0.0013	0.0012		mg/L	4.7	20	10-AUG-14
Iron (Fe)-Total		0.42	0.41		mg/L	0.5	20	10-AUG-14
Lead (Pb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-AUG-14
Magnesium (Mg)-Total		56.4	58.6		mg/L	3.9	20	10-AUG-14
Manganese (Mn)-Total		1.70	1.75		mg/L	3.3	20	10-AUG-14
Nickel (Ni)-Total		0.0242	0.0251		mg/L	3.4	20	10-AUG-14
Potassium (K)-Total		6.64	6.94		mg/L	4.4	20	10-AUG-14
Selenium (Se)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	10-AUG-14
Silicon (Si)-Total		4.45	4.46		mg/L	0.1	20	10-AUG-14
Silver (Ag)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-AUG-14
Sodium (Na)-Total		404	418		mg/L	3.3	20	10-AUG-14
Uranium (U)-Total		0.00678	0.00701		mg/L	3.3	20	10-AUG-14
Zinc (Zn)-Total		<0.030	<0.030	RPD-NA	mg/L	N/A	20	10-AUG-14
WG1927221-6 DUP		L1496774-1						
Aluminum (Al)-Total		0.075	0.085		mg/L	12	20	10-AUG-14
Antimony (Sb)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	10-AUG-14
Arsenic (As)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	10-AUG-14
Barium (Ba)-Total		0.542	0.509		mg/L	6.2	20	10-AUG-14
Boron (B)-Total		3.37	3.29		mg/L	2.5	20	10-AUG-14
Cadmium (Cd)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	10-AUG-14
Calcium (Ca)-Total		5.85	5.69		mg/L	2.8	20	10-AUG-14



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 19 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R2912775							
WG1927221-6	DUP	L1496774-1						
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	10-AUG-14
Copper (Cu)-Total		0.0102	0.0116		mg/L	13	20	10-AUG-14
Lead (Pb)-Total		0.0128	0.0128		mg/L	0.1	20	10-AUG-14
Magnesium (Mg)-Total		6.17	5.98		mg/L	3.1	20	10-AUG-14
Manganese (Mn)-Total		0.0553	0.0669		mg/L	19	20	10-AUG-14
Nickel (Ni)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	10-AUG-14
Potassium (K)-Total		8.34	8.01		mg/L	3.9	20	10-AUG-14
Selenium (Se)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	10-AUG-14
Silicon (Si)-Total		2.35	2.35		mg/L	0.1	20	10-AUG-14
Silver (Ag)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	10-AUG-14
Sodium (Na)-Total		1440	1400		mg/L	2.7	20	10-AUG-14
Uranium (U)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-AUG-14
Zinc (Zn)-Total		0.063	0.059		mg/L	6.0	20	10-AUG-14
WG1927221-2	LCS							
Aluminum (Al)-Total			103.1		%		80-120	10-AUG-14
Antimony (Sb)-Total			105.2		%		80-120	10-AUG-14
Arsenic (As)-Total			103.6		%		80-120	10-AUG-14
Barium (Ba)-Total			106.1		%		80-120	10-AUG-14
Boron (B)-Total			103.7		%		80-120	10-AUG-14
Cadmium (Cd)-Total			103.6		%		80-120	10-AUG-14
Calcium (Ca)-Total			99.9		%		80-120	10-AUG-14
Chromium (Cr)-Total			100.9		%		80-120	10-AUG-14
Copper (Cu)-Total			100.9		%		80-120	10-AUG-14
Iron (Fe)-Total			95.8		%		80-120	10-AUG-14
Lead (Pb)-Total			102.5		%		80-120	10-AUG-14
Magnesium (Mg)-Total			104.7		%		80-120	10-AUG-14
Manganese (Mn)-Total			104.6		%		80-120	10-AUG-14
Nickel (Ni)-Total			103.7		%		80-120	10-AUG-14
Potassium (K)-Total			107.4		%		80-120	10-AUG-14
Selenium (Se)-Total			104.9		%		80-120	10-AUG-14
Silicon (Si)-Total			109.4		%		80-120	10-AUG-14
Silver (Ag)-Total			103.7		%		80-120	10-AUG-14
Sodium (Na)-Total			104.4		%		80-120	10-AUG-14



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 20 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2912775							
WG1927221-2 LCS								
Uranium (U)-Total			103.9		%		80-120	10-AUG-14
Zinc (Zn)-Total			103.4		%		80-120	10-AUG-14
WG1927221-5 LCS								
Aluminum (Al)-Total			96.7		%		70-130	10-AUG-14
Antimony (Sb)-Total			104.1		%		70-130	10-AUG-14
Arsenic (As)-Total			100.8		%		70-130	10-AUG-14
Barium (Ba)-Total			105.3		%		70-130	10-AUG-14
Boron (B)-Total			103.8		%		70-130	10-AUG-14
Cadmium (Cd)-Total			102.5		%		70-130	10-AUG-14
Calcium (Ca)-Total			99.6		%		70-130	10-AUG-14
Chromium (Cr)-Total			100.9		%		70-130	10-AUG-14
Copper (Cu)-Total			98.8		%		70-130	10-AUG-14
Iron (Fe)-Total			94.3		%		70-130	10-AUG-14
Lead (Pb)-Total			100.7		%		70-130	10-AUG-14
Magnesium (Mg)-Total			101.0		%		70-130	10-AUG-14
Manganese (Mn)-Total			102.8		%		70-130	10-AUG-14
Nickel (Ni)-Total			101.7		%		70-130	10-AUG-14
Potassium (K)-Total			105.0		%		70-130	10-AUG-14
Selenium (Se)-Total			104.8		%		70-130	10-AUG-14
Silicon (Si)-Total			109.0		%		70-130	10-AUG-14
Silver (Ag)-Total			103.3		%		70-130	10-AUG-14
Sodium (Na)-Total			101.2		%		70-130	10-AUG-14
Uranium (U)-Total			100.1		%		70-130	10-AUG-14
Zinc (Zn)-Total			100.6		%		70-130	10-AUG-14
WG1927221-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	10-AUG-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Barium (Ba)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Boron (B)-Total			<0.010		mg/L		0.01	10-AUG-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Calcium (Ca)-Total			<0.020		mg/L		0.02	10-AUG-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Copper (Cu)-Total			<0.00010		mg/L		0.0001	10-AUG-14



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 21 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2912775							
WG1927221-1 MB								
Iron (Fe)-Total			<0.010		mg/L		0.01	10-AUG-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	10-AUG-14
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Nickel (Ni)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Potassium (K)-Total			<0.050		mg/L		0.05	10-AUG-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Silicon (Si)-Total			<0.050		mg/L		0.05	10-AUG-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Sodium (Na)-Total			<0.050		mg/L		0.05	10-AUG-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	10-AUG-14
WG1927221-4 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	10-AUG-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Barium (Ba)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Boron (B)-Total			<0.010		mg/L		0.01	10-AUG-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Calcium (Ca)-Total			<0.020		mg/L		0.02	10-AUG-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Copper (Cu)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Iron (Fe)-Total			<0.010		mg/L		0.01	10-AUG-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	10-AUG-14
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Nickel (Ni)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Potassium (K)-Total			<0.050		mg/L		0.05	10-AUG-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Silicon (Si)-Total			<0.050		mg/L		0.05	10-AUG-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Sodium (Na)-Total			<0.050		mg/L		0.05	10-AUG-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	10-AUG-14



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 22 of 38

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R2912775							
WG1927465-1	MB							
Copper (Cu)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Batch	R2914191							
WG1927221-6	DUP	L1496774-1						
Iron (Fe)-Total		3.09	4.72	DUP-H	mg/L	42	20	11-AUG-14
NAPHTHENIC-ACID-FM								
	Water							
Batch	R2930372							
WG1932480-3	DUP	L1496774-2						
Naphthenic Acids		6.6	6.8		mg/L	2.8	30	27-AUG-14
WG1932480-7	DUP	L1499790-3						
Naphthenic Acids		6.1	6.5		mg/L	6.0	30	27-AUG-14
WG1932480-4	LCS							
Naphthenic Acids			89.1		%		70-130	27-AUG-14
WG1932480-8	LCS							
Naphthenic Acids			90.9		%		70-130	27-AUG-14
WG1932480-1	MB							
Naphthenic Acids			<1.0		mg/L		1	27-AUG-14
WG1932480-5	MB							
Naphthenic Acids			<1.0		mg/L		1	27-AUG-14
WG1932480-2	MS	L1496774-1						
Naphthenic Acids			89.6		%		50-150	27-AUG-14
WG1932480-6	MS	L1499790-2						
Naphthenic Acids			75.7		%		50-150	27-AUG-14
NH3-CFA-ED								
	Water							
Batch	R2918088							
WG1930533-10	DUP	L1500452-18						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	14-AUG-14
WG1930533-6	DUP	L1498824-1						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	14-AUG-14
WG1930533-7	DUP	L1501996-1						
Ammonia, Total (as N)		0.443	0.451		mg/L	1.8	20	14-AUG-14
WG1930533-2	LCS							
Ammonia, Total (as N)			97.4		%		85-115	14-AUG-14
WG1930533-1	MB							
Ammonia, Total (as N)			<0.050		mg/L		0.05	14-AUG-14
WG1930533-11	MS	L1499744-2						



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 23 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-CFA-ED		Water						
Batch	R2918088							
WG1930533-11 MS		L1499744-2						
Ammonia, Total (as N)			99.5		%		75-125	14-AUG-14
WG1930533-5 MS		L1498878-11						
Ammonia, Total (as N)			101.1		%		75-125	14-AUG-14
WG1930533-9 MS		L1500452-11						
Ammonia, Total (as N)			104.6		%		75-125	14-AUG-14
NO2-IC-ED		Water						
Batch	R2909698							
WG1925549-3 DUP		L1496706-1						
Nitrite (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	06-AUG-14
WG1925549-5 DUP		L1497205-9						
Nitrite (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	06-AUG-14
WG1925549-11 LCS								
Nitrite (as N)			92.5		%		90-110	06-AUG-14
WG1925549-13 LCS								
Nitrite (as N)			91.0		%		90-110	06-AUG-14
WG1925549-15 LCS								
Nitrite (as N)			92.3		%		90-110	06-AUG-14
WG1925549-17 LCS								
Nitrite (as N)			92.2		%		90-110	06-AUG-14
WG1925549-19 LCS								
Nitrite (as N)			92.7		%		90-110	06-AUG-14
WG1925549-2 LCS								
Nitrite (as N)			94.8		%		90-110	06-AUG-14
WG1925549-21 LCS								
Nitrite (as N)			92.1		%		90-110	06-AUG-14
WG1925549-9 LCS								
Nitrite (as N)			91.2		%		90-110	06-AUG-14
WG1925549-1 MB								
Nitrite (as N)			<0.020		mg/L		0.02	06-AUG-14
WG1925549-10 MB								
Nitrite (as N)			<0.020		mg/L		0.02	06-AUG-14
WG1925549-12 MB								
Nitrite (as N)			<0.020		mg/L		0.02	06-AUG-14
WG1925549-14 MB								
Nitrite (as N)			<0.020		mg/L		0.02	06-AUG-14
WG1925549-16 MB								
Nitrite (as N)			<0.020		mg/L		0.02	06-AUG-14



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 25 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-ED		Water						
Batch	R2912741							
WG1927719-22	MB							
Nitrite (as N)			<0.020		mg/L		0.02	09-AUG-14
WG1927719-4	MB							
Nitrite (as N)			<0.020		mg/L		0.02	09-AUG-14
WG1927719-8	MB							
Nitrite (as N)			<0.020		mg/L		0.02	09-AUG-14
WG1927719-10	MS	L1499564-3						
Nitrite (as N)			78.5		%		75-125	09-AUG-14
WG1927719-14	MS	L1499490-2						
Nitrite (as N)			82.9		%		75-125	09-AUG-14
WG1927719-18	MS	L1499670-6						
Nitrite (as N)			98.4		%		75-125	09-AUG-14
NO3-IC-ED		Water						
Batch	R2909698							
WG1925549-3	DUP	L1496706-1						
Nitrate (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	06-AUG-14
WG1925549-5	DUP	L1497205-9						
Nitrate (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	06-AUG-14
WG1925549-7	DUP	L1497475-9						
Nitrate (as N)		0.136	0.133		mg/L	2.2	20	06-AUG-14
WG1925549-11	LCS							
Nitrate (as N)			95.3		%		90-110	06-AUG-14
WG1925549-13	LCS							
Nitrate (as N)			98.9		%		90-110	06-AUG-14
WG1925549-15	LCS							
Nitrate (as N)			97.7		%		90-110	06-AUG-14
WG1925549-17	LCS							
Nitrate (as N)			98.9		%		90-110	06-AUG-14
WG1925549-19	LCS							
Nitrate (as N)			100.7		%		90-110	06-AUG-14
WG1925549-2	LCS							
Nitrate (as N)			101.8		%		90-110	06-AUG-14
WG1925549-21	LCS							
Nitrate (as N)			99.4		%		90-110	06-AUG-14
WG1925549-9	LCS							
Nitrate (as N)			100.7		%		90-110	06-AUG-14
WG1925549-1	MB							
Nitrate (as N)			<0.050		mg/L		0.05	06-AUG-14



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 26 of 38

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-ED		Water						
Batch	R2909698							
WG1925549-10	MB							
Nitrate (as N)			<0.050		mg/L		0.05	06-AUG-14
WG1925549-12	MB							
Nitrate (as N)			<0.050		mg/L		0.05	06-AUG-14
WG1925549-14	MB							
Nitrate (as N)			<0.050		mg/L		0.05	06-AUG-14
WG1925549-16	MB							
Nitrate (as N)			<0.050		mg/L		0.05	06-AUG-14
WG1925549-18	MB							
Nitrate (as N)			<0.050		mg/L		0.05	06-AUG-14
WG1925549-20	MB							
Nitrate (as N)			<0.050		mg/L		0.05	06-AUG-14
WG1925549-22	MB							
Nitrate (as N)			<0.050		mg/L		0.05	06-AUG-14
WG1925549-4	MS	L1496706-1						
Nitrate (as N)			90.3		%		75-125	06-AUG-14
WG1925549-6	MS	L1497205-9						
Nitrate (as N)			87.9		%		75-125	06-AUG-14
WG1925549-8	MS	L1497475-9						
Nitrate (as N)			90.8		%		75-125	06-AUG-14
Batch	R2912741							
WG1927719-13	DUP	L1499490-2						
Nitrate (as N)		24.6	24.5		mg/L	0.1	20	09-AUG-14
WG1927719-17	DUP	L1499670-6						
Nitrate (as N)		0.769	0.791		mg/L	2.7	20	09-AUG-14
WG1927719-5	DUP	L1499575-5						
Nitrate (as N)		0.531	0.532		mg/L	0.1	20	09-AUG-14
WG1927719-9	DUP	L1499564-3						
Nitrate (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	09-AUG-14
WG1927719-11	LCS							
Nitrate (as N)			104.5		%		90-110	09-AUG-14
WG1927719-15	LCS							
Nitrate (as N)			107.0		%		90-110	09-AUG-14
WG1927719-19	LCS							
Nitrate (as N)			105.4		%		90-110	09-AUG-14
WG1927719-2	LCS							
Nitrate (as N)			98.9		%		90-110	09-AUG-14
WG1927719-21	LCS							



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 27 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-ED		Water						
Batch	R2912741							
WG1927719-21	LCS							
Nitrate (as N)			102.1		%		90-110	09-AUG-14
WG1927719-3	LCS							
Nitrate (as N)			105.6		%		90-110	09-AUG-14
WG1927719-7	LCS							
Nitrate (as N)			105.0		%		90-110	09-AUG-14
WG1927719-1	MB							
Nitrate (as N)			<0.050		mg/L		0.05	09-AUG-14
WG1927719-16	MB							
Nitrate (as N)			<0.050		mg/L		0.05	09-AUG-14
WG1927719-20	MB							
Nitrate (as N)			<0.050		mg/L		0.05	09-AUG-14
WG1927719-22	MB							
Nitrate (as N)			<0.050		mg/L		0.05	09-AUG-14
WG1927719-4	MB							
Nitrate (as N)			<0.050		mg/L		0.05	09-AUG-14
WG1927719-8	MB							
Nitrate (as N)			<0.050		mg/L		0.05	09-AUG-14
WG1927719-10	MS	L1499564-3						
Nitrate (as N)			100.1		%		75-125	09-AUG-14
WG1927719-14	MS	L1499490-2						
Nitrate (as N)			N/A	MS-B	%		-	09-AUG-14
WG1927719-18	MS	L1499670-6						
Nitrate (as N)			104.7		%		75-125	09-AUG-14
WG1927719-6	MS	L1499575-5						
Nitrate (as N)			96.0		%		75-125	09-AUG-14
PAH-ABT1-CL		Water						
Batch	R2920176							
WG1931655-2	LCS							
Acenaphthene			88.6		%		60-130	13-AUG-14
Acenaphthylene			97.6		%		60-130	13-AUG-14
Anthracene			99.2		%		60-130	13-AUG-14
Fluoranthene			99.1		%		60-130	13-AUG-14
Fluorene			91.7		%		60-130	13-AUG-14
Naphthalene			92.3		%		50-130	13-AUG-14
Phenanthrene			95.8		%		60-130	13-AUG-14
Pyrene			108.1		%		60-130	13-AUG-14



Environmental

Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 28 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch R2920176								
WG1931655-2 LCS								
	Benzo(a)anthracene		104.1		%		60-130	13-AUG-14
	Benzo(k)fluoranthene		97.2		%		60-130	13-AUG-14
	Benzo(b&j)fluoranthene		93.9		%		60-130	13-AUG-14
	Benzo(g,h,i)perylene		110.1		%		60-130	13-AUG-14
	Benzo(a)pyrene		100.6		%		60-130	13-AUG-14
	Chrysene		103.5		%		60-130	13-AUG-14
	Dibenzo(a,h)anthracene		107.3		%		60-130	13-AUG-14
	Indeno(1,2,3-cd)pyrene		105.2		%		60-130	13-AUG-14
WG1931655-1 MB								
	Acenaphthene		<0.000020		mg/L		0.00002	13-AUG-14
	Acenaphthylene		<0.000020		mg/L		0.00002	13-AUG-14
	Anthracene		<0.000010		mg/L		0.00001	13-AUG-14
	Fluoranthene		<0.000020		mg/L		0.00002	13-AUG-14
	Fluorene		<0.000020		mg/L		0.00002	13-AUG-14
	Naphthalene		<0.000050		mg/L		0.00005	13-AUG-14
	Phenanthrene		<0.000050		mg/L		0.00005	13-AUG-14
	Pyrene		<0.000010		mg/L		0.00001	13-AUG-14
	Benzo(a)anthracene		<0.000010		mg/L		0.00001	13-AUG-14
	Benzo(k)fluoranthene		<0.000010		mg/L		0.00001	13-AUG-14
	Benzo(b&j)fluoranthene		<0.000010		mg/L		0.00001	13-AUG-14
	Benzo(g,h,i)perylene		<0.000020		mg/L		0.00002	13-AUG-14
	Benzo(a)pyrene		<0.0000050		mg/L		0.000005	13-AUG-14
	Chrysene		<0.000020		mg/L		0.00002	13-AUG-14
	Dibenzo(a,h)anthracene		<0.0000050		mg/L		0.000005	13-AUG-14
	Indeno(1,2,3-cd)pyrene		<0.000010		mg/L		0.00001	13-AUG-14
	Surrogate: d10-Acenaphthene		88.8		%		60-130	13-AUG-14
	Surrogate: d10-Phenanthrene		95.0		%		60-130	13-AUG-14
	Surrogate: d12-Chrysene		96.9		%		60-130	13-AUG-14
Batch R2922480								
WG1933257-2 LCS								
	Acenaphthene		92.0		%		60-130	15-AUG-14
	Acenaphthylene		100.4		%		60-130	15-AUG-14
	Anthracene		99.4		%		60-130	15-AUG-14
	Fluoranthene		96.0		%		60-130	15-AUG-14



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 29 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch	R2922480							
WG1933257-2	LCS							
Fluorene			92.9		%		60-130	15-AUG-14
Naphthalene			94.6		%		50-130	15-AUG-14
Phenanthrene			96.8		%		60-130	15-AUG-14
Pyrene			104.6		%		60-130	15-AUG-14
Benzo(a)anthracene			99.0		%		60-130	15-AUG-14
Benzo(k)fluoranthene			93.4		%		60-130	15-AUG-14
Benzo(b&j)fluoranthene			91.1		%		60-130	15-AUG-14
Benzo(g,h,i)perylene			98.2		%		60-130	15-AUG-14
Benzo(a)pyrene			98.1		%		60-130	15-AUG-14
Chrysene			98.8		%		60-130	15-AUG-14
Dibenzo(a,h)anthracene			95.8		%		60-130	15-AUG-14
Indeno(1,2,3-cd)pyrene			97.6		%		60-130	15-AUG-14
WG1933257-1	MB							
Acenaphthene			<0.000020		mg/L		0.00002	15-AUG-14
Acenaphthylene			<0.000020		mg/L		0.00002	15-AUG-14
Anthracene			<0.000010		mg/L		0.00001	15-AUG-14
Fluoranthene			<0.000020		mg/L		0.00002	15-AUG-14
Fluorene			<0.000020		mg/L		0.00002	15-AUG-14
Naphthalene			<0.000050		mg/L		0.00005	15-AUG-14
Phenanthrene			<0.000050		mg/L		0.00005	15-AUG-14
Pyrene			<0.000010		mg/L		0.00001	15-AUG-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	15-AUG-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	15-AUG-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	15-AUG-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	15-AUG-14
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	15-AUG-14
Chrysene			<0.000020		mg/L		0.00002	15-AUG-14
Dibenzo(a,h)anthracene			<0.0000050		mg/L		0.000005	15-AUG-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	15-AUG-14
Surrogate: d10-Acenaphthene			100.6		%		60-130	15-AUG-14
Surrogate: d10-Phenanthrene			99.3		%		60-130	15-AUG-14
Surrogate: d12-Chrysene			98.6		%		60-130	15-AUG-14
WG1933257-3	MB							
Acenaphthene			<0.000020		mg/L		0.00002	18-AUG-14



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 30 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch R2922480								
WG1933257-3 MB								
Acenaphthylene			<0.000020		mg/L		0.00002	18-AUG-14
Anthracene			<0.000010		mg/L		0.00001	18-AUG-14
Fluoranthene			<0.000020		mg/L		0.00002	18-AUG-14
Fluorene			<0.000020		mg/L		0.00002	18-AUG-14
Naphthalene			<0.000050		mg/L		0.00005	18-AUG-14
Phenanthrene			<0.000050		mg/L		0.00005	18-AUG-14
Pyrene			<0.000010		mg/L		0.00001	18-AUG-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	18-AUG-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	18-AUG-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	18-AUG-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	18-AUG-14
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	18-AUG-14
Chrysene			<0.000020		mg/L		0.00002	18-AUG-14
Dibenzo(a,h)anthracene			<0.0000050		mg/L		0.000005	18-AUG-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	18-AUG-14
Surrogate: d10-Acenaphthene			105.6		%		60-130	18-AUG-14
Surrogate: d10-Phenanthrene			109.8		%		60-130	18-AUG-14
Surrogate: d12-Chrysene			108.5		%		60-130	18-AUG-14
PH/EC/ALK-ED		Water						
Batch R2910608								
WG1925808-10 DUP		L1498067-7						
pH		8.04	8.07	J	pH	0.02	0.3	07-AUG-14
Conductivity (EC)		571	572		uS/cm	0.2	10	07-AUG-14
Bicarbonate (HCO3)		347	346		mg/L	0.1	25	07-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	07-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	07-AUG-14
Alkalinity, Total (as CaCO3)		284	284		mg/L	0.1	20	07-AUG-14
WG1925808-11 DUP		L1497746-1						
pH		8.11	8.10	J	pH	0.01	0.3	08-AUG-14
Conductivity (EC)		723	726		uS/cm	0.4	10	08-AUG-14
Bicarbonate (HCO3)		533	501		mg/L	6.1	25	08-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	08-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	08-AUG-14



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 31 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R2910608							
WG1925808-11	DUP	L1497746-1						
Alkalinity, Total (as CaCO3)		437	411		mg/L	6.1	20	08-AUG-14
WG1925808-6	DUP	L1496706-1						
pH		8.31	8.33	J	pH	0.02	0.3	07-AUG-14
Conductivity (EC)		2580	2590		uS/cm	0.4	10	07-AUG-14
Bicarbonate (HCO3)		780	775		mg/L	0.7	25	07-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	07-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	07-AUG-14
Alkalinity, Total (as CaCO3)		643	642		mg/L	0.1	20	07-AUG-14
WG1925808-7	DUP	L1497647-8						
pH		8.05	8.04	J	pH	0.01	0.3	07-AUG-14
Conductivity (EC)		1140	1140		uS/cm	0.2	10	07-AUG-14
Bicarbonate (HCO3)		593	561		mg/L	5.6	25	07-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	07-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	07-AUG-14
Alkalinity, Total (as CaCO3)		486	459		mg/L	5.6	20	07-AUG-14
WG1925808-8	DUP	L1497372-2						
pH		8.34	8.37	J	pH	0.03	0.3	08-AUG-14
Conductivity (EC)		500	504		uS/cm	0.8	10	08-AUG-14
Bicarbonate (HCO3)		336	333		mg/L	0.7	25	08-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	08-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	08-AUG-14
Alkalinity, Total (as CaCO3)		281	281		mg/L	0.1	20	08-AUG-14
WG1925808-13	LCS							
Conductivity (EC)			99.9		%		90-110	07-AUG-14
WG1925808-14	LCS							
pH			7.00		pH		6.7-7.3	07-AUG-14
WG1925808-15	LCS							
Alkalinity, Total (as CaCO3)			99.8		%		85-115	07-AUG-14
WG1925808-16	LCS							
Conductivity (EC)			98.0		%		90-110	07-AUG-14
WG1925808-18	LCS							
Conductivity (EC)			98.8		%		90-110	07-AUG-14
WG1925808-19	LCS							
pH			6.95		pH		6.7-7.3	07-AUG-14
WG1925808-2	LCS							



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 32 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R2910608							
WG1925808-2	LCS							
Conductivity (EC)			100.4		%		90-110	07-AUG-14
WG1925808-20	LCS							
Alkalinity, Total (as CaCO3)			101.4		%		85-115	07-AUG-14
WG1925808-21	LCS							
Conductivity (EC)			97.3		%		90-110	07-AUG-14
WG1925808-23	LCS							
Conductivity (EC)			97.5		%		90-110	07-AUG-14
WG1925808-24	LCS							
pH			7.00		pH		6.7-7.3	07-AUG-14
WG1925808-25	LCS							
Alkalinity, Total (as CaCO3)			99.4		%		85-115	07-AUG-14
WG1925808-26	LCS							
Conductivity (EC)			95.7		%		90-110	08-AUG-14
WG1925808-28	LCS							
Conductivity (EC)			96.5		%		90-110	08-AUG-14
WG1925808-29	LCS							
pH			7.00		pH		6.7-7.3	08-AUG-14
WG1925808-3	LCS							
pH			6.99		pH		6.7-7.3	07-AUG-14
WG1925808-30	LCS							
Alkalinity, Total (as CaCO3)			99.1		%		85-115	08-AUG-14
WG1925808-31	LCS							
Conductivity (EC)			93.7		%		90-110	08-AUG-14
WG1925808-4	LCS							
Alkalinity, Total (as CaCO3)			98.8		%		85-115	07-AUG-14
WG1925808-5	LCS							
Conductivity (EC)			99.0		%		90-110	07-AUG-14
WG1925808-1	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	07-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	07-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	07-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	07-AUG-14
WG1925808-12	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	07-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	07-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	07-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	07-AUG-14



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 33 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R2910608							
WG1925808-17 MB								
Bicarbonate (HCO3)			<5.0		mg/L		5	07-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	07-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	07-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	07-AUG-14
WG1925808-22 MB								
Bicarbonate (HCO3)			<5.0		mg/L		5	08-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	08-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	08-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	08-AUG-14
WG1925808-27 MB								
Bicarbonate (HCO3)			<5.0		mg/L		5	08-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	08-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	08-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	08-AUG-14
PHENOLS-4AAP-ED		Water						
Batch	R2923340							
WG1934143-3 DUP	L1496774-3							
Phenols (4AAP)	<0.0010	<0.0010		RPD-NA	mg/L	N/A	15	19-AUG-14
WG1934143-4 DUP	L1499790-6							
Phenols (4AAP)	0.0033	0.0037			mg/L	11	15	19-AUG-14
WG1934143-6 DUP	L1497751-8							
Phenols (4AAP)	<0.0010	<0.0010		RPD-NA	mg/L	N/A	15	19-AUG-14
WG1934143-7 DUP	L1494217-3							
Phenols (4AAP)	0.0032	0.0032			mg/L	0.0	15	19-AUG-14
WG1934143-2 LCS								
Phenols (4AAP)		105.0			%		85-115	19-AUG-14
WG1934143-1 MB								
Phenols (4AAP)		<0.0010			mg/L		0.001	19-AUG-14
WG1934143-5 MS	L1499730-4							
Phenols (4AAP)		100.0			%		75-125	19-AUG-14
SO4-IC-ED		Water						
Batch	R2909698							
WG1925549-3 DUP	L1496706-1							
Sulfate (SO4)	<0.50	<0.50		RPD-NA	mg/L	N/A	20	06-AUG-14
WG1925549-5 DUP	L1497205-9							
Sulfate (SO4)	321	318			mg/L			



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 35 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-ED		Water						
Batch	R2912741							
WG1927719-17	DUP	L1499670-6						
Sulfate (SO4)		18.4	18.7		mg/L	1.5	20	09-AUG-14
WG1927719-5	DUP	L1499575-5						
Sulfate (SO4)		407	407		mg/L	0.0	20	09-AUG-14
WG1927719-11	LCS							
Sulfate (SO4)			103.3		%		90-110	09-AUG-14
WG1927719-15	LCS							
Sulfate (SO4)			102.9		%		90-110	09-AUG-14
WG1927719-19	LCS							
Sulfate (SO4)			102.5		%		90-110	09-AUG-14
WG1927719-2	LCS							
Sulfate (SO4)			101.8		%		90-110	09-AUG-14
WG1927719-21	LCS							
Sulfate (SO4)			101.7		%		90-110	09-AUG-14
WG1927719-3	LCS							
Sulfate (SO4)			102.8		%		90-110	09-AUG-14
WG1927719-7	LCS							
Sulfate (SO4)			103.3		%		90-110	09-AUG-14
WG1927719-1	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-12	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-16	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-20	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-22	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-4	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-8	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-18	MS	L1499670-6						
Sulfate (SO4)			104.2		%		75-125	09-AUG-14
WG1927719-6	MS	L1499575-5						
Sulfate (SO4)			N/A	MS-B	%		-	09-AUG-14
SOLIDS-TDS-ED		Water						



Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Page 36 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-ED		Water						
Batch	R2912810							
WG1926634-3	DUP	L1497207-3						
Total Dissolved Solids		1210	1200		mg/L	0.7	20	08-AUG-14
WG1926634-2	LCS							
Total Dissolved Solids			99.5		%		85-115	08-AUG-14
WG1926634-1	MB							
Total Dissolved Solids			<10		mg/L		10	08-AUG-14
TURBIDITY-ED		Water						
Batch	R2909764							
WG1925268-3	DUP	L1496774-1						
Turbidity		17.7	18.2		NTU	2.8	15	06-AUG-14
WG1925268-2	LCS							
Turbidity			98.6		%		70-130	06-AUG-14
WG1925268-1	MB							
Turbidity			<0.10		NTU		0.1	06-AUG-14
Batch	R2911021							
WG1925868-3	DUP	L1496774-4						
Turbidity		48.7	50.4		NTU	3.4	15	07-AUG-14
WG1925868-2	LCS							
Turbidity			98.6		%		70-130	07-AUG-14
WG1925868-1	MB							
Turbidity			<0.10		NTU		0.1	07-AUG-14

Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2
Contact: AKIN OWOJORI

Page 37 of 38

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L1496774

Report Date: 27-AUG-14

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Page 38 of 38

Contact: AKIN OWOJORI

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Turbidity							
	4	04-AUG-14 13:30	07-AUG-14 00:00	48	59	hours	EHT
	5	04-AUG-14 13:40	07-AUG-14 00:00	48	58	hours	EHT
Anions and Nutrients							
Nitrate as N by IC							
	5	04-AUG-14 13:40	10-AUG-14 08:00	48	138	hours	EHT
Nitrite as N by IC							
	5	04-AUG-14 13:40	10-AUG-14 08:00	48	138	hours	EHT

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1496774 were received on 05-AUG-14 10:12.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



ALS 140811-02 (14-CEE)

CONFIDENTIAL ANALYSIS REPORT

REPORT #: 140811-02

WO #: 14-CEE

PO #: L1496774

CLIENT: ALS Laboratory Group - Edmonton
9936-67 Avenue
Edmonton, AB
T6E 0P5

ATTENTION: ALS-ED Reporting
Tel: (780) 413-5227
Fax: (780) 437-2311

SAMPLE DESCRIPTION: Water Samples

DATE AND TIME OF SAMPLE COLLECTION: August 04, 2014

DATE AND TIME OF SAMPLE RECEIPT: August 06, 2014/12:05

SAMPLE TEMPERATURE WHEN RECEIVED: 9.5° Celsius

TEST PERFORMED:
Iron Related Bacteria
Sulfate Reducing Bacteria

TEST START DATE: August 06, 2014/13:05

DATE COMPLETED: August 10, 2014

CERTIFICATE OF ANALYSIS: See Page 2

QUALITY CONTROL DATA: See Attached Appendix 1

The report shall not be reproduced, except in full, without the written authority of PBR Laboratories Inc.

Certificate of Analysis

PBR ID	Sample #	Client ID	Lot #	Test	Protocol	Quantity Analyzed	*DF	Result	Units	Note
14-CEE-01	L1496774-1	16053140804017		Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		7.0×10^5	CFU/ml	1
14-CEE-02	L1496774-2	16053140804018		Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		1.8×10^4	CFU/ml	1
14-CEE-03	L1496774-3	16053140804019		Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		7.0×10^5	CFU/ml	1
14-CEE-04	L1496774-4	16053140804020		Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		1.8×10^4	CFU/ml	1
14-CEE-05	L1496774-5	16053140804021		Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		7.0×10^5	CFU/ml	1

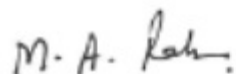
*DF - Dilution Factor used for analysis

Notes

1 CFU = Colony Forming Unit.

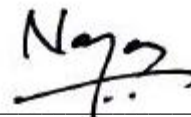
BART results represent the Approximate Population only.

The reported results apply only to the items tested.



Abdul Rahman Mohammed (Analyst)
Date: Aug 11 2014

Approved By:



Narayan Pokharel, Ph.D.
Date: Aug 11 2014





PIBR
Laboratories Inc.

ALS 140811-02 (14-CEE)

APPENDIX 1

Quality Control Data for Iron Related Bacteria (BART)

Controls	Organism/Medium	Result
Sterility (media blank)	BART medium	Pass
Positive	Acidithiobacillus ferrooxidans	Pass
Negative	D/W Sterile	Pass

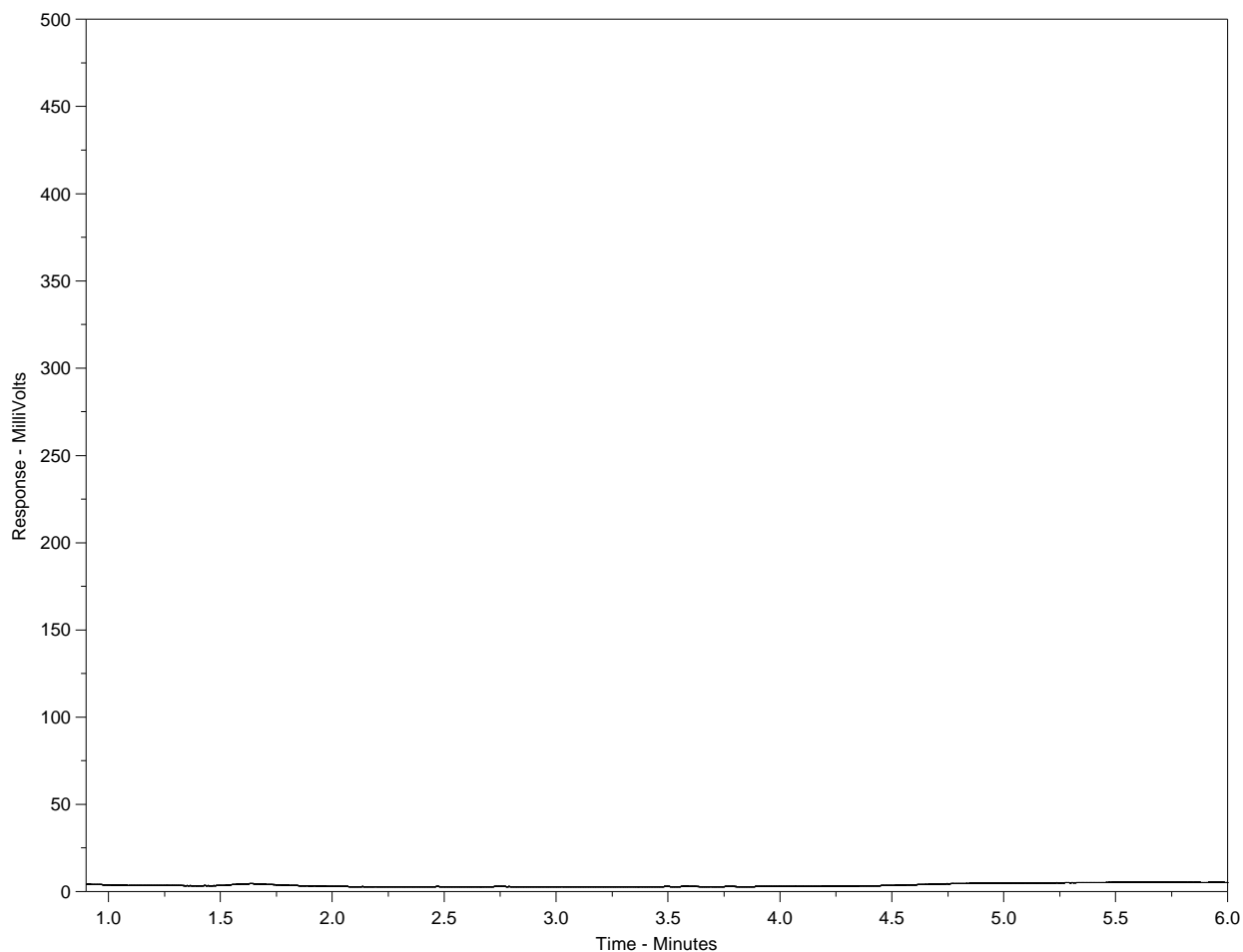
Quality Control Data for Sulfate Reducing Bacteria (BART)

Controls	Organism/Medium	Result
Sterility	BART medium	Pass
Positive	SRB	Pass
Negative	D/W Sterile	Pass

Hydrocarbon Distribution Report



ALS Sample ID: L1496774-1
Client ID: 16053140804017



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	1067°F				
← Gasoline →			← Motor Oils/ Lube Oils/ Grease →				
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

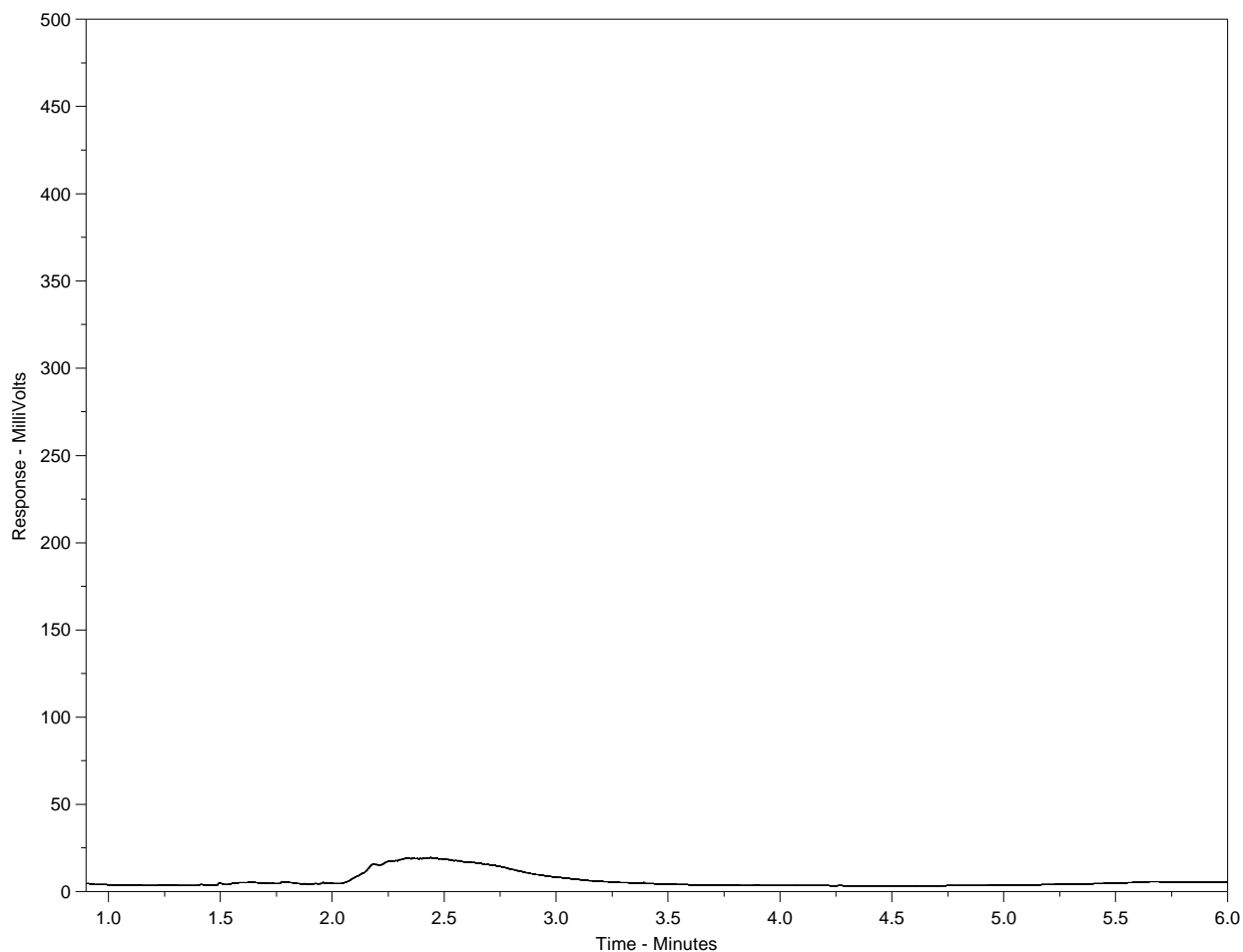
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1496774-2
Client ID: 16053140804018



F2		F3		F4		F4	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	1067°F				
Gasoline				Motor Oils/ Lube Oils/ Grease			
Diesel/ Jet Fuels							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

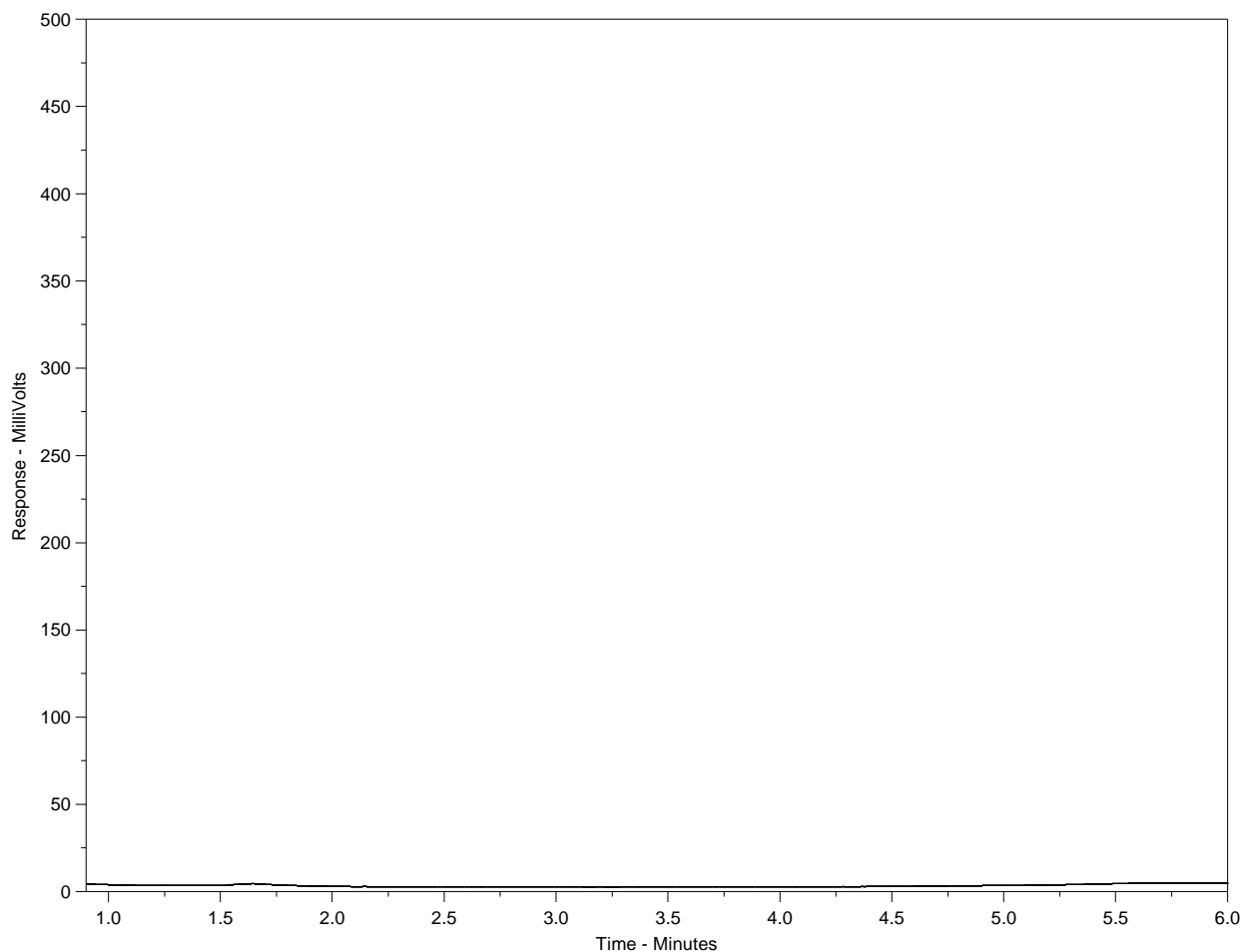
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1496774-3
 Client ID: 16053140804019



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	1067°F				
← Gasoline →			← Motor Oils/ Lube Oils/ Grease →				
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

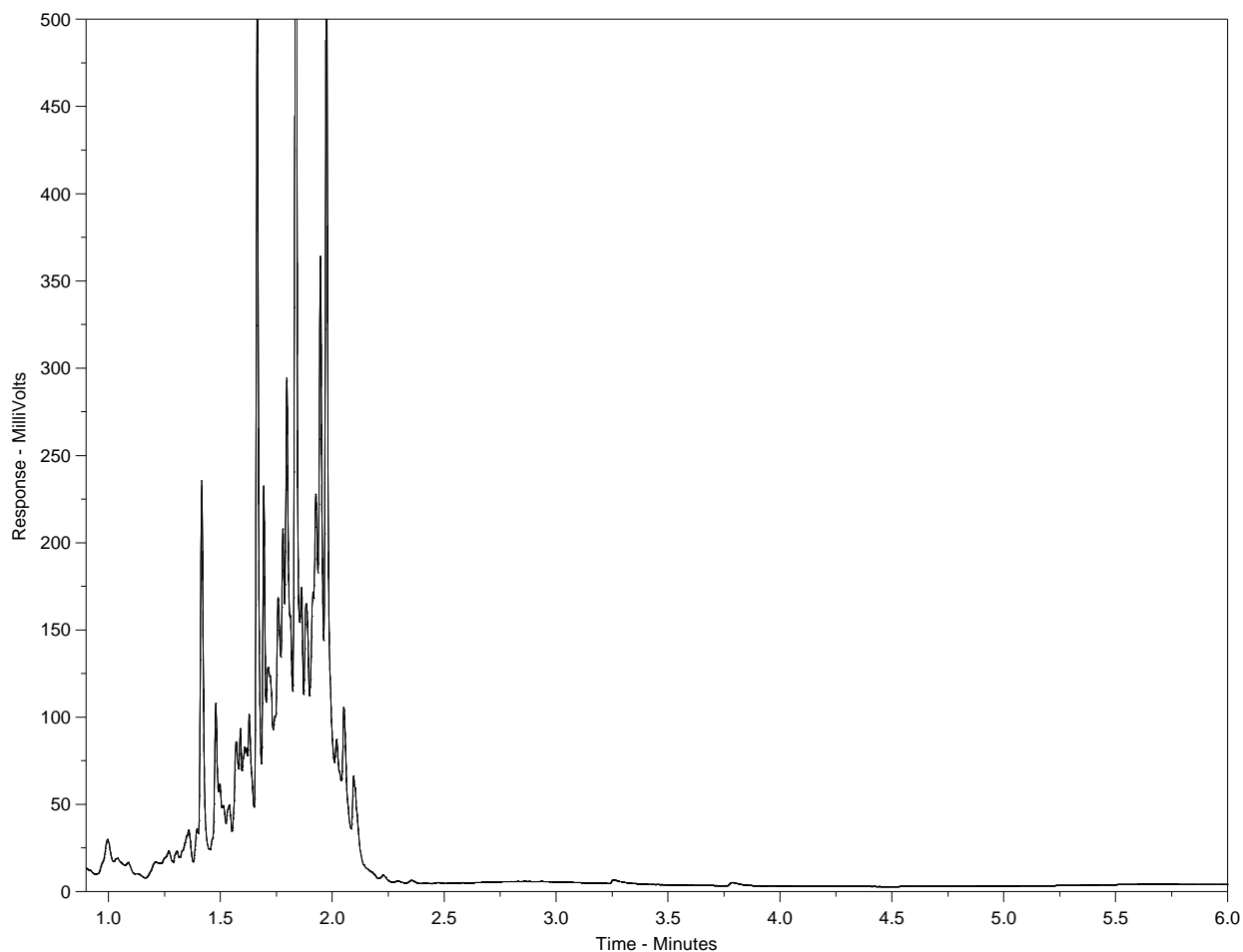
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note:
 This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1496774-4
 Client ID: 16053140804020



F2		F3		F4		F4	
nC10		nC16		nC34		nC50	
174°C		287°C		481°C		575°C	
346°F		549°F		898°F		1067°F	
Gasoline				Motor Oils/ Lube Oils/ Grease			
Diesel/ Jet Fuels							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

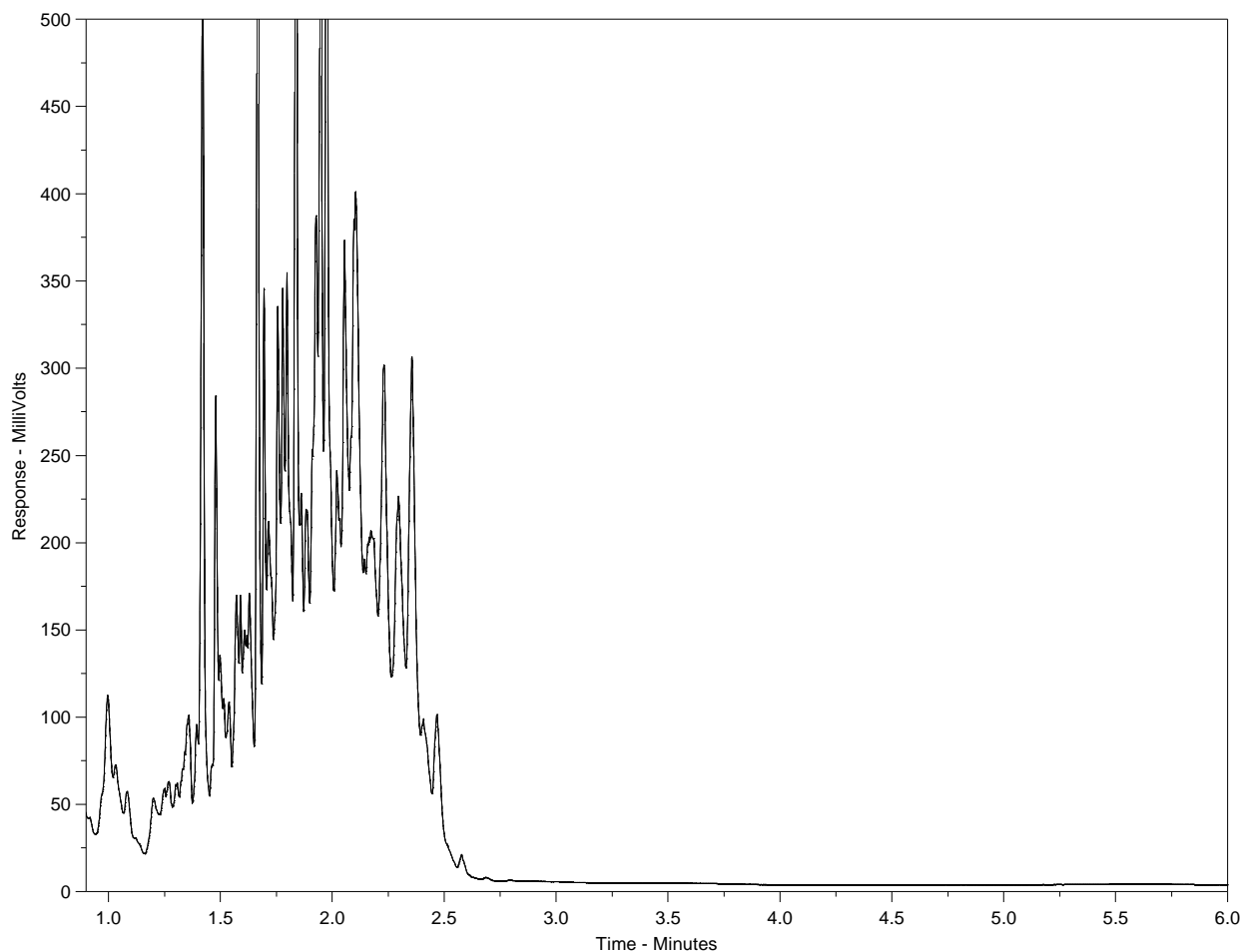
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1496774-5
Client ID: 16053140804021



← F2 →		← F3 →		← F4 →		← F4 →	
nC10		nC16		nC34		nC50	
174°C		287°C		481°C		575°C	
346°F		549°F		898°F		1067°F	
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.



Matrix Solutions Inc.
ATTN: AKIN OWOJORI
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Date Received: 06-AUG-14
Report Date: 29-AUG-14 10:47 (MT)
Version: FINAL

Client Phone: 403-513-2275

Certificate of Analysis

Lab Work Order #: L1497659
Project P.O. #: NOT SUBMITTED
Job Reference: 16053-502 NAOS
C of C Numbers: M076070
Legal Site Desc:

Nicole Thibault
Account Manager

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ADDRESS: 9936-67 Avenue, Edmonton, AB T6E 0P5 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1497659-1 16053140805021									
Sampled By: CLIENT on 05-AUG-14 @ 10:05									
Matrix: water									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-	07-AUG-14	07-AUG-14	R2908669
Toluene	<0.00050	-		0.00050	mg/L	-	07-AUG-14	07-AUG-14	R2908669
EthylBenzene	<0.00050	-		0.00050	mg/L	-	07-AUG-14	07-AUG-14	R2908669
o-Xylene	<0.00050	-		0.00050	mg/L	-	07-AUG-14	07-AUG-14	R2908669
m+p-Xylene	<0.00050	-		0.00050	mg/L	-	07-AUG-14	07-AUG-14	R2908669
Styrene	<0.0010	-		0.0010	mg/L	-	07-AUG-14	07-AUG-14	R2908669
F1(C6-C10)	<0.10	-		0.10	mg/L	-	07-AUG-14	07-AUG-14	R2908669
F1-BTEX	<0.10	-		0.10	mg/L	-	07-AUG-14	07-AUG-14	R2908669
Xylenes	<0.00071	-		0.00071	mg/L	-	07-AUG-14	07-AUG-14	R2908669
Surr: 1,4-Difluorobenzene (SS)	101.0	-		N/A	%	-	07-AUG-14	07-AUG-14	R2908669
Surr: 4-Bromofluorobenzene (SS)	96.0	-		N/A	%	-	07-AUG-14	07-AUG-14	R2908669
Surr: 3,4-Dichlorotoluene (SS)	97.0	-		N/A	%	-	07-AUG-14	07-AUG-14	R2908669
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	08-AUG-14	08-AUG-14	R2912766
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	08-AUG-14	08-AUG-14	R2912766
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	08-AUG-14	08-AUG-14	R2912766
Surr: 2-Bromobenzotrifluoride	99.6	-		N/A	%	-	08-AUG-14	08-AUG-14	R2912766
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		19-AUG-14	R2923482
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	<0.30	-	DLM	0.30	mg/L	-		12-AUG-14	R2915850
Antimony (Sb)-Total	<0.010	-	DLM	0.010	mg/L	-		12-AUG-14	R2915850
Arsenic (As)-Total	<0.010	-	DLM	0.010	mg/L	-		12-AUG-14	R2915850
Barium (Ba)-Total	1.90	+/-0.21	DLM	0.0050	mg/L	0		12-AUG-14	R2915850
Boron (B)-Total	4.1	+/-0.7	DLM	1.0	mg/L	0		12-AUG-14	R2915850
Cadmium (Cd)-Total	<0.0010	-	DLM	0.0010	mg/L	-		12-AUG-14	R2915850
Calcium (Ca)-Total	58.5	+/-6.9	DLM	2.0	mg/L	0		12-AUG-14	R2915850
Chromium (Cr)-Total	<0.010	-	DLM	0.010	mg/L	-		12-AUG-14	R2915850
Copper (Cu)-Total	<0.010	-	DLM	0.010	mg/L	-		12-AUG-14	R2915850
Iron (Fe)-Total	18.5	+/-2.9	DLM	1.0	mg/L	0		12-AUG-14	R2915850
Lead (Pb)-Total	<0.0050	-	DLM	0.0050	mg/L	-		12-AUG-14	R2915850
Magnesium (Mg)-Total	164	+/-20	DLM	0.50	mg/L	0		12-AUG-14	R2915850
Manganese (Mn)-Total	0.111	+/-0.011	DLM	0.0050	mg/L	0		12-AUG-14	R2915850
Nickel (Ni)-Total	<0.010	-	DLM	0.010	mg/L	-		12-AUG-14	R2915850
Potassium (K)-Total	38.3	+/-4.7	DLM	5.0	mg/L	0		12-AUG-14	R2915850
Selenium (Se)-Total	<0.010	-	DLM	0.010	mg/L	-		12-AUG-14	R2915850
Silicon (Si)-Total	<5.0	-	DLM	5.0	mg/L	-		12-AUG-14	R2915850
Silver (Ag)-Total	<0.0010	-	DLM	0.0010	mg/L	-		12-AUG-14	R2915850
Sodium (Na)-Total	8880	+/-1100	DLM	5.0	mg/L	0		12-AUG-14	R2915850
Uranium (U)-Total	<0.0010	-	DLM	0.0010	mg/L	-		12-AUG-14	R2915850
Zinc (Zn)-Total	<0.30	-	DLM	0.30	mg/L	-		12-AUG-14	R2915850
Miscellaneous Parameters									
Ammonia, Total (as N)	11.6	-		0.050	mg/L	-		18-AUG-14	R2922152
Dissolved Organic Carbon	12.0	+/-1.4		1.0	mg/L	0		19-AUG-14	R2922966
Iron Bacteria	See Attached	-				-		07-AUG-14	R2922158
Naphthenic Acids	10.1	+/-1.8		1.0	mg/L	0	18-AUG-14	28-AUG-14	R2932711
Phenols (4AAP)	0.0071	+/-0.0012		0.0010	mg/L	-7.4%		19-AUG-14	R2923340
Sulphate Reducing Bacteria	See Attached	-				-		07-AUG-14	R2922158

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1497659-1 16053140805021									
Sampled By: CLIENT on 05-AUG-14 @ 10:05									
Matrix: water									
Total Dissolved Solids	23200	+/-1600		10	mg/L	0		08-AUG-14	R2912810
Silicon (as SiO2)-Total	<11	-		11	mg/L	-		13-AUG-14	
Turbidity	179	+/-9.9		0.10	NTU	0		07-AUG-14	R2911021
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Anthracene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Fluoranthene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Fluorene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Naphthalene	<0.000050	-		0.000050	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Phenanthrene	<0.000050	-		0.000050	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Pyrene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(a)pyrene	<0.000050	-		0.000005	mg/L	-	18-AUG-14	18-AUG-14	R2923280
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Dibenzo(a,h)anthracene	<0.000050	-		0.000005	mg/L	-	18-AUG-14	18-AUG-14	R2923280
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Surr: d10-Acenaphthene	68.3	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280
Surr: d10-Phenanthrene	82.5	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280
Surr: d12-Chrysene	73.9	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	13200	+/-750	DLM	20	mg/L	0		08-AUG-14	R2912274
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.10	-	DLM	0.10	mg/L	-		20-AUG-14	R2923365
Antimony (Sb)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		20-AUG-14	R2923365
Arsenic (As)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		20-AUG-14	R2923365
Barium (Ba)-Dissolved	1.82	+/-0.16	DLM	0.0050	mg/L	0		20-AUG-14	R2923365
Boron (B)-Dissolved	2.5	+/-0.3	DLM	1.0	mg/L	0		20-AUG-14	R2923365
Cadmium (Cd)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		20-AUG-14	R2923365
Calcium (Ca)-Dissolved	54.3	+/-7.4	DLM	2.0	mg/L	0		20-AUG-14	R2923365
Chromium (Cr)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		20-AUG-14	R2923365
Copper (Cu)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		20-AUG-14	R2923365
Iron (Fe)-Dissolved	3.1	+/-0.3	DLM	1.0	mg/L	0		20-AUG-14	R2923365
Lead (Pb)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		20-AUG-14	R2923365
Magnesium (Mg)-Dissolved	144	+/-11	DLM	0.50	mg/L	0		20-AUG-14	R2923365
Manganese (Mn)-Dissolved	0.0947	+/-0.0065	DLM	0.0050	mg/L	0		20-AUG-14	R2923365
Nickel (Ni)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		20-AUG-14	R2923365
Potassium (K)-Dissolved	33.8	+/-2.6	DLM	5.0	mg/L	0		20-AUG-14	R2923365
Selenium (Se)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		20-AUG-14	R2923365
Silicon (Si)-Dissolved	<5.0	-	DLM	5.0	mg/L	-		20-AUG-14	R2923365
Silver (Ag)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		20-AUG-14	R2923365
Sodium (Na)-Dissolved	8500	+/-600	DLM	5.0	mg/L	0		20-AUG-14	R2923365
Uranium (U)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		20-AUG-14	R2923365
Zinc (Zn)-Dissolved	<0.10	-	DLM	0.10	mg/L	-		20-AUG-14	R2923365
Ion Balance Calculation									
Ion Balance	93.1	-			%	-		20-AUG-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1497659-1 16053140805021 Sampled By: CLIENT on 05-AUG-14 @ 10:05 Matrix: water									
Ion Balance Calculation									
TDS (Calculated)	23200	-			mg/L	-		20-AUG-14	
Hardness (as CaCO3)	729	-			mg/L	-		20-AUG-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.000005 0	mg/L	-		19-AUG-14	R2923482
Nitrate as N by IC									
Nitrate (as N)	<2.0	-	DLM	2.0	mg/L	-		08-AUG-14	R2912274
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<2.2	-		2.2	mg/L	-		13-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.80	-	DLM	0.80	mg/L	-		08-AUG-14	R2912274
Sulfate by IC									
Sulfate (SO4)	<20	-	DLM	20	mg/L	-		08-AUG-14	R2912274
pH, Conductivity and Total Alkalinity									
pH	8.50	+/-0.01		0.10	pH	0		10-AUG-14	R2913010
Conductivity (EC)	38300	+/-1900		0.20	uS/cm	0		10-AUG-14	R2913010
Bicarbonate (HCO3)	2370	+/-88		5.0	mg/L	0		10-AUG-14	R2913010
Carbonate (CO3)	108	+/-14		5.0	mg/L	0		10-AUG-14	R2913010
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		10-AUG-14	R2913010
Alkalinity, Total (as CaCO3)	2120	+/-130		2.0	mg/L	0		10-AUG-14	R2913010
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	<11	-		11	mg/L	-		20-AUG-14	
L1497659-2 16053140805022 Sampled By: CLIENT on 05-AUG-14 @ 11:24 Matrix: water									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-	RRV	0.00050	mg/L	-	07-AUG-14	07-AUG-14	R2908669
Toluene	<0.00050	-	RRV	0.00050	mg/L	-	07-AUG-14	07-AUG-14	R2908669
EthylBenzene	<0.00050	-	RRV	0.00050	mg/L	-	07-AUG-14	07-AUG-14	R2908669
o-Xylene	<0.00050	-	RRV	0.00050	mg/L	-	07-AUG-14	07-AUG-14	R2908669
m+p-Xylene	0.00072	-	RRV	0.00050	mg/L	-	07-AUG-14	07-AUG-14	R2908669
Styrene	<0.0010	-	RRV	0.0010	mg/L	-	07-AUG-14	07-AUG-14	R2908669
F1(C6-C10)	<0.10	-	RRV	0.10	mg/L	-	07-AUG-14	07-AUG-14	R2908669
F1-BTEX	<0.10	-		0.10	mg/L	-	07-AUG-14	07-AUG-14	R2908669
Xylenes	0.00072	-		0.00071	mg/L	-	07-AUG-14	07-AUG-14	R2908669
Surr: 1,4-Difluorobenzene (SS)	99.0	-		N/A	%	-	07-AUG-14	07-AUG-14	R2908669
Surr: 4-Bromofluorobenzene (SS)	92.0	-		N/A	%	-	07-AUG-14	07-AUG-14	R2908669
Surr: 3,4-Dichlorotoluene (SS)	99.0	-		N/A	%	-	07-AUG-14	07-AUG-14	R2908669
F2, F3, F4									
F2 (>C10-C16)	0.28	+/-0.08		0.25	mg/L	0	08-AUG-14	08-AUG-14	R2912766
F3 (C16-C34)	1.15	+/-0.29		0.25	mg/L	0	08-AUG-14	08-AUG-14	R2912766
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	08-AUG-14	08-AUG-14	R2912766
Surr: 2-Bromobenzotrifluoride	97.2	-		N/A	%	-	08-AUG-14	08-AUG-14	R2912766
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.000005 0	mg/L	-		19-AUG-14	R2923482
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.0298	+/-0.0055		0.0030	mg/L	0		12-AUG-14	R2915850
Antimony (Sb)-Total	<0.00040	-		0.00040	mg/L	-		12-AUG-14	R2915850

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1497659-2 16053140805022									
Sampled By: CLIENT on 05-AUG-14 @ 11:24									
Matrix: water									
Total Metals in Water by CRC ICPMS									
Arsenic (As)-Total	0.00063	+/-0.00009		0.00040	mg/L	0		12-AUG-14	R2915850
Barium (Ba)-Total	0.167	+/-0.019		0.0050	mg/L	0		12-AUG-14	R2915850
Boron (B)-Total	0.565	+/-0.090		0.050	mg/L	0		12-AUG-14	R2915850
Cadmium (Cd)-Total	<0.00020	-		0.00020	mg/L	-		12-AUG-14	R2915850
Calcium (Ca)-Total	48.4	+/-5.7		0.50	mg/L	0		12-AUG-14	R2915850
Chromium (Cr)-Total	<0.0050	-		0.0050	mg/L	-		12-AUG-14	R2915850
Copper (Cu)-Total	0.0035	+/-0.0004		0.0010	mg/L	0		12-AUG-14	R2915850
Iron (Fe)-Total	6.42	+/-1.0		0.010	mg/L	0		12-AUG-14	R2915850
Lead (Pb)-Total	0.0185	+/-0.0029		0.00010	mg/L	0		12-AUG-14	R2915850
Magnesium (Mg)-Total	7.40	+/-0.90		0.10	mg/L	0		12-AUG-14	R2915850
Manganese (Mn)-Total	0.340	+/-0.034		0.0020	mg/L	0		12-AUG-14	R2915850
Nickel (Ni)-Total	<0.0020	-		0.0020	mg/L	-		12-AUG-14	R2915850
Potassium (K)-Total	2.63	+/-0.32		0.10	mg/L	0		12-AUG-14	R2915850
Selenium (Se)-Total	<0.00040	-		0.00040	mg/L	-		12-AUG-14	R2915850
Silicon (Si)-Total	5.05	+/-1.0		0.050	mg/L	0		12-AUG-14	R2915850
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		12-AUG-14	R2915850
Sodium (Na)-Total	88.4	+/-11		1.0	mg/L	0		12-AUG-14	R2915850
Uranium (U)-Total	<0.00010	-		0.00010	mg/L	-		12-AUG-14	R2915850
Zinc (Zn)-Total	0.0158	+/-0.0033		0.0040	mg/L	0		12-AUG-14	R2915850
Miscellaneous Parameters									
Ammonia, Total (as N)	0.631	-		0.050	mg/L	-		18-AUG-14	R2922152
Dissolved Organic Carbon	22.3	+/-2.4		1.0	mg/L	0		19-AUG-14	R2922966
Iron Bacteria	See Attached	-				-		07-AUG-14	R2922158
Naphthenic Acids	5.4	+/-1.0		1.0	mg/L	0	18-AUG-14	28-AUG-14	R2932711
Phenols (4AAP)	0.0034	+/-0.0008		0.0010	mg/L	-7.4%		19-AUG-14	R2923340
Sulphate Reducing Bacteria	See Attached	-				-		07-AUG-14	R2922158
Total Dissolved Solids	608	+/-41		10	mg/L	0		08-AUG-14	R2912810
Silicon (as SiO2)-Total	10.8	-		0.11	mg/L	-		13-AUG-14	
Turbidity	11.7	+/-0.69		0.10	NTU	0		07-AUG-14	R2911021
PAH & Carcinogenic PAH List									
Acenaphthene	0.000032	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Anthracene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Fluoranthene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Fluorene	0.000023	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Naphthalene	0.000305	-		0.000050	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Phenanthrene	<0.000050	-		0.000050	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Pyrene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(a)pyrene	<0.0000050	-		0.000005	mg/L	-	18-AUG-14	18-AUG-14	R2923280
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	18-AUG-14	18-AUG-14	R2923280
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Surr: d10-Acenaphthene	84.4	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280
Surr: d10-Phenanthrene	94.3	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1497659-2 16053140805022 Sampled By: CLIENT on 05-AUG-14 @ 11:24 Matrix: water									
PAH & Carcinogenic PAH List Surr: d12-Chrysene	92.2	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280
Major Ions & Trace Dissolved Metals									
Chloride by IC Chloride (Cl)	58.0	+/-3.3		0.50	mg/L	0		08-AUG-14	R2912274
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	0.0062	+/-0.0010		0.0050	mg/L	0		20-AUG-14	R2923365
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-		20-AUG-14	R2923365
Arsenic (As)-Dissolved	0.00044	+/-0.00005		0.00040	mg/L	0		20-AUG-14	R2923365
Barium (Ba)-Dissolved	0.167	+/-0.015		0.0050	mg/L	0		20-AUG-14	R2923365
Boron (B)-Dissolved	0.289	+/-0.035		0.050	mg/L	0		20-AUG-14	R2923365
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		20-AUG-14	R2923365
Calcium (Ca)-Dissolved	44.6	+/-6.1		0.50	mg/L	0		20-AUG-14	R2923365
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		20-AUG-14	R2923365
Copper (Cu)-Dissolved	<0.0010	-		0.0010	mg/L	-		20-AUG-14	R2923365
Iron (Fe)-Dissolved	5.33	+/-0.48		0.010	mg/L	0		20-AUG-14	R2923365
Lead (Pb)-Dissolved	<0.00010	-		0.00010	mg/L	-		20-AUG-14	R2923365
Magnesium (Mg)-Dissolved	7.04	+/-0.55		0.10	mg/L	0		20-AUG-14	R2923365
Manganese (Mn)-Dissolved	0.341	+/-0.023		0.0020	mg/L	0		20-AUG-14	R2923365
Nickel (Ni)-Dissolved	<0.0020	-		0.0020	mg/L	-		20-AUG-14	R2923365
Potassium (K)-Dissolved	2.57	+/-0.20		0.10	mg/L	0		20-AUG-14	R2923365
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-		20-AUG-14	R2923365
Silicon (Si)-Dissolved	5.20	+/-0.44		0.050	mg/L	0		20-AUG-14	R2923365
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		20-AUG-14	R2923365
Sodium (Na)-Dissolved	86.6	+/-6.1		1.0	mg/L	0		20-AUG-14	R2923365
Uranium (U)-Dissolved	<0.00010	-		0.00010	mg/L	-		20-AUG-14	R2923365
Zinc (Zn)-Dissolved	<0.0030	-		0.0030	mg/L	-		20-AUG-14	R2923365
Ion Balance Calculation									
Ion Balance	92.3	-			%	-		20-AUG-14	
TDS (Calculated)	367	-			mg/L	-		20-AUG-14	
Hardness (as CaCO3)	140	-			mg/L	-		20-AUG-14	
Mercury (Hg) - Dissolved Mercury (Hg)-Dissolved	<0.0000050	-		0.000005 0	mg/L	-		19-AUG-14	R2923482
Nitrate as N by IC Nitrate (as N)	<0.050	-		0.050	mg/L	-		08-AUG-14	R2912274
Nitrate+Nitrite Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		13-AUG-14	
Nitrite as N by IC Nitrite (as N)	<0.020	-		0.020	mg/L	-		08-AUG-14	R2912274
Sulfate by IC Sulfate (SO4)	<0.50	-		0.50	mg/L	-		08-AUG-14	R2912274
pH, Conductivity and Total Alkalinity									
pH	8.44	+/-0.01		0.10	pH	0		10-AUG-14	R2913010
Conductivity (EC)	705	+/-35		0.20	uS/cm	0		10-AUG-14	R2913010
Bicarbonate (HCO3)	328	+/-13		5.0	mg/L	0		10-AUG-14	R2913010
Carbonate (CO3)	6.8	+/-2.5		5.0	mg/L	0		10-AUG-14	R2913010
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		10-AUG-14	R2913010
Alkalinity, Total (as CaCO3)	280	+/-18		2.0	mg/L	0		10-AUG-14	R2913010
Silicon (reported as Silica) Dissolved Silicon (reported as Silica) Silicon (as SiO2)-Dissolved	11.1	-		0.11	mg/L	-		20-AUG-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1497659-3 16053140805023									
Sampled By: CLIENT on 05-AUG-14 @ 17:10									
Matrix: water									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-	RRV	0.00050	mg/L	-	07-AUG-14	07-AUG-14	R2908669
Toluene	<0.00050	-	RRV	0.00050	mg/L	-	07-AUG-14	07-AUG-14	R2908669
EthylBenzene	<0.00050	-	RRV	0.00050	mg/L	-	07-AUG-14	07-AUG-14	R2908669
o-Xylene	<0.00050	-	RRV	0.00050	mg/L	-	07-AUG-14	07-AUG-14	R2908669
m+p-Xylene	<0.00050	-	RRV	0.00050	mg/L	-	07-AUG-14	07-AUG-14	R2908669
Styrene	<0.0010	-	RRV	0.0010	mg/L	-	07-AUG-14	07-AUG-14	R2908669
F1(C6-C10)	<0.10	-	RRV	0.10	mg/L	-	07-AUG-14	07-AUG-14	R2908669
F1-BTEX	<0.10	-	RRV	0.10	mg/L	-	07-AUG-14	07-AUG-14	R2908669
Xylenes	<0.00071	-	RRV	0.00071	mg/L	-	07-AUG-14	07-AUG-14	R2908669
Surr: 1,4-Difluorobenzene (SS)	98.0	-		N/A	%	-	07-AUG-14	07-AUG-14	R2908669
Surr: 4-Bromofluorobenzene (SS)	94.0	-		N/A	%	-	07-AUG-14	07-AUG-14	R2908669
Surr: 3,4-Dichlorotoluene (SS)	101.0	-		N/A	%	-	07-AUG-14	07-AUG-14	R2908669
F2, F3, F4									
F2 (>C10-C16)	5.86	+/-1.4		0.25	mg/L	0	08-AUG-14	08-AUG-14	R2912766
F3 (C16-C34)	5.33	+/-1.2		0.25	mg/L	0	08-AUG-14	08-AUG-14	R2912766
F4 (C34-C50)	2.00	+/-0.46		0.25	mg/L	0	08-AUG-14	08-AUG-14	R2912766
Surr: 2-Bromobenzotrifluoride	110.4	-		N/A	%	-	08-AUG-14	08-AUG-14	R2912766
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	0.0000485	+/-0.0000085	RRV	0.0000050	mg/L	0		20-AUG-14	R2923482
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	6.70	+/-1.1		0.0030	mg/L	0		10-AUG-14	R2912775
Antimony (Sb)-Total	0.00079	+/-0.00012		0.00040	mg/L	0		10-AUG-14	R2912775
Arsenic (As)-Total	0.00796	+/-0.00092		0.00040	mg/L	0		10-AUG-14	R2912775
Barium (Ba)-Total	0.201	+/-0.022		0.0050	mg/L	0		10-AUG-14	R2912775
Boron (B)-Total	0.194	+/-0.031		0.050	mg/L	0		10-AUG-14	R2912775
Cadmium (Cd)-Total	0.00155	+/-0.00030		0.00020	mg/L	0		10-AUG-14	R2912775
Calcium (Ca)-Total	89.7	+/-11		0.50	mg/L	0		10-AUG-14	R2912775
Chromium (Cr)-Total	0.0144	+/-0.0021		0.0050	mg/L	0		10-AUG-14	R2912775
Copper (Cu)-Total	0.0345	+/-0.0040		0.0010	mg/L	0		10-AUG-14	R2912775
Iron (Fe)-Total	37.0	+/-5.9		0.010	mg/L	0		10-AUG-14	R2912775
Lead (Pb)-Total	0.409	+/-0.065		0.00010	mg/L	0		10-AUG-14	R2912775
Magnesium (Mg)-Total	72.2	+/-8.8		0.10	mg/L	0		10-AUG-14	R2912775
Manganese (Mn)-Total	0.783	+/-0.079		0.0020	mg/L	0		10-AUG-14	R2912775
Nickel (Ni)-Total	0.0250	+/-0.0027		0.0020	mg/L	0		10-AUG-14	R2912775
Potassium (K)-Total	4.97	+/-0.61		0.10	mg/L	0		10-AUG-14	R2912775
Selenium (Se)-Total	<0.00040	-		0.00040	mg/L	-		10-AUG-14	R2912775
Silicon (Si)-Total	20.8	+/-4.1		0.050	mg/L	0		10-AUG-14	R2912775
Silver (Ag)-Total	0.00119	+/-0.00024		0.00040	mg/L	0		10-AUG-14	R2912775
Sodium (Na)-Total	43.4	+/-5.3		1.0	mg/L	0		10-AUG-14	R2912775
Uranium (U)-Total	0.00186	+/-0.00026		0.00010	mg/L	0		10-AUG-14	R2912775
Zinc (Zn)-Total	1.13	+/-0.17		0.0040	mg/L	0		10-AUG-14	R2912775
Miscellaneous Parameters									
Ammonia, Total (as N)	0.390	-		0.050	mg/L	-		18-AUG-14	R2922152
Dissolved Organic Carbon	25.5	+/-2.8		1.0	mg/L	0		19-AUG-14	R2922966
Iron Bacteria	See Attached	-				-		07-AUG-14	R2922158
Naphthenic Acids	3.2	+/-0.7		1.0	mg/L	0	18-AUG-14	28-AUG-14	R2932711
Phenols (4AAP)	0.0025	+/-0.0008		0.0010	mg/L	-7.4%		19-AUG-14	R2923340
Sulphate Reducing Bacteria	See Attached	-				-		07-AUG-14	R2922158

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1497659-3 16053140805023									
Sampled By: CLIENT on 05-AUG-14 @ 17:10									
Matrix: water									
Total Dissolved Solids	574	+/-38		10	mg/L	0		08-AUG-14	R2912810
Silicon (as SiO2)-Total	44.4	-		0.11	mg/L	-		11-AUG-14	
Turbidity	1240	+/-68		0.10	NTU	0		07-AUG-14	R2911021
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000070	-	DLM	0.000070	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Acenaphthylene	<0.000040	-	DLM	0.000040	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Anthracene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Fluoranthene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Fluorene	0.000060	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Naphthalene	0.000623	-		0.000050	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Phenanthrene	<0.000070	-	DLM	0.000070	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Pyrene	0.000033	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(b&j)fluoranthene	<0.000020	-	DLM	0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(a)pyrene	<0.000080	-	DLM	0.000008	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Chrysene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Dibenzo(a,h)anthracene	<0.000050	-		0.000005	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Surr: d10-Acenaphthene	81.5	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280
Surr: d10-Phenanthrene	84.1	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280
Surr: d12-Chrysene	81.9	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	14.9	+/-0.85		0.50	mg/L	0		08-AUG-14	R2912274
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-		20-AUG-14	R2923365
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-		20-AUG-14	R2923365
Arsenic (As)-Dissolved	0.00155	+/-0.00016		0.00040	mg/L	0		20-AUG-14	R2923365
Barium (Ba)-Dissolved	0.0918	+/-0.0080		0.0050	mg/L	0		20-AUG-14	R2923365
Boron (B)-Dissolved	0.117	+/-0.014		0.050	mg/L	0		20-AUG-14	R2923365
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		20-AUG-14	R2923365
Calcium (Ca)-Dissolved	67.3	+/-9.2		0.50	mg/L	0		20-AUG-14	R2923365
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		20-AUG-14	R2923365
Copper (Cu)-Dissolved	<0.0010	-		0.0010	mg/L	-		20-AUG-14	R2923365
Iron (Fe)-Dissolved	2.10	+/-0.19		0.010	mg/L	0		20-AUG-14	R2923365
Lead (Pb)-Dissolved	<0.00010	-		0.00010	mg/L	-		20-AUG-14	R2923365
Magnesium (Mg)-Dissolved	66.7	+/-5.2		0.10	mg/L	0		20-AUG-14	R2923365
Manganese (Mn)-Dissolved	0.398	+/-0.027		0.0020	mg/L	0		20-AUG-14	R2923365
Nickel (Ni)-Dissolved	<0.0020	-		0.0020	mg/L	-		20-AUG-14	R2923365
Potassium (K)-Dissolved	3.24	+/-0.25		0.10	mg/L	0		20-AUG-14	R2923365
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-		20-AUG-14	R2923365
Silicon (Si)-Dissolved	6.99	+/-0.59		0.050	mg/L	0		20-AUG-14	R2923365
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		20-AUG-14	R2923365
Sodium (Na)-Dissolved	37.2	+/-2.6		1.0	mg/L	0		20-AUG-14	R2923365
Uranium (U)-Dissolved	0.00049	+/-0.00005		0.00010	mg/L	0		20-AUG-14	R2923365
Zinc (Zn)-Dissolved	0.0197	+/-0.0023		0.0030	mg/L	0		20-AUG-14	R2923365
Ion Balance Calculation									
Ion Balance	101	-			%	-		20-AUG-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1497659-3 16053140805023 Sampled By: CLIENT on 05-AUG-14 @ 17:10 Matrix: water									
Ion Balance Calculation									
TDS (Calculated)	494	-			mg/L	-		20-AUG-14	
Hardness (as CaCO3)	443	-			mg/L	-		20-AUG-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		19-AUG-14	R2923482
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		08-AUG-14	R2912274
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		13-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		08-AUG-14	R2912274
Sulfate by IC									
Sulfate (SO4)	5.13	+/-0.32		0.50	mg/L	0		08-AUG-14	R2912274
pH, Conductivity and Total Alkalinity									
pH	8.50	+/-0.01		0.10	pH	0		10-AUG-14	R2913010
Conductivity (EC)	885	+/-44		0.20	uS/cm	0		10-AUG-14	R2913010
Bicarbonate (HCO3)	572	+/-22		5.0	mg/L	0		10-AUG-14	R2913010
Carbonate (CO3)	18.3	+/-3.6		5.0	mg/L	0		10-AUG-14	R2913010
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		10-AUG-14	R2913010
Alkalinity, Total (as CaCO3)	499	+/-31		2.0	mg/L	0		10-AUG-14	R2913010
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	15.0	-		0.11	mg/L	-		20-AUG-14	
L1497659-4 16053140805025 Sampled By: CLIENT on 05-AUG-14 @ 18:27 Matrix: water									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-	07-AUG-14	07-AUG-14	R2908669
Toluene	<0.00050	-		0.00050	mg/L	-	07-AUG-14	07-AUG-14	R2908669
EthylBenzene	<0.00050	-		0.00050	mg/L	-	07-AUG-14	07-AUG-14	R2908669
o-Xylene	<0.00050	-		0.00050	mg/L	-	07-AUG-14	07-AUG-14	R2908669
m+p-Xylene	<0.00050	-		0.00050	mg/L	-	07-AUG-14	07-AUG-14	R2908669
Styrene	<0.0010	-		0.0010	mg/L	-	07-AUG-14	07-AUG-14	R2908669
F1(C6-C10)	<0.10	-		0.10	mg/L	-	07-AUG-14	07-AUG-14	R2908669
F1-BTEX	<0.10	-		0.10	mg/L	-	07-AUG-14	07-AUG-14	R2908669
Xylenes	<0.00071	-		0.00071	mg/L	-	07-AUG-14	07-AUG-14	R2908669
Surr:	1,4-Difluorobenzene (SS)	102.0	-	N/A	%	-	07-AUG-14	07-AUG-14	R2908669
Surr:	4-Bromofluorobenzene (SS)	101.0	-	N/A	%	-	07-AUG-14	07-AUG-14	R2908669
Surr:	3,4-Dichlorotoluene (SS)	94.0	-	N/A	%	-	07-AUG-14	07-AUG-14	R2908669
* Refer to Referenced Information for Qualifiers (if any) and Methodology.									

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Nitrate (as N)	MS-B	
Matrix Spike	Sulfate (SO4)	MS-B	

Sample Parameter Qualifier Key:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
BTXS,F1-ED	Water	BTEX, Styrene and F1 (C6-C10)		EPA 5021/8015&8260 GC-MS & FID
C-DIS-ORG-ED	Water	Dissolved Organic Carbon		APHA 5310 B-Instrumental
CL-IC-ED	Water	Chloride by IC		APHA 4110 B-ION CHROMATOGRAPHY
F2,F3,F4-ED	Water	F2, F3, F4		EPA 3510/CCME PHC CWS-GC-FID
HG-D-L-CVAA-ED	Water	Mercury (Hg) - Dissolved		EPA 245.7 / EPA 245.1
HG-T-L-CVAA-ED	Water	Mercury (Hg)		EPA 245.7 / EPA 245.1
IB-BART-PB	Water	Iron Bacteria		BART Test Kit
BART Test Kit Analysis performed at PBR Laboratories Inc., Edmonton.				
IONBALANCE-ED	Water	Ion Balance Calculation		APHA 1030E
MET-D-CCMS-ED	Water	Dissolved Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
NAPHTHENIC-ACID-FM	Water	Naphthenic Acids by FTIR		Naphthenic Acids by FTIR, Syncrude, 1994
Dissolved naphthenic acids are solvent extracted from acidified aqueous samples using Dichloromethane prior to quantitation by Fourier Transform Infra-Red spectroscopy. Note that FTIR is not uniquely selective to naphthenic acids. If present, other carboxylic acids (e.g. humic acids, fulvic acids) may also be detected by this method.				
NH3-CFA-ED	Water	Ammonia in Water by Colour		APHA 4500 NH3-NITROGEN (AMMONIA)
This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.				
NO2+NO3-CALC-ED	Water	Nitrate+Nitrite		CALCULATION
NO2-IC-ED	Water	Nitrite as N by IC		APHA 4110 B-ION CHROMATOGRAPHY
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
NO3-IC-ED	Water	Nitrate as N by IC		APHA 4110 B-ION CHROMATOGRAPHY
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
PAH-ABT1-CL	Water	PAH & Carcinogenic PAH List		EPA 3510/8270-GC/MS
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity		APHA 4500-H, 2510, 2320
All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)				
PHENOLS-4AAP-ED	Water	Phenols (4AAP)		AB ENV.06537-COLORIMETRIC
This analysis is carried out using procedures adapted from ENVIRODAT VMV 06537 689, Method Code 154, in "Methods Manual for Chemical Analysis of Water and Wastes" published by the Alberta Environmental Centre. This automated method is based on the distillation of phenol and subsequent reaction of the distillate with alkaline ferricyanide and 4-aminoantipyrine to form a red complex which is measured at 505 nm.				
SIO2-D-CALC-ED	Water	Dissolved Silicon (reported as Silica)		CALCULATION
SIO2-T-CALC-ED	Water	Total Silicon (reported as Silica)		CALCULATION

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
SO4-IC-ED	Water	Sulfate by IC		APHA 4110 B-ION CHROMATOGRAPHY
SOLIDS-TDS-ED	Water	Total Dissolved Solids		APHA 2540 C
SRB-BART-PB	Water	Sulphate Reducing Bacteria / BART method		BART TEST KIT
BART Test Kit				
TURBIDITY-ED	Water	Turbidity		APHA 2130 B-Nephelometer

** The indicated Method Reference is the closest nationally or internationally recognized reference for the applicable ALS test method. ALS methods may incorporate modifications from the specified reference to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
PB	PBR LABORATORIES
FM	ALS ENVIRONMENTAL - FORT MCMURRAY, ALBERTA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

M076070

GLOSSARY OF REPORT TERMS

Surr - Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

MU: Measurement Uncertainty. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 which gives a level of confidence of approximately 95%.

Bias: The reported method bias is the average long term deviation from the target value for a long term reference or control sample, measured in percent. Zero values indicate no detectable method bias.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 1 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R2908669							
WG1926445-2	LCS							
Benzene			77.6		%		70-130	07-AUG-14
Toluene			70.1		%		70-130	07-AUG-14
EthylBenzene			73.2		%		70-130	07-AUG-14
o-Xylene			76.1		%		70-130	07-AUG-14
m+p-Xylene			75.7		%		70-130	07-AUG-14
Styrene			74.2		%		70-130	07-AUG-14
WG1926445-3	LCS							
F1(C6-C10)			107.0		%		70-130	07-AUG-14
WG1926445-6	LCS							
Benzene			94.5		%		70-130	08-AUG-14
Toluene			88.4		%		70-130	08-AUG-14
EthylBenzene			92.4		%		70-130	08-AUG-14
o-Xylene			95.1		%		70-130	08-AUG-14
m+p-Xylene			96.0		%		70-130	08-AUG-14
Styrene			93.0		%		70-130	08-AUG-14
WG1926445-7	LCS							
F1(C6-C10)			111.2		%		70-130	08-AUG-14
WG1926445-1	MB							
Benzene			<0.00050		mg/L		0.0005	07-AUG-14
Toluene			<0.00050		mg/L		0.0005	07-AUG-14
EthylBenzene			<0.00050		mg/L		0.0005	07-AUG-14
o-Xylene			<0.00050		mg/L		0.0005	07-AUG-14
m+p-Xylene			<0.00050		mg/L		0.0005	07-AUG-14
Styrene			<0.0010		mg/L		0.001	07-AUG-14
F1(C6-C10)			<0.10		mg/L		0.1	07-AUG-14
Surrogate: 1,4-Difluorobenzene (SS)			103.0		%		70-130	07-AUG-14
Surrogate: 4-Bromofluorobenzene (SS)			101.0		%		70-130	07-AUG-14
Surrogate: 3,4-Dichlorotoluene (SS)			93.0		%		70-130	07-AUG-14
WG1926445-5	MB							
Benzene			<0.00050		mg/L		0.0005	08-AUG-14
Toluene			<0.00050		mg/L		0.0005	08-AUG-14
EthylBenzene			<0.00050		mg/L		0.0005	08-AUG-14
o-Xylene			<0.00050		mg/L		0.0005	08-AUG-14
m+p-Xylene			<0.00050		mg/L		0.0005	08-AUG-14
							0.001	



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 2 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R2908669							
WG1926445-5	MB							
Styrene			<0.0010		mg/L		0.001	08-AUG-14
F1(C6-C10)			<0.10		mg/L		0.1	08-AUG-14
Surrogate: 1,4-Difluorobenzene (SS)			99.0		%		70-130	08-AUG-14
Surrogate: 4-Bromofluorobenzene (SS)			93.0		%		70-130	08-AUG-14
Surrogate: 3,4-Dichlorotoluene (SS)			96.0		%		70-130	08-AUG-14
C-DIS-ORG-ED		Water						
Batch	R2922966							
WG1933766-3	CVS							
Dissolved Organic Carbon			112.7		%		80-160	19-AUG-14
WG1933766-6	DUP	L1503303-5						
Dissolved Organic Carbon		7.6	7.0		mg/L	8.3	20	19-AUG-14
WG1933766-2	LCS							
Dissolved Organic Carbon			90.8		%		80-120	19-AUG-14
WG1933766-1	MB							
Dissolved Organic Carbon			<1.0		mg/L		1	19-AUG-14
WG1933766-7	MS	L1503303-5						
Dissolved Organic Carbon			95.6		%		70-130	19-AUG-14
CL-IC-ED		Water						
Batch	R2912274							
WG1926502-3	DUP	L1498061-9						
Chloride (Cl)		88.7	88.9		mg/L	0.3	20	08-AUG-14
WG1926502-5	DUP	L1498878-7						
Chloride (Cl)		<0.50	<0.50	RPD-NA	mg/L	N/A	20	08-AUG-14
WG1926502-11	LCS							
Chloride (Cl)			100.7		%		90-110	08-AUG-14
WG1926502-13	LCS							
Chloride (Cl)			101.6		%		90-110	08-AUG-14
WG1926502-15	LCS							
Chloride (Cl)			102.4		%		90-110	08-AUG-14
WG1926502-17	LCS							
Chloride (Cl)			102.4		%		90-110	08-AUG-14
WG1926502-2	LCS							
Chloride (Cl)			101.1		%		90-110	08-AUG-14
WG1926502-9	LCS							
Chloride (Cl)			101.7		%		90-110	08-AUG-14
WG1926502-1	MB							



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 3 of 34

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-ED		Water						
Batch	R2912274							
WG1926502-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	08-AUG-14
WG1926502-10	MB							
Chloride (Cl)			<0.50		mg/L		0.5	08-AUG-14
WG1926502-12	MB							
Chloride (Cl)			<0.50		mg/L		0.5	08-AUG-14
WG1926502-14	MB							
Chloride (Cl)			<0.50		mg/L		0.5	08-AUG-14
WG1926502-16	MB							
Chloride (Cl)			<0.50		mg/L		0.5	08-AUG-14
WG1926502-18	MB							
Chloride (Cl)			<0.50		mg/L		0.5	08-AUG-14
WG1926502-4	MS	L1498061-9						
Chloride (Cl)			92.7		%		75-125	08-AUG-14
WG1926502-6	MS	L1498878-7						
Chloride (Cl)			102.2		%		75-125	08-AUG-14
F2,F3,F4-ED		Water						
Batch	R2912766							
WG1925826-2	LCS							
F2 (>C10-C16)			100.4		%		65-135	08-AUG-14
F3 (C16-C34)			99.3		%		65-135	08-AUG-14
F4 (C34-C50)			94.3		%		65-135	08-AUG-14
WG1925826-5	LCS							
F2 (>C10-C16)			102.6		%		65-135	08-AUG-14
F3 (C16-C34)			102.7		%		65-135	08-AUG-14
F4 (C34-C50)			96.3		%		65-135	08-AUG-14
WG1925826-1	MB							
F2 (>C10-C16)			<0.25		mg/L		0.25	08-AUG-14
F3 (C16-C34)			<0.25		mg/L		0.25	08-AUG-14
F4 (C34-C50)			<0.25		mg/L		0.25	08-AUG-14
Surrogate: 2-Bromobenzotrifluoride			99.3		%		50-150	08-AUG-14
WG1925826-4	MB							
F2 (>C10-C16)			<0.25		mg/L		0.25	08-AUG-14
F3 (C16-C34)			<0.25		mg/L		0.25	08-AUG-14
F4 (C34-C50)			<0.25		mg/L		0.25	08-AUG-14
Surrogate: 2-Bromobenzotrifluoride			101.4		%		50-150	08-AUG-14
WG1925826-3	MS	L1496774-1						



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 4 of 34

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F2,F3,F4-ED								
	Water							
Batch	R2912766							
WG1925826-3 MS		L1496774-1						
F2 (>C10-C16)			95.3		%		50-150	08-AUG-14
F3 (C16-C34)			95.2		%		50-150	08-AUG-14
F4 (C34-C50)			92.4		%		50-150	08-AUG-14
HG-D-L-CVAA-ED								
	Water							
Batch	R2923482							
WG1933778-3 DUP		L1496774-1						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	19-AUG-14
WG1933778-7 DUP		L1499730-1						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	19-AUG-14
WG1933778-2 LCS								
Mercury (Hg)-Dissolved			92.7		%		80-120	19-AUG-14
WG1933778-6 LCS								
Mercury (Hg)-Dissolved			88.0		%		80-120	19-AUG-14
WG1933778-1 MB								
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	19-AUG-14
WG1933778-5 MB								
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	19-AUG-14
WG1933778-4 MS		L1496774-1						
Mercury (Hg)-Dissolved			77.0		%		70-130	19-AUG-14
WG1933778-8 MS		L1499730-1						
Mercury (Hg)-Dissolved			95.6		%		70-130	19-AUG-14
HG-T-L-CVAA-ED								
	Water							
Batch	R2923482							
WG1933780-12 DUP		L1500733-20						
Mercury (Hg)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	19-AUG-14
WG1933780-3 DUP		L1496849-1						
Mercury (Hg)-Total		<0.020	<0.0000050	RPD-NA	mg/L	N/A	20	19-AUG-14
WG1933780-7 DUP		L1500733-1						
Mercury (Hg)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	19-AUG-14
WG1933780-10 LCS								
Mercury (Hg)-Total			87.1		%		80-120	19-AUG-14
WG1933780-2 LCS								
Mercury (Hg)-Total			101.1		%		80-120	19-AUG-14
WG1933780-6 LCS								
Mercury (Hg)-Total			103.2		%		80-120	20-AUG-14
WG1933780-1 MB								
							0.000005	



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 5 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-L-CVAA-ED		Water						
Batch	R2923482							
WG1933780-1 MB								
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	19-AUG-14
WG1933780-5 MB								
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	19-AUG-14
WG1933780-9 MB								
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	19-AUG-14
WG1933780-11 MS		L1500733-20						
Mercury (Hg)-Total			92.7		%		70-130	19-AUG-14
WG1933780-4 MS		L1496849-1						
Mercury (Hg)-Total			97.0		%		70-130	19-AUG-14
WG1933780-8 MS		L1500733-1						
Mercury (Hg)-Total			86.6		%		70-130	19-AUG-14
MET-D-CCMS-ED		Water						
Batch	R2923365							
WG1933789-11 CRM		ED-HIGH-WATRM						
Aluminum (Al)-Dissolved			101.1		%		80-120	20-AUG-14
Antimony (Sb)-Dissolved			99.6		%		80-120	20-AUG-14
Arsenic (As)-Dissolved			97.9		%		80-120	20-AUG-14
Barium (Ba)-Dissolved			102.4		%		80-120	20-AUG-14
Boron (B)-Dissolved			83.8		%		80-120	20-AUG-14
Cadmium (Cd)-Dissolved			101.7		%		80-120	20-AUG-14
Calcium (Ca)-Dissolved			98.3		%		80-120	20-AUG-14
Chromium (Cr)-Dissolved			98.6		%		80-120	20-AUG-14
Copper (Cu)-Dissolved			98.1		%		80-120	20-AUG-14
Lead (Pb)-Dissolved			102.1		%		80-120	20-AUG-14
Magnesium (Mg)-Dissolved			101.2		%		80-120	20-AUG-14
Manganese (Mn)-Dissolved			97.0		%		80-120	20-AUG-14
Nickel (Ni)-Dissolved			98.3		%		80-120	20-AUG-14
Potassium (K)-Dissolved			99.5		%		80-120	20-AUG-14
Selenium (Se)-Dissolved			101.8		%		80-120	20-AUG-14
Silicon (Si)-Dissolved			103.7		%		80-120	20-AUG-14
Silver (Ag)-Dissolved			101.6		%		80-120	20-AUG-14
Sodium (Na)-Dissolved			102.2		%		80-120	20-AUG-14
Uranium (U)-Dissolved			103.6		%		80-120	20-AUG-14
Zinc (Zn)-Dissolved			97.7		%		80-120	20-AUG-14
WG1933789-14 CRM		ED-HIGH-WATRM						



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 6 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2923365							
WG1933789-14 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			99.0		%		80-120	20-AUG-14
Antimony (Sb)-Dissolved			98.8		%		80-120	20-AUG-14
Arsenic (As)-Dissolved			97.7		%		80-120	20-AUG-14
Barium (Ba)-Dissolved			100.6		%		80-120	20-AUG-14
Boron (B)-Dissolved			81.6		%		80-120	20-AUG-14
Cadmium (Cd)-Dissolved			102.0		%		80-120	20-AUG-14
Calcium (Ca)-Dissolved			94.0		%		80-120	20-AUG-14
Chromium (Cr)-Dissolved			100.3		%		80-120	20-AUG-14
Copper (Cu)-Dissolved			98.9		%		80-120	20-AUG-14
Lead (Pb)-Dissolved			103.1		%		80-120	20-AUG-14
Magnesium (Mg)-Dissolved			104.9		%		80-120	20-AUG-14
Manganese (Mn)-Dissolved			97.7		%		80-120	20-AUG-14
Nickel (Ni)-Dissolved			98.8		%		80-120	20-AUG-14
Potassium (K)-Dissolved			99.6		%		80-120	20-AUG-14
Selenium (Se)-Dissolved			103.2		%		80-120	20-AUG-14
Silicon (Si)-Dissolved			105.4		%		80-120	20-AUG-14
Silver (Ag)-Dissolved			98.1		%		80-120	20-AUG-14
Sodium (Na)-Dissolved			100.7		%		80-120	20-AUG-14
Uranium (U)-Dissolved			107.9		%		80-120	20-AUG-14
Zinc (Zn)-Dissolved			100.8		%		80-120	20-AUG-14
WG1933789-2 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			96.7		%		80-120	19-AUG-14
Antimony (Sb)-Dissolved			95.1		%		80-120	19-AUG-14
Arsenic (As)-Dissolved			94.4		%		80-120	19-AUG-14
Barium (Ba)-Dissolved			97.9		%		80-120	19-AUG-14
Boron (B)-Dissolved			83.2		%		80-120	20-AUG-14
Cadmium (Cd)-Dissolved			104.6		%		80-120	19-AUG-14
Calcium (Ca)-Dissolved			91.3		%		80-120	19-AUG-14
Chromium (Cr)-Dissolved			96.1		%		80-120	19-AUG-14
Copper (Cu)-Dissolved			93.0		%		80-120	19-AUG-14
Lead (Pb)-Dissolved			99.9		%		80-120	19-AUG-14
Magnesium (Mg)-Dissolved			97.1		%		80-120	19-AUG-14
Manganese (Mn)-Dissolved			96.8		%		80-120	19-AUG-14
Nickel (Ni)-Dissolved			95.1		%		80-120	19-AUG-14



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 7 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2923365							
WG1933789-2 CRM	ED-HIGH-WATRM							
Potassium (K)-Dissolved			99.0		%		80-120	19-AUG-14
Selenium (Se)-Dissolved			99.6		%		80-120	19-AUG-14
Silicon (Si)-Dissolved			97.6		%		80-120	19-AUG-14
Silver (Ag)-Dissolved			96.8		%		80-120	19-AUG-14
Sodium (Na)-Dissolved			102.9		%		80-120	19-AUG-14
Uranium (U)-Dissolved			105.4		%		80-120	19-AUG-14
Zinc (Zn)-Dissolved			96.5		%		80-120	19-AUG-14
WG1933789-8 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			96.8		%		80-120	20-AUG-14
Antimony (Sb)-Dissolved			98.7		%		80-120	20-AUG-14
Arsenic (As)-Dissolved			98.0		%		80-120	20-AUG-14
Barium (Ba)-Dissolved			101.3		%		80-120	20-AUG-14
Boron (B)-Dissolved			83.2		%		80-120	20-AUG-14
Cadmium (Cd)-Dissolved			102.8		%		80-120	20-AUG-14
Calcium (Ca)-Dissolved			99.2		%		80-120	20-AUG-14
Chromium (Cr)-Dissolved			98.5		%		80-120	20-AUG-14
Copper (Cu)-Dissolved			98.7		%		80-120	20-AUG-14
Lead (Pb)-Dissolved			102.6		%		80-120	20-AUG-14
Magnesium (Mg)-Dissolved			103.7		%		80-120	20-AUG-14
Manganese (Mn)-Dissolved			97.4		%		80-120	20-AUG-14
Nickel (Ni)-Dissolved			100.1		%		80-120	20-AUG-14
Potassium (K)-Dissolved			96.5		%		80-120	20-AUG-14
Selenium (Se)-Dissolved			101.2		%		80-120	20-AUG-14
Silicon (Si)-Dissolved			104.2		%		80-120	20-AUG-14
Silver (Ag)-Dissolved			101.6		%		80-120	20-AUG-14
Sodium (Na)-Dissolved			98.8		%		80-120	20-AUG-14
Uranium (U)-Dissolved			108.0		%		80-120	20-AUG-14
Zinc (Zn)-Dissolved			98.6		%		80-120	20-AUG-14
WG1933789-12 DUP	L1501257-1							
Aluminum (Al)-Dissolved		0.0026	0.0023		mg/L	9.5	20	20-AUG-14
Antimony (Sb)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	20-AUG-14
Arsenic (As)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	20-AUG-14
Barium (Ba)-Dissolved		0.0190	0.0194		mg/L	2.4	20	20-AUG-14
Boron (B)-Dissolved		3.05	3.02		mg/L	1.2	20	20-AUG-14



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 8 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2923365							
WG1933789-12	DUP	L1501257-1						
Cadmium (Cd)-Dissolved		0.000049	0.000054		mg/L	10	20	20-AUG-14
Calcium (Ca)-Dissolved		210	204		mg/L	3.2	20	20-AUG-14
Chromium (Cr)-Dissolved		<0.00020	0.00022	RPD-NA	mg/L	N/A	20	20-AUG-14
Copper (Cu)-Dissolved		0.00120	0.00121		mg/L	0.4	20	20-AUG-14
Iron (Fe)-Dissolved		<0.020	<0.020	RPD-NA	mg/L	N/A	20	20-AUG-14
Lead (Pb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	20-AUG-14
Magnesium (Mg)-Dissolved		73.2	75.2		mg/L	2.7	20	20-AUG-14
Manganese (Mn)-Dissolved		0.00047	0.00049		mg/L	3.6	20	20-AUG-14
Nickel (Ni)-Dissolved		0.00135	0.00131		mg/L	3.1	20	20-AUG-14
Potassium (K)-Dissolved		3.39	3.43		mg/L	1.1	20	20-AUG-14
Selenium (Se)-Dissolved		0.00183	0.00190		mg/L	3.7	20	20-AUG-14
Silicon (Si)-Dissolved		4.30	4.19		mg/L	2.7	20	20-AUG-14
Silver (Ag)-Dissolved		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	20-AUG-14
Sodium (Na)-Dissolved		71.6	72.4		mg/L	1.1	20	20-AUG-14
Uranium (U)-Dissolved		0.00222	0.00219		mg/L	1.4	20	20-AUG-14
Zinc (Zn)-Dissolved		0.0087	0.0082		mg/L	6.3	20	20-AUG-14
WG1933789-15	DUP	L1496864-1						
Aluminum (Al)-Dissolved		0.0084	0.0084		mg/L	0.1	20	20-AUG-14
Antimony (Sb)-Dissolved		0.00028	0.00028		mg/L	2.3	20	20-AUG-14
Arsenic (As)-Dissolved		0.00014	0.00015		mg/L	1.8	20	20-AUG-14
Barium (Ba)-Dissolved		0.0470	0.0474		mg/L	0.8	20	20-AUG-14
Boron (B)-Dissolved		0.302	0.299		mg/L	0.8	20	20-AUG-14
Cadmium (Cd)-Dissolved		0.000022	0.000018		mg/L	17	20	20-AUG-14
Calcium (Ca)-Dissolved		121	120		mg/L	1.0	20	20-AUG-14
Chromium (Cr)-Dissolved		0.00018	0.00018		mg/L	3.3	20	20-AUG-14
Copper (Cu)-Dissolved		0.00092	0.00091		mg/L	1.4	20	20-AUG-14
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	20-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	20-AUG-14
Magnesium (Mg)-Dissolved		37.0	37.3		mg/L	0.8	20	20-AUG-14
Manganese (Mn)-Dissolved		0.0387	0.0386		mg/L	0.2	20	20-AUG-14
Nickel (Ni)-Dissolved		0.0237	0.0242		mg/L	1.7	20	20-AUG-14
Potassium (K)-Dissolved		11.9	11.7		mg/L	1.2	20	20-AUG-14
Selenium (Se)-Dissolved		0.00011	0.00011		mg/L	4.8	20	20-AUG-14



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 9 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2923365							
WG1933789-15 DUP		L1496864-1						
Silicon (Si)-Dissolved		3.32	3.28		mg/L	1.1	20	20-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	20-AUG-14
Sodium (Na)-Dissolved		74.6	74.0		mg/L	0.8	20	20-AUG-14
Uranium (U)-Dissolved		0.00306	0.00313		mg/L	2.2	20	20-AUG-14
Zinc (Zn)-Dissolved		0.0049	0.0043		mg/L	12	20	20-AUG-14
WG1933789-3 DUP		L1491927-2						
Aluminum (Al)-Dissolved		0.0070	0.0067		mg/L	4.1	20	20-AUG-14
Antimony (Sb)-Dissolved		0.00517	0.00517		mg/L	0.0	20	20-AUG-14
Arsenic (As)-Dissolved		0.0535	0.0524		mg/L	1.9	20	20-AUG-14
Barium (Ba)-Dissolved		0.0109	0.0112		mg/L	2.6	20	20-AUG-14
Boron (B)-Dissolved		0.043	0.043		mg/L	0.7	20	20-AUG-14
Cadmium (Cd)-Dissolved		0.000041	0.000038		mg/L	9.0	20	20-AUG-14
Calcium (Ca)-Dissolved		44.0	43.2		mg/L	2.0	20	20-AUG-14
Chromium (Cr)-Dissolved		0.00011	<0.00010	RPD-NA	mg/L	N/A	20	20-AUG-14
Copper (Cu)-Dissolved		0.00522	0.00521		mg/L	0.0	20	20-AUG-14
Iron (Fe)-Dissolved		0.013	0.013		mg/L	1.5	20	20-AUG-14
Lead (Pb)-Dissolved		0.000082	0.000085		mg/L	4.3	20	20-AUG-14
Magnesium (Mg)-Dissolved		9.05	9.10		mg/L	0.6	20	20-AUG-14
Manganese (Mn)-Dissolved		0.0216	0.0213		mg/L	1.1	20	20-AUG-14
Nickel (Ni)-Dissolved		0.00116	0.00106		mg/L	9.1	20	20-AUG-14
Potassium (K)-Dissolved		2.75	2.66		mg/L	3.4	20	20-AUG-14
Selenium (Se)-Dissolved		0.00039	0.00041		mg/L	4.4	20	20-AUG-14
Silicon (Si)-Dissolved		2.66	2.63		mg/L	0.9	20	20-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	20-AUG-14
Sodium (Na)-Dissolved		17.3	17.2		mg/L	1.0	20	20-AUG-14
Uranium (U)-Dissolved		0.0218	0.0220		mg/L	1.0	20	20-AUG-14
Zinc (Zn)-Dissolved		0.109	0.104		mg/L	3.8	20	20-AUG-14
WG1933789-6 DUP		L1496870-5						
Aluminum (Al)-Dissolved		0.0174	0.0162		mg/L	7.0	20	20-AUG-14
Antimony (Sb)-Dissolved		0.00053	0.00054		mg/L	1.2	20	20-AUG-14
Arsenic (As)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	20-AUG-14
Barium (Ba)-Dissolved		0.0773	0.0788		mg/L	1.9	20	20-AUG-14
Boron (B)-Dissolved		0.968	0.966		mg/L	0.2	20	20-AUG-14



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 10 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2923365							
WG1933789-6	DUP	L1496870-5						
Cadmium (Cd)-Dissolved		0.000085	0.000072		mg/L	17	20	20-AUG-14
Calcium (Ca)-Dissolved		227	221		mg/L	2.6	20	20-AUG-14
Chromium (Cr)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	20-AUG-14
Copper (Cu)-Dissolved		0.00079	0.00079		mg/L	0.1	20	20-AUG-14
Iron (Fe)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	20-AUG-14
Lead (Pb)-Dissolved		<0.00025	<0.00025	RPD-NA	mg/L	N/A	20	20-AUG-14
Magnesium (Mg)-Dissolved		125	126		mg/L	0.6	20	20-AUG-14
Manganese (Mn)-Dissolved		0.261	0.267		mg/L	2.6	20	20-AUG-14
Nickel (Ni)-Dissolved		0.120	0.121		mg/L	0.2	20	20-AUG-14
Potassium (K)-Dissolved		33.9	35.0		mg/L	3.3	20	20-AUG-14
Selenium (Se)-Dissolved		0.00055	0.00059		mg/L	5.9	20	20-AUG-14
Silicon (Si)-Dissolved		5.53	5.62		mg/L	1.7	20	20-AUG-14
Silver (Ag)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	20-AUG-14
Sodium (Na)-Dissolved		170	176		mg/L	3.6	20	20-AUG-14
Uranium (U)-Dissolved		0.0130	0.0132		mg/L	1.1	20	20-AUG-14
Zinc (Zn)-Dissolved		0.0071	0.0063		mg/L	12	20	20-AUG-14
WG1933789-9	DUP	L1500399-6						
Aluminum (Al)-Dissolved		0.0030	0.0024	J	mg/L	0.0006	0.002	20-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	20-AUG-14
Arsenic (As)-Dissolved		0.00071	0.00068		mg/L	3.9	20	20-AUG-14
Barium (Ba)-Dissolved		0.0394	0.0389		mg/L	1.3	20	20-AUG-14
Boron (B)-Dissolved		0.024	0.023		mg/L	3.2	20	20-AUG-14
Cadmium (Cd)-Dissolved		0.000017	0.000018		mg/L	7.4	20	20-AUG-14
Calcium (Ca)-Dissolved		25.0	25.9		mg/L	3.4	20	20-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	20-AUG-14
Copper (Cu)-Dissolved		0.00139	0.00136		mg/L	2.5	20	20-AUG-14
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	20-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	20-AUG-14
Magnesium (Mg)-Dissolved		8.15	7.75		mg/L	5.1	20	20-AUG-14
Manganese (Mn)-Dissolved		0.167	0.166		mg/L	1.1	20	20-AUG-14
Nickel (Ni)-Dissolved		0.00130	0.00127		mg/L	2.0	20	20-AUG-14
Potassium (K)-Dissolved		1.06	1.05		mg/L	1.3	20	20-AUG-14
Selenium (Se)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	20-AUG-14



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 11 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2923365							
WG1933789-9 DUP		L1500399-6						
Silicon (Si)-Dissolved		7.07	7.05		mg/L	0.3	20	20-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	20-AUG-14
Sodium (Na)-Dissolved		7.1	6.8		mg/L	3.5	20	20-AUG-14
Uranium (U)-Dissolved		0.000202	0.000197		mg/L	2.5	20	20-AUG-14
Zinc (Zn)-Dissolved		0.0014	0.0014		mg/L	5.8	20	20-AUG-14
WG1933789-1 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	19-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	19-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	19-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	19-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	19-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	19-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	19-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	19-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	19-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	19-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	19-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	19-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	19-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	19-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	19-AUG-14
WG1933789-10 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	19-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	19-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	19-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	19-AUG-14



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 12 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2923365							
WG1933789-10 MB								
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	19-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	19-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	19-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	19-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	19-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	19-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	19-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	19-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	19-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	19-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	19-AUG-14
WG1933789-13 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	19-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	19-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	19-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	19-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	19-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	19-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	19-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	19-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	19-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	19-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	19-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	19-AUG-14



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 13 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2923365							
WG1933789-13 MB								
	Sodium (Na)-Dissolved		<0.050		mg/L		0.05	19-AUG-14
	Uranium (U)-Dissolved		<0.000010		mg/L		0.00001	19-AUG-14
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	19-AUG-14
WG1933789-4 MB								
	Aluminum (Al)-Dissolved		<0.0010		mg/L		0.001	19-AUG-14
	Antimony (Sb)-Dissolved		<0.00010		mg/L		0.0001	19-AUG-14
	Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	19-AUG-14
	Barium (Ba)-Dissolved		<0.000050		mg/L		0.00005	19-AUG-14
	Boron (B)-Dissolved		<0.010		mg/L		0.01	19-AUG-14
	Cadmium (Cd)-Dissolved		<0.000010		mg/L		0.00001	19-AUG-14
	Calcium (Ca)-Dissolved		<0.020		mg/L		0.02	19-AUG-14
	Chromium (Cr)-Dissolved		<0.00010		mg/L		0.0001	19-AUG-14
	Copper (Cu)-Dissolved		<0.00010		mg/L		0.0001	19-AUG-14
	Iron (Fe)-Dissolved		<0.010		mg/L		0.01	19-AUG-14
	Lead (Pb)-Dissolved		<0.000050		mg/L		0.00005	19-AUG-14
	Magnesium (Mg)-Dissolved		<0.0050		mg/L		0.005	19-AUG-14
	Manganese (Mn)-Dissolved		<0.000050		mg/L		0.00005	19-AUG-14
	Nickel (Ni)-Dissolved		<0.00010		mg/L		0.0001	19-AUG-14
	Potassium (K)-Dissolved		<0.050		mg/L		0.05	19-AUG-14
	Selenium (Se)-Dissolved		<0.00010		mg/L		0.0001	19-AUG-14
	Silicon (Si)-Dissolved		<0.050		mg/L		0.05	19-AUG-14
	Silver (Ag)-Dissolved		<0.000010		mg/L		0.00001	19-AUG-14
	Sodium (Na)-Dissolved		<0.050		mg/L		0.05	19-AUG-14
	Uranium (U)-Dissolved		<0.000010		mg/L		0.00001	19-AUG-14
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	19-AUG-14
WG1933789-7 MB								
	Aluminum (Al)-Dissolved		<0.0010		mg/L		0.001	19-AUG-14
	Antimony (Sb)-Dissolved		<0.00010		mg/L		0.0001	19-AUG-14
	Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	19-AUG-14
	Barium (Ba)-Dissolved		<0.000050		mg/L		0.00005	19-AUG-14
	Boron (B)-Dissolved		<0.010		mg/L		0.01	19-AUG-14
	Cadmium (Cd)-Dissolved		<0.000010		mg/L		0.00001	19-AUG-14
	Calcium (Ca)-Dissolved		<0.020		mg/L		0.02	19-AUG-14
	Chromium (Cr)-Dissolved		<0.00010		mg/L		0.0001	19-AUG-14



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 14 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch R2923365								
WG1933789-7 MB								
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	19-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	19-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	19-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	19-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	19-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	19-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	19-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	19-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	19-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	19-AUG-14
MET-T-CCMS-ED		Water						
Batch R2912775								
WG1927221-3 DUP		L1498485-18						
Aluminum (Al)-Total		0.193	0.187		mg/L	3.1	20	10-AUG-14
Antimony (Sb)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	10-AUG-14
Arsenic (As)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	10-AUG-14
Barium (Ba)-Total		0.0538	0.0543		mg/L	1.0	20	10-AUG-14
Boron (B)-Total		15.1	16.1		mg/L	6.7	20	10-AUG-14
Cadmium (Cd)-Total		0.00022	0.00022		mg/L	0.0	20	10-AUG-14
Calcium (Ca)-Total		203	207		mg/L	2.1	20	10-AUG-14
Chromium (Cr)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	10-AUG-14
Copper (Cu)-Total		0.0013	0.0012		mg/L	4.7	20	10-AUG-14
Iron (Fe)-Total		0.42	0.41		mg/L	0.5	20	10-AUG-14
Lead (Pb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-AUG-14
Magnesium (Mg)-Total		56.4	58.6		mg/L	3.9	20	10-AUG-14
Manganese (Mn)-Total		1.70	1.75		mg/L	3.3	20	10-AUG-14
Nickel (Ni)-Total		0.0242	0.0251		mg/L	3.4	20	10-AUG-14
Potassium (K)-Total		6.64	6.94		mg/L	4.4	20	10-AUG-14
Selenium (Se)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	10-AUG-14
Silicon (Si)-Total		4.45	4.46		mg/L	0.1	20	10-AUG-14



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 15 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R2912775							
WG1927221-3	DUP	L1498485-18						
Silver (Ag)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-AUG-14
Sodium (Na)-Total		404	418		mg/L	3.3	20	10-AUG-14
Uranium (U)-Total		0.00678	0.00701		mg/L	3.3	20	10-AUG-14
Zinc (Zn)-Total		<0.030	<0.030	RPD-NA	mg/L	N/A	20	10-AUG-14
WG1927221-6	DUP	L1496774-1						
Aluminum (Al)-Total		0.075	0.085		mg/L	12	20	10-AUG-14
Antimony (Sb)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	10-AUG-14
Arsenic (As)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	10-AUG-14
Barium (Ba)-Total		0.542	0.509		mg/L	6.2	20	10-AUG-14
Boron (B)-Total		3.37	3.29		mg/L	2.5	20	10-AUG-14
Cadmium (Cd)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	10-AUG-14
Calcium (Ca)-Total		5.85	5.69		mg/L	2.8	20	10-AUG-14
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	10-AUG-14
Copper (Cu)-Total		0.0102	0.0116		mg/L	13	20	10-AUG-14
Lead (Pb)-Total		0.0128	0.0128		mg/L	0.1	20	10-AUG-14
Magnesium (Mg)-Total		6.17	5.98		mg/L	3.1	20	10-AUG-14
Manganese (Mn)-Total		0.0553	0.0669		mg/L	19	20	10-AUG-14
Nickel (Ni)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	10-AUG-14
Potassium (K)-Total		8.34	8.01		mg/L	3.9	20	10-AUG-14
Selenium (Se)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	10-AUG-14
Silicon (Si)-Total		2.35	2.35		mg/L	0.1	20	10-AUG-14
Silver (Ag)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	10-AUG-14
Sodium (Na)-Total		1440	1400		mg/L	2.7	20	10-AUG-14
Uranium (U)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-AUG-14
Zinc (Zn)-Total		0.063	0.059		mg/L	6.0	20	10-AUG-14
WG1927221-2	LCS							
Aluminum (Al)-Total			103.1		%		80-120	10-AUG-14
Antimony (Sb)-Total			105.2		%		80-120	10-AUG-14
Arsenic (As)-Total			103.6		%		80-120	10-AUG-14
Barium (Ba)-Total			106.1		%		80-120	10-AUG-14
Boron (B)-Total			103.7		%		80-120	10-AUG-14
Cadmium (Cd)-Total			103.6		%		80-120	10-AUG-14
Calcium (Ca)-Total			99.9		%		80-120	10-AUG-14



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 16 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2912775							
WG1927221-2 LCS								
Chromium (Cr)-Total			100.9		%		80-120	10-AUG-14
Copper (Cu)-Total			100.9		%		80-120	10-AUG-14
Iron (Fe)-Total			95.8		%		80-120	10-AUG-14
Lead (Pb)-Total			102.5		%		80-120	10-AUG-14
Magnesium (Mg)-Total			104.7		%		80-120	10-AUG-14
Manganese (Mn)-Total			104.6		%		80-120	10-AUG-14
Nickel (Ni)-Total			103.7		%		80-120	10-AUG-14
Potassium (K)-Total			107.4		%		80-120	10-AUG-14
Selenium (Se)-Total			104.9		%		80-120	10-AUG-14
Silicon (Si)-Total			109.4		%		80-120	10-AUG-14
Silver (Ag)-Total			103.7		%		80-120	10-AUG-14
Sodium (Na)-Total			104.4		%		80-120	10-AUG-14
Uranium (U)-Total			103.9		%		80-120	10-AUG-14
Zinc (Zn)-Total			103.4		%		80-120	10-AUG-14
WG1927221-5 LCS								
Aluminum (Al)-Total			96.7		%		70-130	10-AUG-14
Antimony (Sb)-Total			104.1		%		70-130	10-AUG-14
Arsenic (As)-Total			100.8		%		70-130	10-AUG-14
Barium (Ba)-Total			105.3		%		70-130	10-AUG-14
Boron (B)-Total			103.8		%		70-130	10-AUG-14
Cadmium (Cd)-Total			102.5		%		70-130	10-AUG-14
Calcium (Ca)-Total			99.6		%		70-130	10-AUG-14
Chromium (Cr)-Total			100.9		%		70-130	10-AUG-14
Copper (Cu)-Total			98.8		%		70-130	10-AUG-14
Iron (Fe)-Total			94.3		%		70-130	10-AUG-14
Lead (Pb)-Total			100.7		%		70-130	10-AUG-14
Magnesium (Mg)-Total			101.0		%		70-130	10-AUG-14
Manganese (Mn)-Total			102.8		%		70-130	10-AUG-14
Nickel (Ni)-Total			101.7		%		70-130	10-AUG-14
Potassium (K)-Total			105.0		%		70-130	10-AUG-14
Selenium (Se)-Total			104.8		%		70-130	10-AUG-14
Silicon (Si)-Total			109.0		%		70-130	10-AUG-14
Silver (Ag)-Total			103.3		%		70-130	10-AUG-14
Sodium (Na)-Total			101.2		%		70-130	10-AUG-14



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 17 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2912775							
WG1927221-5 LCS								
Uranium (U)-Total			100.1		%		70-130	10-AUG-14
Zinc (Zn)-Total			100.6		%		70-130	10-AUG-14
WG1927221-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	10-AUG-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Barium (Ba)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Boron (B)-Total			<0.010		mg/L		0.01	10-AUG-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Calcium (Ca)-Total			<0.020		mg/L		0.02	10-AUG-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Copper (Cu)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Iron (Fe)-Total			<0.010		mg/L		0.01	10-AUG-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	10-AUG-14
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Nickel (Ni)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Potassium (K)-Total			<0.050		mg/L		0.05	10-AUG-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Silicon (Si)-Total			<0.050		mg/L		0.05	10-AUG-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Sodium (Na)-Total			<0.050		mg/L		0.05	10-AUG-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	10-AUG-14
WG1927221-4 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	10-AUG-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Barium (Ba)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Boron (B)-Total			<0.010		mg/L		0.01	10-AUG-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Calcium (Ca)-Total			<0.020		mg/L		0.02	10-AUG-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Copper (Cu)-Total			<0.00010		mg/L		0.0001	10-AUG-14



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 18 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch R2912775								
WG1927221-4 MB								
Iron (Fe)-Total			<0.010		mg/L		0.01	10-AUG-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	10-AUG-14
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	10-AUG-14
Nickel (Ni)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Potassium (K)-Total			<0.050		mg/L		0.05	10-AUG-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	10-AUG-14
Silicon (Si)-Total			<0.050		mg/L		0.05	10-AUG-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Sodium (Na)-Total			<0.050		mg/L		0.05	10-AUG-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	10-AUG-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	10-AUG-14
Batch R2915850								
WG1926261-13 DUP		L1497480-10						
Aluminum (Al)-Total		0.037	0.041		mg/L	11	20	12-AUG-14
Antimony (Sb)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	12-AUG-14
Arsenic (As)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	12-AUG-14
Barium (Ba)-Total		0.108	0.110		mg/L	2.0	20	12-AUG-14
Boron (B)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	12-AUG-14
Cadmium (Cd)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	12-AUG-14
Calcium (Ca)-Total		35.0	37.6		mg/L	7.3	20	12-AUG-14
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	12-AUG-14
Copper (Cu)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	12-AUG-14
Iron (Fe)-Total		0.040	0.045		mg/L	12	20	12-AUG-14
Lead (Pb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	12-AUG-14
Magnesium (Mg)-Total		14.7	15.0		mg/L	2.0	20	12-AUG-14
Manganese (Mn)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	12-AUG-14
Nickel (Ni)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	12-AUG-14
Potassium (K)-Total		0.57	0.58		mg/L	2.4	20	12-AUG-14
Selenium (Se)-Total		0.00120	0.00127		mg/L	5.4	20	12-AUG-14
Silicon (Si)-Total		2.81	2.84		mg/L	1.1	20	12-AUG-14
Silver (Ag)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	12-AUG-14
Sodium (Na)-Total		3.5	3.6		mg/L	3.0	20	12-AUG-14



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 19 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2915850							
WG1926261-13 DUP		L1497480-10						
Uranium (U)-Total		0.00045	0.00045		mg/L	0.3	20	12-AUG-14
Zinc (Zn)-Total		0.0413	0.0424		mg/L	2.4	20	12-AUG-14
WG1926261-14 DUP		L1497475-1						
Aluminum (Al)-Total		0.0648	0.0580		mg/L	11	20	12-AUG-14
Antimony (Sb)-Total		0.00046	0.00047		mg/L	3.2	20	12-AUG-14
Arsenic (As)-Total		0.00040	0.00042		mg/L	5.0	20	12-AUG-14
Barium (Ba)-Total		0.0315	0.0310		mg/L	1.6	20	12-AUG-14
Boron (B)-Total		0.056	0.055		mg/L	2.7	20	12-AUG-14
Cadmium (Cd)-Total		0.000013	0.000012		mg/L	11	20	12-AUG-14
Calcium (Ca)-Total		45.5	44.2		mg/L	3.0	20	12-AUG-14
Chromium (Cr)-Total		0.00013	0.00013		mg/L	4.0	20	12-AUG-14
Iron (Fe)-Total		0.090	0.085		mg/L	5.5	20	12-AUG-14
Lead (Pb)-Total		0.000056	0.000054		mg/L	2.8	20	12-AUG-14
Magnesium (Mg)-Total		23.2	23.3		mg/L	0.5	20	12-AUG-14
Manganese (Mn)-Total		0.0278	0.0277		mg/L	0.2	20	12-AUG-14
Nickel (Ni)-Total		0.00200	0.00203		mg/L	1.6	20	12-AUG-14
Potassium (K)-Total		2.49	2.54		mg/L	2.0	20	12-AUG-14
Selenium (Se)-Total		0.00310	0.00312		mg/L	0.6	20	12-AUG-14
Silicon (Si)-Total		2.15	2.20		mg/L	2.5	20	12-AUG-14
Silver (Ag)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	12-AUG-14
Sodium (Na)-Total		327	335		mg/L	2.2	20	12-AUG-14
Uranium (U)-Total		0.00493	0.00498		mg/L	1.0	20	12-AUG-14
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	12-AUG-14
WG1926261-15 DUP		L1496696-2						
Aluminum (Al)-Total		0.0302	0.0277		mg/L	8.4	20	12-AUG-14
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	12-AUG-14
Arsenic (As)-Total		0.00077	0.00080		mg/L	3.3	20	12-AUG-14
Barium (Ba)-Total		0.0824	0.0860		mg/L	4.4	20	12-AUG-14
Boron (B)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	12-AUG-14
Cadmium (Cd)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	12-AUG-14
Calcium (Ca)-Total		62.3	66.5		mg/L	6.4	20	12-AUG-14
Chromium (Cr)-Total		0.00011	0.00011		mg/L	3.7	20	12-AUG-14
Copper (Cu)-Total		0.00036	0.00037		mg/L	0.3	20	12-AUG-14



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 20 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R2915850							
WG1926261-15	DUP	L1496696-2						
Iron (Fe)-Total		0.382	0.392		mg/L	2.5	20	12-AUG-14
Lead (Pb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	12-AUG-14
Magnesium (Mg)-Total		14.3	14.6		mg/L	2.0	20	12-AUG-14
Manganese (Mn)-Total		0.0336	0.0337		mg/L	0.3	20	12-AUG-14
Nickel (Ni)-Total		0.00056	0.00056		mg/L	0.1	20	12-AUG-14
Potassium (K)-Total		0.769	0.787		mg/L	2.4	20	12-AUG-14
Selenium (Se)-Total		0.00011	0.00010		mg/L	6.7	20	12-AUG-14
Silicon (Si)-Total		4.54	4.62		mg/L	1.7	20	12-AUG-14
Silver (Ag)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	12-AUG-14
Sodium (Na)-Total		4.68	4.72		mg/L	0.9	20	12-AUG-14
Uranium (U)-Total		0.000646	0.000667		mg/L	3.1	20	12-AUG-14
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	12-AUG-14
WG1926261-6	LCS							
Aluminum (Al)-Total			102.7		%		70-130	12-AUG-14
Antimony (Sb)-Total			92.9		%		70-130	12-AUG-14
Arsenic (As)-Total			100.4		%		70-130	12-AUG-14
Barium (Ba)-Total			109.5		%		70-130	12-AUG-14
Boron (B)-Total			93.1		%		70-130	12-AUG-14
Cadmium (Cd)-Total			97.4		%		70-130	12-AUG-14
Calcium (Ca)-Total			99.3		%		70-130	12-AUG-14
Chromium (Cr)-Total			100.9		%		70-130	12-AUG-14
Copper (Cu)-Total			98.8		%		70-130	12-AUG-14
Iron (Fe)-Total			100.9		%		70-130	12-AUG-14
Lead (Pb)-Total			100.7		%		70-130	12-AUG-14
Magnesium (Mg)-Total			106.1		%		70-130	12-AUG-14
Manganese (Mn)-Total			99.7		%		70-130	12-AUG-14
Nickel (Ni)-Total			100.2		%		70-130	12-AUG-14
Potassium (K)-Total			101.9		%		70-130	12-AUG-14
Selenium (Se)-Total			101.1		%		70-130	12-AUG-14
Silicon (Si)-Total			101.5		%		70-130	12-AUG-14
Silver (Ag)-Total			100.0		%		70-130	12-AUG-14
Sodium (Na)-Total			101.1		%		70-130	12-AUG-14
Uranium (U)-Total			96.9		%		70-130	12-AUG-14



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 21 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2915850							
WG1926261-6	LCS							
Zinc (Zn)-Total			99.1		%		70-130	12-AUG-14
WG1926261-7	LCS							
Aluminum (Al)-Total			100.0		%		70-130	12-AUG-14
Antimony (Sb)-Total			95.9		%		70-130	12-AUG-14
Arsenic (As)-Total			99.6		%		70-130	12-AUG-14
Barium (Ba)-Total			110.7		%		70-130	12-AUG-14
Boron (B)-Total			92.8		%		70-130	12-AUG-14
Cadmium (Cd)-Total			100.2		%		70-130	12-AUG-14
Calcium (Ca)-Total			98.6		%		70-130	12-AUG-14
Chromium (Cr)-Total			100.8		%		70-130	12-AUG-14
Copper (Cu)-Total			98.0		%		70-130	12-AUG-14
Iron (Fe)-Total			99.4		%		70-130	12-AUG-14
Lead (Pb)-Total			99.5		%		70-130	12-AUG-14
Magnesium (Mg)-Total			105.3		%		70-130	12-AUG-14
Manganese (Mn)-Total			99.9		%		70-130	12-AUG-14
Nickel (Ni)-Total			99.4		%		70-130	12-AUG-14
Potassium (K)-Total			103.1		%		70-130	12-AUG-14
Selenium (Se)-Total			99.3		%		70-130	12-AUG-14
Silicon (Si)-Total			102.6		%		70-130	12-AUG-14
Silver (Ag)-Total			99.7		%		70-130	12-AUG-14
Sodium (Na)-Total			100.6		%		70-130	12-AUG-14
Uranium (U)-Total			96.6		%		70-130	12-AUG-14
Zinc (Zn)-Total			98.7		%		70-130	12-AUG-14
WG1926261-2	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	12-AUG-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	12-AUG-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	12-AUG-14
Barium (Ba)-Total			<0.000050		mg/L		0.00005	12-AUG-14
Boron (B)-Total			<0.010		mg/L		0.01	12-AUG-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	12-AUG-14
Calcium (Ca)-Total			<0.020		mg/L		0.02	12-AUG-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	12-AUG-14
Copper (Cu)-Total			<0.00010		mg/L		0.0001	12-AUG-14
Iron (Fe)-Total			<0.010		mg/L		0.01	12-AUG-14



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 22 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2915850							
WG1926261-2	MB							
Lead (Pb)-Total			<0.000050		mg/L		0.00005	12-AUG-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	12-AUG-14
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	12-AUG-14
Nickel (Ni)-Total			<0.00010		mg/L		0.0001	12-AUG-14
Potassium (K)-Total			<0.050		mg/L		0.05	12-AUG-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	12-AUG-14
Silicon (Si)-Total			<0.050		mg/L		0.05	12-AUG-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	12-AUG-14
Sodium (Na)-Total			<0.050		mg/L		0.05	12-AUG-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	12-AUG-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	12-AUG-14
WG1926261-3	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	12-AUG-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	12-AUG-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	12-AUG-14
Barium (Ba)-Total			<0.000050		mg/L		0.00005	12-AUG-14
Boron (B)-Total			<0.010		mg/L		0.01	12-AUG-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	12-AUG-14
Calcium (Ca)-Total			<0.020		mg/L		0.02	12-AUG-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	12-AUG-14
Copper (Cu)-Total			<0.00010		mg/L		0.0001	12-AUG-14
Iron (Fe)-Total			<0.010		mg/L		0.01	12-AUG-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	12-AUG-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	12-AUG-14
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	12-AUG-14
Nickel (Ni)-Total			<0.00010		mg/L		0.0001	12-AUG-14
Potassium (K)-Total			<0.050		mg/L		0.05	12-AUG-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	12-AUG-14
Silicon (Si)-Total			<0.050		mg/L		0.05	12-AUG-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	12-AUG-14
Sodium (Na)-Total			<0.050		mg/L		0.05	12-AUG-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	12-AUG-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	12-AUG-14
NAPHTHENIC-ACID-FM		Water						



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 23 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NAPHTHENIC-ACID-FM								
	Water							
Batch	R2932711							
WG1932925-3	DUP	L1497659-2						
Naphthenic Acids		5.4	5.6		mg/L	3.5	30	28-AUG-14
WG1932925-7	DUP	L1500399-3						
Naphthenic Acids		<1.0	<1.0	RPD-NA	mg/L	N/A	30	28-AUG-14
WG1932925-4	LCS							
Naphthenic Acids			101.4		%		70-130	28-AUG-14
WG1932925-8	LCS							
Naphthenic Acids			90.9		%		70-130	28-AUG-14
WG1932925-1	MB							
Naphthenic Acids			<1.0		mg/L		1	28-AUG-14
WG1932925-5	MB							
Naphthenic Acids			<1.0		mg/L		1	28-AUG-14
WG1932925-2	MS	L1497659-1						
Naphthenic Acids			107.7		%		50-150	28-AUG-14
WG1932925-6	MS	L1500399-2						
Naphthenic Acids			117.2		%		50-150	28-AUG-14
NH3-CFA-ED								
	Water							
Batch	R2922152							
WG1932793-10	DUP	L1503564-1						
Ammonia, Total (as N)		0.443	0.446		mg/L	0.6	20	18-AUG-14
WG1932793-11	DUP	L1500733-16						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	18-AUG-14
WG1932793-12	DUP	L1500733-27						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	18-AUG-14
WG1932793-5	DUP	L1502397-1						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	18-AUG-14
WG1932793-7	DUP	L1500910-2						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	18-AUG-14
WG1932793-2	LCS							
Ammonia, Total (as N)			98.8		%		85-115	18-AUG-14
WG1932793-1	MB							
Ammonia, Total (as N)			<0.050		mg/L		0.05	18-AUG-14
WG1932793-13	MS	L1500733-35						
Ammonia, Total (as N)			112.4		%		75-125	18-AUG-14
WG1932793-15	MS	L1500231-2						
Ammonia, Total (as N)			107.0		%		75-125	18-AUG-14
WG1932793-8	MS	L1496562-2						
Ammonia, Total (as N)			109.7		%		75-125	18-AUG-14



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 24 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-CFA-ED								
	Water							
Batch	R2922152							
WG1932793-9 MS		L1497751-8						
Ammonia, Total (as N)			108.6		%		75-125	18-AUG-14
NO2-IC-ED								
	Water							
Batch	R2912274							
WG1926502-3 DUP		L1498061-9						
Nitrite (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	08-AUG-14
WG1926502-5 DUP		L1498878-7						
Nitrite (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	08-AUG-14
WG1926502-7 DUP		L1499123-2						
Nitrite (as N)		0.043	0.043		mg/L	0.2	20	08-AUG-14
WG1926502-11 LCS								
Nitrite (as N)			90.3		%		90-110	08-AUG-14
WG1926502-13 LCS								
Nitrite (as N)			92.0		%		90-110	08-AUG-14
WG1926502-15 LCS								
Nitrite (as N)			93.8		%		90-110	08-AUG-14
WG1926502-17 LCS								
Nitrite (as N)			91.2		%		90-110	08-AUG-14
WG1926502-2 LCS								
Nitrite (as N)			93.2		%		90-110	08-AUG-14
WG1926502-9 LCS								
Nitrite (as N)			92.6		%		90-110	08-AUG-14
WG1926502-1 MB								
Nitrite (as N)			<0.020		mg/L		0.02	08-AUG-14
WG1926502-10 MB								
Nitrite (as N)			<0.020		mg/L		0.02	08-AUG-14
WG1926502-12 MB								
Nitrite (as N)			<0.020		mg/L		0.02	08-AUG-14
WG1926502-14 MB								
Nitrite (as N)			<0.020		mg/L		0.02	08-AUG-14
WG1926502-16 MB								
Nitrite (as N)			<0.020		mg/L		0.02	08-AUG-14
WG1926502-18 MB								
Nitrite (as N)			<0.020		mg/L		0.02	08-AUG-14
WG1926502-6 MS		L1498878-7						
Nitrite (as N)			91.5		%		75-125	08-AUG-14
WG1926502-8 MS		L1499123-2						



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 25 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-ED		Water						
Batch	R2912274							
WG1926502-8	MS	L1499123-2						
Nitrite (as N)			82.2		%		75-125	08-AUG-14
NO3-IC-ED		Water						
Batch	R2912274							
WG1926502-3	DUP	L1498061-9						
Nitrate (as N)		0.157	0.161		mg/L	2.3	20	08-AUG-14
WG1926502-5	DUP	L1498878-7						
Nitrate (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	08-AUG-14
WG1926502-7	DUP	L1499123-2						
Nitrate (as N)		9.92	9.87		mg/L	0.5	20	08-AUG-14
WG1926502-11	LCS							
Nitrate (as N)			101.4		%		90-110	08-AUG-14
WG1926502-13	LCS							
Nitrate (as N)			97.8		%		90-110	08-AUG-14
WG1926502-15	LCS							
Nitrate (as N)			103.5		%		90-110	08-AUG-14
WG1926502-17	LCS							
Nitrate (as N)			101.7		%		90-110	08-AUG-14
WG1926502-2	LCS							
Nitrate (as N)			97.8		%		90-110	08-AUG-14
WG1926502-9	LCS							
Nitrate (as N)			103.1		%		90-110	08-AUG-14
WG1926502-1	MB							
Nitrate (as N)			<0.050		mg/L		0.05	08-AUG-14
WG1926502-10	MB							
Nitrate (as N)			<0.050		mg/L		0.05	08-AUG-14
WG1926502-12	MB							
Nitrate (as N)			<0.050		mg/L		0.05	08-AUG-14
WG1926502-14	MB							
Nitrate (as N)			<0.050		mg/L		0.05	08-AUG-14
WG1926502-16	MB							
Nitrate (as N)			<0.050		mg/L		0.05	08-AUG-14
WG1926502-18	MB							
Nitrate (as N)			<0.050		mg/L		0.05	08-AUG-14
WG1926502-4	MS	L1498061-9						
Nitrate (as N)			91.1		%		75-125	08-AUG-14
WG1926502-6	MS	L1498878-7						



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 26 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-ED								
	Water							
Batch	R2912274							
WG1926502-6	MS	L1498878-7						
Nitrate (as N)			99.5		%		75-125	08-AUG-14
WG1926502-8	MS	L1499123-2						
Nitrate (as N)			N/A	MS-B	%		-	08-AUG-14
PAH-ABT1-CL								
	Water							
Batch	R2923280							
WG1934082-2	LCS							
Acenaphthene			85.7		%		60-130	19-AUG-14
Acenaphthylene			94.9		%		60-130	19-AUG-14
Anthracene			97.2		%		60-130	19-AUG-14
Fluoranthene			92.2		%		60-130	19-AUG-14
Fluorene			87.4		%		60-130	19-AUG-14
Naphthalene			85.6		%		50-130	19-AUG-14
Phenanthrene			93.6		%		60-130	19-AUG-14
Pyrene			99.5		%		60-130	19-AUG-14
Benzo(a)anthracene			97.9		%		60-130	19-AUG-14
Benzo(k)fluoranthene			91.4		%		60-130	19-AUG-14
Benzo(b&j)fluoranthene			94.5		%		60-130	19-AUG-14
Benzo(g,h,i)perylene			92.9		%		60-130	19-AUG-14
Benzo(a)pyrene			91.4		%		60-130	19-AUG-14
Chrysene			94.4		%		60-130	19-AUG-14
Dibenzo(a,h)anthracene			93.9		%		60-130	19-AUG-14
Indeno(1,2,3-cd)pyrene			95.5		%		60-130	19-AUG-14
WG1934082-1	MB							
Acenaphthene			<0.000020		mg/L		0.00002	18-AUG-14
Acenaphthylene			<0.000020		mg/L		0.00002	18-AUG-14
Anthracene			<0.000010		mg/L		0.00001	18-AUG-14
Fluoranthene			<0.000020		mg/L		0.00002	18-AUG-14
Fluorene			<0.000020		mg/L		0.00002	18-AUG-14
Naphthalene			<0.000050		mg/L		0.00005	18-AUG-14
Phenanthrene			<0.000050		mg/L		0.00005	18-AUG-14
Pyrene			<0.000010		mg/L		0.00001	18-AUG-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	18-AUG-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	18-AUG-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	18-AUG-14



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 27 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch R2923280								
WG1934082-1 MB								
	Benzo(g,h,i)perylene		<0.000020		mg/L		0.00002	18-AUG-14
	Benzo(a)pyrene		<0.000005C		mg/L		0.000005	18-AUG-14
	Chrysene		<0.000020		mg/L		0.00002	18-AUG-14
	Dibenzo(a,h)anthracene		<0.000005C		mg/L		0.000005	18-AUG-14
	Indeno(1,2,3-cd)pyrene		<0.000010		mg/L		0.00001	18-AUG-14
	Surrogate: d10-Acenaphthene		75.6		%		60-130	18-AUG-14
	Surrogate: d10-Phenanthrene		84.2		%		60-130	18-AUG-14
	Surrogate: d12-Chrysene		92.5		%		60-130	18-AUG-14
WG1934082-3 MB								
	Acenaphthene		<0.000020		mg/L		0.00002	19-AUG-14
	Acenaphthylene		<0.000020		mg/L		0.00002	19-AUG-14
	Anthracene		<0.000010		mg/L		0.00001	19-AUG-14
	Fluoranthene		<0.000020		mg/L		0.00002	19-AUG-14
	Fluorene		<0.000020		mg/L		0.00002	19-AUG-14
	Naphthalene		<0.000050		mg/L		0.00005	19-AUG-14
	Phenanthrene		<0.000050		mg/L		0.00005	19-AUG-14
	Pyrene		<0.000010		mg/L		0.00001	19-AUG-14
	Benzo(a)anthracene		<0.000010		mg/L		0.00001	19-AUG-14
	Benzo(k)fluoranthene		<0.000010		mg/L		0.00001	19-AUG-14
	Benzo(b&j)fluoranthene		<0.000010		mg/L		0.00001	19-AUG-14
	Benzo(g,h,i)perylene		<0.000020		mg/L		0.00002	19-AUG-14
	Benzo(a)pyrene		<0.000005C		mg/L		0.000005	19-AUG-14
	Chrysene		<0.000020		mg/L		0.00002	19-AUG-14
	Dibenzo(a,h)anthracene		<0.000005C		mg/L		0.000005	19-AUG-14
	Indeno(1,2,3-cd)pyrene		<0.000010		mg/L		0.00001	19-AUG-14
	Surrogate: d10-Acenaphthene		92.6		%		60-130	19-AUG-14
	Surrogate: d10-Phenanthrene		96.0		%		60-130	19-AUG-14
	Surrogate: d12-Chrysene		95.8		%		60-130	19-AUG-14
PH/EC/ALK-ED		Water						
Batch R2913010								
WG1927525-10 DUP		L1498878-7						
	pH	5.42	5.44	J	pH	0.02	0.3	10-AUG-14
	Conductivity (EC)	0.76	0.73		uS/cm	4.0	10	10-AUG-14
	Bicarbonate (HCO3)	<5.0	<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 28 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R2913010							
WG1927525-10	DUP	L1498878-7						
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14
Alkalinity, Total (as CaCO3)		<2.0	<2.0	RPD-NA	mg/L	N/A	20	10-AUG-14
WG1927525-6	DUP	L1499294-1						
pH		8.20	8.27	J	pH	0.07	0.3	09-AUG-14
Conductivity (EC)		2720	2680		uS/cm	1.5	10	09-AUG-14
Bicarbonate (HCO3)		869	868		mg/L	0.1	25	09-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	09-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	09-AUG-14
Alkalinity, Total (as CaCO3)		712	711		mg/L	0.1	20	09-AUG-14
WG1927525-8	DUP	L1498571-1						
pH		8.21	8.24	J	pH	0.03	0.3	09-AUG-14
Conductivity (EC)		940	947		uS/cm	0.8	10	09-AUG-14
Bicarbonate (HCO3)		491	494		mg/L	0.5	25	09-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	09-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	09-AUG-14
Alkalinity, Total (as CaCO3)		403	405		mg/L	0.5	20	09-AUG-14
WG1927525-9	DUP	L1498418-2						
pH		8.31	8.38	J	pH	0.06	0.3	10-AUG-14
Conductivity (EC)		829	824		uS/cm	0.6	10	10-AUG-14
Bicarbonate (HCO3)		461	450		mg/L	2.5	25	10-AUG-14
Carbonate (CO3)		<5.0	6.9	RPD-NA	mg/L	N/A	25	10-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14
Alkalinity, Total (as CaCO3)		381	380		mg/L	0.3	20	10-AUG-14
WG1927525-12	LCS							
Conductivity (EC)			97.1		%		90-110	09-AUG-14
WG1927525-14	LCS							
Alkalinity, Total (as CaCO3)			98.5		%		85-115	09-AUG-14
WG1927525-15	LCS							
Conductivity (EC)			98.2		%		90-110	09-AUG-14
WG1927525-17	LCS							
Conductivity (EC)			99.9		%		90-110	09-AUG-14
WG1927525-18	LCS							
pH			7.01		pH		6.7-7.3	09-AUG-14
WG1927525-19	LCS							



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 29 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R2913010							
WG1927525-19	LCS							
Alkalinity, Total (as CaCO3)			99.4		%		85-115	09-AUG-14
WG1927525-2	LCS							
Conductivity (EC)			97.1		%		90-110	09-AUG-14
WG1927525-20	LCS							
Conductivity (EC)			97.8		%		90-110	09-AUG-14
WG1927525-22	LCS							
Conductivity (EC)			99.4		%		90-110	09-AUG-14
WG1927525-23	LCS							
pH			7.02		pH		6.7-7.3	09-AUG-14
WG1927525-24	LCS							
Alkalinity, Total (as CaCO3)			99.3		%		85-115	09-AUG-14
WG1927525-25	LCS							
Conductivity (EC)			97.1		%		90-110	09-AUG-14
WG1927525-27	LCS							
Conductivity (EC)			99.3		%		90-110	10-AUG-14
WG1927525-28	LCS							
pH			7.03		pH		6.7-7.3	10-AUG-14
WG1927525-29	LCS							
Alkalinity, Total (as CaCO3)			98.9		%		85-115	10-AUG-14
WG1927525-3	LCS							
pH			7.01		pH		6.7-7.3	09-AUG-14
WG1927525-30	LCS							
Conductivity (EC)			96.3		%		90-110	10-AUG-14
WG1927525-32	LCS							
Conductivity (EC)			97.8		%		90-110	10-AUG-14
WG1927525-33	LCS							
pH			7.03		pH		6.7-7.3	10-AUG-14
WG1927525-34	LCS							
Alkalinity, Total (as CaCO3)			99.2		%		85-115	10-AUG-14
WG1927525-35	LCS							
Conductivity (EC)			95.5		%		90-110	10-AUG-14
WG1927525-4	LCS							
Alkalinity, Total (as CaCO3)			99.0		%		85-115	09-AUG-14
WG1927525-5	LCS							
Conductivity (EC)			98.4		%		90-110	09-AUG-14
WG1927525-1	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	09-AUG-14



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 30 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R2913010							
WG1927525-1 MB								
Carbonate (CO3)			<5.0		mg/L		5	09-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	09-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	09-AUG-14
WG1927525-11 MB								
Bicarbonate (HCO3)			<5.0		mg/L		5	09-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	09-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	09-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	09-AUG-14
WG1927525-16 MB								
Bicarbonate (HCO3)			<5.0		mg/L		5	09-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	09-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	09-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	09-AUG-14
WG1927525-21 MB								
Bicarbonate (HCO3)			<5.0		mg/L		5	09-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	09-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	09-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	09-AUG-14
WG1927525-26 MB								
Bicarbonate (HCO3)			<5.0		mg/L		5	10-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	10-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	10-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	10-AUG-14
WG1927525-31 MB								
Bicarbonate (HCO3)			<5.0		mg/L		5	10-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	10-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	10-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	10-AUG-14
PHENOLS-4AAP-ED		Water						
Batch	R2923340							
WG1934143-3 DUP	L1496774-3							
Phenols (4AAP)	<0.0010	<0.0010	RPD-NA		mg/L	N/A	15	19-AUG-14
WG1934143-4 DUP	L1499790-6							
Phenols (4AAP)	0.0033	0.0037			mg/L	11	15	19-AUG-14
WG1934143-6 DUP	L1497751-8							



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 31 of 34

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PHENOLS-4AAP-ED								
	Water							
Batch	R2923340							
WG1934143-6	DUP	L1497751-8						
Phenols (4AAP)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	15	19-AUG-14
WG1934143-7	DUP	L1494217-3						
Phenols (4AAP)		0.0032	0.0032		mg/L	0.0	15	19-AUG-14
WG1934143-2	LCS							
Phenols (4AAP)			105.0		%		85-115	19-AUG-14
WG1934143-1	MB							
Phenols (4AAP)			<0.0010		mg/L		0.001	19-AUG-14
WG1934143-5	MS	L1499730-4						
Phenols (4AAP)			100.0		%		75-125	19-AUG-14
SO4-IC-ED								
	Water							
Batch	R2912274							
WG1926502-3	DUP	L1498061-9						
Sulfate (SO4)		51.3	51.3		mg/L	0.1	20	08-AUG-14
WG1926502-5	DUP	L1498878-7						
Sulfate (SO4)		<0.50	<0.50	RPD-NA	mg/L	N/A	20	08-AUG-14
WG1926502-7	DUP	L1499123-2						
Sulfate (SO4)		251	251		mg/L	0.1	20	08-AUG-14
WG1926502-11	LCS							
Sulfate (SO4)			100.8		%		90-110	08-AUG-14
WG1926502-13	LCS							
Sulfate (SO4)			101.6		%		90-110	08-AUG-14
WG1926502-15	LCS							
Sulfate (SO4)			102.4		%		90-110	08-AUG-14
WG1926502-17	LCS							
Sulfate (SO4)			102.3		%		90-110	08-AUG-14
WG1926502-2	LCS							
Sulfate (SO4)			101.3		%		90-110	08-AUG-14
WG1926502-9	LCS							
Sulfate (SO4)			101.8		%		90-110	08-AUG-14
WG1926502-1	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	08-AUG-14
WG1926502-10	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	08-AUG-14
WG1926502-12	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	08-AUG-14
WG1926502-14	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	08-AUG-14



Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Page 32 of 34

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-ED								
	Water							
Batch	R2912274							
WG1926502-16	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	08-AUG-14
WG1926502-18	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	08-AUG-14
WG1926502-4	MS	L1498061-9						
Sulfate (SO4)			94.4		%		75-125	08-AUG-14
WG1926502-6	MS	L1498878-7						
Sulfate (SO4)			102.0		%		75-125	08-AUG-14
WG1926502-8	MS	L1499123-2						
Sulfate (SO4)			N/A	MS-B	%		-	08-AUG-14
SOLIDS-TDS-ED								
	Water							
Batch	R2912810							
WG1926634-3	DUP	L1497207-3						
Total Dissolved Solids		1210	1200		mg/L	0.7	20	08-AUG-14
WG1926634-2	LCS							
Total Dissolved Solids			99.5		%		85-115	08-AUG-14
WG1926634-1	MB							
Total Dissolved Solids			<10		mg/L		10	08-AUG-14
TURBIDITY-ED								
	Water							
Batch	R2911021							
WG1925868-3	DUP	L1496774-4						
Turbidity		48.7	50.4		NTU	3.4	15	07-AUG-14
WG1925868-2	LCS							
Turbidity			98.6		%		70-130	07-AUG-14
WG1925868-1	MB							
Turbidity			<0.10		NTU		0.1	07-AUG-14

Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Page 33 of 34

Contact: AKIN OWOJORI

Legend:

Limit ALS Control Limit (Data Quality Objectives)
DUP Duplicate
RPD Relative Percent Difference
N/A Not Available
LCS Laboratory Control Sample
SRM Standard Reference Material
MS Matrix Spike
MSD Matrix Spike Duplicate
ADE Average Desorption Efficiency
MB Method Blank
IRM Internal Reference Material
CRM Certified Reference Material
CCV Continuing Calibration Verification
CVS Calibration Verification Standard
LCSD Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L1497659

Report Date: 29-AUG-14

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Page 34 of 34

Contact: AKIN OWOJORI

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Anions and Nutrients							
Nitrate as N by IC	1	05-AUG-14 10:05	08-AUG-14 08:00	48	70	hours	EHTL
	2	05-AUG-14 11:24	08-AUG-14 08:00	48	69	hours	EHTL
	3	05-AUG-14 17:10	08-AUG-14 08:00	48	63	hours	EHT
Nitrite as N by IC	1	05-AUG-14 10:05	08-AUG-14 08:00	48	70	hours	EHTL
	2	05-AUG-14 11:24	08-AUG-14 08:00	48	69	hours	EHTL
	3	05-AUG-14 17:10	08-AUG-14 08:00	48	63	hours	EHT

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1497659 were received on 06-AUG-14 12:05.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



ALS 140818-02 (14-CFE)

CONFIDENTIAL ANALYSIS REPORT

REPORT #: 140818-02

WO #: 14-CFE

PO #: L1497659

CLIENT: ALS Laboratory Group - Edmonton
9936-67 Avenue
Edmonton, AB
T6E 0P5

ATTENTION: ALS-ED Reporting
Tel: (780) 413-5227
Fax: (780) 437-2311

SAMPLE DESCRIPTION: Water Samples

DATE AND TIME OF SAMPLE COLLECTION: August 05, 2014

DATE AND TIME OF SAMPLE RECEIPT: August 07, 2014/12:50

SAMPLE TEMPERATURE WHEN RECEIVED: 7.5° Celsius

TEST PERFORMED:
Iron Related Bacteria
Sulfate Reducing Bacteria

TEST START DATE: August 07, 2014/13:50

DATE COMPLETED: August 16, 2014

CERTIFICATE OF ANALYSIS: See Page 2

QUALITY CONTROL DATA: See Attached Appendix 1

The report shall not be reproduced, except in full, without the written authority of PBR Laboratories Inc.

Certificate of Analysis

PBR ID	Sample #	Client ID	Lot #	Test	Protocol	Quantity Analyzed	*DF	Result	Units	Note
14-CFE-01	L1497659-1	16053140805021		Iron Related Bacteria	BART	15 ml		2.3×10^3	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		7.0×10^5	CFU/ml	1
14-CFE-02	L1497659-2	16053140805022		Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		1.2×10^3	CFU/ml	1
14-CFE-03	L1497659-3	16053140805023		Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		1.8×10^4	CFU/ml	1

*DF - Dilution Factor used for analysis

Notes

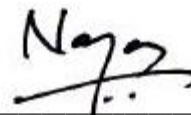
1 CFU = Colony Forming Unit.

BART results represent the Approximate Population only.

The reported results apply only to the items tested.


Rambabu Naravaneni Ph. D (Analyst)
Date: Aug 18 2014

Approved By:


Narayan Pokharel, Ph.D.
Date: Aug 18 2014



P|B|R
Laboratories Inc.

ALS 140818-02 (14-CFE)

APPENDIX 1

Quality Control Data for Iron Related Bacteria (BART)

Controls	Organism/Medium	Result
Sterility (media blank)	BART medium	Pass
Positive	Acidithiobacillus ferrooxidans	Pass
Negative	D/W Sterile	Pass

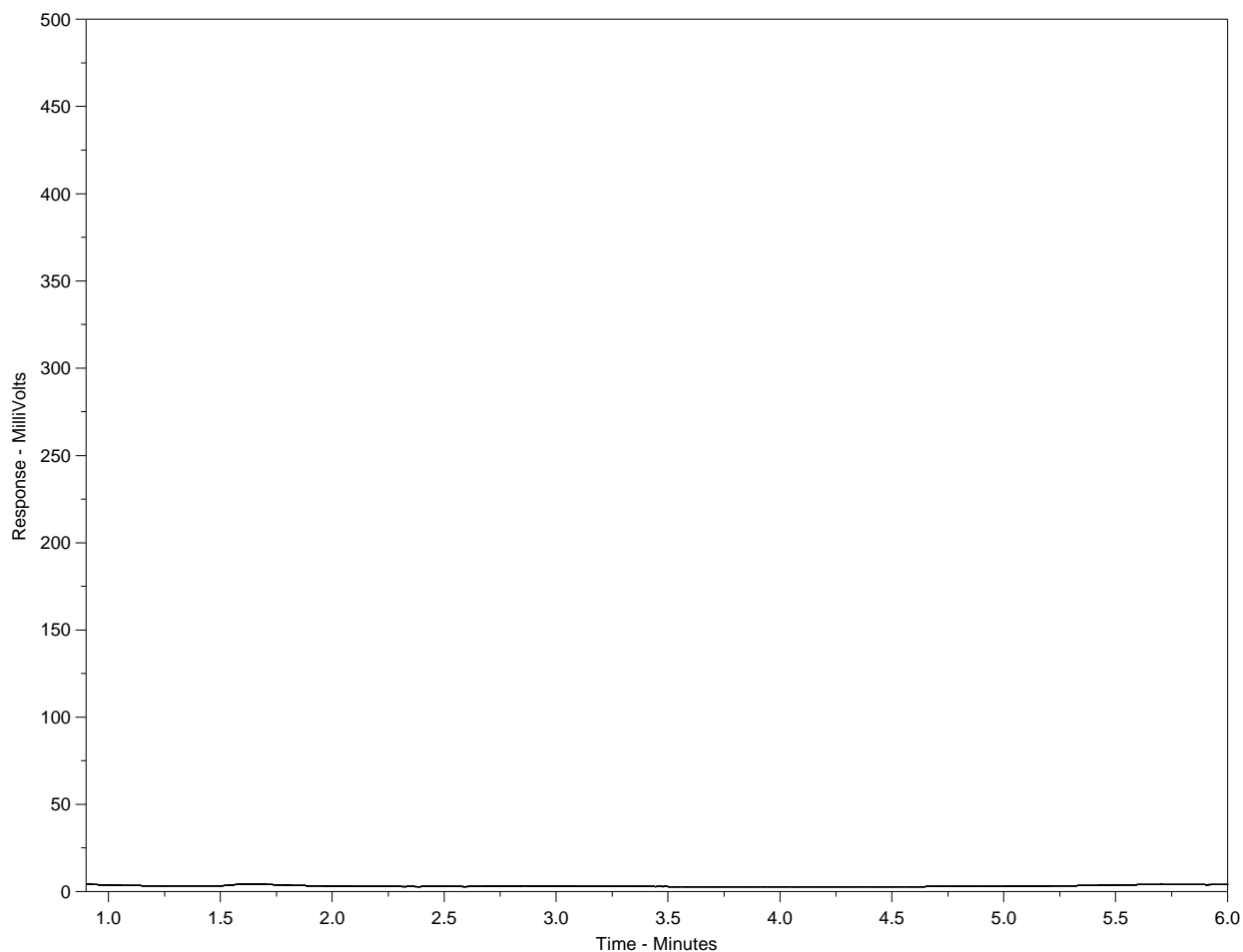
Quality Control Data for Sulfate Reducing Bacteria (BART)

Controls	Organism/Medium	Result
Sterility	BART medium	Pass
Positive	SRB	Pass
Negative	D/W Sterile	Pass

Hydrocarbon Distribution Report



ALS Sample ID: L1497659-1
Client ID: 16053140805021



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	1067°F				
← Gasoline →			← Motor Oils/ Lube Oils/ Grease →				
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

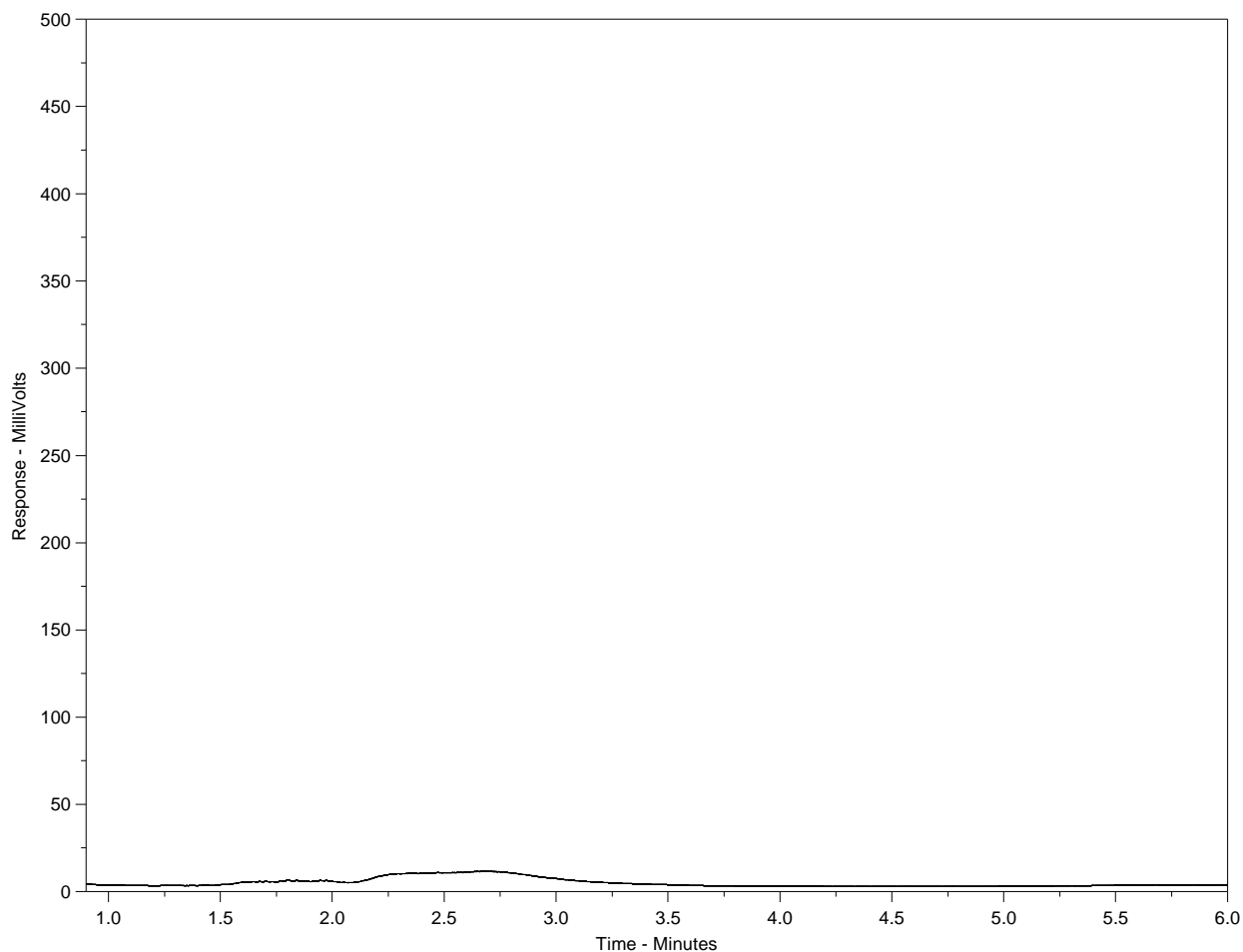
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1497659-2
 Client ID: 16053140805022



F2		F3		F4		F4	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	1067°F				
Gasoline				Motor Oils/ Lube Oils/ Grease			
Diesel/ Jet Fuels							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

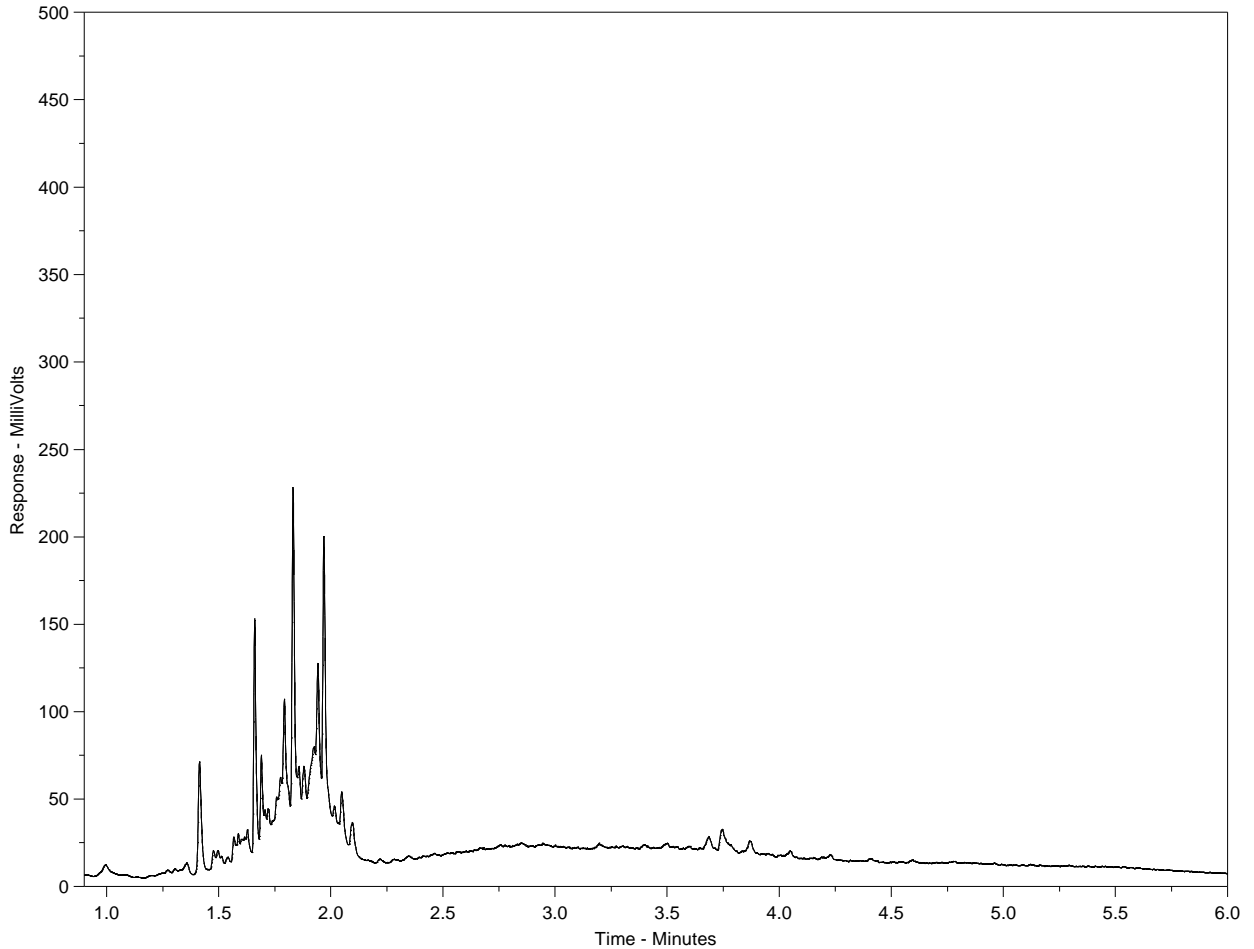
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1497659-3
Client ID: 16053140805023



← F2 →		← F3 →		← F4 →		← F4 →	
nC10		nC16		nC34		nC50	
174°C		287°C		481°C		575°C	
346°F		549°F		898°F		1067°F	
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.



Matrix Solutions Inc.
ATTN: SUE RAYNARD
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Date Received: 07-AUG-14
Report Date: 29-AUG-14 10:48 (MT)
Version: FINAL

Client Phone: 403-513-2275

Certificate of Analysis

Lab Work Order #: L1498418
Project P.O. #: NOT SUBMITTED
Job Reference: 16053-502 NAOS
C of C Numbers: M076071
Legal Site Desc:

Nicole Thibault
Account Manager

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ADDRESS: 9936-67 Avenue, Edmonton, AB T6E 0P5 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1498418-1 16053140806024									
Sampled By: bobby p, jeremy I on 06-AUG-14 @ 11:55									
Matrix: h20									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Toluene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
EthylBenzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
o-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Styrene	<0.0010	-		0.0010	mg/L	-		12-AUG-14	R2915907
F1(C6-C10)	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
F1-BTEX	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
Xylenes	<0.00071	-		0.00071	mg/L	-		12-AUG-14	R2915907
Surr: 1,4-Difluorobenzene (SS)	99.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 4-Bromofluorobenzene (SS)	94.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 3,4-Dichlorotoluene (SS)	105.0	-		N/A	%	-		12-AUG-14	R2915907
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
Surr: 2-Bromobenzotrifluoride	97.6	-		N/A	%	-	12-AUG-14	12-AUG-14	R2917059
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		20-AUG-14	R2924333
				0					
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.0087	+/-0.0025		0.0030	mg/L	0		13-AUG-14	R2917038
Antimony (Sb)-Total	<0.00040	-		0.00040	mg/L	-		13-AUG-14	R2917038
Arsenic (As)-Total	<0.00040	-		0.00040	mg/L	-		13-AUG-14	R2917038
Barium (Ba)-Total	0.0454	+/-0.0051		0.0050	mg/L	0		13-AUG-14	R2917038
Boron (B)-Total	0.326	+/-0.052		0.050	mg/L	0		13-AUG-14	R2917038
Cadmium (Cd)-Total	<0.00020	-		0.00020	mg/L	-		13-AUG-14	R2917038
Calcium (Ca)-Total	82.6	+/-9.8		0.50	mg/L	0		13-AUG-14	R2917038
Chromium (Cr)-Total	<0.0050	-		0.0050	mg/L	-		13-AUG-14	R2917038
Copper (Cu)-Total	<0.0010	-		0.0010	mg/L	-		13-AUG-14	R2917038
Iron (Fe)-Total	3.41	+/-0.54		0.010	mg/L	0		13-AUG-14	R2917038
Lead (Pb)-Total	<0.00010	-		0.00010	mg/L	-		13-AUG-14	R2917038
Magnesium (Mg)-Total	30.1	+/-3.7		0.10	mg/L	0		13-AUG-14	R2917038
Manganese (Mn)-Total	0.459	+/-0.046		0.0020	mg/L	0		13-AUG-14	R2917038
Nickel (Ni)-Total	<0.0020	-		0.0020	mg/L	-		13-AUG-14	R2917038
Potassium (K)-Total	5.21	+/-0.64		0.10	mg/L	0		13-AUG-14	R2917038
Selenium (Se)-Total	<0.00040	-		0.00040	mg/L	-		13-AUG-14	R2917038
Silicon (Si)-Total	8.45	+/-1.7		0.050	mg/L	0		13-AUG-14	R2917038
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		13-AUG-14	R2917038
Sodium (Na)-Total	46.6	+/-5.7		1.0	mg/L	0		13-AUG-14	R2917038
Uranium (U)-Total	<0.00010	-		0.00010	mg/L	-		13-AUG-14	R2917038
Zinc (Zn)-Total	<0.0040	-		0.0040	mg/L	-		13-AUG-14	R2917038
Miscellaneous Parameters									
Ammonia, Total (as N)	0.537	-		0.050	mg/L	-		19-AUG-14	R2923049
Dissolved Organic Carbon	7.0	+/-0.9		1.0	mg/L	0		16-AUG-14	R2921067
Iron Bacteria	See Attached	-				-		08-AUG-14	R2922158
Naphthenic Acids	<1.0	-		1.0	mg/L	-	18-AUG-14	28-AUG-14	R2932711
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		20-AUG-14	R2924308
Sulphate Reducing Bacteria	See Attached	-				-		08-AUG-14	R2922158

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1498418-1 16053140806024									
Sampled By: bobby p, jeremy l on 06-AUG-14 @ 11:55									
Matrix: h20									
Total Dissolved Solids	504	+/-34		10	mg/L	0	11-AUG-14		R2915573
Silicon (as SiO2)-Total	18.1	-		0.11	mg/L	-	14-AUG-14		
Turbidity	23.7	+/-1.4		0.10	NTU	0	08-AUG-14		R2911521
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Anthracene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Fluoranthene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Fluorene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Naphthalene	<0.000050	-		0.000050	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Phenanthrene	<0.000050	-		0.000050	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Pyrene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(a)pyrene	<0.000050	-		0.000005	mg/L	-	18-AUG-14	18-AUG-14	R2923280
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Dibenzo(a,h)anthracene	<0.000050	-		0.000005	mg/L	-	18-AUG-14	18-AUG-14	R2923280
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Surr: d10-Acenaphthene	86.9	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280
Surr: d10-Phenanthrene	93.4	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280
Surr: d12-Chrysene	80.5	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	1.61	+/-0.13		0.50	mg/L	0	08-AUG-14		R2915836
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-	20-AUG-14		R2924279
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-	20-AUG-14		R2924279
Arsenic (As)-Dissolved	<0.00040	-		0.00040	mg/L	-	20-AUG-14		R2924279
Barium (Ba)-Dissolved	0.0427	+/-0.0037		0.0050	mg/L	0	20-AUG-14		R2924279
Boron (B)-Dissolved	0.361	+/-0.044		0.050	mg/L	0	20-AUG-14		R2924279
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-	20-AUG-14		R2924279
Calcium (Ca)-Dissolved	83.7	+/-11		0.50	mg/L	0	20-AUG-14		R2924279
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-	20-AUG-14		R2924279
Copper (Cu)-Dissolved	<0.0010	-		0.0010	mg/L	-	20-AUG-14		R2924279
Iron (Fe)-Dissolved	3.29	+/-0.30		0.010	mg/L	0	20-AUG-14		R2924279
Lead (Pb)-Dissolved	<0.00010	-		0.00010	mg/L	-	20-AUG-14		R2924279
Magnesium (Mg)-Dissolved	31.4	+/-2.4		0.10	mg/L	0	20-AUG-14		R2924279
Manganese (Mn)-Dissolved	0.459	+/-0.031		0.0020	mg/L	0	20-AUG-14		R2924279
Nickel (Ni)-Dissolved	<0.0020	-		0.0020	mg/L	-	20-AUG-14		R2924279
Potassium (K)-Dissolved	5.29	+/-0.41		0.10	mg/L	0	20-AUG-14		R2924279
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-	20-AUG-14		R2924279
Silicon (Si)-Dissolved	8.57	+/-0.73		0.050	mg/L	0	20-AUG-14		R2924279
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-	20-AUG-14		R2924279
Sodium (Na)-Dissolved	48.2	+/-3.4		1.0	mg/L	0	20-AUG-14		R2924279
Uranium (U)-Dissolved	<0.00010	-		0.00010	mg/L	-	20-AUG-14		R2924279
Zinc (Zn)-Dissolved	0.0031	+/-0.0005		0.0030	mg/L	0	20-AUG-14		R2924279
Ion Balance Calculation									
Ion Balance	99.5	-			%	-	21-AUG-14		

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1498418-1 16053140806024 Sampled By: bobby p, jeremy I on 06-AUG-14 @ 11:55 Matrix: h20									
Ion Balance Calculation									
TDS (Calculated)	479	-			mg/L	-		21-AUG-14	
Hardness (as CaCO3)	338	-			mg/L	-		21-AUG-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.000005 0	mg/L	-		20-AUG-14	R2924333
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		08-AUG-14	R2915836
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		12-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		08-AUG-14	R2915836
Sulfate by IC									
Sulfate (SO4)	102	+/-5.8		0.50	mg/L	0		08-AUG-14	R2915836
pH, Conductivity and Total Alkalinity									
pH	8.38	+/-0.01		0.10	pH	0		10-AUG-14	R2913010
Conductivity (EC)	806	+/-40		0.20	uS/cm	0		10-AUG-14	R2913010
Bicarbonate (HCO3)	408	+/-16		5.0	mg/L	0		10-AUG-14	R2913010
Carbonate (CO3)	6.6	+/-2.5		5.0	mg/L	0		10-AUG-14	R2913010
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		10-AUG-14	R2913010
Alkalinity, Total (as CaCO3)	345	+/-22		2.0	mg/L	0		10-AUG-14	R2913010
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	18.3	-		0.11	mg/L	-		21-AUG-14	
L1498418-2 16053140806026 Sampled By: bobby p, jeremy I on 06-AUG-14 @ 12:31 Matrix: h20									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Toluene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
EthylBenzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
o-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Styrene	<0.0010	-		0.0010	mg/L	-		12-AUG-14	R2915907
F1(C6-C10)	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
F1-BTEX	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
Xylenes	<0.00071	-		0.00071	mg/L	-		12-AUG-14	R2915907
Surr: 1,4-Difluorobenzene (SS)	101.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 4-Bromofluorobenzene (SS)	93.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 3,4-Dichlorotoluene (SS)	101.0	-		N/A	%	-		12-AUG-14	R2915907
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
Surr: 2-Bromobenzotrifluoride	99.5	-		N/A	%	-	12-AUG-14	12-AUG-14	R2917059
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	0.0000078	+/-0.0000043		0.000005 0	mg/L	0		20-AUG-14	R2924333
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.782	+/-0.12		0.0030	mg/L	0		13-AUG-14	R2917038
Antimony (Sb)-Total	<0.00040	-		0.00040	mg/L	-		13-AUG-14	R2917038

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1498418-2 16053140806026									
Sampled By: bobby p, jeremy I on 06-AUG-14 @ 12:31									
Matrix: h20									
Total Metals in Water by CRC ICPMS									
Arsenic (As)-Total	0.00125	+/-0.00015		0.00040	mg/L	0		13-AUG-14	R2917038
Barium (Ba)-Total	0.0632	+/-0.0071		0.0050	mg/L	0		13-AUG-14	R2917038
Boron (B)-Total	0.344	+/-0.055		0.050	mg/L	0		13-AUG-14	R2917038
Cadmium (Cd)-Total	0.00020	+/-0.00004		0.00020	mg/L	0		13-AUG-14	R2917038
Calcium (Ca)-Total	95.6	+/-11		0.50	mg/L	0		13-AUG-14	R2917038
Chromium (Cr)-Total	<0.0050	-		0.0050	mg/L	-		13-AUG-14	R2917038
Copper (Cu)-Total	0.0020	+/-0.0003		0.0010	mg/L	0		13-AUG-14	R2917038
Iron (Fe)-Total	5.08	+/-0.80		0.010	mg/L	0		13-AUG-14	R2917038
Lead (Pb)-Total	0.00163	+/-0.00026		0.00010	mg/L	0		13-AUG-14	R2917038
Magnesium (Mg)-Total	35.5	+/-4.3		0.10	mg/L	0		13-AUG-14	R2917038
Manganese (Mn)-Total	0.508	+/-0.051		0.0020	mg/L	0		13-AUG-14	R2917038
Nickel (Ni)-Total	0.0024	+/-0.0003		0.0020	mg/L	0		13-AUG-14	R2917038
Potassium (K)-Total	4.15	+/-0.51		0.10	mg/L	0		13-AUG-14	R2917038
Selenium (Se)-Total	<0.00040	-		0.00040	mg/L	-		13-AUG-14	R2917038
Silicon (Si)-Total	8.55	+/-1.7		0.050	mg/L	0		13-AUG-14	R2917038
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		13-AUG-14	R2917038
Sodium (Na)-Total	49.4	+/-6.1		1.0	mg/L	0		13-AUG-14	R2917038
Uranium (U)-Total	0.00152	+/-0.00021		0.00010	mg/L	0		13-AUG-14	R2917038
Zinc (Zn)-Total	0.0138	+/-0.0031		0.0040	mg/L	0		13-AUG-14	R2917038
Miscellaneous Parameters									
Ammonia, Total (as N)	<0.050	-		0.050	mg/L	-		19-AUG-14	R2923049
Dissolved Organic Carbon	10.9	+/-1.3		1.0	mg/L	0		16-AUG-14	R2921067
Iron Bacteria	See Attached	-				-		08-AUG-14	R2922158
Naphthenic Acids	1.0	+/-0.4		1.0	mg/L	0	18-AUG-14	28-AUG-14	R2932711
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		20-AUG-14	R2924308
Sulphate Reducing Bacteria	See Attached	-				-		08-AUG-14	R2922158
Total Dissolved Solids	541	+/-36		10	mg/L	0		11-AUG-14	R2915573
Silicon (as SiO2)-Total	18.3	-		0.11	mg/L	-		13-AUG-14	
Turbidity	51.0	+/-2.9		0.10	NTU	0		08-AUG-14	R2911521
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Anthracene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Fluoranthene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Fluorene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Naphthalene	<0.000050	-		0.000050	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Phenanthrene	<0.000050	-		0.000050	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Pyrene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(a)pyrene	<0.0000050	-		0.000005	mg/L	-	18-AUG-14	18-AUG-14	R2923280
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	18-AUG-14	18-AUG-14	R2923280
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Surr: d10-Acenaphthene	83.8	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280
Surr: d10-Phenanthrene	92.5	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1498418-2 16053140806026									
Sampled By: bobby p, jeremy l on 06-AUG-14 @ 12:31									
Matrix: h20									
PAH & Carcinogenic PAH List									
Surr: d12-Chrysene	81.8	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	1.89	+/-0.14		0.50	mg/L	0		08-AUG-14	R2915836
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-		20-AUG-14	R2924279
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-		20-AUG-14	R2924279
Arsenic (As)-Dissolved	0.00043	+/-0.00004		0.00040	mg/L	0		20-AUG-14	R2924279
Barium (Ba)-Dissolved	0.0486	+/-0.0042		0.0050	mg/L	0		20-AUG-14	R2924279
Boron (B)-Dissolved	0.337	+/-0.041		0.050	mg/L	0		20-AUG-14	R2924279
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		20-AUG-14	R2924279
Calcium (Ca)-Dissolved	91.5	+/-12		0.50	mg/L	0		20-AUG-14	R2924279
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		20-AUG-14	R2924279
Copper (Cu)-Dissolved	<0.0010	-		0.0010	mg/L	-		20-AUG-14	R2924279
Iron (Fe)-Dissolved	1.75	+/-0.16		0.010	mg/L	0		20-AUG-14	R2924279
Lead (Pb)-Dissolved	<0.00010	-		0.00010	mg/L	-		20-AUG-14	R2924279
Magnesium (Mg)-Dissolved	35.3	+/-2.7		0.10	mg/L	0		20-AUG-14	R2924279
Manganese (Mn)-Dissolved	0.466	+/-0.032		0.0020	mg/L	0		20-AUG-14	R2924279
Nickel (Ni)-Dissolved	<0.0020	-		0.0020	mg/L	-		20-AUG-14	R2924279
Potassium (K)-Dissolved	4.24	+/-0.33		0.10	mg/L	0		20-AUG-14	R2924279
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-		20-AUG-14	R2924279
Silicon (Si)-Dissolved	6.83	+/-0.58		0.050	mg/L	0		20-AUG-14	R2924279
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		20-AUG-14	R2924279
Sodium (Na)-Dissolved	44.2	+/-3.1		1.0	mg/L	0		20-AUG-14	R2924279
Uranium (U)-Dissolved	0.00119	+/-0.00012		0.00010	mg/L	0		20-AUG-14	R2924279
Zinc (Zn)-Dissolved	<0.0030	-		0.0030	mg/L	-		20-AUG-14	R2924279
Ion Balance Calculation									
Ion Balance	102	-			%	-		21-AUG-14	
TDS (Calculated)	490	-			mg/L	-		21-AUG-14	
Hardness (as CaCO3)	374	-			mg/L	-		21-AUG-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		20-AUG-14	R2924333
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		08-AUG-14	R2915836
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		12-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		08-AUG-14	R2915836
Sulfate by IC									
Sulfate (SO4)	83.8	+/-4.7		0.50	mg/L	0		08-AUG-14	R2915836
pH, Conductivity and Total Alkalinity									
pH	8.31	+/-0.01		0.10	pH	0		10-AUG-14	R2913010
Conductivity (EC)	829	+/-42		0.20	uS/cm	0		10-AUG-14	R2913010
Bicarbonate (HCO3)	461	+/-18		5.0	mg/L	0		10-AUG-14	R2913010
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		10-AUG-14	R2913010
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		10-AUG-14	R2913010
Alkalinity, Total (as CaCO3)	381	+/-24		2.0	mg/L	0		10-AUG-14	R2913010
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	14.6	-		0.11	mg/L	-		21-AUG-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1498418-3 16053140806027									
Sampled By: bobby p, jeremy l on 06-AUG-14 @ 13:20									
Matrix: h20									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Toluene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
EthylBenzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
o-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Styrene	<0.0010	-		0.0010	mg/L	-		12-AUG-14	R2915907
F1(C6-C10)	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
F1-BTEX	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
Xylenes	<0.00071	-		0.00071	mg/L	-		12-AUG-14	R2915907
Surr: 1,4-Difluorobenzene (SS)	100.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 4-Bromofluorobenzene (SS)	92.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 3,4-Dichlorotoluene (SS)	100.0	-		N/A	%	-		12-AUG-14	R2915907
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
Surr: 2-Bromobenzotrifluoride	98.0	-		N/A	%	-	12-AUG-14	12-AUG-14	R2917059
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	0.0000076	+/-0.0000043		0.0000050	mg/L	0		20-AUG-14	R2924333
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.702	+/-0.11	DLM	0.0060	mg/L	0		13-AUG-14	R2917038
Antimony (Sb)-Total	<0.00040	-	DLM	0.00040	mg/L	-		13-AUG-14	R2917038
Arsenic (As)-Total	0.00209	+/-0.00025	DLM	0.00040	mg/L	0		13-AUG-14	R2917038
Barium (Ba)-Total	0.0451	+/-0.0051	DLM	0.0050	mg/L	0		13-AUG-14	R2917038
Boron (B)-Total	1.86	+/-0.30	DLM	0.050	mg/L	0		13-AUG-14	R2917038
Cadmium (Cd)-Total	<0.00020	-	DLM	0.00020	mg/L	-		13-AUG-14	R2917038
Calcium (Ca)-Total	39.4	+/-4.7	DLM	0.50	mg/L	0		13-AUG-14	R2917038
Chromium (Cr)-Total	<0.0050	-	DLM	0.0050	mg/L	-		13-AUG-14	R2917038
Copper (Cu)-Total	0.0027	+/-0.0004	DLM	0.0010	mg/L	0		13-AUG-14	R2917038
Iron (Fe)-Total	1.69	+/-0.27	DLM	0.020	mg/L	0		13-AUG-14	R2917038
Lead (Pb)-Total	0.00121	+/-0.00019	DLM	0.00010	mg/L	0		13-AUG-14	R2917038
Magnesium (Mg)-Total	20.5	+/-2.5	DLM	0.10	mg/L	0		13-AUG-14	R2917038
Manganese (Mn)-Total	0.151	+/-0.015	DLM	0.0020	mg/L	0		13-AUG-14	R2917038
Nickel (Ni)-Total	0.0045	+/-0.0005	DLM	0.0020	mg/L	0		13-AUG-14	R2917038
Potassium (K)-Total	6.86	+/-0.84	DLM	0.10	mg/L	0		13-AUG-14	R2917038
Selenium (Se)-Total	<0.00040	-	DLM	0.00040	mg/L	-		13-AUG-14	R2917038
Silicon (Si)-Total	5.64	+/-1.1	DLM	0.10	mg/L	0		13-AUG-14	R2917038
Silver (Ag)-Total	<0.00040	-	DLM	0.00040	mg/L	-		13-AUG-14	R2917038
Sodium (Na)-Total	328	+/-40	DLM	1.0	mg/L	0		13-AUG-14	R2917038
Uranium (U)-Total	0.00019	+/-0.00003	DLM	0.00010	mg/L	0		13-AUG-14	R2917038
Zinc (Zn)-Total	0.0121	+/-0.0028	DLM	0.0060	mg/L	0		13-AUG-14	R2917038
Miscellaneous Parameters									
Ammonia, Total (as N)	2.22	-		0.050	mg/L	-		19-AUG-14	R2923049
Dissolved Organic Carbon	5.8	+/-0.8		1.0	mg/L	0		16-AUG-14	R2921067
Iron Bacteria	See Attached	-				-		08-AUG-14	R2922158
Naphthenic Acids	<1.0	-		1.0	mg/L	-	18-AUG-14	28-AUG-14	R2932711
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		20-AUG-14	R2924308
Sulphate Reducing Bacteria	See Attached	-				-		08-AUG-14	R2922158

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1498418-3 16053140806027									
Sampled By: bobby p, jeremy l on 06-AUG-14 @ 13:20									
Matrix: h20									
Total Dissolved Solids	1140	+/-76	DLA	40	mg/L	0	11-AUG-14	11-AUG-14	R2915573
Silicon (as SiO2)-Total	12.1	-		0.21	mg/L	-	13-AUG-14	13-AUG-14	
Turbidity	>4000	+/-220		0.10	NTU	0	08-AUG-14	08-AUG-14	R2911521
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Anthracene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Fluoranthene	0.000022	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Fluorene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Naphthalene	<0.000050	-		0.000050	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Phenanthrene	<0.000050	-		0.000050	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Pyrene	0.000022	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(b&j)fluoranthene	0.000016	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(a)pyrene	0.0000070	-		0.000005	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Chrysene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
B(A)P Total Potency Equivalent	0.000013	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Surr: d10-Acenaphthene	85.7	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280
Surr: d10-Phenanthrene	90.4	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280
Surr: d12-Chrysene	81.5	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	10.9	+/-0.63		0.50	mg/L	0	08-AUG-14	08-AUG-14	R2915836
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-	20-AUG-14	20-AUG-14	R2924279
Antimony (Sb)-Dissolved	0.00058	+/-0.00006	DLM	0.00040	mg/L	0	20-AUG-14	20-AUG-14	R2924279
Arsenic (As)-Dissolved	0.00094	+/-0.00010	DLM	0.00040	mg/L	0	20-AUG-14	20-AUG-14	R2924279
Barium (Ba)-Dissolved	0.0310	+/-0.0027	DLM	0.0050	mg/L	0	20-AUG-14	20-AUG-14	R2924279
Boron (B)-Dissolved	1.86	+/-0.23	DLM	0.050	mg/L	0	20-AUG-14	20-AUG-14	R2924279
Cadmium (Cd)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-	20-AUG-14	20-AUG-14	R2924279
Calcium (Ca)-Dissolved	36.8	+/-5.0	DLM	0.50	mg/L	0	20-AUG-14	20-AUG-14	R2924279
Chromium (Cr)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-	20-AUG-14	20-AUG-14	R2924279
Copper (Cu)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-	20-AUG-14	20-AUG-14	R2924279
Iron (Fe)-Dissolved	0.083	+/-0.007	DLM	0.020	mg/L	0	20-AUG-14	20-AUG-14	R2924279
Lead (Pb)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-	20-AUG-14	20-AUG-14	R2924279
Magnesium (Mg)-Dissolved	18.7	+/-1.5	DLM	0.10	mg/L	0	20-AUG-14	20-AUG-14	R2924279
Manganese (Mn)-Dissolved	0.115	+/-0.0078	DLM	0.0020	mg/L	0	20-AUG-14	20-AUG-14	R2924279
Nickel (Ni)-Dissolved	0.0038	+/-0.0003	DLM	0.0020	mg/L	0	20-AUG-14	20-AUG-14	R2924279
Potassium (K)-Dissolved	7.19	+/-0.56	DLM	0.10	mg/L	0	20-AUG-14	20-AUG-14	R2924279
Selenium (Se)-Dissolved	<0.00040	-	DLM	0.00040	mg/L	-	20-AUG-14	20-AUG-14	R2924279
Silicon (Si)-Dissolved	4.10	+/-0.35	DLM	0.10	mg/L	0	20-AUG-14	20-AUG-14	R2924279
Silver (Ag)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-	20-AUG-14	20-AUG-14	R2924279
Sodium (Na)-Dissolved	286	+/-20	DLM	1.0	mg/L	0	20-AUG-14	20-AUG-14	R2924279
Uranium (U)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-	20-AUG-14	20-AUG-14	R2924279
Zinc (Zn)-Dissolved	0.0050	+/-0.0007	DLM	0.0030	mg/L	0	20-AUG-14	20-AUG-14	R2924279
Ion Balance Calculation									
Ion Balance	93.3	-			%	-	21-AUG-14	21-AUG-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1498418-3 16053140806027 Sampled By: bobby p, jeremy I on 06-AUG-14 @ 13:20 Matrix: h20									
Ion Balance Calculation									
TDS (Calculated)	962	-			mg/L	-		21-AUG-14	
Hardness (as CaCO3)	169	-			mg/L	-		21-AUG-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.000005 0	mg/L	-		20-AUG-14	R2924333
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		08-AUG-14	R2915836
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		12-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		08-AUG-14	R2915836
Sulfate by IC									
Sulfate (SO4)	244	+/-14		0.50	mg/L	0		08-AUG-14	R2915836
pH, Conductivity and Total Alkalinity									
pH	8.53	+/-0.01		0.10	pH	0		10-AUG-14	R2913010
Conductivity (EC)	1610	+/-80		0.20	uS/cm	0		10-AUG-14	R2913010
Bicarbonate (HCO3)	685	+/-26		5.0	mg/L	0		10-AUG-14	R2913010
Carbonate (CO3)	21.2	+/-3.9		5.0	mg/L	0		10-AUG-14	R2913010
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		10-AUG-14	R2913010
Alkalinity, Total (as CaCO3)	597	+/-37		2.0	mg/L	0		10-AUG-14	R2913010
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	8.76	-		0.21	mg/L	-		21-AUG-14	
L1498418-4 16053140806028 Sampled By: bobby p, jeremy I on 06-AUG-14 @ 15:50 Matrix: h20									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Toluene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
EthylBenzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
o-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Styrene	<0.0010	-		0.0010	mg/L	-		12-AUG-14	R2915907
F1(C6-C10)	0.13	-		0.10	mg/L	-		12-AUG-14	R2915907
F1-BTEX	0.13	-		0.10	mg/L	-		12-AUG-14	R2915907
Xylenes	<0.00071	-		0.00071	mg/L	-		12-AUG-14	R2915907
Surr: 1,4-Difluorobenzene (SS)	100.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 4-Bromofluorobenzene (SS)	93.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 3,4-Dichlorotoluene (SS)	97.0	-		N/A	%	-		12-AUG-14	R2915907
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
Surr: 2-Bromobenzotrifluoride	107.1	-		N/A	%	-	12-AUG-14	12-AUG-14	R2917059
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	0.0000070	+/-0.0000043		0.000005 0	mg/L	0		20-AUG-14	R2924333
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	1.04	+/-0.16		0.0030	mg/L	0		13-AUG-14	R2917038
Antimony (Sb)-Total	0.00043	+/-0.00009		0.00040	mg/L	0		13-AUG-14	R2917038

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1498418-4 16053140806028									
Sampled By: bobby p, jeremy l on 06-AUG-14 @ 15:50									
Matrix: h20									
Total Metals in Water by CRC ICPMS									
Arsenic (As)-Total	0.00274	+/-0.00033		0.00040	mg/L	0		13-AUG-14	R2917038
Barium (Ba)-Total	0.222	+/-0.025		0.0050	mg/L	0		13-AUG-14	R2917038
Boron (B)-Total	0.130	+/-0.021		0.050	mg/L	0		13-AUG-14	R2917038
Cadmium (Cd)-Total	<0.00020	-		0.00020	mg/L	-		13-AUG-14	R2917038
Calcium (Ca)-Total	115	+/-14		0.50	mg/L	0		13-AUG-14	R2917038
Chromium (Cr)-Total	<0.0050	-		0.0050	mg/L	-		13-AUG-14	R2917038
Copper (Cu)-Total	0.0046	+/-0.0006		0.0010	mg/L	0		13-AUG-14	R2917038
Iron (Fe)-Total	6.67	+/-1.1		0.010	mg/L	0		13-AUG-14	R2917038
Lead (Pb)-Total	0.00440	+/-0.00070		0.00010	mg/L	0		13-AUG-14	R2917038
Magnesium (Mg)-Total	51.0	+/-6.2		0.10	mg/L	0		13-AUG-14	R2917038
Manganese (Mn)-Total	0.433	+/-0.044		0.0020	mg/L	0		13-AUG-14	R2917038
Nickel (Ni)-Total	0.0088	+/-0.0010		0.0020	mg/L	0		13-AUG-14	R2917038
Potassium (K)-Total	2.19	+/-0.27		0.10	mg/L	0		13-AUG-14	R2917038
Selenium (Se)-Total	0.00077	+/-0.00011		0.00040	mg/L	0		13-AUG-14	R2917038
Silicon (Si)-Total	9.49	+/-1.9		0.050	mg/L	0		13-AUG-14	R2917038
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		13-AUG-14	R2917038
Sodium (Na)-Total	35.5	+/-4.4		1.0	mg/L	0		13-AUG-14	R2917038
Uranium (U)-Total	0.00518	+/-0.00073		0.00010	mg/L	0		13-AUG-14	R2917038
Zinc (Zn)-Total	0.402	+/-0.062		0.0040	mg/L	0		13-AUG-14	R2917038
Miscellaneous Parameters									
Ammonia, Total (as N)	0.129	-		0.050	mg/L	-		19-AUG-14	R2923049
Dissolved Organic Carbon	12.2	+/-1.4		1.0	mg/L	0		16-AUG-14	R2921067
Iron Bacteria	See Attached	-				-		08-AUG-14	R2922158
Naphthenic Acids	<1.0	-		1.0	mg/L	-	18-AUG-14	28-AUG-14	R2932711
Phenols (4AAP)	0.0011	+/-0.0007		0.0010	mg/L	-7.4%		20-AUG-14	R2924308
Sulphate Reducing Bacteria	See Attached	-				-		08-AUG-14	R2922158
Total Dissolved Solids	613	+/-41		10	mg/L	0		11-AUG-14	R2915573
Silicon (as SiO2)-Total	20.3	-		0.11	mg/L	-		13-AUG-14	
Turbidity	263	+/-15		0.10	NTU	0		08-AUG-14	R2911521
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Anthracene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Fluoranthene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Fluorene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Naphthalene	<0.000050	-		0.000050	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Phenanthrene	<0.000050	-		0.000050	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Pyrene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(a)pyrene	<0.0000060	-	DLM	0.000006 0	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Chrysene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005 0	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Surr: d10-Acenaphthene	76.2	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280
Surr: d10-Phenanthrene	90.1	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1498418-4 16053140806028 Sampled By: bobby p, jeremy l on 06-AUG-14 @ 15:50 Matrix: h20									
PAH & Carcinogenic PAH List Surr: d12-Chrysene	84.2	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280
Major Ions & Trace Dissolved Metals									
Chloride by IC Chloride (Cl)	3.25	+/-0.21		0.50	mg/L	0		08-AUG-14	R2915836
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-		20-AUG-14	R2924279
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-		20-AUG-14	R2924279
Arsenic (As)-Dissolved	0.00057	+/-0.00006		0.00040	mg/L	0		20-AUG-14	R2924279
Barium (Ba)-Dissolved	0.178	+/-0.015		0.0050	mg/L	0		20-AUG-14	R2924279
Boron (B)-Dissolved	0.126	+/-0.015		0.050	mg/L	0		20-AUG-14	R2924279
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		20-AUG-14	R2924279
Calcium (Ca)-Dissolved	109	+/-15		0.50	mg/L	0		20-AUG-14	R2924279
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		20-AUG-14	R2924279
Copper (Cu)-Dissolved	0.0012	+/-0.0001		0.0010	mg/L	0		20-AUG-14	R2924279
Iron (Fe)-Dissolved	0.830	+/-0.075		0.010	mg/L	0		20-AUG-14	R2924279
Lead (Pb)-Dissolved	<0.00010	-		0.00010	mg/L	-		20-AUG-14	R2924279
Magnesium (Mg)-Dissolved	46.3	+/-3.6		0.10	mg/L	0		20-AUG-14	R2924279
Manganese (Mn)-Dissolved	0.156	+/-0.011		0.0020	mg/L	0		20-AUG-14	R2924279
Nickel (Ni)-Dissolved	0.0027	+/-0.0002		0.0020	mg/L	0		20-AUG-14	R2924279
Potassium (K)-Dissolved	1.40	+/-0.11		0.10	mg/L	0		20-AUG-14	R2924279
Selenium (Se)-Dissolved	0.00063	+/-0.00010		0.00040	mg/L	0		20-AUG-14	R2924279
Silicon (Si)-Dissolved	7.28	+/-0.62		0.050	mg/L	0		20-AUG-14	R2924279
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		20-AUG-14	R2924279
Sodium (Na)-Dissolved	31.8	+/-2.2		1.0	mg/L	0		20-AUG-14	R2924279
Uranium (U)-Dissolved	0.00413	+/-0.00043		0.00010	mg/L	0		20-AUG-14	R2924279
Zinc (Zn)-Dissolved	0.0356	+/-0.0042		0.0030	mg/L	0		20-AUG-14	R2924279
Ion Balance Calculation									
Ion Balance	96.2	-			%	-		21-AUG-14	
TDS (Calculated)	572	-			mg/L	-		21-AUG-14	
Hardness (as CaCO3)	463	-			mg/L	-		21-AUG-14	
Mercury (Hg) - Dissolved Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		20-AUG-14	R2924333
Nitrate as N by IC Nitrate (as N)	<0.050	-		0.050	mg/L	-		08-AUG-14	R2915836
Nitrate+Nitrite Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		12-AUG-14	
Nitrite as N by IC Nitrite (as N)	<0.020	-		0.020	mg/L	-		08-AUG-14	R2915836
Sulfate by IC Sulfate (SO4)	133	+/-7.5		0.50	mg/L	0		08-AUG-14	R2915836
pH, Conductivity and Total Alkalinity									
pH	8.14	+/-0.01		0.10	pH	0		10-AUG-14	R2913010
Conductivity (EC)	967	+/-48		0.20	uS/cm	0		10-AUG-14	R2913010
Bicarbonate (HCO3)	503	+/-19		5.0	mg/L	0		10-AUG-14	R2913010
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		10-AUG-14	R2913010
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		10-AUG-14	R2913010
Alkalinity, Total (as CaCO3)	412	+/-26		2.0	mg/L	0		10-AUG-14	R2913010
Silicon (reported as Silica) Dissolved Silicon (reported as Silica) Silicon (as SiO2)-Dissolved	15.6	-		0.11	mg/L	-		21-AUG-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1498418-5 16053140806029									
Sampled By: bobby p, jeremy l on 06-AUG-14 @ 17:10									
Matrix: h20									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Toluene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
EthylBenzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
o-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Styrene	<0.0010	-		0.0010	mg/L	-		12-AUG-14	R2915907
F1(C6-C10)	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
F1-BTEX	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
Xylenes	<0.00071	-		0.00071	mg/L	-		12-AUG-14	R2915907
Surr: 1,4-Difluorobenzene (SS)	100.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 4-Bromofluorobenzene (SS)	92.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 3,4-Dichlorotoluene (SS)	99.0	-		N/A	%	-		12-AUG-14	R2915907
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
Surr: 2-Bromobenzotrifluoride	94.4	-		N/A	%	-	12-AUG-14	12-AUG-14	R2917059
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		20-AUG-14	R2924333
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.123	+/-0.020	DLM	0.0060	mg/L	0		13-AUG-14	R2917038
Antimony (Sb)-Total	<0.00040	-	DLM	0.00040	mg/L	-		13-AUG-14	R2917038
Arsenic (As)-Total	<0.00040	-	DLM	0.00040	mg/L	-		13-AUG-14	R2917038
Barium (Ba)-Total	0.0198	+/-0.0022	DLM	0.0050	mg/L	0		13-AUG-14	R2917038
Boron (B)-Total	1.26	+/-0.20	DLM	0.050	mg/L	0		13-AUG-14	R2917038
Cadmium (Cd)-Total	<0.00020	-	DLM	0.00020	mg/L	-		13-AUG-14	R2917038
Calcium (Ca)-Total	50.1	+/-5.9	DLM	0.50	mg/L	0		13-AUG-14	R2917038
Chromium (Cr)-Total	<0.0050	-	DLM	0.0050	mg/L	-		13-AUG-14	R2917038
Copper (Cu)-Total	<0.0010	-	DLM	0.0010	mg/L	-		13-AUG-14	R2917038
Iron (Fe)-Total	0.870	+/-0.14	DLM	0.020	mg/L	0		13-AUG-14	R2917038
Lead (Pb)-Total	0.00023	+/-0.00004	DLM	0.00010	mg/L	0		13-AUG-14	R2917038
Magnesium (Mg)-Total	27.3	+/-3.3	DLM	0.10	mg/L	0		13-AUG-14	R2917038
Manganese (Mn)-Total	0.0325	+/-0.0033	DLM	0.0020	mg/L	0		13-AUG-14	R2917038
Nickel (Ni)-Total	<0.0020	-	DLM	0.0020	mg/L	-		13-AUG-14	R2917038
Potassium (K)-Total	5.41	+/-0.66	DLM	0.10	mg/L	0		13-AUG-14	R2917038
Selenium (Se)-Total	<0.00040	-	DLM	0.00040	mg/L	-		13-AUG-14	R2917038
Silicon (Si)-Total	6.04	+/-1.2	DLM	0.10	mg/L	0		13-AUG-14	R2917038
Silver (Ag)-Total	<0.00040	-	DLM	0.00040	mg/L	-		13-AUG-14	R2917038
Sodium (Na)-Total	377	+/-46	DLM	1.0	mg/L	0		13-AUG-14	R2917038
Uranium (U)-Total	0.00017	+/-0.00002	DLM	0.00010	mg/L	0		13-AUG-14	R2917038
Zinc (Zn)-Total	0.0084	+/-0.0024	DLM	0.0060	mg/L	0		13-AUG-14	R2917038
Miscellaneous Parameters									
Ammonia, Total (as N)	2.21	-		0.050	mg/L	-		19-AUG-14	R2923049
Dissolved Organic Carbon	9.0	+/-1.1		1.0	mg/L	0		16-AUG-14	R2921067
Iron Bacteria	See Attached	-				-		08-AUG-14	R2922158
Naphthenic Acids	<1.0	-		1.0	mg/L	-	18-AUG-14	28-AUG-14	R2932711
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		20-AUG-14	R2924308
Sulphate Reducing Bacteria	See Attached	-				-		08-AUG-14	R2922158

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1498418-5 16053140806029									
Sampled By: bobby p, jeremy l on 06-AUG-14 @ 17:10									
Matrix: h20									
Total Dissolved Solids	1150	+/-77		10	mg/L	0	11-AUG-14		R2915573
Silicon (as SiO2)-Total	12.9	-		0.21	mg/L	-	13-AUG-14		
Turbidity	7.93	+/-0.48		0.10	NTU	0	08-AUG-14		R2911521
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Anthracene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Fluoranthene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Fluorene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Naphthalene	<0.000050	-		0.000050	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Phenanthrene	<0.000050	-		0.000050	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Pyrene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Benzo(a)pyrene	<0.000050	-		0.000005	mg/L	-	18-AUG-14	18-AUG-14	R2923280
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Dibenzo(a,h)anthracene	<0.000050	-		0.000005	mg/L	-	18-AUG-14	18-AUG-14	R2923280
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	18-AUG-14	18-AUG-14	R2923280
Surr: d10-Acenaphthene	90.3	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280
Surr: d10-Phenanthrene	94.5	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280
Surr: d12-Chrysene	88.4	-		N/A	%	-	18-AUG-14	18-AUG-14	R2923280
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	50.5	+/-2.9		0.50	mg/L	0	08-AUG-14		R2915836
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-	20-AUG-14		R2924279
Antimony (Sb)-Dissolved	<0.00040	-	DLM	0.00040	mg/L	-	20-AUG-14		R2924279
Arsenic (As)-Dissolved	<0.00040	-	DLM	0.00040	mg/L	-	20-AUG-14		R2924279
Barium (Ba)-Dissolved	0.0140	+/-0.0012	DLM	0.0050	mg/L	0	20-AUG-14		R2924279
Boron (B)-Dissolved	1.27	+/-0.15	DLM	0.050	mg/L	0	20-AUG-14		R2924279
Cadmium (Cd)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-	20-AUG-14		R2924279
Calcium (Ca)-Dissolved	47.0	+/-6.4	DLM	0.50	mg/L	0	20-AUG-14		R2924279
Chromium (Cr)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-	20-AUG-14		R2924279
Copper (Cu)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-	20-AUG-14		R2924279
Iron (Fe)-Dissolved	0.058	+/-0.005	DLM	0.020	mg/L	0	20-AUG-14		R2924279
Lead (Pb)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-	20-AUG-14		R2924279
Magnesium (Mg)-Dissolved	27.8	+/-2.2	DLM	0.10	mg/L	0	20-AUG-14		R2924279
Manganese (Mn)-Dissolved	0.0333	+/-0.0023	DLM	0.0020	mg/L	0	20-AUG-14		R2924279
Nickel (Ni)-Dissolved	<0.0020	-	DLM	0.0020	mg/L	-	20-AUG-14		R2924279
Potassium (K)-Dissolved	5.47	+/-0.42	DLM	0.10	mg/L	0	20-AUG-14		R2924279
Selenium (Se)-Dissolved	<0.00040	-	DLM	0.00040	mg/L	-	20-AUG-14		R2924279
Silicon (Si)-Dissolved	5.88	+/-0.50	DLM	0.10	mg/L	0	20-AUG-14		R2924279
Silver (Ag)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-	20-AUG-14		R2924279
Sodium (Na)-Dissolved	350	+/-25	DLM	1.0	mg/L	0	20-AUG-14		R2924279
Uranium (U)-Dissolved	0.00018	+/-0.00002	DLM	0.00010	mg/L	0	20-AUG-14		R2924279
Zinc (Zn)-Dissolved	0.0055	+/-0.0007	DLM	0.0030	mg/L	0	20-AUG-14		R2924279
Ion Balance Calculation									
Ion Balance	101	-			%	-		21-AUG-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1498418-5 16053140806029									
Sampled By: bobby p, jeremy I on 06-AUG-14 @ 17:10									
Matrix: h20									
Ion Balance Calculation									
TDS (Calculated)	1140	-			mg/L	-		21-AUG-14	
Hardness (as CaCO3)	232	-			mg/L	-		21-AUG-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		20-AUG-14	R2924333
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		08-AUG-14	R2915836
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		12-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		08-AUG-14	R2915836
Sulfate by IC									
Sulfate (SO4)	277	+/-16		0.50	mg/L	0		08-AUG-14	R2915836
pH, Conductivity and Total Alkalinity									
pH	8.64	+/-0.01		0.10	pH	0		10-AUG-14	R2913010
Conductivity (EC)	1830	+/-92		0.20	uS/cm	0		10-AUG-14	R2913010
Bicarbonate (HCO3)	706	+/-27		5.0	mg/L	0		10-AUG-14	R2913010
Carbonate (CO3)	38.2	+/-5.8		5.0	mg/L	0		10-AUG-14	R2913010
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		10-AUG-14	R2913010
Alkalinity, Total (as CaCO3)	642	+/-40		2.0	mg/L	0		10-AUG-14	R2913010
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	12.6	-		0.21	mg/L	-		21-AUG-14	
L1498418-6 16053140806030									
Sampled By: bobby p, jeremy I on 06-AUG-14 @ 17:50									
Matrix: h20									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Toluene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
EthylBenzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
o-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Styrene	<0.0010	-		0.0010	mg/L	-		12-AUG-14	R2915907
F1(C6-C10)	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
F1-BTEX	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
Xylenes	<0.00071	-		0.00071	mg/L	-		12-AUG-14	R2915907
Surr: 1,4-Difluorobenzene (SS)	99.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 4-Bromofluorobenzene (SS)	90.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 3,4-Dichlorotoluene (SS)	92.0	-		N/A	%	-		12-AUG-14	R2915907
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
Surr: 2-Bromobenzotrifluoride	101.7	-		N/A	%	-	12-AUG-14	12-AUG-14	R2917059
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	0.0000347	+/-0.0000067		0.0000050	mg/L	0		20-AUG-14	R2924333
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	4.78	+/-0.76		0.0030	mg/L	0		13-AUG-14	R2917038
Antimony (Sb)-Total	<0.00040	-		0.00040	mg/L	-		13-AUG-14	R2917038

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1498418-6 16053140806030									
Sampled By: bobby p, jeremy l on 06-AUG-14 @ 17:50									
Matrix: h20									
Total Metals in Water by CRC ICPMS									
Arsenic (As)-Total	0.00711	+/-0.00083		0.00040	mg/L	0		13-AUG-14	R2917038
Barium (Ba)-Total	0.141	+/-0.016		0.0050	mg/L	0		13-AUG-14	R2917038
Boron (B)-Total	1.27	+/-0.20		0.050	mg/L	0		13-AUG-14	R2917038
Cadmium (Cd)-Total	0.00082	+/-0.00016		0.00020	mg/L	0		13-AUG-14	R2917038
Calcium (Ca)-Total	139	+/-16		0.50	mg/L	0		13-AUG-14	R2917038
Chromium (Cr)-Total	0.0077	+/-0.0011		0.0050	mg/L	0		13-AUG-14	R2917038
Copper (Cu)-Total	0.0209	+/-0.0025		0.0010	mg/L	0		13-AUG-14	R2917038
Iron (Fe)-Total	20.5	+/-3.2		0.010	mg/L	0		13-AUG-14	R2917038
Lead (Pb)-Total	0.0100	+/-0.0016		0.00010	mg/L	0		13-AUG-14	R2917038
Magnesium (Mg)-Total	52.0	+/-6.3		0.10	mg/L	0		13-AUG-14	R2917038
Manganese (Mn)-Total	0.488	+/-0.049		0.0020	mg/L	0		13-AUG-14	R2917038
Nickel (Ni)-Total	0.0183	+/-0.0020		0.0020	mg/L	0		13-AUG-14	R2917038
Potassium (K)-Total	13.1	+/-1.6		0.10	mg/L	0		13-AUG-14	R2917038
Selenium (Se)-Total	0.00057	+/-0.00008		0.00040	mg/L	0		13-AUG-14	R2917038
Silicon (Si)-Total	15.9	+/-3.2		0.050	mg/L	0		13-AUG-14	R2917038
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		13-AUG-14	R2917038
Sodium (Na)-Total	84.0	+/-10		1.0	mg/L	0		13-AUG-14	R2917038
Uranium (U)-Total	0.00201	+/-0.00028		0.00010	mg/L	0		13-AUG-14	R2917038
Zinc (Zn)-Total	0.0626	+/-0.010		0.0040	mg/L	0		13-AUG-14	R2917038
Miscellaneous Parameters									
Ammonia, Total (as N)	3.61	-		0.050	mg/L	-		19-AUG-14	R2923049
Dissolved Organic Carbon	9.2	+/-1.2		1.0	mg/L	0		16-AUG-14	R2921067
Iron Bacteria	See Attached	-				-		08-AUG-14	R2922158
Naphthenic Acids	<1.0	-		1.0	mg/L	-	18-AUG-14	28-AUG-14	R2932711
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		20-AUG-14	R2924308
Sulphate Reducing Bacteria	See Attached	-				-		08-AUG-14	R2922158
Total Dissolved Solids	804	+/-54	DLA	20	mg/L	0		11-AUG-14	R2915573
Silicon (as SiO2)-Total	34.1	-		0.11	mg/L	-		13-AUG-14	
Turbidity	845	+/-47		0.10	NTU	0		08-AUG-14	R2911521
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Anthracene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Fluoranthene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Fluorene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Naphthalene	<0.000050	-		0.000050	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Phenanthrene	<0.000050	-		0.000050	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Pyrene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(a)pyrene	<0.000050	-		0.000005	mg/L	-	19-AUG-14	19-AUG-14	R2924297
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Dibenzo(a,h)anthracene	<0.000050	-		0.000005	mg/L	-	19-AUG-14	19-AUG-14	R2924297
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Surr: d10-Acenaphthene	96.1	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297
Surr: d10-Phenanthrene	104.9	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1498418-6 16053140806030									
Sampled By: bobby p, jeremy l on 06-AUG-14 @ 17:50									
Matrix: h20									
PAH & Carcinogenic PAH List									
Surr: d12-Chrysene	103.3	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	0.60	+/-0.09		0.50	mg/L	0		08-AUG-14	R2915836
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-		20-AUG-14	R2924279
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-		20-AUG-14	R2924279
Arsenic (As)-Dissolved	0.00074	+/-0.00008		0.00040	mg/L	0		20-AUG-14	R2924279
Barium (Ba)-Dissolved	0.0429	+/-0.0037		0.0050	mg/L	0		20-AUG-14	R2924279
Boron (B)-Dissolved	1.18	+/-0.14		0.050	mg/L	0		20-AUG-14	R2924279
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		20-AUG-14	R2924279
Calcium (Ca)-Dissolved	125	+/-17		0.50	mg/L	0		20-AUG-14	R2924279
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		20-AUG-14	R2924279
Copper (Cu)-Dissolved	<0.0010	-		0.0010	mg/L	-		20-AUG-14	R2924279
Iron (Fe)-Dissolved	2.37	+/-0.21		0.010	mg/L	0		20-AUG-14	R2924279
Lead (Pb)-Dissolved	<0.00010	-		0.00010	mg/L	-		20-AUG-14	R2924279
Magnesium (Mg)-Dissolved	50.5	+/-3.9		0.10	mg/L	0		20-AUG-14	R2924279
Manganese (Mn)-Dissolved	0.184	+/-0.013		0.0020	mg/L	0		20-AUG-14	R2924279
Nickel (Ni)-Dissolved	<0.0020	-		0.0020	mg/L	-		20-AUG-14	R2924279
Potassium (K)-Dissolved	11.9	+/-0.93		0.10	mg/L	0		20-AUG-14	R2924279
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-		20-AUG-14	R2924279
Silicon (Si)-Dissolved	7.27	+/-0.62		0.050	mg/L	0		20-AUG-14	R2924279
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		20-AUG-14	R2924279
Sodium (Na)-Dissolved	76.3	+/-5.4		1.0	mg/L	0		20-AUG-14	R2924279
Uranium (U)-Dissolved	0.00014	+/-0.00001		0.00010	mg/L	0		20-AUG-14	R2924279
Zinc (Zn)-Dissolved	<0.0030	-		0.0030	mg/L	-		20-AUG-14	R2924279
Ion Balance Calculation									
Ion Balance	107	-			%	-		21-AUG-14	
TDS (Calculated)	710	-			mg/L	-		21-AUG-14	
Hardness (as CaCO3)	520	-			mg/L	-		21-AUG-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		20-AUG-14	R2924333
Nitrate as N by IC									
Nitrate (as N)	0.152	+/-0.017		0.050	mg/L	0		08-AUG-14	R2915836
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	0.293	-		0.054	mg/L	-		12-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	0.141	+/-0.023		0.020	mg/L	0		08-AUG-14	R2915836
Sulfate by IC									
Sulfate (SO4)	121	+/-6.8		0.50	mg/L	0		08-AUG-14	R2915836
pH, Conductivity and Total Alkalinity									
pH	8.21	+/-0.01		0.10	pH	0		10-AUG-14	R2913010
Conductivity (EC)	1150	+/-57		0.20	uS/cm	0		10-AUG-14	R2913010
Bicarbonate (HCO3)	658	+/-25		5.0	mg/L	0		10-AUG-14	R2913010
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		10-AUG-14	R2913010
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		10-AUG-14	R2913010
Alkalinity, Total (as CaCO3)	539	+/-34		2.0	mg/L	0		10-AUG-14	R2913010
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	15.6	-		0.11	mg/L	-		21-AUG-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1498418-7 16053140806031									
Sampled By: bobby p, jeremy l on 06-AUG-14 @ 17:15									
Matrix: h20									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Toluene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
EthylBenzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
o-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Styrene	<0.0010	-		0.0010	mg/L	-		12-AUG-14	R2915907
F1(C6-C10)	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
F1-BTEX	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
Xylenes	<0.00071	-		0.00071	mg/L	-		12-AUG-14	R2915907
Surr: 1,4-Difluorobenzene (SS)	101.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 4-Bromofluorobenzene (SS)	92.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 3,4-Dichlorotoluene (SS)	101.0	-		N/A	%	-		12-AUG-14	R2915907
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
Surr: 2-Bromobenzotrifluoride	101.0	-		N/A	%	-	12-AUG-14	12-AUG-14	R2917059
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		20-AUG-14	R2924333
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.125	+/-0.020	DLM	0.0060	mg/L	0		13-AUG-14	R2917038
Antimony (Sb)-Total	<0.00040	-	DLM	0.00040	mg/L	-		13-AUG-14	R2917038
Arsenic (As)-Total	<0.00040	-	DLM	0.00040	mg/L	-		13-AUG-14	R2917038
Barium (Ba)-Total	0.0190	+/-0.0021	DLM	0.0050	mg/L	0		13-AUG-14	R2917038
Boron (B)-Total	1.26	+/-0.20	DLM	0.050	mg/L	0		13-AUG-14	R2917038
Cadmium (Cd)-Total	<0.00020	-	DLM	0.00020	mg/L	-		13-AUG-14	R2917038
Calcium (Ca)-Total	50.6	+/-6.0	DLM	0.50	mg/L	0		13-AUG-14	R2917038
Chromium (Cr)-Total	<0.0050	-	DLM	0.0050	mg/L	-		13-AUG-14	R2917038
Copper (Cu)-Total	<0.0010	-	DLM	0.0010	mg/L	-		13-AUG-14	R2917038
Iron (Fe)-Total	0.871	+/-0.14	DLM	0.020	mg/L	0		13-AUG-14	R2917038
Lead (Pb)-Total	0.00025	+/-0.00004	DLM	0.00010	mg/L	0		13-AUG-14	R2917038
Magnesium (Mg)-Total	27.5	+/-3.3	DLM	0.10	mg/L	0		13-AUG-14	R2917038
Manganese (Mn)-Total	0.0323	+/-0.0033	DLM	0.0020	mg/L	0		13-AUG-14	R2917038
Nickel (Ni)-Total	<0.0020	-	DLM	0.0020	mg/L	-		13-AUG-14	R2917038
Potassium (K)-Total	5.25	+/-0.64	DLM	0.10	mg/L	0		13-AUG-14	R2917038
Selenium (Se)-Total	<0.00040	-	DLM	0.00040	mg/L	-		13-AUG-14	R2917038
Silicon (Si)-Total	5.92	+/-1.2	DLM	0.10	mg/L	0		13-AUG-14	R2917038
Silver (Ag)-Total	<0.00040	-	DLM	0.00040	mg/L	-		13-AUG-14	R2917038
Sodium (Na)-Total	380	+/-47	DLM	1.0	mg/L	0		13-AUG-14	R2917038
Uranium (U)-Total	0.00017	+/-0.00002	DLM	0.00010	mg/L	0		13-AUG-14	R2917038
Zinc (Zn)-Total	0.0088	+/-0.0025	DLM	0.0060	mg/L	0		13-AUG-14	R2917038
Miscellaneous Parameters									
Ammonia, Total (as N)	2.27	-		0.050	mg/L	-		19-AUG-14	R2923049
Dissolved Organic Carbon	8.8	+/-1.1		1.0	mg/L	0		16-AUG-14	R2921067
Iron Bacteria	See Attached	-				-		08-AUG-14	R2922158
Naphthenic Acids	<1.0	-		1.0	mg/L	-	18-AUG-14	28-AUG-14	R2932711
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		21-AUG-14	R2925385
Sulphate Reducing Bacteria	See Attached	-				-		08-AUG-14	R2922158

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1498418-7 16053140806031									
Sampled By: bobby p, jeremy I on 06-AUG-14 @ 17:15									
Matrix: h20									
Total Dissolved Solids	1160	+/-77		10	mg/L	0	11-AUG-14		R2915573
Silicon (as SiO2)-Total	12.7	-		0.21	mg/L	-	13-AUG-14		
Turbidity	6.94	+/-0.43		0.10	NTU	0	08-AUG-14		R2911521
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Anthracene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Fluoranthene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Fluorene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Naphthalene	<0.000050	-		0.000050	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Phenanthrene	<0.000050	-		0.000050	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Pyrene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(a)pyrene	<0.000050	-		0.000005	mg/L	-	19-AUG-14	19-AUG-14	R2924297
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Dibenzo(a,h)anthracene	<0.000050	-		0.000005	mg/L	-	19-AUG-14	19-AUG-14	R2924297
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Surr: d10-Acenaphthene	97.5	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297
Surr: d10-Phenanthrene	102.7	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297
Surr: d12-Chrysene	100.4	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	50.9	+/-2.9		0.50	mg/L	0	08-AUG-14		R2915836
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-	20-AUG-14		R2924279
Antimony (Sb)-Dissolved	<0.00040	-	DLM	0.00040	mg/L	-	20-AUG-14		R2924279
Arsenic (As)-Dissolved	<0.00040	-	DLM	0.00040	mg/L	-	20-AUG-14		R2924279
Barium (Ba)-Dissolved	0.0138	+/-0.0012	DLM	0.0050	mg/L	0	20-AUG-14		R2924279
Boron (B)-Dissolved	1.35	+/-0.16	DLM	0.050	mg/L	0	20-AUG-14		R2924279
Cadmium (Cd)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-	20-AUG-14		R2924279
Calcium (Ca)-Dissolved	49.1	+/-6.7	DLM	0.50	mg/L	0	20-AUG-14		R2924279
Chromium (Cr)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-	20-AUG-14		R2924279
Copper (Cu)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-	20-AUG-14		R2924279
Iron (Fe)-Dissolved	0.053	+/-0.005	DLM	0.020	mg/L	0	20-AUG-14		R2924279
Lead (Pb)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-	20-AUG-14		R2924279
Magnesium (Mg)-Dissolved	28.0	+/-2.2	DLM	0.10	mg/L	0	20-AUG-14		R2924279
Manganese (Mn)-Dissolved	0.0324	+/-0.0022	DLM	0.0020	mg/L	0	20-AUG-14		R2924279
Nickel (Ni)-Dissolved	<0.0020	-	DLM	0.0020	mg/L	-	20-AUG-14		R2924279
Potassium (K)-Dissolved	5.51	+/-0.43	DLM	0.10	mg/L	0	20-AUG-14		R2924279
Selenium (Se)-Dissolved	<0.00040	-	DLM	0.00040	mg/L	-	20-AUG-14		R2924279
Silicon (Si)-Dissolved	5.65	+/-0.48	DLM	0.10	mg/L	0	20-AUG-14		R2924279
Silver (Ag)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-	20-AUG-14		R2924279
Sodium (Na)-Dissolved	355	+/-25	DLM	1.0	mg/L	0	20-AUG-14		R2924279
Uranium (U)-Dissolved	0.00014	+/-0.00001	DLM	0.00010	mg/L	0	20-AUG-14		R2924279
Zinc (Zn)-Dissolved	0.0050	+/-0.0007	DLM	0.0030	mg/L	0	20-AUG-14		R2924279
Ion Balance Calculation									
Ion Balance	102	-			%	-	21-AUG-14		

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1498418-7 16053140806031 Sampled By: bobby p,jeremy I on 06-AUG-14 @ 17:15 Matrix: h20									
Ion Balance Calculation									
TDS (Calculated)	1150	-			mg/L	-		21-AUG-14	
Hardness (as CaCO3)	238	-			mg/L	-		21-AUG-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.000005 0	mg/L	-		20-AUG-14	R2924333
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		08-AUG-14	R2915836
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		12-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		08-AUG-14	R2915836
Sulfate by IC									
Sulfate (SO4)	278	+/-16		0.50	mg/L	0		08-AUG-14	R2915836
pH, Conductivity and Total Alkalinity									
pH	8.65	+/-0.01		0.10	pH	0		10-AUG-14	R2913010
Conductivity (EC)	1840	+/-92		0.20	uS/cm	0		10-AUG-14	R2913010
Bicarbonate (HCO3)	703	+/-27		5.0	mg/L	0		10-AUG-14	R2913010
Carbonate (CO3)	37.9	+/-5.8		5.0	mg/L	0		10-AUG-14	R2913010
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		10-AUG-14	R2913010
Alkalinity, Total (as CaCO3)	640	+/-40		2.0	mg/L	0		10-AUG-14	R2913010
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	12.1	-		0.21	mg/L	-		21-AUG-14	
L1498418-8 16053140806032 Sampled By: bobby p,jeremy I on 06-AUG-14 @ 18:45 Matrix: h20									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Toluene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
EthylBenzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
o-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Styrene	<0.0010	-		0.0010	mg/L	-		12-AUG-14	R2915907
F1(C6-C10)	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
F1-BTEX	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
Xylenes	<0.00071	-		0.00071	mg/L	-		12-AUG-14	R2915907
Surr: 1,4-Difluorobenzene (SS)	100.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 4-Bromofluorobenzene (SS)	98.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 3,4-Dichlorotoluene (SS)	102.0	-		N/A	%	-		12-AUG-14	R2915907
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
F3 (C16-C34)	0.39	+/-0.13		0.25	mg/L	0	12-AUG-14	12-AUG-14	R2917059
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
Surr: 2-Bromobenzotrifluoride	141.7	-		N/A	%	-	12-AUG-14	12-AUG-14	R2917059
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	0.000440	+/-0.000069	DLM	0.000025	mg/L	0		20-AUG-14	R2924333
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	139	+/-22	DLM	0.015	mg/L	0		13-AUG-14	R2917038
Antimony (Sb)-Total	0.00093	+/-0.00013	DLM	0.00050	mg/L	0		13-AUG-14	R2917038
Arsenic (As)-Total	0.168	+/-0.019	DLM	0.00050	mg/L	0		13-AUG-14	R2917038

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1498418-8 16053140806032									
Sampled By: bobby p, jeremy l on 06-AUG-14 @ 18:45									
Matrix: h20									
Total Metals in Water by CRC ICPMS									
Barium (Ba)-Total	2.93	+/-0.33	DLM	0.0050	mg/L	0		13-AUG-14	R2917038
Boron (B)-Total	2.87	+/-0.46	DLM	0.050	mg/L	0		13-AUG-14	R2917038
Cadmium (Cd)-Total	0.00686	+/-0.0013	DLM	0.00020	mg/L	0		13-AUG-14	R2917038
Calcium (Ca)-Total	109	+/-13	DLM	0.50	mg/L	0		13-AUG-14	R2917038
Chromium (Cr)-Total	0.235	+/-0.034	DLM	0.0050	mg/L	0		13-AUG-14	R2917038
Copper (Cu)-Total	0.419	+/-0.049	DLM	0.0010	mg/L	0		13-AUG-14	R2917038
Iron (Fe)-Total	337	+/-53	DLM	0.050	mg/L	0		13-AUG-14	R2917038
Lead (Pb)-Total	0.313	+/-0.050	DLM	0.00025	mg/L	0		13-AUG-14	R2917038
Magnesium (Mg)-Total	83.3	+/-10	DLM	0.10	mg/L	0		13-AUG-14	R2917038
Manganese (Mn)-Total	6.36	+/-0.64	DLM	0.0020	mg/L	0		13-AUG-14	R2917038
Nickel (Ni)-Total	0.426	+/-0.046	DLM	0.0020	mg/L	0		13-AUG-14	R2917038
Potassium (K)-Total	32.4	+/-4.0	DLM	0.25	mg/L	0		13-AUG-14	R2917038
Selenium (Se)-Total	0.00930	+/-0.0013	DLM	0.00050	mg/L	0		13-AUG-14	R2917038
Silicon (Si)-Total	216	+/-43	DLM	0.25	mg/L	0		13-AUG-14	R2917038
Silver (Ag)-Total	0.00283	+/-0.00057	DLM	0.00040	mg/L	0		13-AUG-14	R2917038
Sodium (Na)-Total	1080	+/-130	DLM	1.0	mg/L	0		13-AUG-14	R2917038
Uranium (U)-Total	0.0298	+/-0.0042	DLM	0.00010	mg/L	0		13-AUG-14	R2917038
Zinc (Zn)-Total	1.52	+/-0.23	DLM	0.015	mg/L	0		13-AUG-14	R2917038
Miscellaneous Parameters									
Ammonia, Total (as N)	3.69	-		0.050	mg/L	-		19-AUG-14	R2923049
Dissolved Organic Carbon	8.9	+/-1.1		1.0	mg/L	0		16-AUG-14	R2921067
Iron Bacteria	See Attached	-				-		08-AUG-14	R2922158
Naphthenic Acids	<1.0	-		1.0	mg/L	-	18-AUG-14	28-AUG-14	R2932711
Phenols (4AAP)	0.0221	+/-0.0029		0.0010	mg/L	-7.4%		21-AUG-14	R2925385
Sulphate Reducing Bacteria	See Attached	-				-		08-AUG-14	R2922158
Total Dissolved Solids	2620	+/-180	DLA	40	mg/L	0		11-AUG-14	R2915573
Silicon (as SiO2)-Total	462	-		0.53	mg/L	-		14-AUG-14	
Turbidity	>4000	+/-220		0.10	NTU	0		08-AUG-14	R2911521
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Anthracene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Fluoranthene	0.000036	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Fluorene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Naphthalene	0.000086	-		0.000050	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Phenanthrene	0.000058	-		0.000050	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Pyrene	0.000059	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(b&j)fluoranthene	0.000047	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(g,h,i)perylene	0.000035	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(a)pyrene	0.0000220	-		0.000005	mg/L	-	19-AUG-14	19-AUG-14	R2924297
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	19-AUG-14	19-AUG-14	R2924297
				0					
Indeno(1,2,3-cd)pyrene	0.000018	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
B(A)P Total Potency Equivalent	0.000032	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Surr: d10-Acenaphthene	84.9	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297
Surr: d10-Phenanthrene	92.8	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297
Surr: d12-Chrysene	89.4	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1498418-9 16053140807033									
Sampled By: bobby p, jeremy l on 07-AUG-14 @ 08:19									
Matrix: h20									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Toluene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
EthylBenzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
o-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Styrene	<0.0010	-		0.0010	mg/L	-		12-AUG-14	R2915907
F1(C6-C10)	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
F1-BTEX	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
Xylenes	<0.00071	-		0.00071	mg/L	-		12-AUG-14	R2915907
Surr: 1,4-Difluorobenzene (SS)	101.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 4-Bromofluorobenzene (SS)	102.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 3,4-Dichlorotoluene (SS)	85.0	-		N/A	%	-		12-AUG-14	R2915907
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2917059
Surr: 2-Bromobenzotrifluoride	97.7	-		N/A	%	-	12-AUG-14	12-AUG-14	R2917059
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		20-AUG-14	R2924333
				0					
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	<0.0030	-		0.0030	mg/L	-		14-AUG-14	R2918385
Antimony (Sb)-Total	<0.00040	-		0.00040	mg/L	-		13-AUG-14	R2917038
Arsenic (As)-Total	<0.00040	-		0.00040	mg/L	-		13-AUG-14	R2917038
Barium (Ba)-Total	<0.0050	-		0.0050	mg/L	-		13-AUG-14	R2917038
Boron (B)-Total	<0.050	-		0.050	mg/L	-		13-AUG-14	R2917038
Cadmium (Cd)-Total	<0.00020	-		0.00020	mg/L	-		13-AUG-14	R2917038
Calcium (Ca)-Total	<0.50	-		0.50	mg/L	-		13-AUG-14	R2917038
Chromium (Cr)-Total	<0.0050	-		0.0050	mg/L	-		13-AUG-14	R2917038
Copper (Cu)-Total	<0.0010	-		0.0010	mg/L	-		13-AUG-14	R2917038
Iron (Fe)-Total	<0.010	-		0.010	mg/L	-		13-AUG-14	R2917038
Lead (Pb)-Total	<0.00010	-		0.00010	mg/L	-		13-AUG-14	R2917038
Magnesium (Mg)-Total	<0.10	-		0.10	mg/L	-		13-AUG-14	R2917038
Manganese (Mn)-Total	<0.0020	-		0.0020	mg/L	-		13-AUG-14	R2917038
Nickel (Ni)-Total	<0.0020	-		0.0020	mg/L	-		13-AUG-14	R2917038
Potassium (K)-Total	<0.10	-		0.10	mg/L	-		13-AUG-14	R2917038
Selenium (Se)-Total	<0.00040	-		0.00040	mg/L	-		13-AUG-14	R2917038
Silicon (Si)-Total	<0.050	-		0.050	mg/L	-		13-AUG-14	R2917038
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		13-AUG-14	R2917038
Sodium (Na)-Total	<1.0	-		1.0	mg/L	-		13-AUG-14	R2917038
Uranium (U)-Total	<0.00010	-		0.00010	mg/L	-		13-AUG-14	R2917038
Zinc (Zn)-Total	<0.0040	-		0.0040	mg/L	-		13-AUG-14	R2917038
Miscellaneous Parameters									
Ammonia, Total (as N)	<0.050	-		0.050	mg/L	-		19-AUG-14	R2923049
Iron Bacteria	See Attached	-				-		08-AUG-14	R2922158
Naphthenic Acids	<1.0	-		1.0	mg/L	-	18-AUG-14	28-AUG-14	R2932711
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		20-AUG-14	R2924308
Sulphate Reducing Bacteria	See Attached	-				-		08-AUG-14	R2922158
Total Dissolved Solids	<10	-		10	mg/L	-		11-AUG-14	R2915573

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1498418-9 16053140807033									
Sampled By: bobby p, jeremy l on 07-AUG-14 @ 08:19									
Matrix: h20									
Silicon (as SiO2)-Total	<0.11	-		0.11	mg/L	-		15-AUG-14	
Turbidity	1.23	+/-0.12		0.10	NTU	0		08-AUG-14	R2911521
Dissolved Organic Carbon									
Dissolved Organic Carbon	2.7	+/-0.6	RRV	1.0	mg/L	0		20-AUG-14	R2924069
Dissolved Organic Carbon	3.0	+/-0.6		1.0	mg/L	0		16-AUG-14	R2921067
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Anthracene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Fluoranthene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Fluorene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Naphthalene	<0.000050	-		0.000050	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Phenanthrene	<0.000050	-		0.000050	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Pyrene	0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(a)pyrene	<0.0000050	-		0.000005	mg/L	-	19-AUG-14	19-AUG-14	R2924297
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	19-AUG-14	19-AUG-14	R2924297
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Surr: d10-Acenaphthene	91.3	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297
Surr: d10-Phenanthrene	99.3	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297
Surr: d12-Chrysene	96.0	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	<0.50	-		0.50	mg/L	-		08-AUG-14	R2915836
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-		20-AUG-14	R2924279
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-		20-AUG-14	R2924279
Arsenic (As)-Dissolved	<0.00040	-		0.00040	mg/L	-		20-AUG-14	R2924279
Barium (Ba)-Dissolved	<0.0050	-		0.0050	mg/L	-		20-AUG-14	R2924279
Boron (B)-Dissolved	<0.0050	-		0.0050	mg/L	-		20-AUG-14	R2924279
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		20-AUG-14	R2924279
Calcium (Ca)-Dissolved	<0.50	-		0.50	mg/L	-		20-AUG-14	R2924279
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		20-AUG-14	R2924279
Copper (Cu)-Dissolved	<0.0010	-		0.0010	mg/L	-		20-AUG-14	R2924279
Iron (Fe)-Dissolved	<0.010	-		0.010	mg/L	-		20-AUG-14	R2924279
Lead (Pb)-Dissolved	<0.00010	-		0.00010	mg/L	-		20-AUG-14	R2924279
Magnesium (Mg)-Dissolved	<0.10	-		0.10	mg/L	-		20-AUG-14	R2924279
Manganese (Mn)-Dissolved	<0.0020	-		0.0020	mg/L	-		20-AUG-14	R2924279
Nickel (Ni)-Dissolved	<0.0020	-		0.0020	mg/L	-		20-AUG-14	R2924279
Potassium (K)-Dissolved	<0.10	-		0.10	mg/L	-		20-AUG-14	R2924279
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-		20-AUG-14	R2924279
Silicon (Si)-Dissolved	<0.050	-		0.050	mg/L	-		20-AUG-14	R2924279
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		20-AUG-14	R2924279
Sodium (Na)-Dissolved	<1.0	-		1.0	mg/L	-		20-AUG-14	R2924279
Uranium (U)-Dissolved	<0.00010	-		0.00010	mg/L	-		20-AUG-14	R2924279
Zinc (Zn)-Dissolved	<0.0030	-		0.0030	mg/L	-		20-AUG-14	R2924279

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1498418-9 16053140807033 Sampled By: bobby p.jeremy I on 07-AUG-14 @ 08:19 Matrix: h20									
Ion Balance Calculation									
Ion Balance	Low TDS	-			%	-		21-AUG-14	
TDS (Calculated)	<1.0	-			mg/L	-		21-AUG-14	
Hardness (as CaCO3)	<1.0	-			mg/L	-		21-AUG-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.000005 0	mg/L	-		20-AUG-14	R2924333
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		08-AUG-14	R2915836
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		12-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		08-AUG-14	R2915836
Sulfate by IC									
Sulfate (SO4)	<0.50	-		0.50	mg/L	-		08-AUG-14	R2915836
pH, Conductivity and Total Alkalinity									
pH	5.49	+/-0.01	RRV	0.10	pH	0		10-AUG-14	R2913010
Conductivity (EC)	0.73	+/-0.26	RRV	0.20	uS/cm	0		10-AUG-14	R2913010
Bicarbonate (HCO3)	<5.0	-	RRV	5.0	mg/L	-		10-AUG-14	R2913010
Carbonate (CO3)	<5.0	-	RRV	5.0	mg/L	-		10-AUG-14	R2913010
Hydroxide (OH)	<5.0	-	RRV	5.0	mg/L	-		10-AUG-14	R2913010
Alkalinity, Total (as CaCO3)	<2.0	-	RRV	2.0	mg/L	-		10-AUG-14	R2913010
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	<0.11	-		0.11	mg/L	-		21-AUG-14	
L1498418-10 16053140807034 Sampled By: bobby p.jeremy I on 07-AUG-14 @ 08:31 Matrix: h20									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Toluene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
EthylBenzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
o-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Styrene	<0.0010	-		0.0010	mg/L	-		12-AUG-14	R2915907
F1(C6-C10)	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
F1-BTEX	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
Xylenes	<0.00071	-		0.00071	mg/L	-		12-AUG-14	R2915907
Surr:	1,4-Difluorobenzene (SS)	101.0	-	N/A	%	-		12-AUG-14	R2915907
Surr:	4-Bromofluorobenzene (SS)	90.0	-	N/A	%	-		12-AUG-14	R2915907
Surr:	3,4-Dichlorotoluene (SS)	104.0	-	N/A	%	-		12-AUG-14	R2915907
* Refer to Referenced Information for Qualifiers (if any) and Methodology.									

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Aluminum (Al)-Total	DLM	
Matrix Spike	Sulfate (SO4)	MS-B	
Matrix Spike	Dissolved Organic Carbon	MS-B	
Matrix Spike	Dissolved Organic Carbon	MS-B	

Sample Parameter Qualifier Key:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLM	Detection Limit Adjusted due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
BTXS,F1-ED	Water	BTEX, Styrene and F1 (C6-C10)		EPA 5021/8015&8260 GC-MS & FID
C-DIS-ORG-ED	Water	Dissolved Organic Carbon		APHA 5310 B-Instrumental
CL-IC-ED	Water	Chloride by IC		APHA 4110 B-ION CHROMATOGRAPHY
F2,F3,F4-ED	Water	F2, F3, F4		EPA 3510/CCME PHC CWS-GC-FID
HG-D-L-CVAA-ED	Water	Mercury (Hg) - Dissolved		EPA 245.7 / EPA 245.1
HG-T-L-CVAA-ED	Water	Mercury (Hg)		EPA 245.7 / EPA 245.1
IB-BART-PB	Water	Iron Bacteria		BART Test Kit
BART Test Kit Analysis performed at PBR Laboratories Inc., Edmonton.				
IONBALANCE-ED	Water	Ion Balance Calculation		APHA 1030E
MET-D-CCMS-ED	Water	Dissolved Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
NAPHTHENIC-ACID-FM	Water	Naphthenic Acids by FTIR		Naphthenic Acids by FTIR, Syncrude, 1994
Dissolved naphthenic acids are solvent extracted from acidified aqueous samples using Dichloromethane prior to quantitation by Fourier Transform Infra-Red spectroscopy. Note that FTIR is not uniquely selective to naphthenic acids. If present, other carboxylic acids (e.g. humic acids, fulvic acids) may also be detected by this method.				
NH3-CFA-ED	Water	Ammonia in Water by Colour		APHA 4500 NH3-NITROGEN (AMMONIA)
This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.				
NO2+NO3-CALC-ED	Water	Nitrate+Nitrite		CALCULATION
NO2-IC-ED	Water	Nitrite as N by IC		APHA 4110 B-ION CHROMATOGRAPHY
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
NO3-IC-ED	Water	Nitrate as N by IC		APHA 4110 B-ION CHROMATOGRAPHY
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
PAH-ABT1-CL	Water	PAH & Carcinogenic PAH List		EPA 3510/8270-GC/MS
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity		APHA 4500-H, 2510, 2320
All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)				
PHENOLS-4AAP-ED	Water	Phenols (4AAP)		AB ENV.06537-COLORIMETRIC

This analysis is carried out using procedures adapted from ENVIRODAT VMV 06537 689, Method Code 154, in "Methods Manual for Chemical Analysis of Water and Wastes" published by the Alberta Environmental Centre. This automated method is based on the distillation of phenol and subsequent reaction of the distillate with alkaline ferricyanide and 4-aminoantipyrine to form a red complex which is measured at 505 nm.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
SIO2-D-CALC-ED	Water	Dissolved Silicon (reported as Silica)		CALCULATION
SIO2-T-CALC-ED	Water	Total Silicon (reported as Silica)		CALCULATION
SO4-IC-ED	Water	Sulfate by IC		APHA 4110 B-ION CHROMATOGRAPHY
SOLIDS-TDS-ED	Water	Total Dissolved Solids		APHA 2540 C
SRB-BART-PB	Water	Sulphate Reducing Bacteria / BART method		BART TEST KIT
BART Test Kit				
TURBIDITY-ED	Water	Turbidity		APHA 2130 B-Nephelometer

** The indicated Method Reference is the closest nationally or internationally recognized reference for the applicable ALS test method. ALS methods may incorporate modifications from the specified reference to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
PB	PBR LABORATORIES
FM	ALS ENVIRONMENTAL - FORT MCMURRAY, ALBERTA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

M076071

GLOSSARY OF REPORT TERMS

Surr - Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

MU: Measurement Uncertainty. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 which gives a level of confidence of approximately 95%.

Bias: The reported method bias is the average long term deviation from the target value for a long term reference or control sample, measured in percent. Zero values indicate no detectable method bias.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 1 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R2915907							
WG1928137-4	DUP	L1498481-8						
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-AUG-14
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-AUG-14
EthylBenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-AUG-14
o-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	12-AUG-14
m+p-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	12-AUG-14
Styrene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	50	12-AUG-14
F1(C6-C10)		<0.10	<0.10	RPD-NA	mg/L	N/A	30	12-AUG-14
WG1928137-8	DUP	L1499441-5						
Benzene		0.0466	0.0425		mg/L	9.3	30	12-AUG-14
Toluene		0.0420	0.0374		mg/L	12	30	12-AUG-14
EthylBenzene		0.0422	0.0357		mg/L	17	30	12-AUG-14
o-Xylene		0.0416	0.0356		mg/L	16	24	12-AUG-14
m+p-Xylene		0.0416	0.0346		mg/L	18	24	12-AUG-14
Styrene		0.0267	0.0226		mg/L	17	50	12-AUG-14
F1(C6-C10)		0.35	0.34		mg/L	3.0	30	12-AUG-14
WG1928137-2	LCS							
Benzene			117.5		%		70-130	12-AUG-14
Toluene			126.5		%		70-130	12-AUG-14
EthylBenzene			120.6		%		70-130	12-AUG-14
o-Xylene			128.4		%		70-130	12-AUG-14
m+p-Xylene			125.1		%		70-130	12-AUG-14
Styrene			120.0		%		70-130	12-AUG-14
WG1928137-3	LCS							
F1(C6-C10)			93.6		%		70-130	12-AUG-14
WG1928137-6	LCS							
Benzene			84.4		%		70-130	12-AUG-14
Toluene			88.3		%		70-130	12-AUG-14
EthylBenzene			80.0		%		70-130	12-AUG-14
o-Xylene			86.4		%		70-130	12-AUG-14
m+p-Xylene			82.1		%		70-130	12-AUG-14
Styrene			84.4		%		70-130	12-AUG-14
WG1928137-7	LCS							
F1(C6-C10)			82.2		%		70-130	12-AUG-14
WG1928137-1	MB							



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 2 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R2915907							
WG1928137-1	MB							
Benzene			<0.00050		mg/L		0.0005	12-AUG-14
Toluene			<0.00050		mg/L		0.0005	12-AUG-14
EthylBenzene			<0.00050		mg/L		0.0005	12-AUG-14
o-Xylene			<0.00050		mg/L		0.0005	12-AUG-14
m+p-Xylene			<0.00050		mg/L		0.0005	12-AUG-14
Styrene			<0.0010		mg/L		0.001	12-AUG-14
F1(C6-C10)			<0.10		mg/L		0.1	12-AUG-14
Surrogate: 1,4-Difluorobenzene (SS)			102.0		%		70-130	12-AUG-14
Surrogate: 4-Bromofluorobenzene (SS)			100.0		%		70-130	12-AUG-14
Surrogate: 3,4-Dichlorotoluene (SS)			92.0		%		70-130	12-AUG-14
WG1928137-5	MB							
Benzene			<0.00050		mg/L		0.0005	12-AUG-14
Toluene			<0.00050		mg/L		0.0005	12-AUG-14
EthylBenzene			<0.00050		mg/L		0.0005	12-AUG-14
o-Xylene			<0.00050		mg/L		0.0005	12-AUG-14
m+p-Xylene			<0.00050		mg/L		0.0005	12-AUG-14
Styrene			<0.0010		mg/L		0.001	12-AUG-14
F1(C6-C10)			<0.10		mg/L		0.1	12-AUG-14
Surrogate: 1,4-Difluorobenzene (SS)			101.0		%		70-130	12-AUG-14
Surrogate: 4-Bromofluorobenzene (SS)			98.0		%		70-130	12-AUG-14
Surrogate: 3,4-Dichlorotoluene (SS)			91.0		%		70-130	12-AUG-14
C-DIS-ORG-ED		Water						
Batch	R2921067							
WG1932393-3	CVS							
Dissolved Organic Carbon			115.2		%		80-160	17-AUG-14
WG1932393-8	DUP	L1501860-9						
Dissolved Organic Carbon		21.6	21.5		mg/L	0.6	20	16-AUG-14
WG1932393-2	LCS							
Dissolved Organic Carbon			95.8		%		80-120	16-AUG-14
WG1932393-1	MB							
Dissolved Organic Carbon			<1.0		mg/L		1	16-AUG-14
WG1932393-9	MS	L1501860-10						
Dissolved Organic Carbon			N/A	MS-B	%		-	16-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 3 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-ED		Water						
Batch	R2924069							
WG1934716-3	CVS							
Dissolved Organic Carbon			119.0		%		80-160	20-AUG-14
WG1934716-4	DUP	L1499435-3						
Dissolved Organic Carbon		17.7	17.5		mg/L	1.0	20	20-AUG-14
WG1934716-2	LCS							
Dissolved Organic Carbon			97.3		%		80-120	20-AUG-14
WG1934716-1	MB							
Dissolved Organic Carbon			<1.0		mg/L		1	20-AUG-14
WG1934716-5	MS	L1499435-3						
Dissolved Organic Carbon			N/A	MS-B	%		-	20-AUG-14
CL-IC-ED		Water						
Batch	R2915836							
WG1927368-3	DUP	L1498894-9						
Chloride (Cl)		86.4	86.5		mg/L	0.1	20	08-AUG-14
WG1927368-5	DUP	L1498571-1						
Chloride (Cl)		19.6	19.6		mg/L	0.1	20	08-AUG-14
WG1927368-7	DUP	L1498418-2						
Chloride (Cl)		1.89	1.88		mg/L	0.9	20	08-AUG-14
WG1927368-11	LCS							
Chloride (Cl)			104.0		%		90-110	08-AUG-14
WG1927368-13	LCS							
Chloride (Cl)			104.1		%		90-110	08-AUG-14
WG1927368-15	LCS							
Chloride (Cl)			104.3		%		90-110	08-AUG-14
WG1927368-2	LCS							
Chloride (Cl)			101.9		%		90-110	08-AUG-14
WG1927368-9	LCS							
Chloride (Cl)			104.9		%		90-110	08-AUG-14
WG1927368-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	08-AUG-14
WG1927368-10	MB							
Chloride (Cl)			<0.50		mg/L		0.5	08-AUG-14
WG1927368-12	MB							
Chloride (Cl)			<0.50		mg/L		0.5	08-AUG-14
WG1927368-14	MB							
Chloride (Cl)			<0.50		mg/L		0.5	08-AUG-14
WG1927368-16	MB							
Chloride (Cl)			<0.50		mg/L		0.5	08-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 4 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-ED								
	Water							
Batch	R2915836							
WG1927368-4	MS	L1498894-9						
Chloride (Cl)			93.7		%		75-125	08-AUG-14
WG1927368-6	MS	L1498571-1						
Chloride (Cl)			99.8		%		75-125	08-AUG-14
WG1927368-8	MS	L1498418-2						
Chloride (Cl)			100.6		%		75-125	08-AUG-14
F2,F3,F4-ED								
	Water							
Batch	R2917059							
WG1928777-2	LCS							
F2 (>C10-C16)			105.1		%		65-135	12-AUG-14
F3 (C16-C34)			107.5		%		65-135	12-AUG-14
F4 (C34-C50)			106.0		%		65-135	12-AUG-14
WG1928777-5	LCS							
F2 (>C10-C16)			104.1		%		65-135	12-AUG-14
F3 (C16-C34)			104.4		%		65-135	12-AUG-14
F4 (C34-C50)			101.0		%		65-135	12-AUG-14
WG1928777-1	MB							
F2 (>C10-C16)			<0.25		mg/L		0.25	12-AUG-14
F3 (C16-C34)			<0.25		mg/L		0.25	12-AUG-14
F4 (C34-C50)			<0.25		mg/L		0.25	12-AUG-14
Surrogate: 2-Bromobenzotrifluoride			95.9		%		50-150	12-AUG-14
WG1928777-4	MB							
F2 (>C10-C16)			<0.25		mg/L		0.25	12-AUG-14
F3 (C16-C34)			<0.25		mg/L		0.25	12-AUG-14
F4 (C34-C50)			<0.25		mg/L		0.25	12-AUG-14
Surrogate: 2-Bromobenzotrifluoride			99.4		%		50-150	12-AUG-14
WG1928777-3	MS	L1498418-2						
F2 (>C10-C16)			105.2		%		50-150	12-AUG-14
F3 (C16-C34)			105.4		%		50-150	12-AUG-14
F4 (C34-C50)			102.9		%		50-150	12-AUG-14
WG1928777-6	MS	L1500196-2						
F2 (>C10-C16)			99.0		%		50-150	12-AUG-14
F3 (C16-C34)			104.4		%		50-150	12-AUG-14
F4 (C34-C50)			96.9		%		50-150	12-AUG-14
HG-D-L-CVAA-ED								
	Water							



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 5 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-L-CVAA-ED		Water						
Batch	R2924333							
WG1934700-11 DUP		L1498418-1						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	20-AUG-14
WG1934700-15 DUP		L1502445-2						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	20-AUG-14
WG1934700-10 LCS			83.6		%		80-120	20-AUG-14
Mercury (Hg)-Dissolved								
WG1934700-14 LCS			82.6		%		80-120	20-AUG-14
Mercury (Hg)-Dissolved								
WG1934700-13 MB			<0.0000050		mg/L		0.000005	20-AUG-14
Mercury (Hg)-Dissolved								
WG1934700-9 MB			<0.0000050		mg/L		0.000005	20-AUG-14
Mercury (Hg)-Dissolved								
WG1934700-12 MS		L1498418-1	79.7		%		70-130	20-AUG-14
Mercury (Hg)-Dissolved								
WG1934700-16 MS		L1502445-2	94.8		%		70-130	20-AUG-14
Mercury (Hg)-Dissolved								
HG-T-L-CVAA-ED		Water						
Batch	R2924333							
WG1934743-3 DUP		L1498418-9						
Mercury (Hg)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	20-AUG-14
WG1934743-2 LCS			82.0		%		80-120	20-AUG-14
Mercury (Hg)-Total								
WG1934743-1 MB			<0.0000050		mg/L		0.000005	20-AUG-14
Mercury (Hg)-Total								
WG1934743-4 MS		L1498418-9	90.2		%		70-130	20-AUG-14
Mercury (Hg)-Total								
MET-D-CCMS-ED		Water						
Batch	R2924279							
WG1934683-11 CRM		ED-HIGH-WATRM						
Aluminum (Al)-Dissolved			99.1		%		80-120	20-AUG-14
Antimony (Sb)-Dissolved			103.2		%		80-120	20-AUG-14
Arsenic (As)-Dissolved			97.1		%		80-120	20-AUG-14
Barium (Ba)-Dissolved			100.0		%		80-120	20-AUG-14
Boron (B)-Dissolved			92.8		%		80-120	20-AUG-14
Cadmium (Cd)-Dissolved			98.5		%		80-120	20-AUG-14
Calcium (Ca)-Dissolved			93.6		%		80-120	20-AUG-14
Chromium (Cr)-Dissolved			98.9		%		80-120	20-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 6 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2924279							
WG1934683-11 CRM	ED-HIGH-WATRM							
Copper (Cu)-Dissolved			95.5		%		80-120	20-AUG-14
Lead (Pb)-Dissolved			99.8		%		80-120	20-AUG-14
Magnesium (Mg)-Dissolved			103.0		%		80-120	20-AUG-14
Manganese (Mn)-Dissolved			97.0		%		80-120	20-AUG-14
Nickel (Ni)-Dissolved			97.4		%		80-120	20-AUG-14
Potassium (K)-Dissolved			104.8		%		80-120	20-AUG-14
Selenium (Se)-Dissolved			96.1		%		80-120	20-AUG-14
Silicon (Si)-Dissolved			88.6		%		80-120	20-AUG-14
Silver (Ag)-Dissolved			101.6		%		80-120	20-AUG-14
Sodium (Na)-Dissolved			96.9		%		80-120	20-AUG-14
Uranium (U)-Dissolved			102.6		%		80-120	20-AUG-14
Zinc (Zn)-Dissolved			97.4		%		80-120	20-AUG-14
WG1934683-14 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			103.6		%		80-120	20-AUG-14
Antimony (Sb)-Dissolved			102.3		%		80-120	20-AUG-14
Arsenic (As)-Dissolved			98.5		%		80-120	20-AUG-14
Barium (Ba)-Dissolved			101.3		%		80-120	20-AUG-14
Boron (B)-Dissolved			96.8		%		80-120	20-AUG-14
Cadmium (Cd)-Dissolved			104.3		%		80-120	20-AUG-14
Calcium (Ca)-Dissolved			99.3		%		80-120	20-AUG-14
Chromium (Cr)-Dissolved			98.6		%		80-120	20-AUG-14
Copper (Cu)-Dissolved			98.2		%		80-120	20-AUG-14
Lead (Pb)-Dissolved			100.3		%		80-120	20-AUG-14
Magnesium (Mg)-Dissolved			105.6		%		80-120	20-AUG-14
Manganese (Mn)-Dissolved			100.0		%		80-120	20-AUG-14
Nickel (Ni)-Dissolved			100.1		%		80-120	20-AUG-14
Potassium (K)-Dissolved			107.1		%		80-120	20-AUG-14
Selenium (Se)-Dissolved			99.4		%		80-120	20-AUG-14
Silicon (Si)-Dissolved			88.3		%		80-120	20-AUG-14
Silver (Ag)-Dissolved			103.0		%		80-120	20-AUG-14
Sodium (Na)-Dissolved			100.7		%		80-120	20-AUG-14
Uranium (U)-Dissolved			102.7		%		80-120	20-AUG-14
Zinc (Zn)-Dissolved			100.2		%		80-120	20-AUG-14
WG1934683-17 CRM	ED-HIGH-WATRM							



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 7 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2924279							
WG1934683-17 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			102.0		%		80-120	20-AUG-14
Antimony (Sb)-Dissolved			102.9		%		80-120	20-AUG-14
Arsenic (As)-Dissolved			97.4		%		80-120	20-AUG-14
Barium (Ba)-Dissolved			104.1		%		80-120	20-AUG-14
Boron (B)-Dissolved			98.0		%		80-120	20-AUG-14
Cadmium (Cd)-Dissolved			99.1		%		80-120	20-AUG-14
Calcium (Ca)-Dissolved			99.1		%		80-120	20-AUG-14
Chromium (Cr)-Dissolved			96.8		%		80-120	20-AUG-14
Copper (Cu)-Dissolved			96.7		%		80-120	20-AUG-14
Lead (Pb)-Dissolved			100.2		%		80-120	20-AUG-14
Magnesium (Mg)-Dissolved			104.0		%		80-120	20-AUG-14
Manganese (Mn)-Dissolved			96.7		%		80-120	20-AUG-14
Nickel (Ni)-Dissolved			97.7		%		80-120	20-AUG-14
Potassium (K)-Dissolved			101.3		%		80-120	20-AUG-14
Selenium (Se)-Dissolved			98.8		%		80-120	20-AUG-14
Silicon (Si)-Dissolved			88.9		%		80-120	20-AUG-14
Silver (Ag)-Dissolved			100.6		%		80-120	20-AUG-14
Sodium (Na)-Dissolved			98.2		%		80-120	20-AUG-14
Uranium (U)-Dissolved			103.8		%		80-120	20-AUG-14
Zinc (Zn)-Dissolved			99.1		%		80-120	20-AUG-14
WG1934683-2 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			97.4		%		80-120	20-AUG-14
Antimony (Sb)-Dissolved			96.3		%		80-120	20-AUG-14
Arsenic (As)-Dissolved			100.8		%		80-120	20-AUG-14
Barium (Ba)-Dissolved			107.2		%		80-120	20-AUG-14
Boron (B)-Dissolved			94.6		%		80-120	20-AUG-14
Cadmium (Cd)-Dissolved			102.8		%		80-120	20-AUG-14
Calcium (Ca)-Dissolved			93.1		%		80-120	20-AUG-14
Chromium (Cr)-Dissolved			103.4		%		80-120	20-AUG-14
Copper (Cu)-Dissolved			99.1		%		80-120	20-AUG-14
Lead (Pb)-Dissolved			95.0		%		80-120	20-AUG-14
Magnesium (Mg)-Dissolved			104.9		%		80-120	20-AUG-14
Manganese (Mn)-Dissolved			98.7		%		80-120	20-AUG-14
Nickel (Ni)-Dissolved			100.8		%		80-120	20-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 8 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2924279							
WG1934683-2 CRM	ED-HIGH-WATRM							
Potassium (K)-Dissolved			100.8		%		80-120	20-AUG-14
Selenium (Se)-Dissolved			104.4		%		80-120	20-AUG-14
Silicon (Si)-Dissolved			88.7		%		80-120	20-AUG-14
Silver (Ag)-Dissolved			101.0		%		80-120	20-AUG-14
Sodium (Na)-Dissolved			99.1		%		80-120	20-AUG-14
Uranium (U)-Dissolved			93.8		%		80-120	20-AUG-14
Zinc (Zn)-Dissolved			98.8		%		80-120	20-AUG-14
WG1934683-20 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			101.9		%		80-120	20-AUG-14
Antimony (Sb)-Dissolved			105.6		%		80-120	20-AUG-14
Arsenic (As)-Dissolved			98.2		%		80-120	20-AUG-14
Barium (Ba)-Dissolved			103.5		%		80-120	20-AUG-14
Boron (B)-Dissolved			100.9		%		80-120	20-AUG-14
Cadmium (Cd)-Dissolved			101.3		%		80-120	20-AUG-14
Calcium (Ca)-Dissolved			100.8		%		80-120	20-AUG-14
Chromium (Cr)-Dissolved			100.8		%		80-120	20-AUG-14
Copper (Cu)-Dissolved			97.2		%		80-120	20-AUG-14
Lead (Pb)-Dissolved			100.3		%		80-120	20-AUG-14
Magnesium (Mg)-Dissolved			104.3		%		80-120	20-AUG-14
Manganese (Mn)-Dissolved			97.8		%		80-120	20-AUG-14
Nickel (Ni)-Dissolved			98.9		%		80-120	20-AUG-14
Potassium (K)-Dissolved			104.3		%		80-120	20-AUG-14
Selenium (Se)-Dissolved			98.0		%		80-120	20-AUG-14
Silicon (Si)-Dissolved			95.8		%		80-120	20-AUG-14
Silver (Ag)-Dissolved			101.8		%		80-120	20-AUG-14
Sodium (Na)-Dissolved			104.3		%		80-120	20-AUG-14
Uranium (U)-Dissolved			103.0		%		80-120	20-AUG-14
Zinc (Zn)-Dissolved			99.4		%		80-120	20-AUG-14
WG1934683-23 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			103.4		%		80-120	20-AUG-14
Antimony (Sb)-Dissolved			105.5		%		80-120	20-AUG-14
Arsenic (As)-Dissolved			97.1		%		80-120	20-AUG-14
Barium (Ba)-Dissolved			101.9		%		80-120	20-AUG-14
Boron (B)-Dissolved			94.2		%		80-120	20-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 9 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2924279							
WG1934683-23 CRM	ED-HIGH-WATRM							
Cadmium (Cd)-Dissolved			101.7		%		80-120	20-AUG-14
Calcium (Ca)-Dissolved			94.8		%		80-120	20-AUG-14
Chromium (Cr)-Dissolved			100.0		%		80-120	20-AUG-14
Copper (Cu)-Dissolved			97.0		%		80-120	20-AUG-14
Lead (Pb)-Dissolved			99.0		%		80-120	20-AUG-14
Magnesium (Mg)-Dissolved			102.6		%		80-120	20-AUG-14
Manganese (Mn)-Dissolved			98.0		%		80-120	20-AUG-14
Nickel (Ni)-Dissolved			98.0		%		80-120	20-AUG-14
Potassium (K)-Dissolved			103.3		%		80-120	20-AUG-14
Selenium (Se)-Dissolved			97.7		%		80-120	20-AUG-14
Silicon (Si)-Dissolved			88.8		%		80-120	20-AUG-14
Silver (Ag)-Dissolved			98.5		%		80-120	20-AUG-14
Sodium (Na)-Dissolved			96.5		%		80-120	20-AUG-14
Uranium (U)-Dissolved			101.0		%		80-120	20-AUG-14
Zinc (Zn)-Dissolved			98.9		%		80-120	20-AUG-14
WG1934683-5 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			103.0		%		80-120	20-AUG-14
Antimony (Sb)-Dissolved			106.8		%		80-120	20-AUG-14
Arsenic (As)-Dissolved			97.5		%		80-120	20-AUG-14
Barium (Ba)-Dissolved			99.3		%		80-120	20-AUG-14
Boron (B)-Dissolved			96.6		%		80-120	20-AUG-14
Cadmium (Cd)-Dissolved			102.4		%		80-120	20-AUG-14
Calcium (Ca)-Dissolved			97.0		%		80-120	20-AUG-14
Chromium (Cr)-Dissolved			98.7		%		80-120	20-AUG-14
Copper (Cu)-Dissolved			97.3		%		80-120	20-AUG-14
Lead (Pb)-Dissolved			100.1		%		80-120	20-AUG-14
Magnesium (Mg)-Dissolved			105.1		%		80-120	20-AUG-14
Manganese (Mn)-Dissolved			98.1		%		80-120	20-AUG-14
Nickel (Ni)-Dissolved			97.8		%		80-120	20-AUG-14
Potassium (K)-Dissolved			100.4		%		80-120	20-AUG-14
Selenium (Se)-Dissolved			99.5		%		80-120	20-AUG-14
Silicon (Si)-Dissolved			87.2		%		80-120	20-AUG-14
Silver (Ag)-Dissolved			104.8		%		80-120	20-AUG-14
Sodium (Na)-Dissolved			98.5		%		80-120	20-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 10 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2924279							
WG1934683-5 CRM		ED-HIGH-WATRM						
Uranium (U)-Dissolved			99.6		%		80-120	20-AUG-14
Zinc (Zn)-Dissolved			96.4		%		80-120	20-AUG-14
WG1934683-8 CRM		ED-HIGH-WATRM						
Aluminum (Al)-Dissolved			99.9		%		80-120	20-AUG-14
Antimony (Sb)-Dissolved			106.9		%		80-120	20-AUG-14
Arsenic (As)-Dissolved			98.1		%		80-120	20-AUG-14
Barium (Ba)-Dissolved			102.1		%		80-120	20-AUG-14
Boron (B)-Dissolved			94.5		%		80-120	20-AUG-14
Cadmium (Cd)-Dissolved			106.3		%		80-120	20-AUG-14
Calcium (Ca)-Dissolved			95.0		%		80-120	20-AUG-14
Chromium (Cr)-Dissolved			100.1		%		80-120	20-AUG-14
Copper (Cu)-Dissolved			98.6		%		80-120	20-AUG-14
Lead (Pb)-Dissolved			101.0		%		80-120	20-AUG-14
Magnesium (Mg)-Dissolved			100.6		%		80-120	20-AUG-14
Manganese (Mn)-Dissolved			98.2		%		80-120	20-AUG-14
Nickel (Ni)-Dissolved			99.9		%		80-120	20-AUG-14
Potassium (K)-Dissolved			101.3		%		80-120	20-AUG-14
Selenium (Se)-Dissolved			101.1		%		80-120	20-AUG-14
Silicon (Si)-Dissolved			88.7		%		80-120	20-AUG-14
Silver (Ag)-Dissolved			103.0		%		80-120	20-AUG-14
Sodium (Na)-Dissolved			99.4		%		80-120	20-AUG-14
Uranium (U)-Dissolved			102.3		%		80-120	20-AUG-14
Zinc (Zn)-Dissolved			99.8		%		80-120	20-AUG-14
WG1934683-12 DUP		L1501868-7						
Aluminum (Al)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	20-AUG-14
Antimony (Sb)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	20-AUG-14
Arsenic (As)-Dissolved		0.00095	0.00078		mg/L	19	20	20-AUG-14
Barium (Ba)-Dissolved		0.0560	0.0537		mg/L	4.3	20	20-AUG-14
Boron (B)-Dissolved		0.133	0.130		mg/L	2.8	20	20-AUG-14
Calcium (Ca)-Dissolved		298	294		mg/L	1.4	20	20-AUG-14
Chromium (Cr)-Dissolved		0.00084	0.00054	J	mg/L	0.00029	0.001	20-AUG-14
Copper (Cu)-Dissolved		0.00494	0.00458		mg/L	7.5	20	20-AUG-14
Iron (Fe)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	20-AUG-14
Lead (Pb)-Dissolved		<0.00025	<0.00025	RPD-NA	mg/L	N/A	20	20-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 11 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2924279							
WG1934683-12 DUP		L1501868-7						
Magnesium (Mg)-Dissolved		228	229		mg/L	0.3	20	20-AUG-14
Manganese (Mn)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	20-AUG-14
Nickel (Ni)-Dissolved		0.00331	0.00296		mg/L	11	20	20-AUG-14
Potassium (K)-Dissolved		15.9	16.1		mg/L	1.4	20	20-AUG-14
Selenium (Se)-Dissolved		0.0153	0.0153		mg/L	0.2	20	20-AUG-14
Silicon (Si)-Dissolved		7.99	8.22		mg/L	2.8	20	20-AUG-14
Silver (Ag)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	20-AUG-14
Sodium (Na)-Dissolved		74.7	74.3		mg/L	0.6	20	20-AUG-14
Uranium (U)-Dissolved		0.0404	0.0394		mg/L	2.3	20	20-AUG-14
Zinc (Zn)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	20-AUG-14
WG1934683-15 DUP		L1501865-2						
Aluminum (Al)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	20-AUG-14
Antimony (Sb)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	20-AUG-14
Arsenic (As)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	20-AUG-14
Barium (Ba)-Dissolved		0.245	0.245		mg/L	0.2	20	20-AUG-14
Boron (B)-Dissolved		0.265	0.283		mg/L	6.7	20	20-AUG-14
Cadmium (Cd)-Dissolved		0.000288	0.000250		mg/L	14	20	20-AUG-14
Calcium (Ca)-Dissolved		330	337		mg/L	2.1	20	20-AUG-14
Chromium (Cr)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	20-AUG-14
Copper (Cu)-Dissolved		0.00088	0.00093		mg/L	5.4	20	20-AUG-14
Iron (Fe)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	20-AUG-14
Lead (Pb)-Dissolved		<0.00025	<0.00025	RPD-NA	mg/L	N/A	20	20-AUG-14
Magnesium (Mg)-Dissolved		91.9	88.9		mg/L	3.4	20	20-AUG-14
Manganese (Mn)-Dissolved		0.362	0.354		mg/L	2.4	20	20-AUG-14
Nickel (Ni)-Dissolved		0.00470	0.00457		mg/L	2.9	20	20-AUG-14
Potassium (K)-Dissolved		13.2	13.5		mg/L	2.1	20	20-AUG-14
Selenium (Se)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	20-AUG-14
Silicon (Si)-Dissolved		9.39	9.60		mg/L	2.2	20	20-AUG-14
Silver (Ag)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	20-AUG-14
Sodium (Na)-Dissolved		533	531		mg/L	0.4	20	20-AUG-14
Uranium (U)-Dissolved		0.0144	0.0146		mg/L	1.5	20	20-AUG-14
Zinc (Zn)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	20-AUG-14
WG1934683-18 DUP		L1501878-14						



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 12 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2924279							
WG1934683-18 DUP		L1501878-14						
Aluminum (Al)-Dissolved		<0.020	<0.020	RPD-NA	mg/L	N/A	20	20-AUG-14
Antimony (Sb)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	20-AUG-14
Arsenic (As)-Dissolved		0.0021	0.0020		mg/L	1.6	20	20-AUG-14
Barium (Ba)-Dissolved		0.0744	0.0768		mg/L	3.1	20	20-AUG-14
Boron (B)-Dissolved		1.11	1.15		mg/L	3.8	20	20-AUG-14
Cadmium (Cd)-Dissolved		<0.00020	0.00026	RPD-NA	mg/L	N/A	20	20-AUG-14
Calcium (Ca)-Dissolved		199	201		mg/L	1.1	20	20-AUG-14
Chromium (Cr)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	20-AUG-14
Copper (Cu)-Dissolved		0.0072	0.0077		mg/L	6.5	20	20-AUG-14
Iron (Fe)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	20	20-AUG-14
Lead (Pb)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	20-AUG-14
Magnesium (Mg)-Dissolved		309	312		mg/L	0.9	20	20-AUG-14
Manganese (Mn)-Dissolved		0.0237	0.0230		mg/L	3.0	20	20-AUG-14
Nickel (Ni)-Dissolved		0.0199	0.0203		mg/L	2.0	20	20-AUG-14
Potassium (K)-Dissolved		5.9	6.1		mg/L	3.8	20	20-AUG-14
Selenium (Se)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	20-AUG-14
Silicon (Si)-Dissolved		8.7	9.2		mg/L	5.4	20	20-AUG-14
Silver (Ag)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	20-AUG-14
Sodium (Na)-Dissolved		1140	1200		mg/L	4.9	20	20-AUG-14
Uranium (U)-Dissolved		0.316	0.319		mg/L	0.8	20	20-AUG-14
Zinc (Zn)-Dissolved		<0.020	<0.020	RPD-NA	mg/L	N/A	20	20-AUG-14
WG1934683-21 DUP		L1501880-1						
Aluminum (Al)-Dissolved		0.0015	0.0014		mg/L	7.9	20	20-AUG-14
Antimony (Sb)-Dissolved		0.00033	0.00034		mg/L	2.0	20	20-AUG-14
Arsenic (As)-Dissolved		0.0124	0.0124		mg/L	0.0	20	20-AUG-14
Barium (Ba)-Dissolved		0.117	0.115		mg/L	2.3	20	20-AUG-14
Boron (B)-Dissolved		0.157	0.159		mg/L	1.5	20	20-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	20-AUG-14
Calcium (Ca)-Dissolved		77.5	80.2		mg/L	3.4	20	20-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	20-AUG-14
Copper (Cu)-Dissolved		0.00073	0.00074		mg/L	1.0	20	20-AUG-14
Iron (Fe)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	20	20-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	20-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 13 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2924279							
WG1934683-21	DUP	L1501880-1						
Magnesium (Mg)-Dissolved		35.8	36.9		mg/L	3.2	20	20-AUG-14
Manganese (Mn)-Dissolved		0.184	0.184		mg/L	0.1	20	20-AUG-14
Nickel (Ni)-Dissolved		0.00091	0.00092		mg/L	0.8	20	20-AUG-14
Potassium (K)-Dissolved		6.07	6.03		mg/L	0.7	20	20-AUG-14
Selenium (Se)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	20-AUG-14
Silicon (Si)-Dissolved		10.1	9.56		mg/L	5.6	20	20-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	20-AUG-14
Sodium (Na)-Dissolved		153	156		mg/L	2.1	20	20-AUG-14
Uranium (U)-Dissolved		0.00465	0.00477		mg/L	2.5	20	20-AUG-14
Zinc (Zn)-Dissolved		0.0012	0.0011		mg/L	6.7	20	20-AUG-14
WG1934683-24	DUP	L1501880-9						
Aluminum (Al)-Dissolved		0.0038	0.0030	J	mg/L	0.0008	0.002	20-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	20-AUG-14
Arsenic (As)-Dissolved		0.00900	0.00906		mg/L	0.7	20	20-AUG-14
Barium (Ba)-Dissolved		0.295	0.296		mg/L	0.2	20	20-AUG-14
Boron (B)-Dissolved		0.143	0.149		mg/L	3.7	20	20-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	0.000011	RPD-NA	mg/L	N/A	20	20-AUG-14
Calcium (Ca)-Dissolved		93.2	93.8		mg/L	0.6	20	20-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	20-AUG-14
Copper (Cu)-Dissolved		0.00061	0.00062		mg/L	1.7	20	20-AUG-14
Iron (Fe)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	20	20-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	20-AUG-14
Magnesium (Mg)-Dissolved		36.6	37.7		mg/L	3.2	20	20-AUG-14
Manganese (Mn)-Dissolved		0.299	0.311		mg/L	4.0	20	20-AUG-14
Nickel (Ni)-Dissolved		0.00094	0.00097		mg/L	3.5	20	20-AUG-14
Potassium (K)-Dissolved		6.34	6.44		mg/L	1.5	20	20-AUG-14
Selenium (Se)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	20-AUG-14
Silicon (Si)-Dissolved		7.32	7.46		mg/L	2.0	20	20-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	20-AUG-14
Sodium (Na)-Dissolved		104	107		mg/L	2.6	20	20-AUG-14
Uranium (U)-Dissolved		0.00329	0.00325		mg/L	1.4	20	20-AUG-14
Zinc (Zn)-Dissolved		0.0041	0.0041		mg/L	0.7	20	20-AUG-14
WG1934683-3	DUP	L1498126-1						



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 14 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2924279							
WG1934683-3 DUP		L1498126-1						
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	20-AUG-14
Arsenic (As)-Dissolved		0.00029	0.00029		mg/L	2.7	20	20-AUG-14
Barium (Ba)-Dissolved		0.0169	0.0167		mg/L	1.2	20	20-AUG-14
Boron (B)-Dissolved		0.137	0.142		mg/L	3.4	20	20-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	20-AUG-14
Calcium (Ca)-Dissolved		5.19	5.44		mg/L	4.7	20	20-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	20-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	20-AUG-14
Magnesium (Mg)-Dissolved		1.00	1.02		mg/L	1.9	20	20-AUG-14
Nickel (Ni)-Dissolved		0.00027	0.00026		mg/L	4.1	20	20-AUG-14
Potassium (K)-Dissolved		0.912	0.922		mg/L	1.0	20	20-AUG-14
Selenium (Se)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	20-AUG-14
Silicon (Si)-Dissolved		3.44	3.56		mg/L	3.6	20	20-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	20-AUG-14
Sodium (Na)-Dissolved		294	299		mg/L	1.8	20	20-AUG-14
Uranium (U)-Dissolved		0.000031	0.000031		mg/L	0.1	20	20-AUG-14
Zinc (Zn)-Dissolved		0.0090	0.0090		mg/L	0.3	20	20-AUG-14
WG1934683-6 DUP		L1501470-1						
Aluminum (Al)-Dissolved		0.0392	0.0356		mg/L	9.5	20	20-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	20-AUG-14
Arsenic (As)-Dissolved		0.00023	0.00026		mg/L	12	20	20-AUG-14
Barium (Ba)-Dissolved		0.0134	0.0135		mg/L	1.1	20	20-AUG-14
Boron (B)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	20-AUG-14
Cadmium (Cd)-Dissolved		0.000012	<0.000010	RPD-NA	mg/L	N/A	20	20-AUG-14
Calcium (Ca)-Dissolved		10.2	10.5		mg/L	2.7	20	20-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	20-AUG-14
Copper (Cu)-Dissolved		0.0219	0.0220		mg/L	0.8	20	20-AUG-14
Iron (Fe)-Dissolved		0.016	<0.010	RPD-NA	mg/L	N/A	20	20-AUG-14
Lead (Pb)-Dissolved		0.000180	0.000181		mg/L	0.3	20	20-AUG-14
Magnesium (Mg)-Dissolved		4.19	4.20		mg/L	0.2	20	20-AUG-14
Nickel (Ni)-Dissolved		0.00085	0.00076		mg/L	11	20	20-AUG-14
Potassium (K)-Dissolved		1.15	1.15		mg/L	0.6	20	20-AUG-14
Selenium (Se)-Dissolved		0.00014	<0.00010	RPD-NA	mg/L	N/A	20	20-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 15 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2924279							
WG1934683-6 DUP		L1501470-1						
Silicon (Si)-Dissolved		0.338	0.316		mg/L	6.9	20	20-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	20-AUG-14
Sodium (Na)-Dissolved		9.9	10.3		mg/L	4.0	20	20-AUG-14
Uranium (U)-Dissolved		0.000012	<0.000010	RPD-NA	mg/L	N/A	20	20-AUG-14
Zinc (Zn)-Dissolved		0.0070	0.0071		mg/L	0.9	20	20-AUG-14
WG1934683-9 DUP		L1501861-1						
Aluminum (Al)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	20-AUG-14
Antimony (Sb)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	20-AUG-14
Arsenic (As)-Dissolved		0.0020	0.0025	J	mg/L	0.0005	0.002	20-AUG-14
Barium (Ba)-Dissolved		0.0135	0.0131		mg/L	2.9	20	20-AUG-14
Boron (B)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	20	20-AUG-14
Calcium (Ca)-Dissolved		545	559		mg/L	2.6	20	20-AUG-14
Chromium (Cr)-Dissolved		<0.0010	0.0012	RPD-NA	mg/L	N/A	20	20-AUG-14
Copper (Cu)-Dissolved		0.0078	0.0083		mg/L	6.0	20	20-AUG-14
Iron (Fe)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	20	20-AUG-14
Lead (Pb)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	20-AUG-14
Magnesium (Mg)-Dissolved		183	186		mg/L	1.6	20	20-AUG-14
Manganese (Mn)-Dissolved		0.0102	0.0105		mg/L	3.1	20	20-AUG-14
Nickel (Ni)-Dissolved		0.0038	0.0042		mg/L	9.9	20	20-AUG-14
Potassium (K)-Dissolved		26.5	25.4		mg/L	4.6	20	20-AUG-14
Selenium (Se)-Dissolved		0.887	0.872		mg/L	1.7	20	20-AUG-14
Silicon (Si)-Dissolved		10.7	10.3		mg/L	3.9	20	20-AUG-14
Silver (Ag)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	20-AUG-14
Sodium (Na)-Dissolved		600	606		mg/L	1.0	20	20-AUG-14
Uranium (U)-Dissolved		0.0513	0.0528		mg/L	2.7	20	20-AUG-14
Zinc (Zn)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	20-AUG-14
WG1934683-1 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	20-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	20-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	20-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	20-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 16 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2924279							
WG1934683-1 MB								
	Calcium (Ca)-Dissolved		<0.020		mg/L		0.02	20-AUG-14
	Chromium (Cr)-Dissolved		<0.00010		mg/L		0.0001	20-AUG-14
	Copper (Cu)-Dissolved		<0.00010		mg/L		0.0001	20-AUG-14
	Iron (Fe)-Dissolved		<0.010		mg/L		0.01	20-AUG-14
	Lead (Pb)-Dissolved		<0.000050		mg/L		0.00005	20-AUG-14
	Magnesium (Mg)-Dissolved		<0.0050		mg/L		0.005	20-AUG-14
	Manganese (Mn)-Dissolved		<0.000050		mg/L		0.00005	20-AUG-14
	Nickel (Ni)-Dissolved		<0.00010		mg/L		0.0001	20-AUG-14
	Potassium (K)-Dissolved		<0.050		mg/L		0.05	20-AUG-14
	Selenium (Se)-Dissolved		<0.00010		mg/L		0.0001	20-AUG-14
	Silicon (Si)-Dissolved		<0.050		mg/L		0.05	20-AUG-14
	Silver (Ag)-Dissolved		<0.000010		mg/L		0.00001	20-AUG-14
	Sodium (Na)-Dissolved		<0.050		mg/L		0.05	20-AUG-14
	Uranium (U)-Dissolved		<0.000010		mg/L		0.00001	20-AUG-14
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	20-AUG-14
WG1934683-10 MB								
	Aluminum (Al)-Dissolved		<0.0010		mg/L		0.001	20-AUG-14
	Antimony (Sb)-Dissolved		<0.00010		mg/L		0.0001	20-AUG-14
	Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	20-AUG-14
	Barium (Ba)-Dissolved		<0.000050		mg/L		0.00005	20-AUG-14
	Boron (B)-Dissolved		<0.010		mg/L		0.01	20-AUG-14
	Cadmium (Cd)-Dissolved		<0.000010		mg/L		0.00001	20-AUG-14
	Calcium (Ca)-Dissolved		<0.020		mg/L		0.02	20-AUG-14
	Chromium (Cr)-Dissolved		<0.00010		mg/L		0.0001	20-AUG-14
	Copper (Cu)-Dissolved		<0.00010		mg/L		0.0001	20-AUG-14
	Iron (Fe)-Dissolved		<0.010		mg/L		0.01	20-AUG-14
	Lead (Pb)-Dissolved		<0.000050		mg/L		0.00005	20-AUG-14
	Magnesium (Mg)-Dissolved		<0.0050		mg/L		0.005	20-AUG-14
	Manganese (Mn)-Dissolved		<0.000050		mg/L		0.00005	20-AUG-14
	Nickel (Ni)-Dissolved		<0.00010		mg/L		0.0001	20-AUG-14
	Potassium (K)-Dissolved		<0.050		mg/L		0.05	20-AUG-14
	Selenium (Se)-Dissolved		<0.00010		mg/L		0.0001	20-AUG-14
	Silicon (Si)-Dissolved		<0.050		mg/L		0.05	20-AUG-14
	Silver (Ag)-Dissolved		<0.000010		mg/L		0.00001	20-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 17 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2924279							
WG1934683-10 MB								
	Sodium (Na)-Dissolved		<0.050		mg/L		0.05	20-AUG-14
	Uranium (U)-Dissolved		<0.000010		mg/L		0.00001	20-AUG-14
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	20-AUG-14
WG1934683-13 MB								
	Aluminum (Al)-Dissolved		<0.0010		mg/L		0.001	20-AUG-14
	Antimony (Sb)-Dissolved		<0.00010		mg/L		0.0001	20-AUG-14
	Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	20-AUG-14
	Barium (Ba)-Dissolved		<0.000050		mg/L		0.00005	20-AUG-14
	Boron (B)-Dissolved		<0.010		mg/L		0.01	20-AUG-14
	Cadmium (Cd)-Dissolved		<0.000010		mg/L		0.00001	20-AUG-14
	Calcium (Ca)-Dissolved		<0.020		mg/L		0.02	20-AUG-14
	Chromium (Cr)-Dissolved		<0.00010		mg/L		0.0001	20-AUG-14
	Copper (Cu)-Dissolved		<0.00010		mg/L		0.0001	20-AUG-14
	Iron (Fe)-Dissolved		<0.010		mg/L		0.01	20-AUG-14
	Lead (Pb)-Dissolved		<0.000050		mg/L		0.00005	20-AUG-14
	Magnesium (Mg)-Dissolved		<0.0050		mg/L		0.005	20-AUG-14
	Manganese (Mn)-Dissolved		<0.000050		mg/L		0.00005	20-AUG-14
	Nickel (Ni)-Dissolved		<0.00010		mg/L		0.0001	20-AUG-14
	Potassium (K)-Dissolved		<0.050		mg/L		0.05	20-AUG-14
	Selenium (Se)-Dissolved		<0.00010		mg/L		0.0001	20-AUG-14
	Silicon (Si)-Dissolved		<0.050		mg/L		0.05	20-AUG-14
	Silver (Ag)-Dissolved		<0.000010		mg/L		0.00001	20-AUG-14
	Sodium (Na)-Dissolved		<0.050		mg/L		0.05	20-AUG-14
	Uranium (U)-Dissolved		<0.000010		mg/L		0.00001	20-AUG-14
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	20-AUG-14
WG1934683-16 MB								
	Aluminum (Al)-Dissolved		<0.0010		mg/L		0.001	20-AUG-14
	Antimony (Sb)-Dissolved		<0.00010		mg/L		0.0001	20-AUG-14
	Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	20-AUG-14
	Barium (Ba)-Dissolved		<0.000050		mg/L		0.00005	20-AUG-14
	Boron (B)-Dissolved		<0.010		mg/L		0.01	20-AUG-14
	Cadmium (Cd)-Dissolved		<0.000010		mg/L		0.00001	20-AUG-14
	Calcium (Ca)-Dissolved		<0.020		mg/L		0.02	20-AUG-14
	Chromium (Cr)-Dissolved		<0.00010		mg/L		0.0001	20-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 18 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2924279							
WG1934683-16 MB								
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	20-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	20-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	20-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	20-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	20-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	20-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	20-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	20-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	20-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	20-AUG-14
WG1934683-19 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	20-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	20-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	20-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	20-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	20-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	20-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	20-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	20-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	20-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	20-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	20-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	20-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	20-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	20-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 19 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2924279							
WG1934683-19 MB								
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	20-AUG-14
WG1934683-4 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	20-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	20-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	20-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	20-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	20-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	20-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	20-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	20-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	20-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	20-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	20-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	20-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	20-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	20-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	20-AUG-14
WG1934683-7 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	20-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	20-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	20-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	20-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	20-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	20-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 20 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch R2924279								
WG1934683-7 MB								
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	20-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	20-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	20-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	20-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	20-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	20-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	20-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	20-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	20-AUG-14
MET-T-CCMS-ED		Water						
Batch R2917038								
WG1928270-5 DUP		L1499123-1						
Aluminum (Al)-Total		0.053	0.075	J	mg/L	0.023	0.03	13-AUG-14
Antimony (Sb)-Total		0.00061	0.00066		mg/L	7.4	20	13-AUG-14
Arsenic (As)-Total		0.00167	0.00162		mg/L	3.2	20	13-AUG-14
Barium (Ba)-Total		0.179	0.189		mg/L	5.6	20	13-AUG-14
Boron (B)-Total		0.071	0.071		mg/L	0.2	20	13-AUG-14
Cadmium (Cd)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Calcium (Ca)-Total		54.7	51.6		mg/L	5.9	20	13-AUG-14
Chromium (Cr)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-AUG-14
Copper (Cu)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-AUG-14
Iron (Fe)-Total		0.065	0.078		mg/L	18	20	13-AUG-14
Lead (Pb)-Total		<0.00025	<0.00025	RPD-NA	mg/L	N/A	20	13-AUG-14
Magnesium (Mg)-Total		13.1	13.5		mg/L	2.9	20	13-AUG-14
Manganese (Mn)-Total		0.0270	0.0275		mg/L	1.7	20	13-AUG-14
Nickel (Ni)-Total		0.00157	0.00165		mg/L	5.5	20	13-AUG-14
Potassium (K)-Total		5.74	5.77		mg/L	0.5	20	13-AUG-14
Selenium (Se)-Total		0.00266	0.00252		mg/L	5.4	20	13-AUG-14
Silicon (Si)-Total		2.73	2.72		mg/L	0.5	20	13-AUG-14
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Sodium (Na)-Total		132	130		mg/L	1.2	20	13-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 21 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R2917038							
WG1928270-5	DUP	L1499123-1						
Uranium (U)-Total		0.00899	0.00890		mg/L	0.9	20	13-AUG-14
Zinc (Zn)-Total		<0.015	<0.015	RPD-NA	mg/L	N/A	20	13-AUG-14
WG1928270-6	DUP	L1499644-1						
Aluminum (Al)-Total		0.521	0.512		mg/L	1.7	20	13-AUG-14
Antimony (Sb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-AUG-14
Arsenic (As)-Total		0.00198	0.00186		mg/L	5.9	20	13-AUG-14
Barium (Ba)-Total		0.232	0.237		mg/L	1.8	20	13-AUG-14
Boron (B)-Total		0.061	0.062		mg/L	2.1	20	13-AUG-14
Cadmium (Cd)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Calcium (Ca)-Total		146	145		mg/L	0.5	20	13-AUG-14
Chromium (Cr)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-AUG-14
Copper (Cu)-Total		0.00343	0.00332		mg/L	3.2	20	13-AUG-14
Iron (Fe)-Total		0.086	0.074		mg/L	15	20	13-AUG-14
Lead (Pb)-Total		<0.00025	<0.00025	RPD-NA	mg/L	N/A	20	13-AUG-14
Magnesium (Mg)-Total		44.4	42.3		mg/L	4.7	20	13-AUG-14
Manganese (Mn)-Total		0.0180	0.0177		mg/L	1.7	20	13-AUG-14
Nickel (Ni)-Total		0.00260	0.00250		mg/L	3.9	20	13-AUG-14
Potassium (K)-Total		4.57	4.50		mg/L	1.5	20	13-AUG-14
Selenium (Se)-Total		0.00565	0.00528		mg/L	6.8	20	13-AUG-14
Silicon (Si)-Total		2.05	2.04		mg/L	0.5	20	13-AUG-14
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Sodium (Na)-Total		110	109		mg/L	0.8	20	13-AUG-14
Uranium (U)-Total		0.00198	0.00200		mg/L	1.0	20	13-AUG-14
Zinc (Zn)-Total		<0.015	<0.015	RPD-NA	mg/L	N/A	20	13-AUG-14
WG1928797-6	DUP	L1499662-3						
Aluminum (Al)-Total		0.253	0.269		mg/L	6.1	20	13-AUG-14
Antimony (Sb)-Total		0.00042	0.00043		mg/L	1.9	20	13-AUG-14
Arsenic (As)-Total		0.00082	0.00082		mg/L	0.1	20	13-AUG-14
Barium (Ba)-Total		0.0475	0.0469		mg/L	1.4	20	13-AUG-14
Boron (B)-Total		0.397	0.393		mg/L	1.0	20	13-AUG-14
Cadmium (Cd)-Total		0.000035	0.000038		mg/L	9.4	20	13-AUG-14
Calcium (Ca)-Total		100	98.4		mg/L	1.6	20	13-AUG-14
Chromium (Cr)-Total		0.00181	0.00188		mg/L	3.9	20	13-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 22 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R2917038							
WG1928797-6	DUP	L1499662-3						
Copper (Cu)-Total		0.00634	0.00648		mg/L	2.1	20	13-AUG-14
Iron (Fe)-Total		0.319	0.330		mg/L	3.3	20	13-AUG-14
Lead (Pb)-Total		0.000446	0.000441		mg/L	1.0	20	13-AUG-14
Magnesium (Mg)-Total		47.1	49.0		mg/L	3.9	20	13-AUG-14
Manganese (Mn)-Total		0.0408	0.0418		mg/L	2.3	20	13-AUG-14
Nickel (Ni)-Total		0.0966	0.0978		mg/L	1.2	20	13-AUG-14
Potassium (K)-Total		14.3	14.7		mg/L	2.5	20	13-AUG-14
Selenium (Se)-Total		0.00040	0.00038		mg/L	3.8	20	13-AUG-14
Silicon (Si)-Total		6.21	6.29		mg/L	1.4	20	13-AUG-14
Silver (Ag)-Total		0.000015	0.000014		mg/L	4.2	20	13-AUG-14
Sodium (Na)-Total		63.1	65.5		mg/L	3.7	20	13-AUG-14
Uranium (U)-Total		0.00976	0.00960		mg/L	1.6	20	13-AUG-14
Zinc (Zn)-Total		0.0035	0.0033		mg/L	4.5	20	13-AUG-14
WG1928270-4	LCS							
Aluminum (Al)-Total			104.6		%		70-130	13-AUG-14
Antimony (Sb)-Total			99.8		%		70-130	13-AUG-14
Arsenic (As)-Total			101.6		%		70-130	13-AUG-14
Barium (Ba)-Total			105.8		%		70-130	13-AUG-14
Boron (B)-Total			98.6		%		70-130	13-AUG-14
Cadmium (Cd)-Total			104.5		%		70-130	13-AUG-14
Calcium (Ca)-Total			103.0		%		70-130	13-AUG-14
Chromium (Cr)-Total			102.5		%		70-130	13-AUG-14
Copper (Cu)-Total			100.1		%		70-130	13-AUG-14
Iron (Fe)-Total			102.1		%		70-130	13-AUG-14
Lead (Pb)-Total			99.9		%		70-130	13-AUG-14
Magnesium (Mg)-Total			109.1		%		70-130	13-AUG-14
Manganese (Mn)-Total			104.0		%		70-130	13-AUG-14
Nickel (Ni)-Total			102.9		%		70-130	13-AUG-14
Potassium (K)-Total			103.5		%		70-130	13-AUG-14
Selenium (Se)-Total			102.1		%		70-130	13-AUG-14
Silicon (Si)-Total			94.4		%		70-130	13-AUG-14
Silver (Ag)-Total			100.1		%		70-130	13-AUG-14
Sodium (Na)-Total			113.8		%		70-130	13-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 23 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2917038							
WG1928270-4	LCS							
Uranium (U)-Total			95.7		%		70-130	13-AUG-14
Zinc (Zn)-Total			108.1		%		70-130	13-AUG-14
WG1928797-3	LCS							
Aluminum (Al)-Total			103.2		%		70-130	13-AUG-14
Antimony (Sb)-Total			103.2		%		70-130	13-AUG-14
Arsenic (As)-Total			101.8		%		70-130	13-AUG-14
Barium (Ba)-Total			104.5		%		70-130	13-AUG-14
Boron (B)-Total			97.9		%		70-130	13-AUG-14
Cadmium (Cd)-Total			106.2		%		70-130	13-AUG-14
Calcium (Ca)-Total			99.7		%		70-130	13-AUG-14
Chromium (Cr)-Total			103.6		%		70-130	13-AUG-14
Copper (Cu)-Total			99.2		%		70-130	13-AUG-14
Iron (Fe)-Total			98.8		%		70-130	13-AUG-14
Lead (Pb)-Total			103.5		%		70-130	13-AUG-14
Magnesium (Mg)-Total			106.3		%		70-130	13-AUG-14
Manganese (Mn)-Total			102.6		%		70-130	13-AUG-14
Nickel (Ni)-Total			102.5		%		70-130	13-AUG-14
Potassium (K)-Total			102.3		%		70-130	13-AUG-14
Selenium (Se)-Total			102.4		%		70-130	13-AUG-14
Silicon (Si)-Total			98.0		%		70-130	13-AUG-14
Silver (Ag)-Total			103.8		%		70-130	13-AUG-14
Sodium (Na)-Total			119.1		%		70-130	13-AUG-14
Uranium (U)-Total			98.6		%		70-130	13-AUG-14
Zinc (Zn)-Total			104.8		%		70-130	13-AUG-14
WG1928797-4	LCS							
Aluminum (Al)-Total			104.0		%		80-120	13-AUG-14
Antimony (Sb)-Total			100.4		%		80-120	13-AUG-14
Arsenic (As)-Total			102.0		%		80-120	13-AUG-14
Barium (Ba)-Total			106.9		%		80-120	13-AUG-14
Boron (B)-Total			98.7		%		80-120	13-AUG-14
Cadmium (Cd)-Total			101.2		%		80-120	13-AUG-14
Calcium (Ca)-Total			99.4		%		80-120	13-AUG-14
Chromium (Cr)-Total			101.5		%		80-120	13-AUG-14
Copper (Cu)-Total			100.3		%		80-120	13-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 24 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2917038							
WG1928797-4	LCS							
Iron (Fe)-Total			99.3		%		80-120	13-AUG-14
Lead (Pb)-Total			103.6		%		80-120	13-AUG-14
Magnesium (Mg)-Total			107.3		%		80-120	13-AUG-14
Manganese (Mn)-Total			103.2		%		80-120	13-AUG-14
Nickel (Ni)-Total			104.1		%		80-120	13-AUG-14
Potassium (K)-Total			102.1		%		80-120	13-AUG-14
Selenium (Se)-Total			102.4		%		80-120	13-AUG-14
Silicon (Si)-Total			95.3		%		80-120	13-AUG-14
Silver (Ag)-Total			100.0		%		80-120	13-AUG-14
Sodium (Na)-Total			114.0		%		80-120	13-AUG-14
Uranium (U)-Total			97.6		%		80-120	13-AUG-14
Zinc (Zn)-Total			104.8		%		80-120	13-AUG-14
WG1928270-3	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	13-AUG-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Barium (Ba)-Total			<0.000050		mg/L		0.00005	13-AUG-14
Boron (B)-Total			<0.010		mg/L		0.01	13-AUG-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	13-AUG-14
Calcium (Ca)-Total			<0.020		mg/L		0.02	13-AUG-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Copper (Cu)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Iron (Fe)-Total			<0.010		mg/L		0.01	13-AUG-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	13-AUG-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	13-AUG-14
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	13-AUG-14
Nickel (Ni)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Potassium (K)-Total			<0.050		mg/L		0.05	13-AUG-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Silicon (Si)-Total			<0.050		mg/L		0.05	13-AUG-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	13-AUG-14
Sodium (Na)-Total			<0.050		mg/L		0.05	13-AUG-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	13-AUG-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	13-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 25 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2917038							
WG1928398-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	13-AUG-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Barium (Ba)-Total			<0.000050		mg/L		0.00005	13-AUG-14
Boron (B)-Total			<0.010		mg/L		0.01	13-AUG-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	13-AUG-14
Calcium (Ca)-Total			<0.020		mg/L		0.02	13-AUG-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Copper (Cu)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Iron (Fe)-Total			<0.010		mg/L		0.01	13-AUG-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	13-AUG-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	13-AUG-14
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	13-AUG-14
Nickel (Ni)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Potassium (K)-Total			<0.050		mg/L		0.05	13-AUG-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Silicon (Si)-Total			<0.050		mg/L		0.05	13-AUG-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	13-AUG-14
Sodium (Na)-Total			<0.050		mg/L		0.05	13-AUG-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	13-AUG-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	13-AUG-14
WG1928797-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	13-AUG-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Barium (Ba)-Total			<0.000050		mg/L		0.00005	13-AUG-14
Boron (B)-Total			<0.010		mg/L		0.01	13-AUG-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	13-AUG-14
Calcium (Ca)-Total			<0.020		mg/L		0.02	13-AUG-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Copper (Cu)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Iron (Fe)-Total			<0.010		mg/L		0.01	13-AUG-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	13-AUG-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	13-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 26 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2917038							
WG1928797-1 MB								
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	13-AUG-14
Nickel (Ni)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Potassium (K)-Total			<0.050		mg/L		0.05	13-AUG-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Silicon (Si)-Total			<0.050		mg/L		0.05	13-AUG-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	13-AUG-14
Sodium (Na)-Total			<0.050		mg/L		0.05	13-AUG-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	13-AUG-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	13-AUG-14
WG1928797-2 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	13-AUG-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Barium (Ba)-Total			<0.000050		mg/L		0.00005	13-AUG-14
Boron (B)-Total			<0.010		mg/L		0.01	13-AUG-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	13-AUG-14
Calcium (Ca)-Total			<0.020		mg/L		0.02	13-AUG-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Copper (Cu)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Iron (Fe)-Total			<0.010		mg/L		0.01	13-AUG-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	13-AUG-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	13-AUG-14
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	13-AUG-14
Nickel (Ni)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Potassium (K)-Total			<0.050		mg/L		0.05	13-AUG-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Silicon (Si)-Total			<0.050		mg/L		0.05	13-AUG-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	13-AUG-14
Sodium (Na)-Total			<0.050		mg/L		0.05	13-AUG-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	13-AUG-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	13-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 27 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2918385							
WG1928398-2	DUP	L1497726-1						
Aluminum (Al)-Total		<0.015	<0.015	RPD-NA	mg/L	N/A	20	14-AUG-14
WG1928398-1	MB		<0.0030		mg/L		0.003	14-AUG-14
Aluminum (Al)-Total								
NAPHTHENIC-ACID-FM		Water						
Batch	R2932711							
WG1932925-3	DUP	L1497659-2						
Naphthenic Acids		5.4	5.6		mg/L	3.5	30	28-AUG-14
WG1932925-7	DUP	L1500399-3						
Naphthenic Acids		<1.0	<1.0	RPD-NA	mg/L	N/A	30	28-AUG-14
WG1932925-4	LCS		101.4		%		70-130	28-AUG-14
Naphthenic Acids								
WG1932925-8	LCS		90.9		%		70-130	28-AUG-14
Naphthenic Acids								
WG1932925-1	MB		<1.0		mg/L		1	28-AUG-14
Naphthenic Acids								
WG1932925-5	MB		<1.0		mg/L		1	28-AUG-14
Naphthenic Acids								
WG1932925-2	MS	L1497659-1						
Naphthenic Acids			107.7		%		50-150	28-AUG-14
WG1932925-6	MS	L1500399-2						
Naphthenic Acids			117.2		%		50-150	28-AUG-14
NH3-CFA-ED		Water						
Batch	R2923049							
WG1933578-10	DUP	L1504020-1						
Ammonia, Total (as N)		0.433	0.460		mg/L	6.0	20	19-AUG-14
WG1933578-6	DUP	L1498418-9						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	19-AUG-14
WG1933578-8	DUP	L1501286-7						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	19-AUG-14
WG1933578-2	LCS		100.5		%		85-115	19-AUG-14
Ammonia, Total (as N)								
WG1933578-1	MB		<0.050		mg/L		0.05	19-AUG-14
Ammonia, Total (as N)								
WG1933578-11	MS	L1495802-8						
Ammonia, Total (as N)			102.6		%		75-125	19-AUG-14
WG1933578-4	MS	L1501019-2						
Ammonia, Total (as N)			100.7		%		75-125	19-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 28 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-CFA-ED								
	Water							
Batch	R2923049							
WG1933578-7 MS		L1500991-5						
Ammonia, Total (as N)			99.7		%		75-125	19-AUG-14
WG1933578-9 MS		L1501875-2						
Ammonia, Total (as N)			101.0		%		75-125	19-AUG-14
NO2-IC-ED								
	Water							
Batch	R2915836							
WG1927368-3 DUP		L1498894-9						
Nitrite (as N)		0.021	0.023		mg/L	6.8	20	08-AUG-14
WG1927368-5 DUP		L1498571-1						
Nitrite (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	08-AUG-14
WG1927368-7 DUP		L1498418-2						
Nitrite (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	08-AUG-14
WG1927368-11 LCS								
Nitrite (as N)			101.1		%		90-110	08-AUG-14
WG1927368-13 LCS								
Nitrite (as N)			100.2		%		90-110	08-AUG-14
WG1927368-15 LCS								
Nitrite (as N)			103.9		%		90-110	08-AUG-14
WG1927368-2 LCS								
Nitrite (as N)			107.7		%		90-110	08-AUG-14
WG1927368-9 LCS								
Nitrite (as N)			104.4		%		90-110	08-AUG-14
WG1927368-1 MB								
Nitrite (as N)			<0.020		mg/L		0.02	08-AUG-14
WG1927368-10 MB								
Nitrite (as N)			<0.020		mg/L		0.02	08-AUG-14
WG1927368-12 MB								
Nitrite (as N)			<0.020		mg/L		0.02	08-AUG-14
WG1927368-14 MB								
Nitrite (as N)			<0.020		mg/L		0.02	08-AUG-14
WG1927368-16 MB								
Nitrite (as N)			<0.020		mg/L		0.02	08-AUG-14
WG1927368-4 MS		L1498894-9						
Nitrite (as N)			88.4		%		75-125	08-AUG-14
WG1927368-6 MS		L1498571-1						
Nitrite (as N)			104.3		%		75-125	08-AUG-14
WG1927368-8 MS		L1498418-2						
Nitrite (as N)			103.0		%		75-125	08-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 29 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-ED		Water						
Batch	R2915836							
WG1927368-3	DUP	L1498894-9						
Nitrate (as N)		0.075	0.079		mg/L	4.9	20	08-AUG-14
WG1927368-5	DUP	L1498571-1						
Nitrate (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	08-AUG-14
WG1927368-7	DUP	L1498418-2						
Nitrate (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	08-AUG-14
WG1927368-11	LCS							
Nitrate (as N)			104.8		%		90-110	08-AUG-14
WG1927368-13	LCS							
Nitrate (as N)			99.8		%		90-110	08-AUG-14
WG1927368-15	LCS							
Nitrate (as N)			104.1		%		90-110	08-AUG-14
WG1927368-2	LCS							
Nitrate (as N)			103.4		%		90-110	08-AUG-14
WG1927368-9	LCS							
Nitrate (as N)			107.0		%		90-110	08-AUG-14
WG1927368-1	MB							
Nitrate (as N)			<0.050		mg/L		0.05	08-AUG-14
WG1927368-10	MB							
Nitrate (as N)			<0.050		mg/L		0.05	08-AUG-14
WG1927368-12	MB							
Nitrate (as N)			<0.050		mg/L		0.05	08-AUG-14
WG1927368-14	MB							
Nitrate (as N)			<0.050		mg/L		0.05	08-AUG-14
WG1927368-16	MB							
Nitrate (as N)			<0.050		mg/L		0.05	08-AUG-14
WG1927368-4	MS	L1498894-9						
Nitrate (as N)			94.5		%		75-125	08-AUG-14
WG1927368-6	MS	L1498571-1						
Nitrate (as N)			89.7		%		75-125	08-AUG-14
WG1927368-8	MS	L1498418-2						
Nitrate (as N)			92.2		%		75-125	08-AUG-14
PAH-ABT1-CL		Water						
Batch	R2923280							
WG1934082-2	LCS							
Acenaphthene			85.7		%		60-130	19-AUG-14
Acenaphthylene			94.9		%		60-130	19-AUG-14
Anthracene			97.2		%		60-130	19-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 30 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch	R2923280							
WG1934082-2	LCS							
Fluoranthene			92.2		%		60-130	19-AUG-14
Fluorene			87.4		%		60-130	19-AUG-14
Naphthalene			85.6		%		50-130	19-AUG-14
Phenanthrene			93.6		%		60-130	19-AUG-14
Pyrene			99.5		%		60-130	19-AUG-14
Benzo(a)anthracene			97.9		%		60-130	19-AUG-14
Benzo(k)fluoranthene			91.4		%		60-130	19-AUG-14
Benzo(b&j)fluoranthene			94.5		%		60-130	19-AUG-14
Benzo(g,h,i)perylene			92.9		%		60-130	19-AUG-14
Benzo(a)pyrene			91.4		%		60-130	19-AUG-14
Chrysene			94.4		%		60-130	19-AUG-14
Dibenzo(a,h)anthracene			93.9		%		60-130	19-AUG-14
Indeno(1,2,3-cd)pyrene			95.5		%		60-130	19-AUG-14
WG1934082-1	MB							
Acenaphthene			<0.000020		mg/L		0.00002	18-AUG-14
Acenaphthylene			<0.000020		mg/L		0.00002	18-AUG-14
Anthracene			<0.000010		mg/L		0.00001	18-AUG-14
Fluoranthene			<0.000020		mg/L		0.00002	18-AUG-14
Fluorene			<0.000020		mg/L		0.00002	18-AUG-14
Naphthalene			<0.000050		mg/L		0.00005	18-AUG-14
Phenanthrene			<0.000050		mg/L		0.00005	18-AUG-14
Pyrene			<0.000010		mg/L		0.00001	18-AUG-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	18-AUG-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	18-AUG-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	18-AUG-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	18-AUG-14
Benzo(a)pyrene			<0.000050		mg/L		0.00005	18-AUG-14
Chrysene			<0.000020		mg/L		0.00002	18-AUG-14
Dibenzo(a,h)anthracene			<0.000050		mg/L		0.00005	18-AUG-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	18-AUG-14
Surrogate: d10-Acenaphthene			75.6		%		60-130	18-AUG-14
Surrogate: d10-Phenanthrene			84.2		%		60-130	18-AUG-14
Surrogate: d12-Chrysene			92.5		%		60-130	18-AUG-14
WG1934082-3	MB							



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 31 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch R2923280								
WG1934082-3 MB								
Acenaphthene			<0.000020		mg/L		0.00002	19-AUG-14
Acenaphthylene			<0.000020		mg/L		0.00002	19-AUG-14
Anthracene			<0.000010		mg/L		0.00001	19-AUG-14
Fluoranthene			<0.000020		mg/L		0.00002	19-AUG-14
Fluorene			<0.000020		mg/L		0.00002	19-AUG-14
Naphthalene			<0.000050		mg/L		0.00005	19-AUG-14
Phenanthrene			<0.000050		mg/L		0.00005	19-AUG-14
Pyrene			<0.000010		mg/L		0.00001	19-AUG-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	19-AUG-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	19-AUG-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	19-AUG-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	19-AUG-14
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	19-AUG-14
Chrysene			<0.000020		mg/L		0.00002	19-AUG-14
Dibenzo(a,h)anthracene			<0.0000050		mg/L		0.000005	19-AUG-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	19-AUG-14
Surrogate: d10-Acenaphthene			92.6		%		60-130	19-AUG-14
Surrogate: d10-Phenanthrene			96.0		%		60-130	19-AUG-14
Surrogate: d12-Chrysene			95.8		%		60-130	19-AUG-14
Batch R2924297								
WG1934912-2 LCS								
Acenaphthene			85.7		%		60-130	19-AUG-14
Acenaphthylene			94.0		%		60-130	19-AUG-14
Anthracene			95.4		%		60-130	19-AUG-14
Fluoranthene			88.8		%		60-130	19-AUG-14
Fluorene			85.8		%		60-130	19-AUG-14
Naphthalene			88.2		%		50-130	19-AUG-14
Phenanthrene			92.1		%		60-130	19-AUG-14
Pyrene			96.1		%		60-130	19-AUG-14
Benzo(a)anthracene			93.2		%		60-130	19-AUG-14
Benzo(k)fluoranthene			86.7		%		60-130	19-AUG-14
Benzo(b&j)fluoranthene			88.6		%		60-130	19-AUG-14
Benzo(g,h,i)perylene			90.3		%		60-130	19-AUG-14
Benzo(a)pyrene			87.0		%		60-130	19-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 32 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch	R2924297							
WG1934912-2	LCS							
Chrysene			89.8		%		60-130	19-AUG-14
Dibenzo(a,h)anthracene			90.8		%		60-130	19-AUG-14
Indeno(1,2,3-cd)pyrene			88.0		%		60-130	19-AUG-14
WG1934912-1	MB							
Acenaphthene			<0.000020		mg/L		0.00002	19-AUG-14
Acenaphthylene			<0.000020		mg/L		0.00002	19-AUG-14
Anthracene			<0.000010		mg/L		0.00001	19-AUG-14
Fluoranthene			<0.000020		mg/L		0.00002	19-AUG-14
Fluorene			<0.000020		mg/L		0.00002	19-AUG-14
Naphthalene			<0.000050		mg/L		0.00005	19-AUG-14
Phenanthrene			<0.000050		mg/L		0.00005	19-AUG-14
Pyrene			<0.000010		mg/L		0.00001	19-AUG-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	19-AUG-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	19-AUG-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	19-AUG-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	19-AUG-14
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	19-AUG-14
Chrysene			<0.000020		mg/L		0.00002	19-AUG-14
Dibenzo(a,h)anthracene			<0.0000050		mg/L		0.000005	19-AUG-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	19-AUG-14
Surrogate: d10-Acenaphthene			85.2		%		60-130	19-AUG-14
Surrogate: d10-Phenanthrene			90.6		%		60-130	19-AUG-14
Surrogate: d12-Chrysene			90.6		%		60-130	19-AUG-14
PH/EC/ALK-ED		Water						
Batch	R2913010							
WG1927525-10	DUP	L1498878-7						
pH		5.42	5.44	J	pH	0.02	0.3	10-AUG-14
Conductivity (EC)		0.76	0.73		uS/cm	4.0	10	10-AUG-14
Bicarbonate (HCO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14
Alkalinity, Total (as CaCO3)		<2.0	<2.0	RPD-NA	mg/L	N/A	20	10-AUG-14
WG1927525-6	DUP	L1499294-1						
pH		8.20	8.27	J	pH	0.07	0.3	09-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 33 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R2913010							
WG1927525-6	DUP	L1499294-1						
Conductivity (EC)		2720	2680		uS/cm	1.5	10	09-AUG-14
Bicarbonate (HCO3)		869	868		mg/L	0.1	25	09-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	09-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	09-AUG-14
Alkalinity, Total (as CaCO3)		712	711		mg/L	0.1	20	09-AUG-14
WG1927525-8	DUP	L1498571-1						
pH		8.21	8.24	J	pH	0.03	0.3	09-AUG-14
Conductivity (EC)		940	947		uS/cm	0.8	10	09-AUG-14
Bicarbonate (HCO3)		491	494		mg/L	0.5	25	09-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	09-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	09-AUG-14
Alkalinity, Total (as CaCO3)		403	405		mg/L	0.5	20	09-AUG-14
WG1927525-9	DUP	L1498418-2						
pH		8.31	8.38	J	pH	0.06	0.3	10-AUG-14
Conductivity (EC)		829	824		uS/cm	0.6	10	10-AUG-14
Bicarbonate (HCO3)		461	450		mg/L	2.5	25	10-AUG-14
Carbonate (CO3)		<5.0	6.9	RPD-NA	mg/L	N/A	25	10-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14
Alkalinity, Total (as CaCO3)		381	380		mg/L	0.3	20	10-AUG-14
WG1927525-12	LCS							
Conductivity (EC)			97.1		%		90-110	09-AUG-14
WG1927525-14	LCS							
Alkalinity, Total (as CaCO3)			98.5		%		85-115	09-AUG-14
WG1927525-15	LCS							
Conductivity (EC)			98.2		%		90-110	09-AUG-14
WG1927525-17	LCS							
Conductivity (EC)			99.9		%		90-110	09-AUG-14
WG1927525-18	LCS							
pH			7.01		pH		6.7-7.3	09-AUG-14
WG1927525-19	LCS							
Alkalinity, Total (as CaCO3)			99.4		%		85-115	09-AUG-14
WG1927525-2	LCS							
Conductivity (EC)			97.1		%		90-110	09-AUG-14
WG1927525-20	LCS							
Conductivity (EC)			97.8		%		90-110	09-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 34 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R2913010							
WG1927525-22	LCS							
Conductivity (EC)			99.4		%		90-110	09-AUG-14
WG1927525-23	LCS							
pH			7.02		pH		6.7-7.3	09-AUG-14
WG1927525-24	LCS							
Alkalinity, Total (as CaCO3)			99.3		%		85-115	09-AUG-14
WG1927525-25	LCS							
Conductivity (EC)			97.1		%		90-110	09-AUG-14
WG1927525-27	LCS							
Conductivity (EC)			99.3		%		90-110	10-AUG-14
WG1927525-28	LCS							
pH			7.03		pH		6.7-7.3	10-AUG-14
WG1927525-29	LCS							
Alkalinity, Total (as CaCO3)			98.9		%		85-115	10-AUG-14
WG1927525-3	LCS							
pH			7.01		pH		6.7-7.3	09-AUG-14
WG1927525-30	LCS							
Conductivity (EC)			96.3		%		90-110	10-AUG-14
WG1927525-32	LCS							
Conductivity (EC)			97.8		%		90-110	10-AUG-14
WG1927525-33	LCS							
pH			7.03		pH		6.7-7.3	10-AUG-14
WG1927525-34	LCS							
Alkalinity, Total (as CaCO3)			99.2		%		85-115	10-AUG-14
WG1927525-35	LCS							
Conductivity (EC)			95.5		%		90-110	10-AUG-14
WG1927525-4	LCS							
Alkalinity, Total (as CaCO3)			99.0		%		85-115	09-AUG-14
WG1927525-5	LCS							
Conductivity (EC)			98.4		%		90-110	09-AUG-14
WG1927525-1	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	09-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	09-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	09-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	09-AUG-14
WG1927525-11	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	09-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	09-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 35 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R2913010							
WG1927525-11 MB								
Hydroxide (OH)			<5.0		mg/L		5	09-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	09-AUG-14
WG1927525-16 MB								
Bicarbonate (HCO3)			<5.0		mg/L		5	09-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	09-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	09-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	09-AUG-14
WG1927525-21 MB								
Bicarbonate (HCO3)			<5.0		mg/L		5	09-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	09-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	09-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	09-AUG-14
WG1927525-26 MB								
Bicarbonate (HCO3)			<5.0		mg/L		5	10-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	10-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	10-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	10-AUG-14
WG1927525-31 MB								
Bicarbonate (HCO3)			<5.0		mg/L		5	10-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	10-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	10-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	10-AUG-14
PHENOLS-4AAP-ED		Water						
Batch	R2924308							
WG1935037-4 DUP		L1498877-1						
Phenols (4AAP)		0.0014	0.0014		mg/L	0.0	15	20-AUG-14
WG1935037-5 DUP		L1498418-9						
Phenols (4AAP)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	15	20-AUG-14
WG1935037-7 DUP		L1501069-4						
Phenols (4AAP)		0.0054	0.0046	J	mg/L	0.0008	0.002	20-AUG-14
WG1935037-3 LCS								
Phenols (4AAP)			105.6		%		85-115	20-AUG-14
WG1935037-2 MB								
Phenols (4AAP)			<0.0010		mg/L		0.001	20-AUG-14
WG1935037-6 MS		L1499634-6						



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 36 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PHENOLS-4AAP-ED								
	Water							
Batch	R2924308							
WG1935037-6	MS	L1499634-6						
Phenols (4AAP)			100.0		%		75-125	20-AUG-14
Batch	R2925385							
WG1935847-4	DUP	L1492518-14						
Phenols (4AAP)		0.0033	0.0031		mg/L	6.3	15	21-AUG-14
WG1935847-5	DUP	L1502619-2						
Phenols (4AAP)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	15	21-AUG-14
WG1935847-6	DUP	L1502158-2						
Phenols (4AAP)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	15	21-AUG-14
WG1935847-7	DUP	L1495802-4						
Phenols (4AAP)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	15	21-AUG-14
WG1935847-8	DUP	L1500196-1						
Phenols (4AAP)		0.0063	0.0077	J	mg/L	0.0014	0.002	21-AUG-14
WG1935847-3	LCS							
Phenols (4AAP)			98.0		%		85-115	21-AUG-14
WG1935847-2	MB							
Phenols (4AAP)			<0.0010		mg/L		0.001	21-AUG-14
WG1935847-9	MS	L1499883-3						
Phenols (4AAP)			103.0		%		75-125	21-AUG-14
SO4-IC-ED								
	Water							
Batch	R2915836							
WG1927368-3	DUP	L1498894-9						
Sulfate (SO4)		110	111		mg/L	0.1	20	08-AUG-14
WG1927368-5	DUP	L1498571-1						
Sulfate (SO4)		88.5	88.9		mg/L	0.5	20	08-AUG-14
WG1927368-7	DUP	L1498418-2						
Sulfate (SO4)		83.8	83.6		mg/L	0.3	20	08-AUG-14
WG1927368-11	LCS							
Sulfate (SO4)			102.0		%		90-110	08-AUG-14
WG1927368-13	LCS							
Sulfate (SO4)			102.0		%		90-110	08-AUG-14
WG1927368-15	LCS							
Sulfate (SO4)			102.2		%		90-110	08-AUG-14
WG1927368-2	LCS							
Sulfate (SO4)			100.6		%		90-110	08-AUG-14
WG1927368-9	LCS							
Sulfate (SO4)			104.1		%		90-110	08-AUG-14



Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Page 37 of 38

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-ED		Water						
Batch	R2915836							
WG1927368-1 MB	Sulfate (SO4)		<0.50		mg/L		0.5	08-AUG-14
WG1927368-10 MB	Sulfate (SO4)		<0.50		mg/L		0.5	08-AUG-14
WG1927368-12 MB	Sulfate (SO4)		<0.50		mg/L		0.5	08-AUG-14
WG1927368-14 MB	Sulfate (SO4)		<0.50		mg/L		0.5	08-AUG-14
WG1927368-16 MB	Sulfate (SO4)		<0.50		mg/L		0.5	08-AUG-14
WG1927368-4 MS	Sulfate (SO4)	L1498894-9	N/A	MS-B	%		-	08-AUG-14
WG1927368-6 MS	Sulfate (SO4)	L1498571-1	89.7		%		75-125	08-AUG-14
WG1927368-8 MS	Sulfate (SO4)	L1498418-2	89.9		%		75-125	08-AUG-14
SOLIDS-TDS-ED		Water						
Batch	R2915573							
WG1927956-3 DUP	Total Dissolved Solids	L1497751-3 273	274		mg/L	0.4	20	11-AUG-14
WG1927956-4 DUP	Total Dissolved Solids	L1498485-3 2040	2080		mg/L	1.9	20	11-AUG-14
WG1927956-5 DUP	Total Dissolved Solids	L1498878-2 401	409		mg/L	2.0	20	11-AUG-14
WG1927956-2 LCS	Total Dissolved Solids		100.5		%		85-115	11-AUG-14
WG1927956-1 MB	Total Dissolved Solids		<10		mg/L		10	11-AUG-14
TURBIDITY-ED		Water						
Batch	R2911521							
WG1926722-3 DUP	Turbidity	L1498883-2 62.0	63.5		NTU	2.4	15	08-AUG-14
WG1926722-2 LCS	Turbidity		102.2		%		70-130	08-AUG-14
WG1926722-1 MB	Turbidity		<0.10		NTU		0.1	08-AUG-14

Quality Control Report

Workorder: L1498418

Report Date: 29-AUG-14

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Page 38 of 38

Contact: SUE RAYNARD

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects.
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



ALS 140818-03 (14-CFS)

CONFIDENTIAL ANALYSIS REPORT

REPORT #: 140818-03

WO #: 14-CFS

PO #: L1498418

CLIENT: ALS Laboratory Group - Edmonton
9936-67 Avenue
Edmonton, AB
T6E 0P5

ATTENTION: ALSED Reporting
Tel: (780) 413-5227
Fax: (780) 437-2311

SAMPLE DESCRIPTION: Water Samples

DATE AND TIME OF SAMPLE COLLECTION: August 06, 2014

DATE AND TIME OF SAMPLE RECEIPT: August 08, 2014/15:07

SAMPLE TEMPERATURE WHEN RECEIVED: 8.2° Celsius

TEST PERFORMED:

Iron Related Bacteria
Sulfate Reducing Bacteria [P/A]
Sulfate Reducing Bacteria
Iron Related Bacteria [P/A]

TEST START DATE: August 08, 2014/16:07

DATE COMPLETED: August 17, 2014

CERTIFICATE OF ANALYSIS: See Page 2

QUALITY CONTROL DATA: See Attached Appendix 1

The report shall not be reproduced, except in full, without the written authority of PBR Laboratories Inc.

Certificate of Analysis

PBR ID	Sample #	Client ID	Lot #	Test	Protocol	Quantity Analyzed	*DF	Result	Units	Note
14-CFS-01	L1498418-1	16053140806024		Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	1
				Sulfate Reducing Bacteria [P/A]	BART	15 ml		Absent		
14-CFS-02	L1498418-2	16053140806026		Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		200	CFU/ml	1
14-CFS-03	L1498418-3	16053140806027		Iron Related Bacteria	BART	15 ml		2.3×10^3	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		200	CFU/ml	1
14-CFS-04	L1498418-4	16053140806028		Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		1.2×10^3	CFU/ml	1
14-CFS-05	L1498418-5	16053140806029		Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		1.8×10^4	CFU/ml	1
14-CFS-06	L1498418-6	16053140806030		Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		5.0×10^3	CFU/ml	1
14-CFS-07	L1498418-7	16053140806031		Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		1.8×10^4	CFU/ml	1

Certificate of Analysis

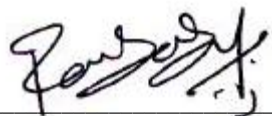
PBR ID	Sample #	Client ID	Lot #	Test	Protocol	Quantity Analyzed	*DF	Result	Units	Note
14-CFS-08	L1498418-8	16053140806032		Iron Related Bacteria	BART	15 ml		9.0 X 10 ³	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		5.0 X 10 ³	CFU/ml	1
14-CFS-09	L1498418-9	16053140806033		Iron Related Bacteria [P/A]	BART	15 ml		Absent		
				Sulfate Reducing Bacteria [P/A]	BART	15 ml		Absent		

*DF - Dilution Factor used for analysis

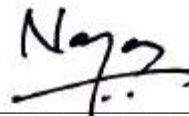
Notes

1 CFU = Colony Forming Unit.
BART results represent the Approximate Population only.

The reported results apply only to the items tested.



Rambabu Naravaneni Ph. D (Analyst)
Date: Aug 18 2014



Approved By: _____

Narayan Pokharel, Ph.D.
Date: Aug 18 2014



APPENDIX 1

Quality Control Data for Iron Related Bacteria (BART)

Controls	Organism/Medium	Result
Sterility (media blank)	BART medium	Pass
Positive	Acidithiobacillus ferrooxidans	Pass
Negative	D/W Sterile	Pass

Quality Control Data for Sulfate Reducing Bacteria [P/A] (BART)

Controls	Organism/Medium	Result
Sterility	BART medium	Pass
Positive	SRB	Pass
Negative	D/W sterile	Pass

Quality Control Data for Sulfate Reducing Bacteria (BART)

Controls	Organism/Medium	Result
Sterility	BART medium	Pass
Positive	SRB	Pass
Negative	D/W Sterile	Pass

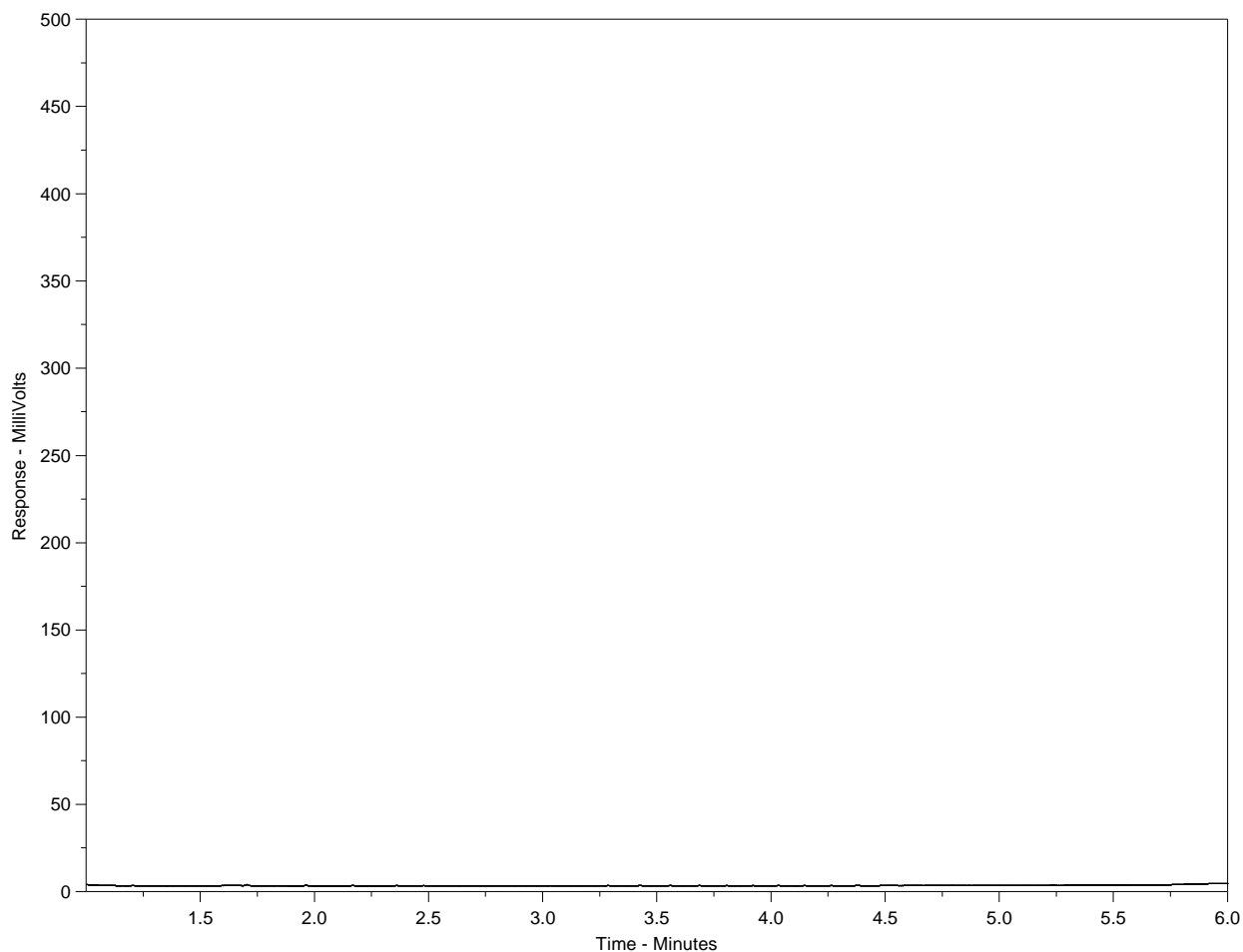
Quality Control Data for Iron Related Bacteria [P/A] (BART)

Controls	Organism/Medium	Result
Sterility	BART Medium	Pass
Positive	Acidithiobacillus ferrooxidans	Pass
Negative	D/W sterile	Pass

Hydrocarbon Distribution Report



ALS Sample ID: L1498418-1
 Client ID: 16053140806024



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	106°F				
← Gasoline →		← Diesel/ Jet Fuels →		← Motor Oils/ Lube Oils/ Grease →			

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

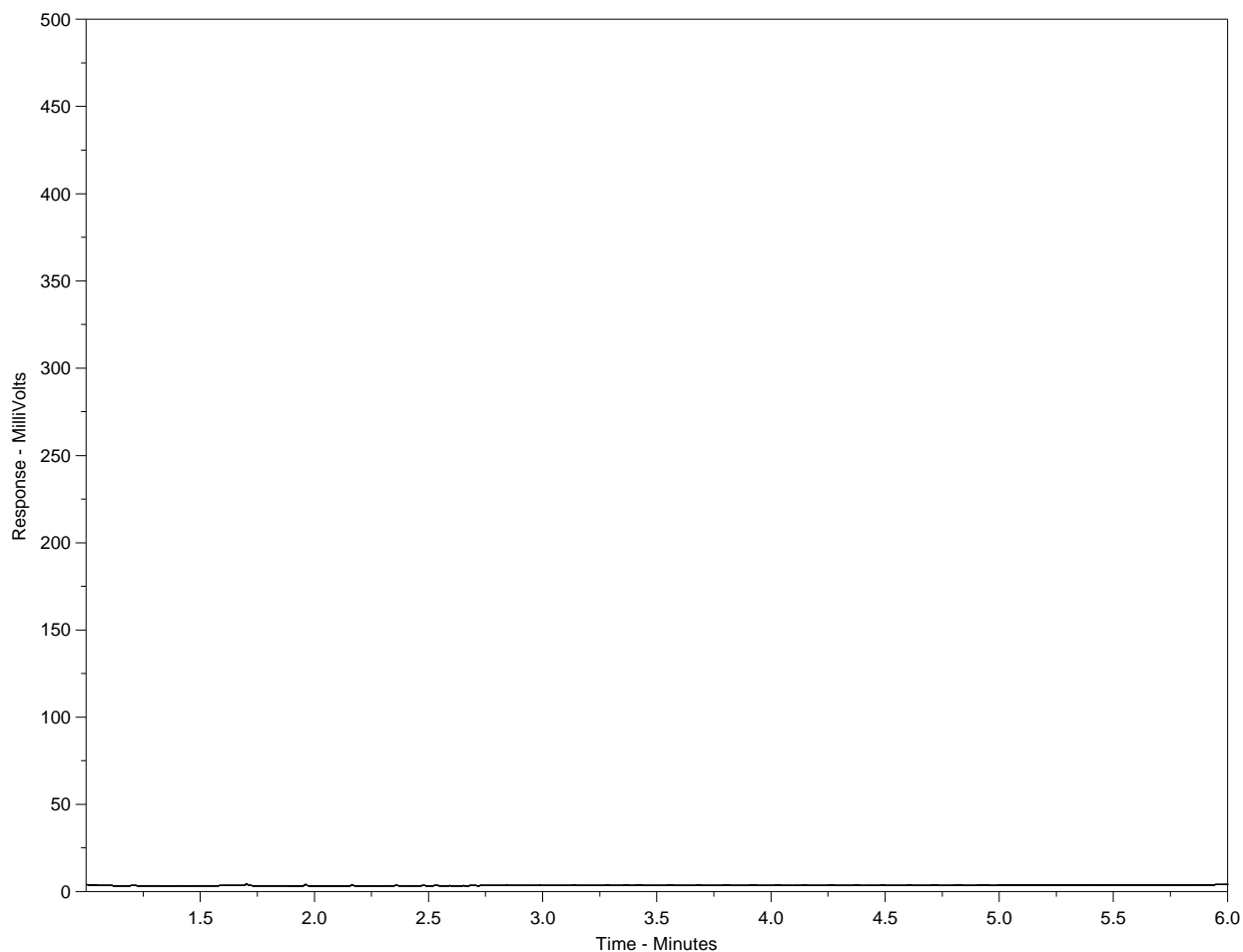
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1498418-2
Client ID: 16053140806026



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	106°F				
← Gasoline →		← Diesel/ Jet Fuels →		← Motor Oils/ Lube Oils/ Grease →			

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

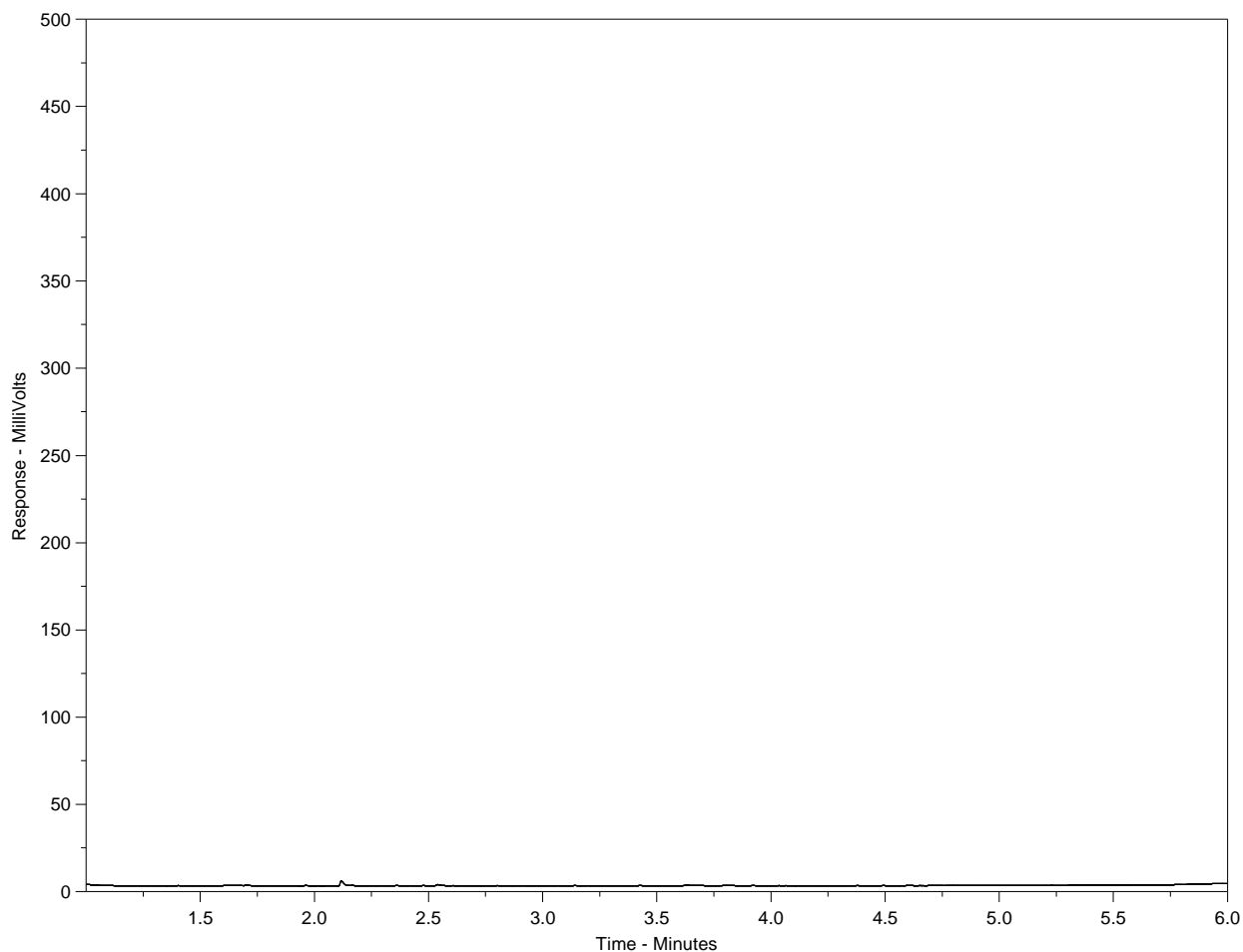
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1498418-3
 Client ID: 16053140806027



← F2 →		← F3 →		← F4 →		← >F4 →	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	106°F				
← Gasoline →		← Diesel/ Jet Fuels →				← Motor Oils/ Lube Oils/ Grease →	

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

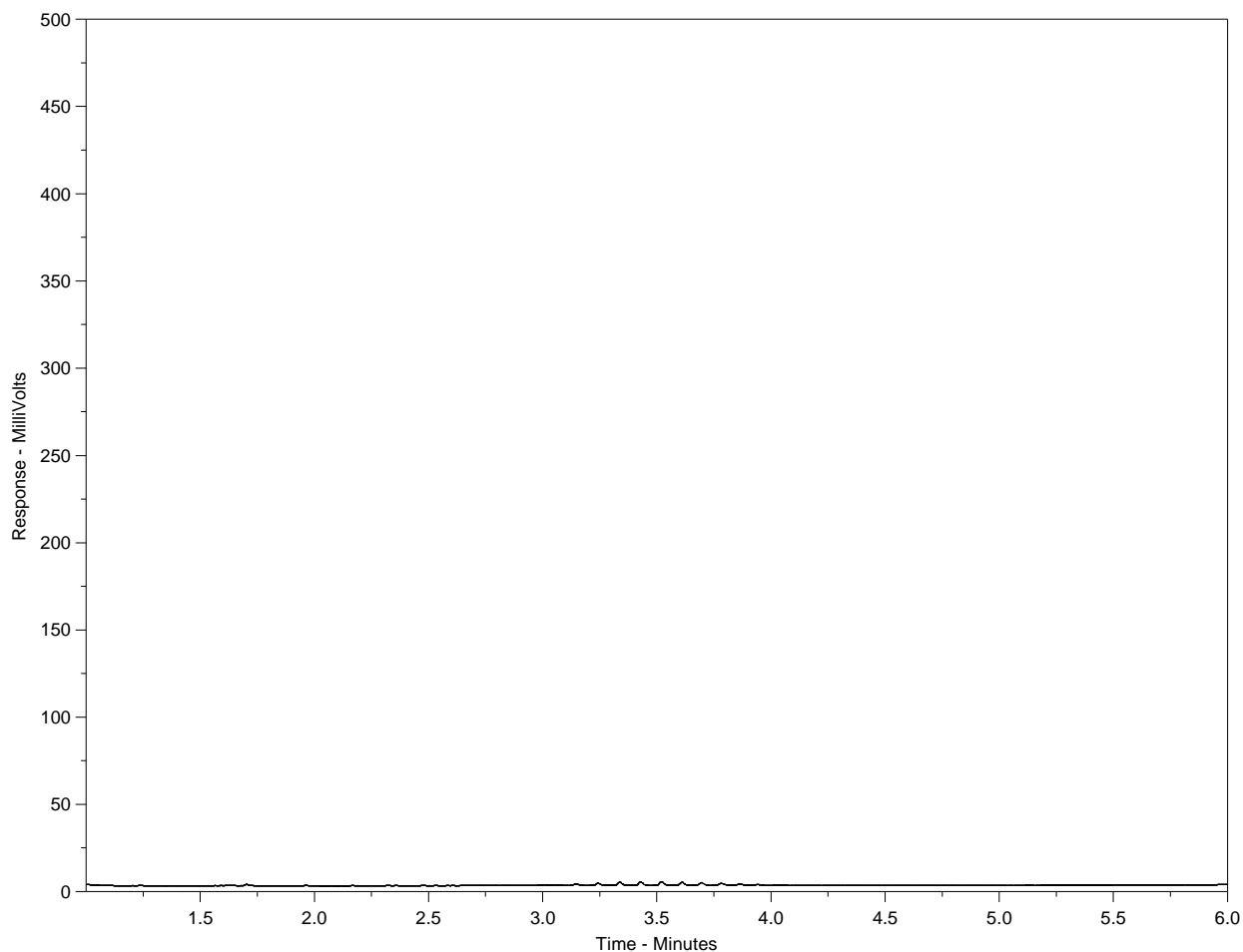
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1498418-4
Client ID: 16053140806028



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	106°F				
← Gasoline →		← Diesel/ Jet Fuels →		← Motor Oils/ Lube Oils/ Grease →			

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

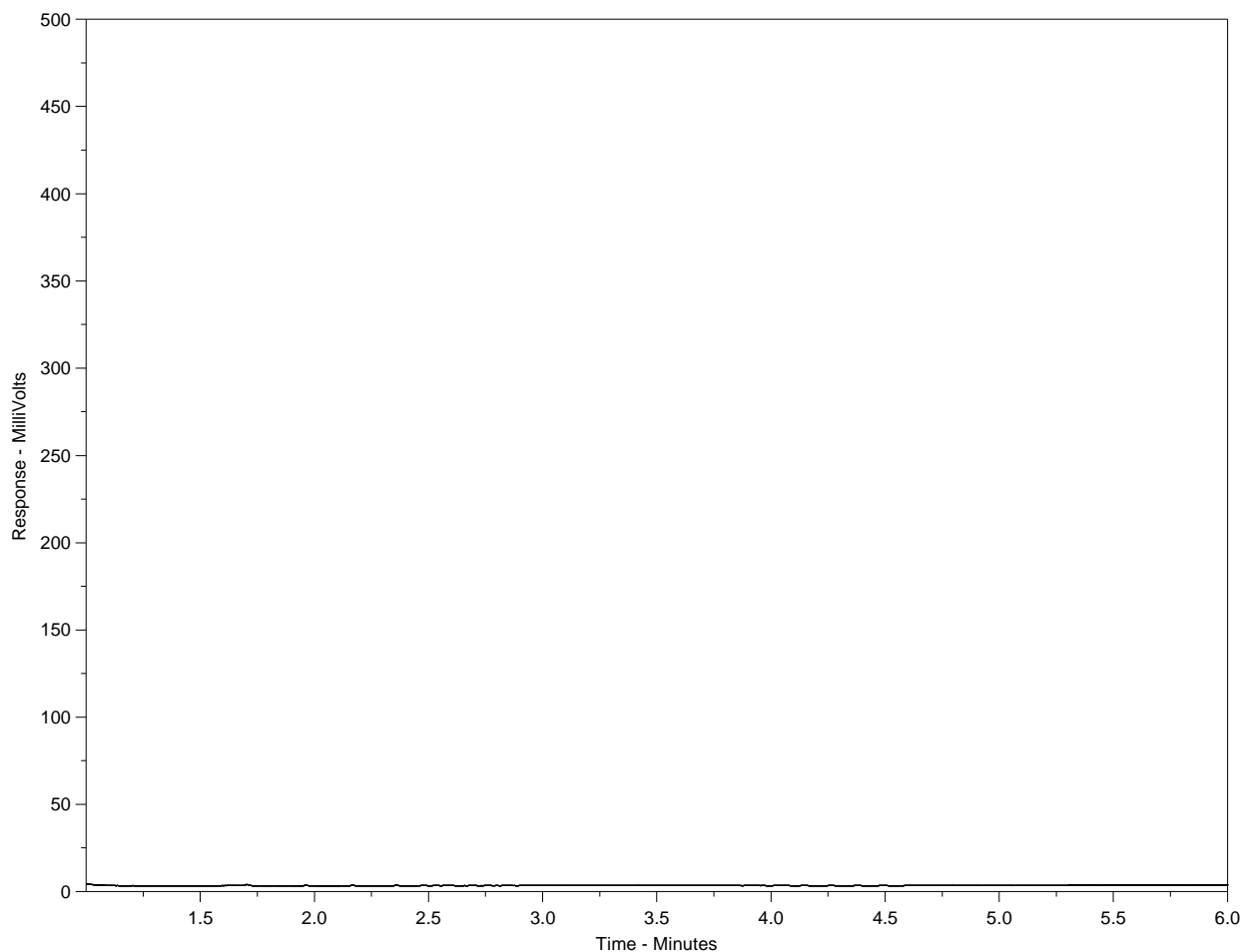
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1498418-5
Client ID: 16053140806029



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	106°F				
← Gasoline →		← Diesel/ Jet Fuels →				← Motor Oils/ Lube Oils/ Grease →	

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

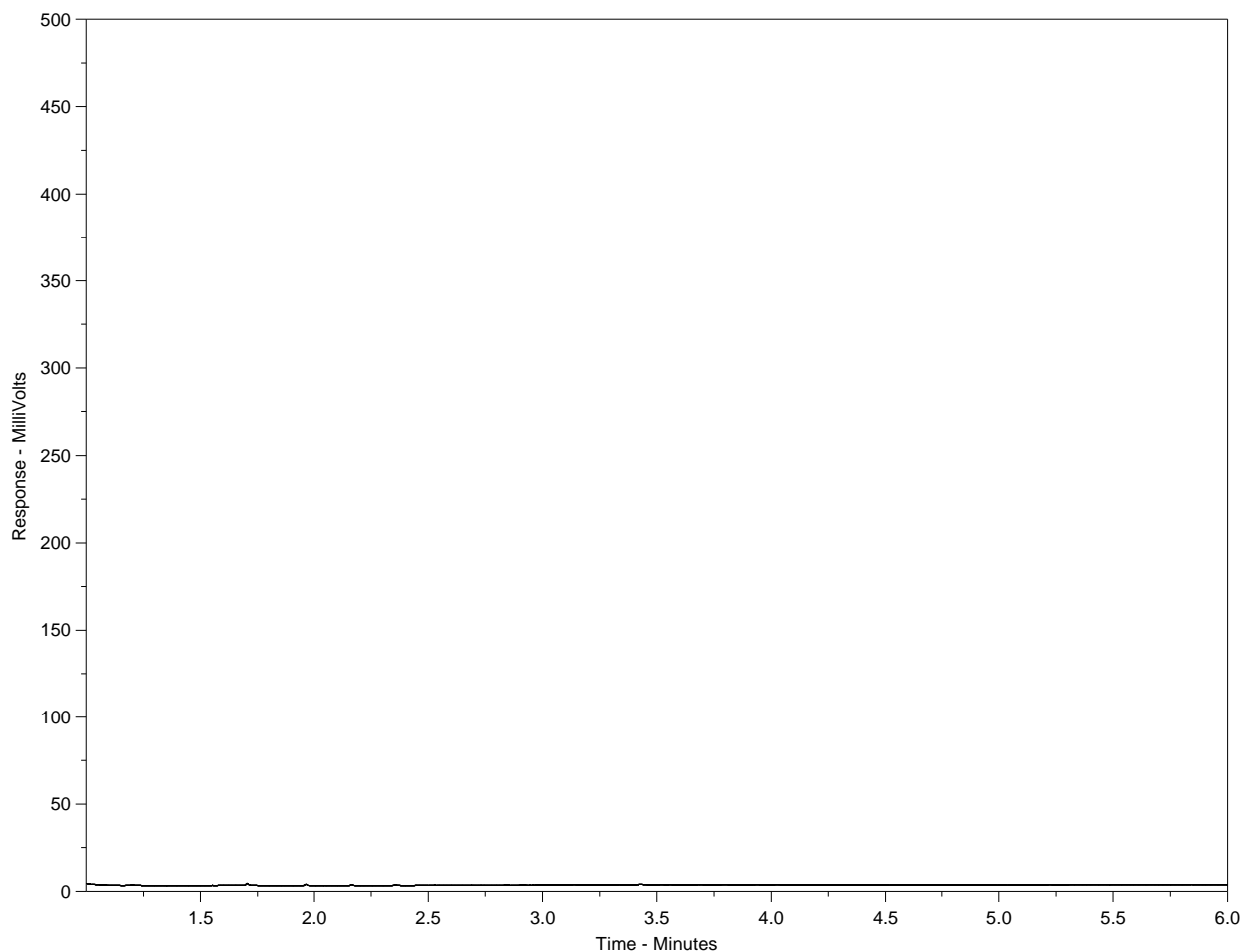
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1498418-6
Client ID: 16053140806030



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	106°F				
← Gasoline →		← Diesel/ Jet Fuels →		← Motor Oils/ Lube Oils/ Grease →			

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

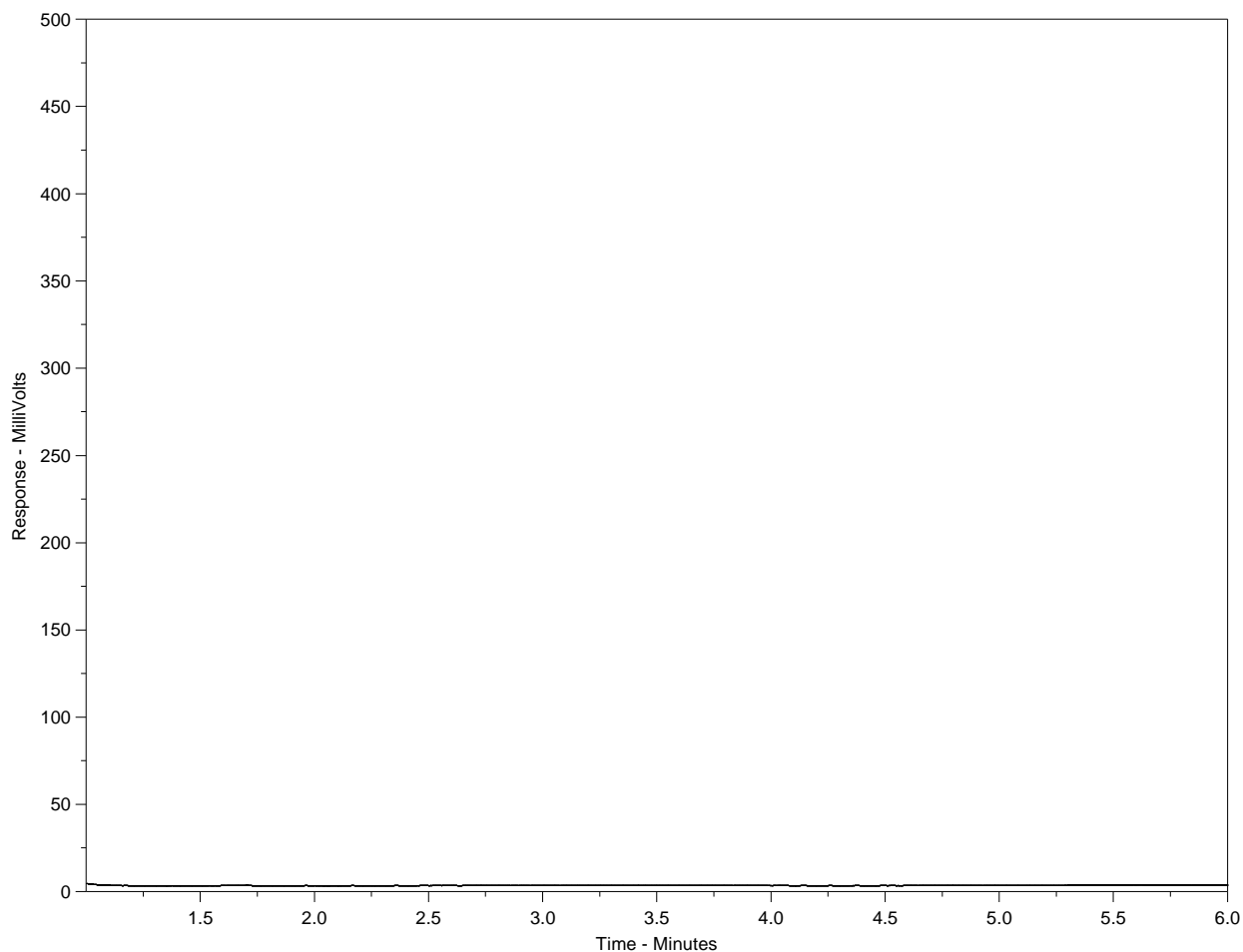
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1498418-7
 Client ID: 16053140806031



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	106°F				
← Gasoline →		← Diesel/ Jet Fuels →		← Motor Oils/ Lube Oils/ Grease →			

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

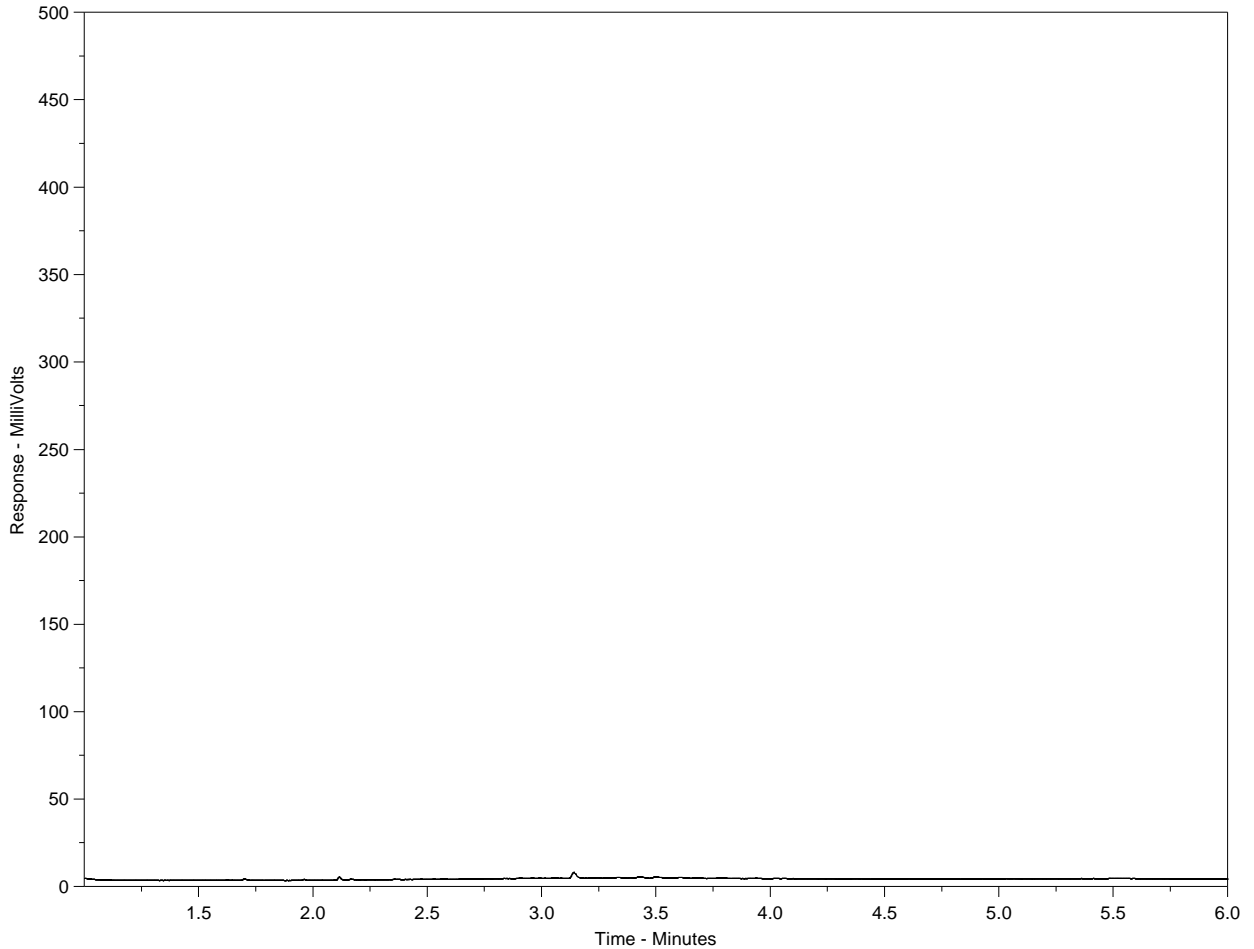
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1498418-8
Client ID: 16053140806032



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	106°F				
← Gasoline →		← Diesel/ Jet Fuels →				← Motor Oils/ Lube Oils/ Grease →	

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

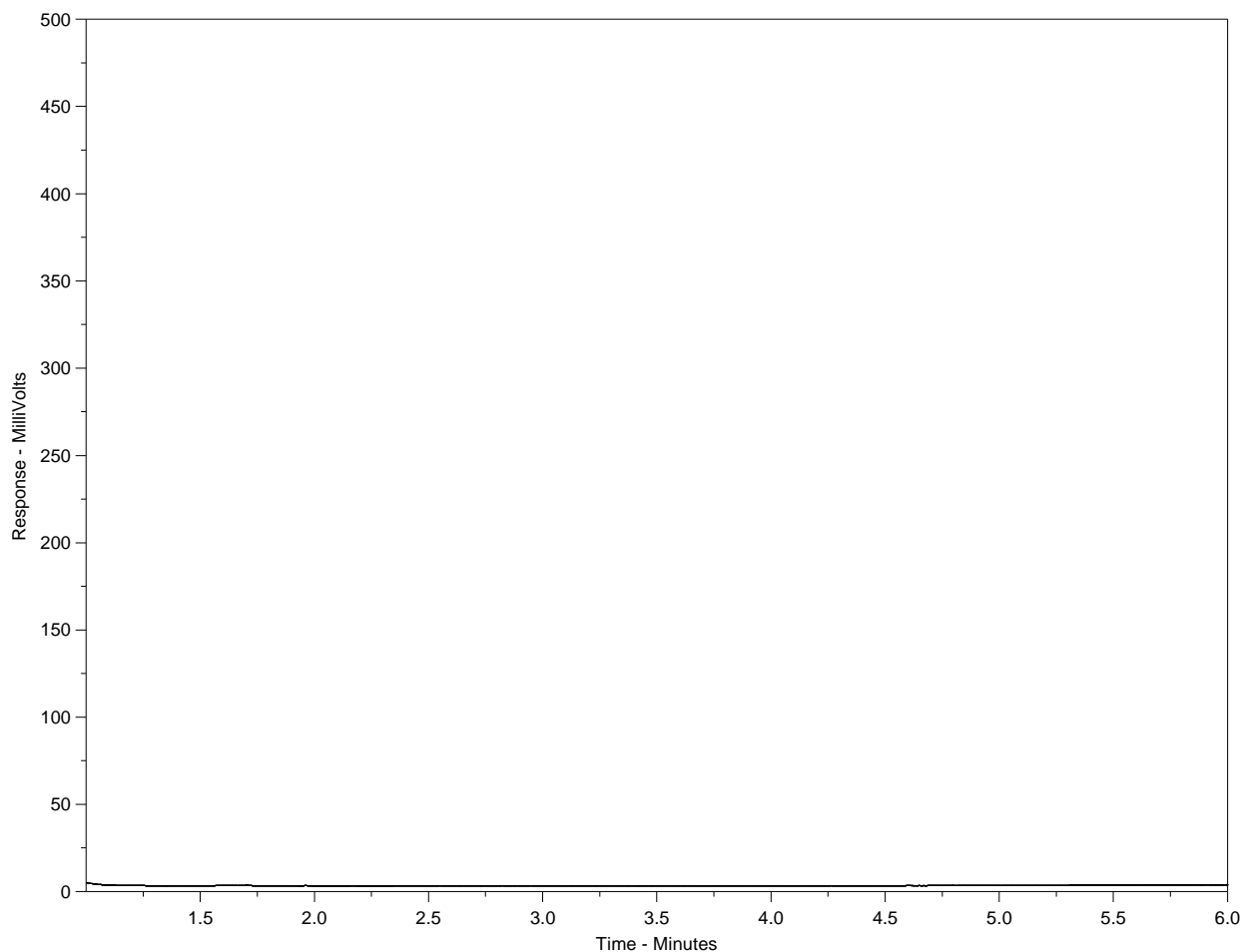
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note:
 This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1498418-9
Client ID: 16053140807033



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	106°F				
← Gasoline →		← Diesel/ Jet Fuels →		← Motor Oils/ Lube Oils/ Grease →			

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.



Matrix Solutions Inc.
ATTN: Sue Raynard
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Date Received: 08-AUG-14
Report Date: 29-AUG-14 19:48 (MT)
Version: FINAL

Client Phone: 403-513-2275

Certificate of Analysis

Lab Work Order #: L1499435
Project P.O. #: NOT SUBMITTED
Job Reference: 16053-502 NAOS
C of C Numbers: M061302
Legal Site Desc: site 2

Nicole Thibault
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1499435-1 16053140807035									
Sampled By: bp/jl on 07-AUG-14 @ 13:36									
Matrix: water									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Toluene	0.00096	-		0.00050	mg/L	-		12-AUG-14	R2915907
EthylBenzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
o-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Styrene	<0.0010	-		0.0010	mg/L	-		12-AUG-14	R2915907
F1(C6-C10)	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
F1-BTEX	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
Xylenes	<0.00071	-		0.00071	mg/L	-		12-AUG-14	R2915907
Surr: 1,4-Difluorobenzene (SS)	100.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 4-Bromofluorobenzene (SS)	90.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 3,4-Dichlorotoluene (SS)	94.0	-		N/A	%	-		12-AUG-14	R2915907
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2916974
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2916974
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2916974
Surr: 2-Bromobenzotrifluoride	107.9	-		N/A	%	-	12-AUG-14	12-AUG-14	R2916974
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		21-AUG-14	R2925489
				0					
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.668	+/-0.11	DLM	0.0060	mg/L	0		13-AUG-14	R2917038
Antimony (Sb)-Total	<0.00040	-	DLM	0.00040	mg/L	-		13-AUG-14	R2917038
Arsenic (As)-Total	0.00767	+/-0.00089	DLM	0.00040	mg/L	0		13-AUG-14	R2917038
Barium (Ba)-Total	0.0252	+/-0.0028	DLM	0.0050	mg/L	0		13-AUG-14	R2917038
Boron (B)-Total	2.17	+/-0.35	DLM	0.050	mg/L	0		13-AUG-14	R2917038
Cadmium (Cd)-Total	<0.00020	-	DLM	0.00020	mg/L	-		13-AUG-14	R2917038
Calcium (Ca)-Total	1.21	+/-0.15	DLM	0.50	mg/L	0		13-AUG-14	R2917038
Chromium (Cr)-Total	<0.0050	-	DLM	0.0050	mg/L	-		13-AUG-14	R2917038
Copper (Cu)-Total	0.0075	+/-0.0009	DLM	0.0010	mg/L	0		13-AUG-14	R2917038
Iron (Fe)-Total	12.5	+/-2.0	DLM	0.020	mg/L	0		13-AUG-14	R2917038
Lead (Pb)-Total	0.00797	+/-0.0013	DLM	0.00010	mg/L	0		13-AUG-14	R2917038
Magnesium (Mg)-Total	0.81	+/-0.10	DLM	0.10	mg/L	0		13-AUG-14	R2917038
Manganese (Mn)-Total	0.155	+/-0.016	DLM	0.0020	mg/L	0		13-AUG-14	R2917038
Nickel (Ni)-Total	0.0027	+/-0.0003	DLM	0.0020	mg/L	0		13-AUG-14	R2917038
Potassium (K)-Total	1.47	+/-0.18	DLM	0.10	mg/L	0		13-AUG-14	R2917038
Selenium (Se)-Total	<0.00040	-	DLM	0.00040	mg/L	-		13-AUG-14	R2917038
Silver (Ag)-Total	<0.00040	-	DLM	0.00040	mg/L	-		13-AUG-14	R2917038
Sodium (Na)-Total	384	+/-47	DLM	1.0	mg/L	0		13-AUG-14	R2917038
Uranium (U)-Total	<0.00010	-	DLM	0.00010	mg/L	-		13-AUG-14	R2917038
Zinc (Zn)-Total	0.200	+/-0.031	DLM	0.0060	mg/L	0		13-AUG-14	R2917038
Miscellaneous Parameters									
Ammonia, Total (as N)	1.02	-		0.050	mg/L	-		19-AUG-14	R2923049
Dissolved Organic Carbon	7.9	+/-1.0		1.0	mg/L	0		20-AUG-14	R2924069
Iron Bacteria	See Attached	-				-		09-AUG-14	R2923715
Naphthenic Acids	<1.0	-		1.0	mg/L	-	20-AUG-14	29-AUG-14	R2933376
Phenols (4AAP)	0.0071	+/-0.0012		0.0010	mg/L	-7.4%		21-AUG-14	R2925385
Sulphate Reducing Bacteria	See Attached	-				-		09-AUG-14	R2923715
Total Dissolved Solids	955	+/-64		10	mg/L	0		13-AUG-14	R2917950

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1499435-1 16053140807035									
Sampled By: bp/jl on 07-AUG-14 @ 13:36									
Matrix: water									
Silicon (as SiO2)-Total	5.54	-		0.21	mg/L	-		14-AUG-14	
Turbidity	65.3	+/-3.6		0.10	NTU	0		09-AUG-14	R2917062
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Anthracene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Fluoranthene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Fluorene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Naphthalene	<0.000050	-		0.000050	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Phenanthrene	<0.000050	-		0.000050	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Pyrene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(a)pyrene	<0.0000050	-		0.000005	mg/L	-	19-AUG-14	19-AUG-14	R2924297
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	19-AUG-14	19-AUG-14	R2924297
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Surr: d10-Acenaphthene	84.7	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297
Surr: d10-Phenanthrene	98.9	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297
Surr: d12-Chrysene	99.5	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	3.51	+/-0.22		0.50	mg/L	0		09-AUG-14	R2912741
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		21-AUG-14	R2925343
Antimony (Sb)-Dissolved	<0.00040	-	DLM	0.00040	mg/L	-		21-AUG-14	R2925343
Arsenic (As)-Dissolved	0.00223	+/-0.00023	DLM	0.00040	mg/L	0		21-AUG-14	R2925343
Barium (Ba)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		21-AUG-14	R2925343
Boron (B)-Dissolved	2.30	+/-0.28	DLM	0.050	mg/L	0		21-AUG-14	R2925343
Cadmium (Cd)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		21-AUG-14	R2925343
Calcium (Ca)-Dissolved	0.84	+/-0.11	DLM	0.50	mg/L	0		21-AUG-14	R2925343
Chromium (Cr)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		21-AUG-14	R2925343
Copper (Cu)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		21-AUG-14	R2925343
Iron (Fe)-Dissolved	<0.020	-	DLM	0.020	mg/L	-		21-AUG-14	R2925343
Lead (Pb)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		21-AUG-14	R2925343
Magnesium (Mg)-Dissolved	0.49	+/-0.04	DLM	0.10	mg/L	0		21-AUG-14	R2925343
Manganese (Mn)-Dissolved	0.0173	+/-0.0012	DLM	0.0020	mg/L	0		21-AUG-14	R2925343
Nickel (Ni)-Dissolved	<0.0020	-	DLM	0.0020	mg/L	-		21-AUG-14	R2925343
Potassium (K)-Dissolved	1.37	+/-0.10	DLM	0.10	mg/L	0		21-AUG-14	R2925343
Selenium (Se)-Dissolved	<0.00040	-	DLM	0.00040	mg/L	-		21-AUG-14	R2925343
Silver (Ag)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		21-AUG-14	R2925343
Sodium (Na)-Dissolved	379	+/-27	DLM	1.0	mg/L	0		21-AUG-14	R2925343
Uranium (U)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		21-AUG-14	R2925343
Zinc (Zn)-Dissolved	<0.0030	-	DLM	0.0030	mg/L	-		21-AUG-14	R2925343
Ion Balance Calculation									
Ion Balance	98.6	-			%	-		22-AUG-14	
TDS (Calculated)	926	-			mg/L	-		22-AUG-14	
Hardness (as CaCO3)	4.1	-			mg/L	-		22-AUG-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1499435-1 16053140807035 Sampled By: bp/jl on 07-AUG-14 @ 13:36 Matrix: water									
Mercury (Hg) - Dissolved Mercury (Hg)-Dissolved	<0.0000050	-		0.000005 0	mg/L	-		21-AUG-14	R2925489
Nitrate as N by IC Nitrate (as N)	<0.050	-		0.050	mg/L	-		09-AUG-14	R2912741
Nitrate+Nitrite Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		15-AUG-14	
Nitrite as N by IC Nitrite (as N)	<0.020	-		0.020	mg/L	-		09-AUG-14	R2912741
Sulfate by IC Sulfate (SO4)	96.7	+/-5.5		0.50	mg/L	0		09-AUG-14	R2912741
pH, Conductivity and Total Alkalinity pH	9.18	+/-0.01		0.10	pH	0		10-AUG-14	R2915317
Conductivity (EC)	1550	+/-78		0.20	uS/cm	0		10-AUG-14	R2915317
Bicarbonate (HCO3)	690	+/-26		5.0	mg/L	0		10-AUG-14	R2915317
Carbonate (CO3)	105	+/-14		5.0	mg/L	0		10-AUG-14	R2915317
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		10-AUG-14	R2915317
Alkalinity, Total (as CaCO3)	740	+/-46		2.0	mg/L	0		10-AUG-14	R2915317
Silicon (reported as Silica) Dissolved Silicon (reported as Silica) Silicon (as SiO2)-Dissolved	1.61	-		0.21	mg/L	-		22-AUG-14	
L1499435-2 16053140807036 Sampled By: bp/jl on 07-AUG-14 @ 16:10 Matrix: water									
BTXS, Styrene & F1-F4 BTEX, Styrene and F1 (C6-C10) Benzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Toluene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
EthylBenzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
o-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
m+p-Xylene	0.00065	-		0.00050	mg/L	-		12-AUG-14	R2915907
Styrene	<0.0010	-		0.0010	mg/L	-		12-AUG-14	R2915907
F1(C6-C10)	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
F1-BTEX	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
Xylenes	<0.00071	-		0.00071	mg/L	-		12-AUG-14	R2915907
Surr: 1,4-Difluorobenzene (SS)	98.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 4-Bromofluorobenzene (SS)	92.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 3,4-Dichlorotoluene (SS)	93.0	-		N/A	%	-		12-AUG-14	R2915907
F2, F3, F4 F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2916974
F3 (C16-C34)	0.28	+/-0.12		0.25	mg/L	0	12-AUG-14	12-AUG-14	R2916974
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2916974
Surr: 2-Bromobenzotrifluoride	96.5	-		N/A	%	-	12-AUG-14	12-AUG-14	R2916974
Alberta Tier 1 Metals (Total) Mercury (Hg) Mercury (Hg)-Total	0.0000067	+/-0.0000043		0.000005 0	mg/L	0		21-AUG-14	R2925489
Total Metals in Water by CRC ICPMS Aluminum (Al)-Total	0.287	+/-0.046		0.0030	mg/L	0		13-AUG-14	R2917038
Antimony (Sb)-Total	<0.00040	-		0.00040	mg/L	-		13-AUG-14	R2917038
Arsenic (As)-Total	0.00225	+/-0.00027		0.00040	mg/L	0		13-AUG-14	R2917038
Barium (Ba)-Total	0.150	+/-0.017		0.0050	mg/L	0		13-AUG-14	R2917038
Boron (B)-Total	<0.050	-		0.050	mg/L	-		13-AUG-14	R2917038

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1499435-2 16053140807036									
Sampled By: bp/jl on 07-AUG-14 @ 16:10									
Matrix: water									
Total Metals in Water by CRC ICPMS									
Cadmium (Cd)-Total	<0.00020	-		0.00020	mg/L	-		13-AUG-14	R2917038
Calcium (Ca)-Total	69.4	+/-8.2		0.50	mg/L	0		13-AUG-14	R2917038
Chromium (Cr)-Total	<0.0050	-		0.0050	mg/L	-		13-AUG-14	R2917038
Copper (Cu)-Total	0.0176	+/-0.0021		0.0010	mg/L	0		13-AUG-14	R2917038
Iron (Fe)-Total	16.8	+/-2.7		0.010	mg/L	0		13-AUG-14	R2917038
Lead (Pb)-Total	0.0392	+/-0.0062		0.00010	mg/L	0		13-AUG-14	R2917038
Magnesium (Mg)-Total	5.88	+/-0.71		0.10	mg/L	0		13-AUG-14	R2917038
Manganese (Mn)-Total	0.385	+/-0.039		0.0020	mg/L	0		13-AUG-14	R2917038
Nickel (Ni)-Total	0.0201	+/-0.0022		0.0020	mg/L	0		13-AUG-14	R2917038
Potassium (K)-Total	0.73	+/-0.09		0.10	mg/L	0		13-AUG-14	R2917038
Selenium (Se)-Total	<0.00040	-		0.00040	mg/L	-		13-AUG-14	R2917038
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		13-AUG-14	R2917038
Sodium (Na)-Total	3.2	+/-0.4		1.0	mg/L	0		13-AUG-14	R2917038
Uranium (U)-Total	0.00028	+/-0.00004		0.00010	mg/L	0		13-AUG-14	R2917038
Zinc (Zn)-Total	0.105	+/-0.017		0.0040	mg/L	0		13-AUG-14	R2917038
Miscellaneous Parameters									
Ammonia, Total (as N)	0.062	-		0.050	mg/L	-		19-AUG-14	R2923049
Dissolved Organic Carbon	4.2	+/-0.7		1.0	mg/L	0		20-AUG-14	R2924069
Iron Bacteria	See Attached	-				-		09-AUG-14	R2923715
Naphthenic Acids	<1.0	-		1.0	mg/L	-	20-AUG-14	29-AUG-14	R2933376
Phenols (4AAP)	0.0016	+/-0.0008		0.0010	mg/L	-7.4%		21-AUG-14	R2925385
Sulphate Reducing Bacteria	See Attached	-				-		09-AUG-14	R2923715
Total Dissolved Solids	211	+/-15		10	mg/L	0		13-AUG-14	R2917950
Silicon (as SiO2)-Total	7.93	-		0.11	mg/L	-		14-AUG-14	
Turbidity	157	+/-8.7		0.10	NTU	0		09-AUG-14	R2917062
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Anthracene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Fluoranthene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Fluorene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Naphthalene	<0.000050	-		0.000050	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Phenanthrene	<0.000050	-		0.000050	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Pyrene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(a)pyrene	<0.0000050	-		0.000005	mg/L	-	19-AUG-14	19-AUG-14	R2924297
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	19-AUG-14	19-AUG-14	R2924297
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Surr: d10-Acenaphthene	89.7	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297
Surr: d10-Phenanthrene	101.1	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297
Surr: d12-Chrysene	99.6	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	2.57	+/-0.17		0.50	mg/L	0		09-AUG-14	R2912741

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1499435-2 16053140807036									
Sampled By: bp/jl on 07-AUG-14 @ 16:10									
Matrix: water									
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-		21-AUG-14	R2925343
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-		21-AUG-14	R2925343
Arsenic (As)-Dissolved	0.00057	+/-0.00006		0.00040	mg/L	0		21-AUG-14	R2925343
Barium (Ba)-Dissolved	0.136	+/-0.012		0.0050	mg/L	0		21-AUG-14	R2925343
Boron (B)-Dissolved	<0.050	-		0.050	mg/L	-		21-AUG-14	R2925343
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		21-AUG-14	R2925343
Calcium (Ca)-Dissolved	72.6	+/-9.9		0.50	mg/L	0		21-AUG-14	R2925343
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		21-AUG-14	R2925343
Copper (Cu)-Dissolved	<0.0010	-		0.0010	mg/L	-		21-AUG-14	R2925343
Iron (Fe)-Dissolved	2.92	+/-0.26		0.010	mg/L	0		21-AUG-14	R2925343
Lead (Pb)-Dissolved	<0.00010	-		0.00010	mg/L	-		21-AUG-14	R2925343
Magnesium (Mg)-Dissolved	5.62	+/-0.44		0.10	mg/L	0		21-AUG-14	R2925343
Manganese (Mn)-Dissolved	0.249	+/-0.017		0.0020	mg/L	0		21-AUG-14	R2925343
Nickel (Ni)-Dissolved	0.0026	+/-0.0002		0.0020	mg/L	0		21-AUG-14	R2925343
Potassium (K)-Dissolved	0.68	+/-0.05		0.10	mg/L	0		21-AUG-14	R2925343
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-		21-AUG-14	R2925343
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		21-AUG-14	R2925343
Sodium (Na)-Dissolved	3.4	+/-0.2		1.0	mg/L	0		21-AUG-14	R2925343
Uranium (U)-Dissolved	0.00021	+/-0.00002		0.00010	mg/L	0		21-AUG-14	R2925343
Zinc (Zn)-Dissolved	0.0038	+/-0.0005		0.0030	mg/L	0		21-AUG-14	R2925343
Ion Balance Calculation									
Ion Balance	103	-			%	-		22-AUG-14	
TDS (Calculated)	210	-			mg/L	-		22-AUG-14	
Hardness (as CaCO3)	204	-			mg/L	-		22-AUG-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		21-AUG-14	R2925489
Nitrate as N by IC									
Nitrate (as N)	0.090	+/-0.011		0.050	mg/L	0		09-AUG-14	R2912741
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	0.090	-		0.054	mg/L	-		15-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		09-AUG-14	R2912741
Sulfate by IC									
Sulfate (SO4)	8.15	+/-0.48		0.50	mg/L	0		09-AUG-14	R2912741
pH, Conductivity and Total Alkalinity									
pH	8.24	+/-0.01		0.10	pH	0		10-AUG-14	R2915317
Conductivity (EC)	383	+/-19		0.20	uS/cm	0		10-AUG-14	R2915317
Bicarbonate (HCO3)	236	+/-9.7		5.0	mg/L	0		10-AUG-14	R2915317
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		10-AUG-14	R2915317
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		10-AUG-14	R2915317
Alkalinity, Total (as CaCO3)	194	+/-13		2.0	mg/L	0		10-AUG-14	R2915317
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	6.89	-		0.11	mg/L	-		22-AUG-14	
L1499435-3 16053140807037									
Sampled By: bp/jl on 07-AUG-14 @ 15:41									
Matrix: water									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Toluene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1499435-3 16053140807037									
Sampled By: bp/jl on 07-AUG-14 @ 15:41									
Matrix: water									
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Anthracene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Fluoranthene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Fluorene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Naphthalene	<0.000050	-		0.000050	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Phenanthrene	<0.000050	-		0.000050	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Pyrene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(a)pyrene	<0.000050	-		0.000005	mg/L	-	19-AUG-14	19-AUG-14	R2924297
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Dibenzo(a,h)anthracene	<0.000050	-		0.000005	mg/L	-	19-AUG-14	19-AUG-14	R2924297
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Surr: d10-Acenaphthene	88.8	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297
Surr: d10-Phenanthrene	98.5	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297
Surr: d12-Chrysene	97.4	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	2.20	+/-0.15		0.50	mg/L	0		09-AUG-14	R2912741
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-		21-AUG-14	R2925343
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-		21-AUG-14	R2925343
Arsenic (As)-Dissolved	0.00310	+/-0.00033		0.00040	mg/L	0		21-AUG-14	R2925343
Barium (Ba)-Dissolved	0.0064	+/-0.0006		0.0050	mg/L	0		21-AUG-14	R2925343
Boron (B)-Dissolved	1.18	+/-0.14		0.050	mg/L	0		21-AUG-14	R2925343
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		21-AUG-14	R2925343
Calcium (Ca)-Dissolved	10.8	+/-1.5		0.50	mg/L	0		21-AUG-14	R2925343
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		21-AUG-14	R2925343
Copper (Cu)-Dissolved	<0.0010	-		0.0010	mg/L	-		21-AUG-14	R2925343
Iron (Fe)-Dissolved	0.258	+/-0.023		0.010	mg/L	0		21-AUG-14	R2925343
Lead (Pb)-Dissolved	<0.00010	-		0.00010	mg/L	-		21-AUG-14	R2925343
Magnesium (Mg)-Dissolved	3.56	+/-0.28		0.10	mg/L	0		21-AUG-14	R2925343
Manganese (Mn)-Dissolved	0.0927	+/-0.0063		0.0020	mg/L	0		21-AUG-14	R2925343
Nickel (Ni)-Dissolved	<0.0020	-		0.0020	mg/L	-		21-AUG-14	R2925343
Potassium (K)-Dissolved	3.05	+/-0.24		0.10	mg/L	0		21-AUG-14	R2925343
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-		21-AUG-14	R2925343
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		21-AUG-14	R2925343
Sodium (Na)-Dissolved	198	+/-14		1.0	mg/L	0		21-AUG-14	R2925343
Uranium (U)-Dissolved	<0.00010	-		0.00010	mg/L	-		21-AUG-14	R2925343
Zinc (Zn)-Dissolved	<0.0030	-		0.0030	mg/L	-		21-AUG-14	R2925343
Ion Balance Calculation									
Ion Balance	100	-			%	-		22-AUG-14	
TDS (Calculated)	509	-			mg/L	-		22-AUG-14	
Hardness (as CaCO3)	41.6	-			mg/L	-		22-AUG-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.000050	-		0.000005	mg/L	-		21-AUG-14	R2925489

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1499435-3 16053140807037									
Sampled By: bp/jl on 07-AUG-14 @ 15:41									
Matrix: water									
Mercury (Hg) - Dissolved				0					
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		09-AUG-14	R2912741
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		15-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		09-AUG-14	R2912741
Sulfate by IC									
Sulfate (SO4)	11.9	+/-0.69		0.50	mg/L	0		09-AUG-14	R2912741
pH, Conductivity and Total Alkalinity									
pH	8.72	+/-0.01		0.10	pH	0		10-AUG-14	R2915317
Conductivity (EC)	869	+/-44		0.20	uS/cm	0		10-AUG-14	R2915317
Bicarbonate (HCO3)	515	+/-20		5.0	mg/L	0		10-AUG-14	R2915317
Carbonate (CO3)	26.4	+/-4.5		5.0	mg/L	0		10-AUG-14	R2915317
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		10-AUG-14	R2915317
Alkalinity, Total (as CaCO3)	466	+/-29		2.0	mg/L	0		10-AUG-14	R2915317
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	2.27	-		0.11	mg/L	-		22-AUG-14	
* Refer to Referenced Information for Qualifiers (if any) and Methodology.									

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Chloride (Cl)	MS-B	
Matrix Spike	Nitrate (as N)	MS-B	
Matrix Spike	Sulfate (SO4)	MS-B	
Matrix Spike	Dissolved Organic Carbon	MS-B	

Sample Parameter Qualifier Key:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
BTXS,F1-ED	Water	BTEX, Styrene and F1 (C6-C10)		EPA 5021/8015&8260 GC-MS & FID
C-DIS-ORG-ED	Water	Dissolved Organic Carbon		APHA 5310 B-Instrumental
CL-IC-ED	Water	Chloride by IC		APHA 4110 B-ION CHROMATOGRAPHY
F2,F3,F4-ED	Water	F2, F3, F4		EPA 3510/CCME PHC CWS-GC-FID
HG-D-L-CVAA-ED	Water	Mercury (Hg) - Dissolved		EPA 245.7 / EPA 245.1
HG-T-L-CVAA-ED	Water	Mercury (Hg)		EPA 245.7 / EPA 245.1
IB-BART-PB	Water	Iron Bacteria		BART Test Kit
BART Test Kit Analysis performed at PBR Laboratories Inc., Edmonton.				
IONBALANCE-ED	Water	Ion Balance Calculation		APHA 1030E
MET-D-CCMS-ED	Water	Dissolved Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
NAPHTHENIC-ACID-FM	Water	Naphthenic Acids by FTIR		Naphthenic Acids by FTIR, Syncrude, 1994
Dissolved naphthenic acids are solvent extracted from acidified aqueous samples using Dichloromethane prior to quantitation by Fourier Transform Infra-Red spectroscopy. Note that FTIR is not uniquely selective to naphthenic acids. If present, other carboxylic acids (e.g. humic acids, fulvic acids) may also be detected by this method.				
NH3-CFA-ED	Water	Ammonia in Water by Colour		APHA 4500 NH3-NITROGEN (AMMONIA)
This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.				
NO2+NO3-CALC-ED	Water	Nitrate+Nitrite		CALCULATION
NO2-IC-ED	Water	Nitrite as N by IC		APHA 4110 B-ION CHROMATOGRAPHY
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
NO3-IC-ED	Water	Nitrate as N by IC		APHA 4110 B-ION CHROMATOGRAPHY
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
PAH-ABT1-CL	Water	PAH & Carcinogenic PAH List		EPA 3510/8270-GC/MS
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity		APHA 4500-H, 2510, 2320

All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PHENOLS-4AAP-ED	Water	Phenols (4AAP)		AB ENV.06537-COLORIMETRIC
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This analysis is carried out using procedures adapted from ENVIRODAT VMV 06537 689, Method Code 154, in "Methods Manual for Chemical Analysis of Water and Wastes" published by the Alberta Environmental Centre. This automated method is based on the distillation of phenol and subsequent reaction of the distillate with alkaline ferricyanide and 4-aminoantipyrine to form a red complex which is measured at 505 nm.

SIO2-D-CALC-ED	Water	Dissolved Silicon (reported as Silica)		CALCULATION
SIO2-T-CALC-ED	Water	Total Silicon (reported as Silica)		CALCULATION

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
SO4-IC-ED	Water	Sulfate by IC		APHA 4110 B-ION CHROMATOGRAPHY
SOLIDS-TDS-ED	Water	Total Dissolved Solids		APHA 2540 C
SRB-BART-PB	Water	Sulphate Reducing Bacteria / BART method		BART TEST KIT
BART Test Kit				
TURBIDITY-ED	Water	Turbidity		APHA 2130 B-Nephelometer

** The indicated Method Reference is the closest nationally or internationally recognized reference for the applicable ALS test method. ALS methods may incorporate modifications from the specified reference to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
PB	PBR LABORATORIES
FM	ALS ENVIRONMENTAL - FORT MCMURRAY, ALBERTA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

M061302

GLOSSARY OF REPORT TERMS

Surr - Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

MU: Measurement Uncertainty. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 which gives a level of confidence of approximately 95%.

Bias: The reported method bias is the average long term deviation from the target value for a long term reference or control sample, measured in percent.

Zero values indicate no detectable method bias.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 1 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R2915907							
WG1928137-4	DUP	L1498481-8						
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-AUG-14
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-AUG-14
EthylBenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-AUG-14
o-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	12-AUG-14
m+p-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	12-AUG-14
Styrene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	50	12-AUG-14
F1(C6-C10)		<0.10	<0.10	RPD-NA	mg/L	N/A	30	12-AUG-14
WG1928137-8	DUP	L1499441-5						
Benzene		0.0466	0.0425		mg/L	9.3	30	12-AUG-14
Toluene		0.0420	0.0374		mg/L	12	30	12-AUG-14
EthylBenzene		0.0422	0.0357		mg/L	17	30	12-AUG-14
o-Xylene		0.0416	0.0356		mg/L	16	24	12-AUG-14
m+p-Xylene		0.0416	0.0346		mg/L	18	24	12-AUG-14
Styrene		0.0267	0.0226		mg/L	17	50	12-AUG-14
F1(C6-C10)		0.35	0.34		mg/L	3.0	30	12-AUG-14
WG1928137-2	LCS							
Benzene			117.5		%		70-130	12-AUG-14
Toluene			126.5		%		70-130	12-AUG-14
EthylBenzene			120.6		%		70-130	12-AUG-14
o-Xylene			128.4		%		70-130	12-AUG-14
m+p-Xylene			125.1		%		70-130	12-AUG-14
Styrene			120.0		%		70-130	12-AUG-14
WG1928137-3	LCS							
F1(C6-C10)			93.6		%		70-130	12-AUG-14
WG1928137-6	LCS							
Benzene			84.4		%		70-130	12-AUG-14
Toluene			88.3		%		70-130	12-AUG-14
EthylBenzene			80.0		%		70-130	12-AUG-14
o-Xylene			86.4		%		70-130	12-AUG-14
m+p-Xylene			82.1		%		70-130	12-AUG-14
Styrene			84.4		%		70-130	12-AUG-14
WG1928137-7	LCS							
F1(C6-C10)			82.2		%		70-130	12-AUG-14
WG1928137-1	MB							



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 2 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R2915907							
WG1928137-1	MB							
Benzene			<0.00050		mg/L		0.0005	12-AUG-14
Toluene			<0.00050		mg/L		0.0005	12-AUG-14
EthylBenzene			<0.00050		mg/L		0.0005	12-AUG-14
o-Xylene			<0.00050		mg/L		0.0005	12-AUG-14
m+p-Xylene			<0.00050		mg/L		0.0005	12-AUG-14
Styrene			<0.0010		mg/L		0.001	12-AUG-14
F1(C6-C10)			<0.10		mg/L		0.1	12-AUG-14
Surrogate: 1,4-Difluorobenzene (SS)			102.0		%		70-130	12-AUG-14
Surrogate: 4-Bromofluorobenzene (SS)			100.0		%		70-130	12-AUG-14
Surrogate: 3,4-Dichlorotoluene (SS)			92.0		%		70-130	12-AUG-14
WG1928137-5	MB							
Benzene			<0.00050		mg/L		0.0005	12-AUG-14
Toluene			<0.00050		mg/L		0.0005	12-AUG-14
EthylBenzene			<0.00050		mg/L		0.0005	12-AUG-14
o-Xylene			<0.00050		mg/L		0.0005	12-AUG-14
m+p-Xylene			<0.00050		mg/L		0.0005	12-AUG-14
Styrene			<0.0010		mg/L		0.001	12-AUG-14
F1(C6-C10)			<0.10		mg/L		0.1	12-AUG-14
Surrogate: 1,4-Difluorobenzene (SS)			101.0		%		70-130	12-AUG-14
Surrogate: 4-Bromofluorobenzene (SS)			98.0		%		70-130	12-AUG-14
Surrogate: 3,4-Dichlorotoluene (SS)			91.0		%		70-130	12-AUG-14
C-DIS-ORG-ED		Water						
Batch	R2924069							
WG1934716-3	CVS							
Dissolved Organic Carbon			119.0		%		80-160	20-AUG-14
WG1934716-4	DUP	L1499435-3						
Dissolved Organic Carbon		17.7	17.5		mg/L	1.0	20	20-AUG-14
WG1934716-2	LCS							
Dissolved Organic Carbon			97.3		%		80-120	20-AUG-14
WG1934716-1	MB							
Dissolved Organic Carbon			<1.0		mg/L		1	20-AUG-14
WG1934716-5	MS	L1499435-3						
Dissolved Organic Carbon			N/A	MS-B	%		-	20-AUG-14

CL-IC-ED **Water**



Environmental

Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 3 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-ED		Water						
Batch	R2912741							
WG1927719-17	DUP	L1499670-6						
Chloride (Cl)		41.4	41.2		mg/L	0.5	20	09-AUG-14
WG1927719-5	DUP	L1499575-5						
Chloride (Cl)		1.83	1.68		mg/L	8.4	20	09-AUG-14
WG1927719-9	DUP	L1499564-3						
Chloride (Cl)		133	134		mg/L	0.9	20	09-AUG-14
WG1927719-11	LCS							
Chloride (Cl)			103.1		%		90-110	09-AUG-14
WG1927719-15	LCS							
Chloride (Cl)			102.1		%		90-110	09-AUG-14
WG1927719-19	LCS							
Chloride (Cl)			101.7		%		90-110	09-AUG-14
WG1927719-2	LCS							
Chloride (Cl)			101.5		%		90-110	09-AUG-14
WG1927719-21	LCS							
Chloride (Cl)			101.3		%		90-110	09-AUG-14
WG1927719-3	LCS							
Chloride (Cl)			101.9		%		90-110	09-AUG-14
WG1927719-7	LCS							
Chloride (Cl)			102.7		%		90-110	09-AUG-14
WG1927719-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-12	MB							
Chloride (Cl)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-16	MB							
Chloride (Cl)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-20	MB							
Chloride (Cl)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-22	MB							
Chloride (Cl)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-4	MB							
Chloride (Cl)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-8	MB							
Chloride (Cl)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-10	MS	L1499564-3						
Chloride (Cl)			N/A	MS-B	%		-	09-AUG-14
WG1927719-18	MS	L1499670-6						
Chloride (Cl)			101.7		%		75-125	09-AUG-14



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 4 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-ED								
	Water							
Batch	R2912741							
WG1927719-6	MS	L1499575-5						
Chloride (Cl)			99.7		%		75-125	09-AUG-14
F2,F3,F4-ED								
	Water							
Batch	R2916974							
WG1928838-2	LCS							
F2 (>C10-C16)			110.9		%		65-135	12-AUG-14
F3 (C16-C34)			113.0		%		65-135	12-AUG-14
F4 (C34-C50)			112.2		%		65-135	12-AUG-14
WG1928838-5	LCS							
F2 (>C10-C16)			116.4		%		65-135	12-AUG-14
F3 (C16-C34)			119.1		%		65-135	12-AUG-14
F4 (C34-C50)			119.4		%		65-135	12-AUG-14
WG1928838-1	MB							
F2 (>C10-C16)			<0.25		mg/L		0.25	12-AUG-14
F3 (C16-C34)			<0.25		mg/L		0.25	12-AUG-14
F4 (C34-C50)			<0.25		mg/L		0.25	12-AUG-14
Surrogate: 2-Bromobenzotrifluoride			95.2		%		50-150	12-AUG-14
WG1928838-4	MB							
F2 (>C10-C16)			<0.25		mg/L		0.25	12-AUG-14
F3 (C16-C34)			<0.25		mg/L		0.25	12-AUG-14
F4 (C34-C50)			<0.25		mg/L		0.25	12-AUG-14
Surrogate: 2-Bromobenzotrifluoride			94.2		%		50-150	12-AUG-14
WG1928838-3	MS	L1498824-1						
F2 (>C10-C16)			106.5		%		50-150	12-AUG-14
F3 (C16-C34)			108.8		%		50-150	12-AUG-14
F4 (C34-C50)			109.0		%		50-150	12-AUG-14
WG1928838-6	MS	L1499441-3						
F2 (>C10-C16)			108.8		%		50-150	12-AUG-14
F3 (C16-C34)			119.4		%		50-150	12-AUG-14
F4 (C34-C50)			116.9		%		50-150	12-AUG-14
HG-D-L-CVAA-ED								
	Water							
Batch	R2925489							
WG1935834-3	DUP	L1499435-1						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	21-AUG-14
WG1935834-2	LCS							



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 5 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-L-CVAA-ED								
	Water							
Batch	R2925489							
WG1935834-2	LCS							
Mercury (Hg)-Dissolved			95.1		%		80-120	21-AUG-14
WG1935834-6	LCS							
Mercury (Hg)-Dissolved			90.9		%		80-120	21-AUG-14
WG1935834-1	MB							
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	21-AUG-14
WG1935834-5	MB							
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	21-AUG-14
WG1935834-4	MS	L1499435-1						
Mercury (Hg)-Dissolved			93.5		%		70-130	21-AUG-14
HG-T-L-CVAA-ED								
	Water							
Batch	R2925489							
WG1935850-3	DUP	L1499441-2						
Mercury (Hg)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	21-AUG-14
WG1935850-2	LCS							
Mercury (Hg)-Total			94.1		%		80-120	21-AUG-14
WG1935850-1	MB							
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	21-AUG-14
WG1935850-4	MS	L1499441-2						
Mercury (Hg)-Total			88.1		%		70-130	21-AUG-14
MET-D-CCMS-ED								
	Water							
Batch	R2925343							
WG1935610-14	CRM	ED-HIGH-WATRM						
Aluminum (Al)-Dissolved			101.7		%		80-120	21-AUG-14
Antimony (Sb)-Dissolved			94.7		%		80-120	21-AUG-14
Arsenic (As)-Dissolved			100.4		%		80-120	21-AUG-14
Barium (Ba)-Dissolved			104.2		%		80-120	21-AUG-14
Boron (B)-Dissolved			101.2		%		80-120	21-AUG-14
Cadmium (Cd)-Dissolved			106.8		%		80-120	21-AUG-14
Calcium (Ca)-Dissolved			104.8		%		80-120	21-AUG-14
Chromium (Cr)-Dissolved			101.7		%		80-120	21-AUG-14
Copper (Cu)-Dissolved			99.7		%		80-120	21-AUG-14
Lead (Pb)-Dissolved			98.9		%		80-120	21-AUG-14
Magnesium (Mg)-Dissolved			102.0		%		80-120	21-AUG-14
Manganese (Mn)-Dissolved			101.6		%		80-120	21-AUG-14
Nickel (Ni)-Dissolved			100.3		%		80-120	21-AUG-14



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 6 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2925343							
WG1935610-14 CRM	ED-HIGH-WATRM							
Potassium (K)-Dissolved			100.6		%		80-120	21-AUG-14
Selenium (Se)-Dissolved			103.8		%		80-120	21-AUG-14
Silver (Ag)-Dissolved			101.4		%		80-120	21-AUG-14
Sodium (Na)-Dissolved			98.0		%		80-120	21-AUG-14
Uranium (U)-Dissolved			100.8		%		80-120	21-AUG-14
Zinc (Zn)-Dissolved			101.4		%		80-120	21-AUG-14
WG1935610-17 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			97.0		%		80-120	21-AUG-14
Antimony (Sb)-Dissolved			96.4		%		80-120	21-AUG-14
Arsenic (As)-Dissolved			93.6		%		80-120	21-AUG-14
Barium (Ba)-Dissolved			94.9		%		80-120	21-AUG-14
Boron (B)-Dissolved			95.9		%		80-120	21-AUG-14
Cadmium (Cd)-Dissolved			97.3		%		80-120	21-AUG-14
Calcium (Ca)-Dissolved			97.8		%		80-120	21-AUG-14
Chromium (Cr)-Dissolved			94.9		%		80-120	21-AUG-14
Copper (Cu)-Dissolved			93.4		%		80-120	21-AUG-14
Lead (Pb)-Dissolved			95.8		%		80-120	21-AUG-14
Magnesium (Mg)-Dissolved			101.2		%		80-120	21-AUG-14
Manganese (Mn)-Dissolved			92.6		%		80-120	21-AUG-14
Nickel (Ni)-Dissolved			94.8		%		80-120	21-AUG-14
Potassium (K)-Dissolved			92.2		%		80-120	21-AUG-14
Selenium (Se)-Dissolved			96.4		%		80-120	21-AUG-14
Silver (Ag)-Dissolved			93.5		%		80-120	21-AUG-14
Sodium (Na)-Dissolved			97.3		%		80-120	21-AUG-14
Uranium (U)-Dissolved			94.8		%		80-120	21-AUG-14
Zinc (Zn)-Dissolved			93.2		%		80-120	21-AUG-14
WG1935610-2 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			101.7		%		80-120	21-AUG-14
Antimony (Sb)-Dissolved			94.7		%		80-120	21-AUG-14
Arsenic (As)-Dissolved			100.4		%		80-120	21-AUG-14
Barium (Ba)-Dissolved			104.2		%		80-120	21-AUG-14
Boron (B)-Dissolved			101.2		%		80-120	21-AUG-14
Cadmium (Cd)-Dissolved			106.8		%		80-120	21-AUG-14
Calcium (Ca)-Dissolved			104.9		%		80-120	21-AUG-14



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 7 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2925343							
WG1935610-2 CRM	ED-HIGH-WATRM							
Chromium (Cr)-Dissolved			101.6		%		80-120	21-AUG-14
Copper (Cu)-Dissolved			99.7		%		80-120	21-AUG-14
Lead (Pb)-Dissolved			98.9		%		80-120	21-AUG-14
Magnesium (Mg)-Dissolved			102.1		%		80-120	21-AUG-14
Manganese (Mn)-Dissolved			101.6		%		80-120	21-AUG-14
Nickel (Ni)-Dissolved			100.3		%		80-120	21-AUG-14
Potassium (K)-Dissolved			100.6		%		80-120	21-AUG-14
Selenium (Se)-Dissolved			103.8		%		80-120	21-AUG-14
Silver (Ag)-Dissolved			101.4		%		80-120	21-AUG-14
Sodium (Na)-Dissolved			98.0		%		80-120	21-AUG-14
Uranium (U)-Dissolved			100.9		%		80-120	21-AUG-14
Zinc (Zn)-Dissolved			101.4		%		80-120	21-AUG-14
WG1935610-20 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			97.6		%		80-120	21-AUG-14
Antimony (Sb)-Dissolved			99.8		%		80-120	21-AUG-14
Arsenic (As)-Dissolved			93.4		%		80-120	21-AUG-14
Barium (Ba)-Dissolved			94.6		%		80-120	21-AUG-14
Boron (B)-Dissolved			97.9		%		80-120	21-AUG-14
Cadmium (Cd)-Dissolved			96.9		%		80-120	21-AUG-14
Calcium (Ca)-Dissolved			98.5		%		80-120	21-AUG-14
Chromium (Cr)-Dissolved			93.6		%		80-120	21-AUG-14
Copper (Cu)-Dissolved			92.3		%		80-120	21-AUG-14
Lead (Pb)-Dissolved			93.4		%		80-120	21-AUG-14
Magnesium (Mg)-Dissolved			101.3		%		80-120	21-AUG-14
Manganese (Mn)-Dissolved			93.2		%		80-120	21-AUG-14
Nickel (Ni)-Dissolved			93.7		%		80-120	21-AUG-14
Potassium (K)-Dissolved			91.7		%		80-120	21-AUG-14
Selenium (Se)-Dissolved			96.0		%		80-120	21-AUG-14
Silver (Ag)-Dissolved			96.3		%		80-120	21-AUG-14
Sodium (Na)-Dissolved			98.9		%		80-120	21-AUG-14
Uranium (U)-Dissolved			94.4		%		80-120	21-AUG-14
Zinc (Zn)-Dissolved			93.0		%		80-120	21-AUG-14
WG1935610-4 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			98.7		%		80-120	21-AUG-14



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 8 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2925343							
WG1935610-4 CRM	ED-HIGH-WATRM							
Antimony (Sb)-Dissolved			95.1		%		80-120	21-AUG-14
Arsenic (As)-Dissolved			97.5		%		80-120	21-AUG-14
Barium (Ba)-Dissolved			96.8		%		80-120	21-AUG-14
Boron (B)-Dissolved			95.6		%		80-120	21-AUG-14
Cadmium (Cd)-Dissolved			108.1		%		80-120	21-AUG-14
Calcium (Ca)-Dissolved			98.8		%		80-120	21-AUG-14
Chromium (Cr)-Dissolved			100.2		%		80-120	21-AUG-14
Copper (Cu)-Dissolved			97.1		%		80-120	21-AUG-14
Lead (Pb)-Dissolved			101.0		%		80-120	21-AUG-14
Magnesium (Mg)-Dissolved			103.2		%		80-120	21-AUG-14
Manganese (Mn)-Dissolved			99.5		%		80-120	21-AUG-14
Nickel (Ni)-Dissolved			97.9		%		80-120	21-AUG-14
Potassium (K)-Dissolved			102.1		%		80-120	21-AUG-14
Selenium (Se)-Dissolved			99.3		%		80-120	21-AUG-14
Silver (Ag)-Dissolved			98.6		%		80-120	21-AUG-14
Sodium (Na)-Dissolved			101.9		%		80-120	21-AUG-14
Uranium (U)-Dissolved			102.5		%		80-120	21-AUG-14
Zinc (Zn)-Dissolved			102.0		%		80-120	21-AUG-14
WG1935610-6 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			99.4		%		80-120	21-AUG-14
Antimony (Sb)-Dissolved			93.1		%		80-120	21-AUG-14
Arsenic (As)-Dissolved			97.6		%		80-120	21-AUG-14
Barium (Ba)-Dissolved			99.8		%		80-120	21-AUG-14
Boron (B)-Dissolved			93.7		%		80-120	21-AUG-14
Cadmium (Cd)-Dissolved			105.7		%		80-120	21-AUG-14
Calcium (Ca)-Dissolved			99.0		%		80-120	21-AUG-14
Chromium (Cr)-Dissolved			97.4		%		80-120	21-AUG-14
Copper (Cu)-Dissolved			97.6		%		80-120	21-AUG-14
Lead (Pb)-Dissolved			98.0		%		80-120	21-AUG-14
Magnesium (Mg)-Dissolved			100.5		%		80-120	21-AUG-14
Manganese (Mn)-Dissolved			98.8		%		80-120	21-AUG-14
Nickel (Ni)-Dissolved			99.6		%		80-120	21-AUG-14
Potassium (K)-Dissolved			93.3		%		80-120	21-AUG-14
Selenium (Se)-Dissolved			98.8		%		80-120	21-AUG-14



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 9 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2925343							
WG1935610-6 CRM	ED-HIGH-WATRM							
Silver (Ag)-Dissolved			99.3		%		80-120	21-AUG-14
Sodium (Na)-Dissolved			98.0		%		80-120	21-AUG-14
Uranium (U)-Dissolved			98.1		%		80-120	21-AUG-14
Zinc (Zn)-Dissolved			100.0		%		80-120	21-AUG-14
WG1935610-8 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			98.7		%		80-120	21-AUG-14
Antimony (Sb)-Dissolved			95.7		%		80-120	21-AUG-14
Arsenic (As)-Dissolved			97.5		%		80-120	21-AUG-14
Barium (Ba)-Dissolved			100.4		%		80-120	21-AUG-14
Boron (B)-Dissolved			94.2		%		80-120	21-AUG-14
Cadmium (Cd)-Dissolved			109.0		%		80-120	21-AUG-14
Calcium (Ca)-Dissolved			99.0		%		80-120	21-AUG-14
Chromium (Cr)-Dissolved			99.0		%		80-120	21-AUG-14
Copper (Cu)-Dissolved			100.5		%		80-120	21-AUG-14
Lead (Pb)-Dissolved			97.2		%		80-120	21-AUG-14
Magnesium (Mg)-Dissolved			101.9		%		80-120	21-AUG-14
Manganese (Mn)-Dissolved			98.5		%		80-120	21-AUG-14
Nickel (Ni)-Dissolved			97.1		%		80-120	21-AUG-14
Potassium (K)-Dissolved			95.2		%		80-120	21-AUG-14
Selenium (Se)-Dissolved			97.9		%		80-120	21-AUG-14
Silver (Ag)-Dissolved			98.8		%		80-120	21-AUG-14
Sodium (Na)-Dissolved			102.6		%		80-120	21-AUG-14
Uranium (U)-Dissolved			100.5		%		80-120	21-AUG-14
Zinc (Zn)-Dissolved			99.1		%		80-120	21-AUG-14
WG1935610-10 DUP	L1502799-5							
Aluminum (Al)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	21-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Arsenic (As)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Barium (Ba)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	21-AUG-14
Boron (B)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	21-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-14
Calcium (Ca)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	21-AUG-14
Chromium (Cr)-Dissolved		0.00030	0.00032		mg/L	6.4	20	21-AUG-14
Copper (Cu)-Dissolved		0.00046	0.00047		mg/L	2.1	20	21-AUG-14



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 10 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2925343							
WG1935610-10 DUP		L1502799-5						
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	21-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	21-AUG-14
Magnesium (Mg)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	20	21-AUG-14
Manganese (Mn)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	21-AUG-14
Nickel (Ni)-Dissolved		0.00015	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Potassium (K)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	21-AUG-14
Selenium (Se)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-14
Sodium (Na)-Dissolved		<1.0	<1.0	RPD-NA	mg/L	N/A	20	21-AUG-14
Uranium (U)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-14
Zinc (Zn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	21-AUG-14
WG1935610-11 DUP		L1501905-7						
Aluminum (Al)-Dissolved		0.0013	0.0014		mg/L	2.7	20	21-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Arsenic (As)-Dissolved		0.00110	0.00108		mg/L	2.2	20	21-AUG-14
Barium (Ba)-Dissolved		0.112	0.107		mg/L	4.2	20	21-AUG-14
Boron (B)-Dissolved		0.375	0.369		mg/L	1.5	20	21-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-14
Calcium (Ca)-Dissolved		65.2	66.8		mg/L	2.3	20	21-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Copper (Cu)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Iron (Fe)-Dissolved		6.03	6.12		mg/L	1.5	20	21-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	21-AUG-14
Magnesium (Mg)-Dissolved		18.2	18.0		mg/L	0.8	20	21-AUG-14
Manganese (Mn)-Dissolved		0.162	0.162		mg/L	0.3	20	21-AUG-14
Nickel (Ni)-Dissolved		0.00012	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Potassium (K)-Dissolved		2.55	2.47		mg/L	3.2	20	21-AUG-14
Selenium (Se)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-14
Sodium (Na)-Dissolved		166	169		mg/L	1.6	20	21-AUG-14
Uranium (U)-Dissolved		0.000016	0.000016		mg/L	1.2	20	21-AUG-14
WG1935610-12 DUP		L1502822-2						
Aluminum (Al)-Dissolved		0.0024	0.0030	J	mg/L	0.0006	0.002	21-AUG-14



Environmental

Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 11 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2925343							
WG1935610-12 DUP		L1502822-2						
Antimony (Sb)-Dissolved		0.00012	0.00011		mg/L	4.5	20	21-AUG-14
Arsenic (As)-Dissolved		0.00122	0.00123		mg/L	0.7	20	21-AUG-14
Barium (Ba)-Dissolved		0.119	0.115		mg/L	2.8	20	21-AUG-14
Boron (B)-Dissolved		0.053	0.053		mg/L	0.4	20	21-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-14
Calcium (Ca)-Dissolved		74.9	75.8		mg/L	1.1	20	21-AUG-14
Chromium (Cr)-Dissolved		0.00023	0.00023		mg/L	1.9	20	21-AUG-14
Copper (Cu)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Iron (Fe)-Dissolved		0.095	0.095		mg/L	0.8	20	21-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	21-AUG-14
Magnesium (Mg)-Dissolved		38.5	37.6		mg/L	2.3	20	21-AUG-14
Manganese (Mn)-Dissolved		0.0191	0.0187		mg/L	2.4	20	21-AUG-14
Nickel (Ni)-Dissolved		0.00132	0.00122		mg/L	8.1	20	21-AUG-14
Potassium (K)-Dissolved		1.52	1.49		mg/L	1.7	20	21-AUG-14
Selenium (Se)-Dissolved		0.00013	0.00013		mg/L	0.1	20	21-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-14
Sodium (Na)-Dissolved		89.1	86.8		mg/L	2.7	20	21-AUG-14
Uranium (U)-Dissolved		0.000069	0.000069		mg/L	0.6	20	21-AUG-14
Zinc (Zn)-Dissolved		0.0012	0.0021	J	mg/L	0.0009	0.002	21-AUG-14
WG1935610-18 DUP		L1498443-1						
Aluminum (Al)-Dissolved		0.0122	0.0123		mg/L	0.1	20	21-AUG-14
Antimony (Sb)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	21-AUG-14
Arsenic (As)-Dissolved		0.00171	0.00175		mg/L	2.4	20	21-AUG-14
Barium (Ba)-Dissolved		0.0387	0.0391		mg/L	1.0	20	21-AUG-14
Boron (B)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	21-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-14
Calcium (Ca)-Dissolved		22.3	21.1		mg/L	5.8	20	21-AUG-14
Chromium (Cr)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	21-AUG-14
Copper (Cu)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	21-AUG-14
Iron (Fe)-Dissolved		1.93	1.95		mg/L	1.0	20	21-AUG-14
Lead (Pb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Magnesium (Mg)-Dissolved		4.98	4.96		mg/L	0.5	20	21-AUG-14
Manganese (Mn)-Dissolved		0.0843	0.0855		mg/L	1.4	20	21-AUG-14



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 12 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2925343							
WG1935610-18	DUP	L1498443-1						
Nickel (Ni)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	21-AUG-14
Potassium (K)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	21-AUG-14
Selenium (Se)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	21-AUG-14
Silver (Ag)-Dissolved		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	21-AUG-14
Sodium (Na)-Dissolved		2.6	2.6		mg/L	0.7	20	21-AUG-14
Uranium (U)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Zinc (Zn)-Dissolved		<0.0040	<0.0040	RPD-NA	mg/L	N/A	20	21-AUG-14
WG1935610-21	DUP	L1500102-2						
Aluminum (Al)-Dissolved		0.0098	0.0090		mg/L	7.7	20	21-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Arsenic (As)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Barium (Ba)-Dissolved		0.0522	0.0536		mg/L	2.5	20	21-AUG-14
Boron (B)-Dissolved		0.027	0.027		mg/L	0.9	20	21-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-14
Calcium (Ca)-Dissolved		59.5	60.8		mg/L	2.2	20	21-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Copper (Cu)-Dissolved		0.00081	0.00079		mg/L	2.0	20	21-AUG-14
Iron (Fe)-Dissolved		0.013	0.012		mg/L	3.8	20	21-AUG-14
Lead (Pb)-Dissolved		0.000075	0.000077		mg/L	2.0	20	21-AUG-14
Magnesium (Mg)-Dissolved		19.6	19.8		mg/L	1.3	20	21-AUG-14
Manganese (Mn)-Dissolved		0.00435	0.00435		mg/L	0.1	20	21-AUG-14
Nickel (Ni)-Dissolved		0.00033	0.00033		mg/L	1.4	20	21-AUG-14
Potassium (K)-Dissolved		0.98	0.98		mg/L	0.0	20	21-AUG-14
Selenium (Se)-Dissolved		0.00103	0.00100		mg/L	2.9	20	21-AUG-14
Sodium (Na)-Dissolved		1.3	1.3		mg/L	0.5	20	21-AUG-14
Uranium (U)-Dissolved		0.000719	0.000724		mg/L	0.8	20	21-AUG-14
Zinc (Zn)-Dissolved		0.0304	0.0304		mg/L	0.1	20	21-AUG-14
WG1935610-9	DUP	L1502799-15						
Aluminum (Al)-Dissolved		0.104	0.109		mg/L	4.6	20	21-AUG-14
Antimony (Sb)-Dissolved		0.00099	0.00096		mg/L	3.0	20	21-AUG-14
Arsenic (As)-Dissolved		0.00155	0.00152		mg/L	1.7	20	21-AUG-14
Barium (Ba)-Dissolved		0.195	0.199		mg/L	1.9	20	21-AUG-14
Boron (B)-Dissolved		0.384	0.373		mg/L	3.0	20	21-AUG-14



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 13 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2925343							
WG1935610-9	DUP	L1502799-15						
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-14
Calcium (Ca)-Dissolved		37.1	37.8		mg/L	2.0	20	21-AUG-14
Chromium (Cr)-Dissolved		0.00028	0.00029		mg/L	3.6	20	21-AUG-14
Copper (Cu)-Dissolved		0.00129	0.00132		mg/L	2.6	20	21-AUG-14
Iron (Fe)-Dissolved		0.058	0.060		mg/L	2.2	20	21-AUG-14
Lead (Pb)-Dissolved		0.000075	0.000082		mg/L	8.5	20	21-AUG-14
Magnesium (Mg)-Dissolved		11.3	11.4		mg/L	0.6	20	21-AUG-14
Manganese (Mn)-Dissolved		0.000843	0.000792		mg/L	6.2	20	21-AUG-14
Nickel (Ni)-Dissolved		0.00424	0.00423		mg/L	0.2	20	21-AUG-14
Potassium (K)-Dissolved		10.0	9.72		mg/L	2.9	20	21-AUG-14
Selenium (Se)-Dissolved		0.00117	0.00120		mg/L	2.1	20	21-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-14
Sodium (Na)-Dissolved		191	186		mg/L	2.5	20	21-AUG-14
Uranium (U)-Dissolved		0.00263	0.00258		mg/L	1.9	20	21-AUG-14
Zinc (Zn)-Dissolved		0.0012	0.0018	J	mg/L	0.0006	0.002	21-AUG-14
WG1935610-1	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	21-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	21-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	21-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	21-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	21-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 14 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2925343							
WG1935610-1 MB								
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	21-AUG-14
WG1935610-13 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	21-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	21-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	21-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	21-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	21-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	21-AUG-14
WG1935610-16 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	21-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	21-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	21-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 15 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2925343							
WG1935610-16 MB								
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	21-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	21-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	21-AUG-14
WG1935610-19 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	21-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	21-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	21-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	21-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	21-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	21-AUG-14
WG1935610-3 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	21-AUG-14



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 16 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2925343							
WG1935610-3 MB								
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	21-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	21-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	21-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	21-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	21-AUG-14
WG1935610-5 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	21-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	21-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	21-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	21-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	21-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 17 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2925343							
WG1935610-5 MB								
Potassium (K)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	21-AUG-14
WG1935610-7 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	21-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	21-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	21-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	21-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	21-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	21-AUG-14
MET-T-CCMS-ED		Water						
Batch	R2917038							
WG1928270-5 DUP		L1499123-1						
Aluminum (Al)-Total		0.053	0.075	J	mg/L	0.023	0.03	13-AUG-14
Antimony (Sb)-Total		0.00061	0.00066		mg/L	7.4	20	13-AUG-14
Arsenic (As)-Total		0.00167	0.00162		mg/L	3.2	20	13-AUG-14
Barium (Ba)-Total		0.179	0.189		mg/L	5.6	20	13-AUG-14



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 18 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R2917038							
WG1928270-5	DUP	L1499123-1						
Boron (B)-Total		0.071	0.071		mg/L	0.2	20	13-AUG-14
Cadmium (Cd)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Calcium (Ca)-Total		54.7	51.6		mg/L	5.9	20	13-AUG-14
Chromium (Cr)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Copper (Cu)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Iron (Fe)-Total		0.065	0.078		mg/L	18	20	13-AUG-14
Lead (Pb)-Total		<0.000025	<0.000025	RPD-NA	mg/L	N/A	20	13-AUG-14
Magnesium (Mg)-Total		13.1	13.5		mg/L	2.9	20	13-AUG-14
Manganese (Mn)-Total		0.0270	0.0275		mg/L	1.7	20	13-AUG-14
Nickel (Ni)-Total		0.00157	0.00165		mg/L	5.5	20	13-AUG-14
Potassium (K)-Total		5.74	5.77		mg/L	0.5	20	13-AUG-14
Selenium (Se)-Total		0.00266	0.00252		mg/L	5.4	20	13-AUG-14
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Sodium (Na)-Total		132	130		mg/L	1.2	20	13-AUG-14
Uranium (U)-Total		0.00899	0.00890		mg/L	0.9	20	13-AUG-14
Zinc (Zn)-Total		<0.015	<0.015	RPD-NA	mg/L	N/A	20	13-AUG-14
WG1928270-6	DUP	L1499644-1						
Aluminum (Al)-Total		0.521	0.512		mg/L	1.7	20	13-AUG-14
Antimony (Sb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Arsenic (As)-Total		0.00198	0.00186		mg/L	5.9	20	13-AUG-14
Barium (Ba)-Total		0.232	0.237		mg/L	1.8	20	13-AUG-14
Boron (B)-Total		0.061	0.062		mg/L	2.1	20	13-AUG-14
Cadmium (Cd)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Calcium (Ca)-Total		146	145		mg/L	0.5	20	13-AUG-14
Chromium (Cr)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Copper (Cu)-Total		0.00343	0.00332		mg/L	3.2	20	13-AUG-14
Iron (Fe)-Total		0.086	0.074		mg/L	15	20	13-AUG-14
Lead (Pb)-Total		<0.000025	<0.000025	RPD-NA	mg/L	N/A	20	13-AUG-14
Magnesium (Mg)-Total		44.4	42.3		mg/L	4.7	20	13-AUG-14
Manganese (Mn)-Total		0.0180	0.0177		mg/L	1.7	20	13-AUG-14
Nickel (Ni)-Total		0.00260	0.00250		mg/L	3.9	20	13-AUG-14
Potassium (K)-Total		4.57	4.50		mg/L	1.5	20	13-AUG-14
Selenium (Se)-Total		0.00565	0.00528		mg/L	6.8	20	13-AUG-14



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 19 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R2917038							
WG1928270-6	DUP	L1499644-1						
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Sodium (Na)-Total		110	109		mg/L	0.8	20	13-AUG-14
Uranium (U)-Total		0.00198	0.00200		mg/L	1.0	20	13-AUG-14
Zinc (Zn)-Total		<0.015	<0.015	RPD-NA	mg/L	N/A	20	13-AUG-14
WG1928270-4	LCS							
Aluminum (Al)-Total			104.6		%		70-130	13-AUG-14
Antimony (Sb)-Total			99.8		%		70-130	13-AUG-14
Arsenic (As)-Total			101.6		%		70-130	13-AUG-14
Barium (Ba)-Total			105.8		%		70-130	13-AUG-14
Boron (B)-Total			98.6		%		70-130	13-AUG-14
Cadmium (Cd)-Total			104.5		%		70-130	13-AUG-14
Calcium (Ca)-Total			103.0		%		70-130	13-AUG-14
Chromium (Cr)-Total			102.5		%		70-130	13-AUG-14
Copper (Cu)-Total			100.1		%		70-130	13-AUG-14
Iron (Fe)-Total			102.1		%		70-130	13-AUG-14
Lead (Pb)-Total			99.9		%		70-130	13-AUG-14
Magnesium (Mg)-Total			109.1		%		70-130	13-AUG-14
Manganese (Mn)-Total			104.0		%		70-130	13-AUG-14
Nickel (Ni)-Total			102.9		%		70-130	13-AUG-14
Potassium (K)-Total			103.5		%		70-130	13-AUG-14
Selenium (Se)-Total			102.1		%		70-130	13-AUG-14
Silver (Ag)-Total			100.1		%		70-130	13-AUG-14
Sodium (Na)-Total			113.8		%		70-130	13-AUG-14
Uranium (U)-Total			95.7		%		70-130	13-AUG-14
Zinc (Zn)-Total			108.1		%		70-130	13-AUG-14
WG1928270-3	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	13-AUG-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Barium (Ba)-Total			<0.000050		mg/L		0.00005	13-AUG-14
Boron (B)-Total			<0.010		mg/L		0.01	13-AUG-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	13-AUG-14
Calcium (Ca)-Total			<0.020		mg/L		0.02	13-AUG-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	13-AUG-14



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 20 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch R2917038								
WG1928270-3 MB								
Copper (Cu)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Iron (Fe)-Total			<0.010		mg/L		0.01	13-AUG-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	13-AUG-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	13-AUG-14
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	13-AUG-14
Nickel (Ni)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Potassium (K)-Total			<0.050		mg/L		0.05	13-AUG-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	13-AUG-14
Sodium (Na)-Total			<0.050		mg/L		0.05	13-AUG-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	13-AUG-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	13-AUG-14
NAPHTHENIC-ACID-FM		Water						
Batch R2933376								
WG1934617-3 DUP		L1498443-2						
Naphthenic Acids		<1.0	<1.0	RPD-NA	mg/L	N/A	30	29-AUG-14
WG1934617-7 DUP		L1501722-6						
Naphthenic Acids		2.6	2.8		mg/L	9.1	30	29-AUG-14
WG1934617-4 LCS								
Naphthenic Acids			76.6		%		70-130	29-AUG-14
WG1934617-8 LCS								
Naphthenic Acids			83.7		%		70-130	29-AUG-14
WG1934617-1 MB								
Naphthenic Acids			<1.0		mg/L		1	29-AUG-14
WG1934617-5 MB								
Naphthenic Acids			<1.0		mg/L		1	29-AUG-14
WG1934617-2 MS		L1498443-1						
Naphthenic Acids			75.6		%		50-150	29-AUG-14
WG1934617-6 MS		L1501722-5						
Naphthenic Acids			71.0		%		50-150	29-AUG-14
NH3-CFA-ED		Water						
Batch R2923049								
WG1933578-10 DUP		L1504020-1						
Ammonia, Total (as N)		0.433	0.460		mg/L	6.0	20	19-AUG-14
WG1933578-6 DUP		L1498418-9						



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 21 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-CFA-ED		Water						
Batch	R2923049							
WG1933578-6	DUP	L1498418-9						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	19-AUG-14
WG1933578-8	DUP	L1501286-7						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	19-AUG-14
WG1933578-2	LCS							
Ammonia, Total (as N)			100.5		%		85-115	19-AUG-14
WG1933578-1	MB							
Ammonia, Total (as N)			<0.050		mg/L		0.05	19-AUG-14
WG1933578-11	MS	L1495802-8						
Ammonia, Total (as N)			102.6		%		75-125	19-AUG-14
WG1933578-4	MS	L1501019-2						
Ammonia, Total (as N)			100.7		%		75-125	19-AUG-14
WG1933578-7	MS	L1500991-5						
Ammonia, Total (as N)			99.7		%		75-125	19-AUG-14
WG1933578-9	MS	L1501875-2						
Ammonia, Total (as N)			101.0		%		75-125	19-AUG-14
NO2-IC-ED		Water						
Batch	R2912741							
WG1927719-13	DUP	L1499490-2						
Nitrite (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	09-AUG-14
WG1927719-17	DUP	L1499670-6						
Nitrite (as N)		0.033	0.034		mg/L	2.1	20	09-AUG-14
WG1927719-5	DUP	L1499575-5						
Nitrite (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	09-AUG-14
WG1927719-9	DUP	L1499564-3						
Nitrite (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	09-AUG-14
WG1927719-11	LCS							
Nitrite (as N)			91.2		%		90-110	09-AUG-14
WG1927719-15	LCS							
Nitrite (as N)			92.5		%		90-110	09-AUG-14
WG1927719-19	LCS							
Nitrite (as N)			90.1		%		90-110	09-AUG-14
WG1927719-2	LCS							
Nitrite (as N)			94.4		%		90-110	09-AUG-14
WG1927719-21	LCS							
Nitrite (as N)			94.6		%		90-110	09-AUG-14
WG1927719-3	LCS							
Nitrite (as N)			90.7		%		90-110	09-AUG-14



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 22 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-ED		Water						
Batch	R2912741							
WG1927719-7	LCS							
Nitrite (as N)			90.3		%		90-110	09-AUG-14
WG1927719-1	MB							
Nitrite (as N)			<0.020		mg/L		0.02	09-AUG-14
WG1927719-12	MB							
Nitrite (as N)			<0.020		mg/L		0.02	09-AUG-14
WG1927719-16	MB							
Nitrite (as N)			<0.020		mg/L		0.02	09-AUG-14
WG1927719-20	MB							
Nitrite (as N)			<0.020		mg/L		0.02	09-AUG-14
WG1927719-22	MB							
Nitrite (as N)			<0.020		mg/L		0.02	09-AUG-14
WG1927719-4	MB							
Nitrite (as N)			<0.020		mg/L		0.02	09-AUG-14
WG1927719-8	MB							
Nitrite (as N)			<0.020		mg/L		0.02	09-AUG-14
WG1927719-10	MS	L1499564-3						
Nitrite (as N)			78.5		%		75-125	09-AUG-14
WG1927719-14	MS	L1499490-2						
Nitrite (as N)			82.9		%		75-125	09-AUG-14
WG1927719-18	MS	L1499670-6						
Nitrite (as N)			98.4		%		75-125	09-AUG-14
NO3-IC-ED		Water						
Batch	R2912741							
WG1927719-13	DUP	L1499490-2						
Nitrate (as N)		24.6	24.5		mg/L	0.1	20	09-AUG-14
WG1927719-17	DUP	L1499670-6						
Nitrate (as N)		0.769	0.791		mg/L	2.7	20	09-AUG-14
WG1927719-5	DUP	L1499575-5						
Nitrate (as N)		0.531	0.532		mg/L	0.1	20	09-AUG-14
WG1927719-9	DUP	L1499564-3						
Nitrate (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	09-AUG-14
WG1927719-11	LCS							
Nitrate (as N)			104.5		%		90-110	09-AUG-14
WG1927719-15	LCS							
Nitrate (as N)			107.0		%		90-110	09-AUG-14
WG1927719-19	LCS							
Nitrate (as N)			105.4		%		90-110	09-AUG-14



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 23 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-ED		Water						
Batch	R2912741							
WG1927719-2	LCS							
Nitrate (as N)			98.9		%		90-110	09-AUG-14
WG1927719-21	LCS							
Nitrate (as N)			102.1		%		90-110	09-AUG-14
WG1927719-3	LCS							
Nitrate (as N)			105.6		%		90-110	09-AUG-14
WG1927719-7	LCS							
Nitrate (as N)			105.0		%		90-110	09-AUG-14
WG1927719-1	MB							
Nitrate (as N)			<0.050		mg/L		0.05	09-AUG-14
WG1927719-16	MB							
Nitrate (as N)			<0.050		mg/L		0.05	09-AUG-14
WG1927719-20	MB							
Nitrate (as N)			<0.050		mg/L		0.05	09-AUG-14
WG1927719-22	MB							
Nitrate (as N)			<0.050		mg/L		0.05	09-AUG-14
WG1927719-4	MB							
Nitrate (as N)			<0.050		mg/L		0.05	09-AUG-14
WG1927719-8	MB							
Nitrate (as N)			<0.050		mg/L		0.05	09-AUG-14
WG1927719-10	MS	L1499564-3						
Nitrate (as N)			100.1		%		75-125	09-AUG-14
WG1927719-14	MS	L1499490-2						
Nitrate (as N)			N/A	MS-B	%		-	09-AUG-14
WG1927719-18	MS	L1499670-6						
Nitrate (as N)			104.7		%		75-125	09-AUG-14
WG1927719-6	MS	L1499575-5						
Nitrate (as N)			96.0		%		75-125	09-AUG-14
PAH-ABT1-CL		Water						
Batch	R2924297							
WG1934912-2	LCS							
Acenaphthene			85.7		%		60-130	19-AUG-14
Acenaphthylene			94.0		%		60-130	19-AUG-14
Anthracene			95.4		%		60-130	19-AUG-14
Fluoranthene			88.8		%		60-130	19-AUG-14
Fluorene			85.8		%		60-130	19-AUG-14
Naphthalene			88.2		%		50-130	19-AUG-14



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 24 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch	R2924297							
WG1934912-2	LCS							
Phenanthrene			92.1		%		60-130	19-AUG-14
Pyrene			96.1		%		60-130	19-AUG-14
Benzo(a)anthracene			93.2		%		60-130	19-AUG-14
Benzo(k)fluoranthene			86.7		%		60-130	19-AUG-14
Benzo(b&j)fluoranthene			88.6		%		60-130	19-AUG-14
Benzo(g,h,i)perylene			90.3		%		60-130	19-AUG-14
Benzo(a)pyrene			87.0		%		60-130	19-AUG-14
Chrysene			89.8		%		60-130	19-AUG-14
Dibenzo(a,h)anthracene			90.8		%		60-130	19-AUG-14
Indeno(1,2,3-cd)pyrene			88.0		%		60-130	19-AUG-14
WG1934912-1	MB							
Acenaphthene			<0.000020		mg/L		0.00002	19-AUG-14
Acenaphthylene			<0.000020		mg/L		0.00002	19-AUG-14
Anthracene			<0.000010		mg/L		0.00001	19-AUG-14
Fluoranthene			<0.000020		mg/L		0.00002	19-AUG-14
Fluorene			<0.000020		mg/L		0.00002	19-AUG-14
Naphthalene			<0.000050		mg/L		0.00005	19-AUG-14
Phenanthrene			<0.000050		mg/L		0.00005	19-AUG-14
Pyrene			<0.000010		mg/L		0.00001	19-AUG-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	19-AUG-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	19-AUG-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	19-AUG-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	19-AUG-14
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	19-AUG-14
Chrysene			<0.000020		mg/L		0.00002	19-AUG-14
Dibenzo(a,h)anthracene			<0.0000050		mg/L		0.000005	19-AUG-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	19-AUG-14
Surrogate: d10-Acenaphthene			85.2		%		60-130	19-AUG-14
Surrogate: d10-Phenanthrene			90.6		%		60-130	19-AUG-14
Surrogate: d12-Chrysene			90.6		%		60-130	19-AUG-14

PH/EC/ALK-ED **Water**



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 25 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R2915317							
WG1927745-6	DUP	L1499399-1						
pH		8.16	8.17	J	pH	0.01	0.3	10-AUG-14
Conductivity (EC)		504	505		uS/cm	0.2	10	10-AUG-14
Bicarbonate (HCO3)		136	136		mg/L	0.0	25	10-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14
Alkalinity, Total (as CaCO3)		112	112		mg/L	0.0	20	10-AUG-14
WG1927745-7	DUP	L1499575-5						
pH		7.96	7.99	J	pH	0.03	0.3	10-AUG-14
Conductivity (EC)		1670	1710		uS/cm	2.4	10	10-AUG-14
Bicarbonate (HCO3)		723	759		mg/L	4.9	25	10-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14
Alkalinity, Total (as CaCO3)		592	622		mg/L	4.9	20	10-AUG-14
WG1927745-8	DUP	L1499564-3						
pH		7.98	7.98	J	pH	0.00	0.3	10-AUG-14
Conductivity (EC)		3460	3450		uS/cm	0.3	10	10-AUG-14
Bicarbonate (HCO3)		491	497		mg/L	1.2	25	10-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14
Alkalinity, Total (as CaCO3)		403	407		mg/L	1.2	20	10-AUG-14
WG1927745-9	DUP	L1499041-1						
pH		8.01	8.02	J	pH	0.01	0.3	10-AUG-14
Conductivity (EC)		7600	7600		uS/cm	0.0	10	10-AUG-14
Bicarbonate (HCO3)		618	625		mg/L	1.0	25	10-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14
Alkalinity, Total (as CaCO3)		507	512		mg/L	1.0	20	10-AUG-14
WG1927745-11	LCS							
Conductivity (EC)			98.7		%		90-110	10-AUG-14
WG1927745-12	LCS							
pH			6.99		pH		6.7-7.3	10-AUG-14
WG1927745-13	LCS							
Alkalinity, Total (as CaCO3)			98.3		%		85-115	10-AUG-14
WG1927745-14	LCS							



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 26 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R2915317							
WG1927745-14	LCS							
Conductivity (EC)			96.9		%		90-110	10-AUG-14
WG1927745-16	LCS							
Conductivity (EC)			98.0		%		90-110	10-AUG-14
WG1927745-17	LCS							
pH			6.98		pH		6.7-7.3	10-AUG-14
WG1927745-18	LCS							
Alkalinity, Total (as CaCO3)			99.0		%		85-115	10-AUG-14
WG1927745-19	LCS							
Conductivity (EC)			96.3		%		90-110	10-AUG-14
WG1927745-2	LCS							
Conductivity (EC)			99.4		%		90-110	12-AUG-14
WG1927745-21	LCS							
Conductivity (EC)			97.3		%		90-110	10-AUG-14
WG1927745-22	LCS							
pH			6.98		pH		6.7-7.3	10-AUG-14
WG1927745-23	LCS							
Alkalinity, Total (as CaCO3)			98.7		%		85-115	10-AUG-14
WG1927745-3	LCS							
pH			7.00		pH		6.7-7.3	12-AUG-14
WG1927745-4	LCS							
Alkalinity, Total (as CaCO3)			97.6		%		85-115	12-AUG-14
WG1927745-5	LCS							
Conductivity (EC)			97.6		%		90-110	12-AUG-14
WG1927745-1	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	12-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	12-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	12-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	12-AUG-14
WG1927745-10	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	10-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	10-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	10-AUG-14
Alkalinity, T total (as CaCO3)			<2.0		mg/L		2	10-AUG-14
WG1927745-15	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	10-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	10-AUG-14



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 28 of 31

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-ED		Water						
Batch	R2912741							
WG1927719-19	LCS							
Sulfate (SO4)			102.5		%		90-110	09-AUG-14
WG1927719-2	LCS							
Sulfate (SO4)			101.8		%		90-110	09-AUG-14
WG1927719-21	LCS							
Sulfate (SO4)			101.7		%		90-110	09-AUG-14
WG1927719-3	LCS							
Sulfate (SO4)			102.8		%		90-110	09-AUG-14
WG1927719-7	LCS							
Sulfate (SO4)			103.3		%		90-110	09-AUG-14
WG1927719-1	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-12	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-16	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-20	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-22	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-4	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-8	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-18	MS	L1499670-6						
Sulfate (SO4)			104.2		%		75-125	09-AUG-14
WG1927719-6	MS	L1499575-5						
Sulfate (SO4)			N/A	MS-B	%		-	09-AUG-14
SOLIDS-TDS-ED		Water						
Batch	R2917950							
WG1929586-3	DUP	L1498881-3						
Total Dissolved Solids		210	205		mg/L	2.4	20	13-AUG-14
WG1929586-4	DUP	L1500102-4						
Total Dissolved Solids		251	263		mg/L	4.7	20	13-AUG-14
WG1929586-2	LCS							
Total Dissolved Solids			98.1		%		85-115	13-AUG-14
WG1929586-1	MB							
Total Dissolved Solids			<10		mg/L		10	13-AUG-14



Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Page 29 of 31

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-ED								
	Water							
Batch	R2917062							
WG1927468-3	DUP	L1498881-1						
Turbidity		4.12	4.10		NTU	0.5	15	09-AUG-14
WG1927468-2	LCS							
Turbidity			100.7		%		70-130	09-AUG-14
WG1927468-1	MB							
Turbidity			<0.10		NTU		0.1	09-AUG-14

Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2
Contact: Sue Raynard

Page 30 of 31

Legend:

Limit ALS Control Limit (Data Quality Objectives)
DUP Duplicate
RPD Relative Percent Difference
N/A Not Available
LCS Laboratory Control Sample
SRM Standard Reference Material
MS Matrix Spike
MSD Matrix Spike Duplicate
ADE Average Desorption Efficiency
MB Method Blank
IRM Internal Reference Material
CRM Certified Reference Material
CCV Continuing Calibration Verification
CVS Calibration Verification Standard
LCSD Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L1499435

Report Date: 29-AUG-14

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Page 31 of 31

Contact: Sue Raynard

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Turbidity	1	07-AUG-14 13:36	09-AUG-14 14:53	48	49	hours	EHTL

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1499435 were received on 08-AUG-14 14:26.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



ALS 140818-08 (14-CFT)

CONFIDENTIAL ANALYSIS REPORT

REPORT #: 140818-08

WO #: 14-CFT

PO #: L1499435

CLIENT: ALS Laboratory Group - Edmonton
9936-67 Avenue
Edmonton, AB
T6E 0P5

ATTENTION: ALS-ED Reporting
Tel: (780) 413-5227
Fax: (780) 437-2311

SAMPLE DESCRIPTION: Water Samples

DATE AND TIME OF SAMPLE COLLECTION: August 07, 2014

DATE AND TIME OF SAMPLE RECEIPT: August 09, 2014/14:44

SAMPLE TEMPERATURE WHEN RECEIVED: 4.7° Celsius

TEST PERFORMED:
Iron Related Bacteria
Sulfate Reducing Bacteria
Sulfate Reducing Bacteria [P/A]

TEST START DATE: August 09, 2014/15:15

DATE COMPLETED: August 18, 2014

CERTIFICATE OF ANALYSIS: See Page 2

QUALITY CONTROL DATA: See Attached Appendix 1

The report shall not be reproduced, except in full, without the written authority of PBR Laboratories Inc.

Certificate of Analysis

PBR ID	Sample #	Client ID	Lot #	Test	Protocol	Quantity Analyzed	*DF	Result	Units	Note
14-CFT-01	L1499435-1	16053140807035		Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		200	CFU/ml	1
14-CFT-02	L1499435-2	16053140807036		Iron Related Bacteria	BART	15 ml		2.3×10^3	CFU/ml	1
				Sulfate Reducing Bacteria [P/A]	BART	15 ml		Absent		
14-CFT-03	L1499435-3	16053140807037		Iron Related Bacteria	BART	15 ml		2.3×10^3	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		1.8×10^4	CFU/ml	1

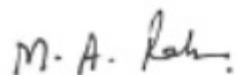
*DF - Dilution Factor used for analysis

Notes

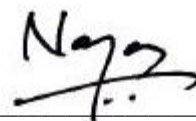
1 CFU = Colony Forming Unit.

BART results represent the Approximate Population only.

The reported results apply only to the items tested.



Abdul Rahman Mohammed (Analyst)
Date: Aug 18 2014



Approved By: Narayan Pokharel, Ph.D.
Date: Aug 18 2014





P|B|R
Laboratories Inc.

ALS 140818-08 (14-CFT)

APPENDIX 1

Quality Control Data for Iron Related Bacteria (BART)

Controls	Organism/Medium	Result
Sterility (media blank)	BART medium	Pass
Positive	Acidithiobacillus ferrooxidans	Pass
Negative	D/W Sterile	Pass

Quality Control Data for Sulfate Reducing Bacteria (BART)

Controls	Organism/Medium	Result
Sterility	BART medium	Pass
Positive	SRB	Pass
Negative	D/W Sterile	Pass

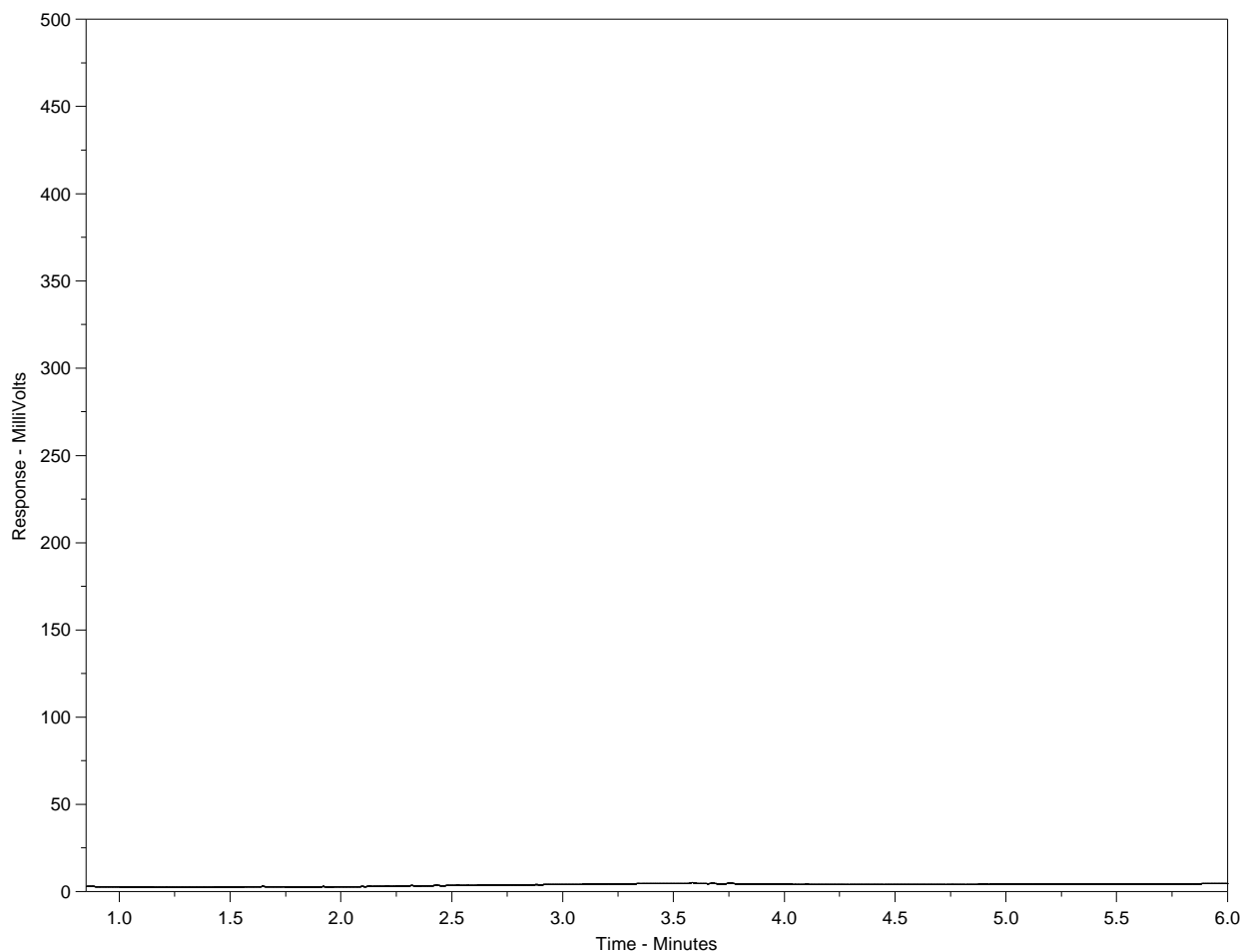
Quality Control Data for Sulfate Reducing Bacteria [P/A] (BART)

Controls	Organism/Medium	Result
Sterility	BART medium	Pass
Positive	SRB	Pass
Negative	D/W sterile	Pass

Hydrocarbon Distribution Report



ALS Sample ID: L1499435-1
Client ID: 16053140807035



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	1067°F				
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

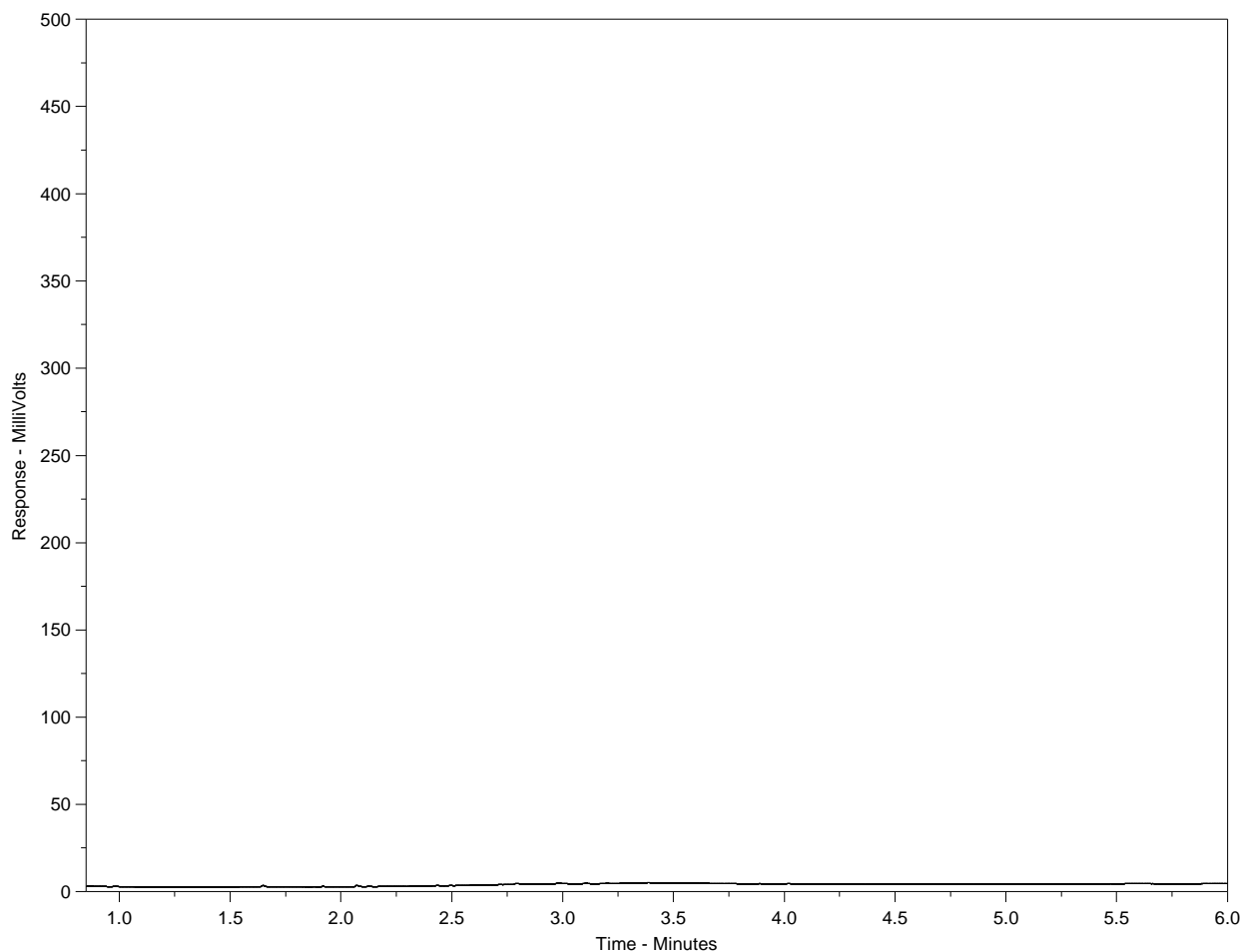
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1499435-2
Client ID: 16053140807036



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	1067°F				
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

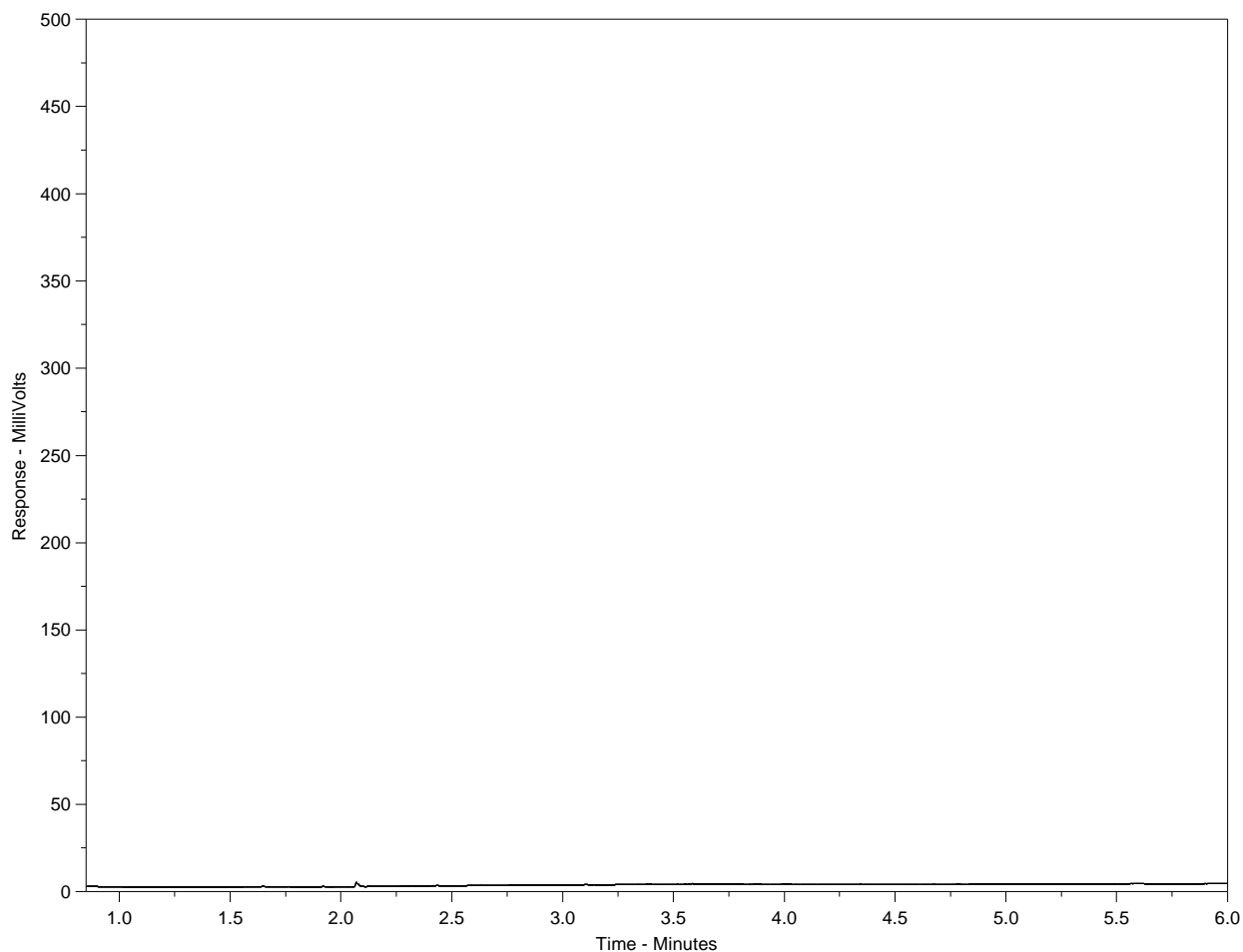
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1499435-3
 Client ID: 16053140807037



F2		F3		F4		F4	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	1067°F				
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.



Matrix Solutions Inc.
ATTN: SUE RAYNARD
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Date Received: 08-AUG-14
Report Date: 29-AUG-14 19:49 (MT)
Version: FINAL

Client Phone: 403-513-2275

Certificate of Analysis

Lab Work Order #: L1499441
Project P.O. #: NOT SUBMITTED
Job Reference: 16053-502 NAOS
C of C Numbers: M061309
Legal Site Desc: site 1

Nicole Thibault
Account Manager

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ADDRESS: 9936-67 Avenue, Edmonton, AB T6E 0P5 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1499441-1 16053140808038 Sampled By: bp/jl on 08-AUG-14 @ 11:29 Matrix: water									
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	13900	+/-790	DLM	10	mg/L	0		09-AUG-14	R2912741
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	0.17	+/-0.03	DLM	0.10	mg/L	0		21-AUG-14	R2925343
Antimony (Sb)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		21-AUG-14	R2925343
Arsenic (As)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		21-AUG-14	R2925343
Barium (Ba)-Dissolved	0.415	+/-0.036	DLM	0.0050	mg/L	0		21-AUG-14	R2925343
Boron (B)-Dissolved	1.3	+/-0.2	DLM	1.0	mg/L	0		22-AUG-14	R2926360
Cadmium (Cd)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		21-AUG-14	R2925343
Calcium (Ca)-Dissolved	19.8	+/-2.7	DLM	2.0	mg/L	0		21-AUG-14	R2925343
Chromium (Cr)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		21-AUG-14	R2925343
Copper (Cu)-Dissolved	0.015	+/-0.001	DLM	0.010	mg/L	0		21-AUG-14	R2925343
Iron (Fe)-Dissolved	<1.0	-	DLM	1.0	mg/L	-		21-AUG-14	R2925343
Lead (Pb)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		21-AUG-14	R2925343
Magnesium (Mg)-Dissolved	158	+/-12	DLM	0.50	mg/L	0		21-AUG-14	R2925343
Manganese (Mn)-Dissolved	0.215	+/-0.015	DLM	0.0050	mg/L	0		21-AUG-14	R2925343
Nickel (Ni)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		21-AUG-14	R2925343
Potassium (K)-Dissolved	50.0	+/-3.9	DLM	5.0	mg/L	0		21-AUG-14	R2925343
Selenium (Se)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		21-AUG-14	R2925343
Silver (Ag)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		21-AUG-14	R2925343
Sodium (Na)-Dissolved	8370	+/-590	DLM	5.0	mg/L	0		21-AUG-14	R2925343
Uranium (U)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		21-AUG-14	R2925343
Zinc (Zn)-Dissolved	<0.10	-	DLM	0.10	mg/L	-		21-AUG-14	R2925343
Ion Balance Calculation									
Ion Balance	93.2	-			%	-		22-AUG-14	
TDS (Calculated)	23000	-			mg/L	-		22-AUG-14	
Hardness (as CaCO3)	700	-			mg/L	-		22-AUG-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		21-AUG-14	R2925489
Nitrate as N by IC									
Nitrate (as N)	<1.0	-	DLM	1.0	mg/L	-		09-AUG-14	R2912741
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<1.1	-		1.1	mg/L	-		15-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.40	-	DLM	0.40	mg/L	-		09-AUG-14	R2912741
Sulfate by IC									
Sulfate (SO4)	130	+/-7	DLM	10	mg/L	0		09-AUG-14	R2912741
pH, Conductivity and Total Alkalinity									
pH	8.81	+/-0.01		0.10	pH	0		10-AUG-14	R2915317
Conductivity (EC)	38100	+/-1900		0.20	uS/cm	0		10-AUG-14	R2915317
Bicarbonate (HCO3)	555	+/-21		5.0	mg/L	0		10-AUG-14	R2915317
Carbonate (CO3)	96.1	+/-13		5.0	mg/L	0		10-AUG-14	R2915317
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		10-AUG-14	R2915317
Alkalinity, Total (as CaCO3)	615	+/-39		2.0	mg/L	0		10-AUG-14	R2915317
L1499441-2 16053140808039 Sampled By: bp/jl on 08-AUG-14 @ 11:00 Matrix: water BTXS, Styrene & F1-F4 BTEX, Styrene and F1 (C6-C10) Benzene									
Benzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1499441-2 16053140808039									
Sampled By: bp/jl on 08-AUG-14 @ 11:00									
Matrix: water									
BTEX, Styrene and F1 (C6-C10)									
Toluene	0.00212	-		0.00050	mg/L	-		12-AUG-14	R2915907
EthylBenzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
o-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Styrene	<0.0010	-		0.0010	mg/L	-		12-AUG-14	R2915907
F1(C6-C10)	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
F1-BTEX	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
Xylenes	<0.00071	-		0.00071	mg/L	-		12-AUG-14	R2915907
Surr: 1,4-Difluorobenzene (SS)	100.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 4-Bromofluorobenzene (SS)	94.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 3,4-Dichlorotoluene (SS)	99.0	-		N/A	%	-		12-AUG-14	R2915907
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2916974
F3 (C16-C34)	1.58	+/-0.38		0.25	mg/L	0	12-AUG-14	12-AUG-14	R2916974
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2916974
Surr: 2-Bromobenzotrifluoride	100.8	-		N/A	%	-	12-AUG-14	12-AUG-14	R2916974
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.000005 0	mg/L	-		21-AUG-14	R2925489
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	1.54	+/-0.24	DLM	0.30	mg/L	0		13-AUG-14	R2917038
Antimony (Sb)-Total	<0.010	-	DLM	0.010	mg/L	-		13-AUG-14	R2917038
Arsenic (As)-Total	<0.010	-	DLM	0.010	mg/L	-		13-AUG-14	R2917038
Barium (Ba)-Total	0.0147	+/-0.0017	DLM	0.0050	mg/L	0		13-AUG-14	R2917038
Boron (B)-Total	5.4	+/-0.9	DLM	1.0	mg/L	0		13-AUG-14	R2917038
Cadmium (Cd)-Total	<0.0010	-	DLM	0.0010	mg/L	-		13-AUG-14	R2917038
Calcium (Ca)-Total	2.4	+/-0.3	DLM	2.0	mg/L	0		13-AUG-14	R2917038
Chromium (Cr)-Total	<0.010	-	DLM	0.010	mg/L	-		13-AUG-14	R2917038
Copper (Cu)-Total	<0.010	-	DLM	0.010	mg/L	-		13-AUG-14	R2917038
Iron (Fe)-Total	15.6	+/-2.5	DLM	1.0	mg/L	0		13-AUG-14	R2917038
Lead (Pb)-Total	<0.0050	-	DLM	0.0050	mg/L	-		13-AUG-14	R2917038
Magnesium (Mg)-Total	14.6	+/-1.8	DLM	0.50	mg/L	0		13-AUG-14	R2917038
Manganese (Mn)-Total	0.184	+/-0.019	DLM	0.0050	mg/L	0		13-AUG-14	R2917038
Nickel (Ni)-Total	<0.010	-	DLM	0.010	mg/L	-		13-AUG-14	R2917038
Potassium (K)-Total	16.6	+/-2.0	DLM	5.0	mg/L	0		13-AUG-14	R2917038
Selenium (Se)-Total	<0.010	-	DLM	0.010	mg/L	-		13-AUG-14	R2917038
Silicon (Si)-Total	<5.0	-	DLM	5.0	mg/L	-		13-AUG-14	R2917038
Silver (Ag)-Total	<0.0010	-	DLM	0.0010	mg/L	-		13-AUG-14	R2917038
Sodium (Na)-Total	2720	+/-330	DLM	5.0	mg/L	0		13-AUG-14	R2917038
Uranium (U)-Total	<0.0010	-	DLM	0.0010	mg/L	-		13-AUG-14	R2917038
Zinc (Zn)-Total	<0.30	-	DLM	0.30	mg/L	-		13-AUG-14	R2917038
Miscellaneous Parameters									
Ammonia, Total (as N)	3.93	-		0.050	mg/L	-		19-AUG-14	R2923049
Dissolved Organic Carbon	28.6	+/-3.1		1.0	mg/L	0		20-AUG-14	R2924069
Iron Bacteria	See Attached	-				-		09-AUG-14	R2923715
Naphthenic Acids	11.7	+/-2.1		1.0	mg/L	0	21-AUG-14	29-AUG-14	R2933378
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		21-AUG-14	R2925385
Sulphate Reducing Bacteria	See Attached	-				-		09-AUG-14	R2923715
Total Dissolved Solids	6680	+/-450		10	mg/L	0		13-AUG-14	R2917950
Silicon (as SiO2)-Total	<11	-		11	mg/L	-		14-AUG-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1499441-2 16053140808039									
Sampled By: bp/jl on 08-AUG-14 @ 11:00									
Matrix: water									
Turbidity	20.2	+/-1.2		0.10	NTU	0		09-AUG-14	R2917062
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Anthracene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Fluoranthene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Fluorene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Naphthalene	<0.000050	-		0.000050	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Phenanthrene	<0.000050	-		0.000050	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Pyrene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Benzo(a)pyrene	<0.000050	-		0.000005	mg/L	-	19-AUG-14	19-AUG-14	R2924297
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Dibenzo(a,h)anthracene	<0.000050	-		0.000005	mg/L	-	19-AUG-14	19-AUG-14	R2924297
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	19-AUG-14	19-AUG-14	R2924297
Surr: d10-Acenaphthene	86.9	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297
Surr: d10-Phenanthrene	98.4	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297
Surr: d12-Chrysene	99.5	-		N/A	%	-	19-AUG-14	19-AUG-14	R2924297
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	2670	+/-150	DLM	10	mg/L	0		09-AUG-14	R2912741
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	0.37	+/-0.06	DLM	0.10	mg/L	0		21-AUG-14	R2925343
Antimony (Sb)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		21-AUG-14	R2925343
Arsenic (As)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		21-AUG-14	R2925343
Barium (Ba)-Dissolved	0.0226	+/-0.0020	DLM	0.0050	mg/L	0		21-AUG-14	R2925343
Boron (B)-Dissolved	5.3	+/-0.6	DLM	1.0	mg/L	0		21-AUG-14	R2925343
Cadmium (Cd)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		21-AUG-14	R2925343
Calcium (Ca)-Dissolved	2.4	+/-0.3	DLM	2.0	mg/L	0		21-AUG-14	R2925343
Chromium (Cr)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		21-AUG-14	R2925343
Copper (Cu)-Dissolved	0.013	+/-0.001	DLM	0.010	mg/L	0		21-AUG-14	R2925343
Iron (Fe)-Dissolved	<1.0	-	DLM	1.0	mg/L	-		21-AUG-14	R2925343
Lead (Pb)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		21-AUG-14	R2925343
Magnesium (Mg)-Dissolved	13.8	+/-1.1	DLM	0.50	mg/L	0		21-AUG-14	R2925343
Manganese (Mn)-Dissolved	0.0306	+/-0.0021	DLM	0.0050	mg/L	0		21-AUG-14	R2925343
Nickel (Ni)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		21-AUG-14	R2925343
Potassium (K)-Dissolved	16.1	+/-1.3	DLM	5.0	mg/L	0		21-AUG-14	R2925343
Selenium (Se)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		21-AUG-14	R2925343
Silicon (Si)-Dissolved	<5.0	-	DLM	5.0	mg/L	-		21-AUG-14	R2925343
Silver (Ag)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		21-AUG-14	R2925343
Sodium (Na)-Dissolved	2550	+/-180	DLM	5.0	mg/L	0		21-AUG-14	R2925343
Uranium (U)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		21-AUG-14	R2925343
Zinc (Zn)-Dissolved	<0.10	-	DLM	0.10	mg/L	-		21-AUG-14	R2925343
Ion Balance Calculation									
Ion Balance	94.2	-			%	-		22-AUG-14	
TDS (Calculated)	6590	-			mg/L	-		22-AUG-14	
Hardness (as CaCO3)	62.8	-			mg/L	-		22-AUG-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1499441-2 16053140808039 Sampled By: bp/jl on 08-AUG-14 @ 11:00 Matrix: water									
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.000005 0	mg/L	-		21-AUG-14	R2925489
Nitrate as N by IC									
Nitrate (as N)	<1.0	-	DLM	1.0	mg/L	-		09-AUG-14	R2912741
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<1.1	-		1.1	mg/L	-		15-AUG-14	
Nitrite as N by IC									
Nitrite (as N)	<0.40	-	DLM	0.40	mg/L	-		09-AUG-14	R2912741
Sulfate by IC									
Sulfate (SO4)	<10	-	DLM	10	mg/L	-		09-AUG-14	R2912741
pH, Conductivity and Total Alkalinity									
pH	8.80	+/-0.01		0.10	pH	0		10-AUG-14	R2915317
Conductivity (EC)	11200	+/-560		0.20	uS/cm	0		10-AUG-14	R2915317
Bicarbonate (HCO3)	2340	+/-87		5.0	mg/L	0		10-AUG-14	R2915317
Carbonate (CO3)	183	+/-24		5.0	mg/L	0		10-AUG-14	R2915317
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		10-AUG-14	R2915317
Alkalinity, Total (as CaCO3)	2230	+/-140		2.0	mg/L	0		10-AUG-14	R2915317
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	<11	-		11	mg/L	-		22-AUG-14	
L1499441-3 16053140808040 Sampled By: bp/jl on 08-AUG-14 @ 13:32 Matrix: water									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Toluene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
EthylBenzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
o-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Styrene	<0.0010	-		0.0010	mg/L	-		12-AUG-14	R2915907
F1(C6-C10)	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
F1-BTEX	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
Xylenes	<0.00071	-		0.00071	mg/L	-		12-AUG-14	R2915907
Surr:	1,4-Difluorobenzene (SS)	98.0	-	N/A	%	-		12-AUG-14	R2915907
Surr:	4-Bromofluorobenzene (SS)	91.0	-	N/A	%	-		12-AUG-14	R2915907
Surr:	3,4-Dichlorotoluene (SS)	92.0	-	N/A	%	-		12-AUG-14	R2915907
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2916974
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2916974
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	12-AUG-14	12-AUG-14	R2916974
Surr:	2-Bromobenzotrifluoride	97.2	-	N/A	%	-	12-AUG-14	12-AUG-14	R2916974
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.000005 0	mg/L	-		21-AUG-14	R2925489
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	<0.0030	-		0.0030	mg/L	-		13-AUG-14	R2917038
Antimony (Sb)-Total	<0.00040	-		0.00040	mg/L	-		13-AUG-14	R2917038
Arsenic (As)-Total	<0.00040	-		0.00040	mg/L	-		13-AUG-14	R2917038
Barium (Ba)-Total	<0.0050	-		0.0050	mg/L	-		13-AUG-14	R2917038
Boron (B)-Total	<0.050	-		0.050	mg/L	-		13-AUG-14	R2917038

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1499441-4 16053140808041 Sampled By: bp/jl on 08-AUG-14 @ 13:59 Matrix: water									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Toluene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
EthylBenzene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
o-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		12-AUG-14	R2915907
Styrene	<0.0010	-		0.0010	mg/L	-		12-AUG-14	R2915907
F1(C6-C10)	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
F1-BTEX	<0.10	-		0.10	mg/L	-		12-AUG-14	R2915907
Xylenes	<0.00071	-		0.00071	mg/L	-		12-AUG-14	R2915907
Surr: 1,4-Difluorobenzene (SS)	100.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 4-Bromofluorobenzene (SS)	92.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 3,4-Dichlorotoluene (SS)	89.0	-		N/A	%	-		12-AUG-14	R2915907
L1499441-5 16053140808042 Sampled By: bp/jl on 08-AUG-14 @ 14:05 Matrix: water									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	0.0466	-		0.00050	mg/L	-		12-AUG-14	R2915907
Toluene	0.0420	-		0.00050	mg/L	-		12-AUG-14	R2915907
EthylBenzene	0.0422	-		0.00050	mg/L	-		12-AUG-14	R2915907
o-Xylene	0.0416	-		0.00050	mg/L	-		12-AUG-14	R2915907
m+p-Xylene	0.0416	-		0.00050	mg/L	-		12-AUG-14	R2915907
Styrene	0.0267	-		0.0010	mg/L	-		12-AUG-14	R2915907
F1(C6-C10)	0.35	-		0.10	mg/L	-		12-AUG-14	R2915907
F1-BTEX	0.13	-		0.10	mg/L	-		12-AUG-14	R2915907
Xylenes	0.0832	-		0.00071	mg/L	-		12-AUG-14	R2915907
Surr: 1,4-Difluorobenzene (SS)	100.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 4-Bromofluorobenzene (SS)	94.0	-		N/A	%	-		12-AUG-14	R2915907
Surr: 3,4-Dichlorotoluene (SS)	98.0	-		N/A	%	-		12-AUG-14	R2915907
* Refer to Referenced Information for Qualifiers (if any) and Methodology.									

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Chloride (Cl)	MS-B	
Matrix Spike	Nitrate (as N)	MS-B	
Matrix Spike	Sulfate (SO4)	MS-B	
Matrix Spike	Dissolved Organic Carbon	MS-B	

Sample Parameter Qualifier Key:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
BTXS,F1-ED	Water	BTEX, Styrene and F1 (C6-C10)		EPA 5021/8015&8260 GC-MS & FID
C-DIS-ORG-ED	Water	Dissolved Organic Carbon		APHA 5310 B-Instrumental
CL-IC-ED	Water	Chloride by IC		APHA 4110 B-ION CHROMATOGRAPHY
F2,F3,F4-ED	Water	F2, F3, F4		EPA 3510/CCME PHC CWS-GC-FID
HG-D-L-CVAA-ED	Water	Mercury (Hg) - Dissolved		EPA 245.7 / EPA 245.1
HG-T-L-CVAA-ED	Water	Mercury (Hg)		EPA 245.7 / EPA 245.1
IB-BART-PB	Water	Iron Bacteria		BART Test Kit
BART Test Kit Analysis performed at PBR Laboratories Inc., Edmonton.				
IONBALANCE-ED	Water	Ion Balance Calculation		APHA 1030E
MET-D-CCMS-ED	Water	Dissolved Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
NAPHTHENIC-ACID-FM	Water	Naphthenic Acids by FTIR		Naphthenic Acids by FTIR, Syncrude, 1994
Dissolved naphthenic acids are solvent extracted from acidified aqueous samples using Dichloromethane prior to quantitation by Fourier Transform Infra-Red spectroscopy. Note that FTIR is not uniquely selective to naphthenic acids. If present, other carboxylic acids (e.g. humic acids, fulvic acids) may also be detected by this method.				
NH3-CFA-ED	Water	Ammonia in Water by Colour		APHA 4500 NH3-NITROGEN (AMMONIA)
This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.				
NO2+NO3-CALC-ED	Water	Nitrate+Nitrite		CALCULATION
NO2-IC-ED	Water	Nitrite as N by IC		APHA 4110 B-ION CHROMATOGRAPHY
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
NO3-IC-ED	Water	Nitrate as N by IC		APHA 4110 B-ION CHROMATOGRAPHY
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
PAH-ABT1-CL	Water	PAH & Carcinogenic PAH List		EPA 3510/8270-GC/MS
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity		APHA 4500-H, 2510, 2320
All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)				
PHENOLS-4AAP-ED	Water	Phenols (4AAP)		AB ENV.06537-COLORIMETRIC
This analysis is carried out using procedures adapted from ENVIRODAT VMV 06537 689, Method Code 154, in "Methods Manual for Chemical Analysis of Water and Wastes" published by the Alberta Environmental Centre. This automated method is based on the distillation of phenol and subsequent reaction of the distillate with alkaline ferricyanide and 4-aminoantipyrine to form a red complex which is measured at 505 nm.				
SIO2-D-CALC-ED	Water	Dissolved Silicon (reported as Silica)		CALCULATION

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
SIO2-T-CALC-ED	Water	Total Silicon (reported as Silica)		CALCULATION
SO4-IC-ED	Water	Sulfate by IC		APHA 4110 B-ION CHROMATOGRAPHY
SOLIDS-TDS-ED	Water	Total Dissolved Solids		APHA 2540 C
SRB-BART-PB	Water	Sulphate Reducing Bacteria / BART method		BART TEST KIT
BART Test Kit				
TURBIDITY-ED	Water	Turbidity		APHA 2130 B-Nephelometer

** The indicated Method Reference is the closest nationally or internationally recognized reference for the applicable ALS test method. ALS methods may incorporate modifications from the specified reference to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
PB	PBR LABORATORIES
FM	ALS ENVIRONMENTAL - FORT MCMURRAY, ALBERTA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

M061309

GLOSSARY OF REPORT TERMS

Surr - Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

MU: Measurement Uncertainty. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 which gives a level of confidence of approximately 95%.

Bias: The reported method bias is the average long term deviation from the target value for a long term reference or control sample, measured in percent.

Zero values indicate no detectable method bias.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 1 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R2915907							
WG1928137-4	DUP	L1498481-8						
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-AUG-14
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-AUG-14
EthylBenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-AUG-14
o-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	12-AUG-14
m+p-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	12-AUG-14
Styrene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	50	12-AUG-14
F1(C6-C10)		<0.10	<0.10	RPD-NA	mg/L	N/A	30	12-AUG-14
WG1928137-8	DUP	L1499441-5						
Benzene		0.0466	0.0425		mg/L	9.3	30	12-AUG-14
Toluene		0.0420	0.0374		mg/L	12	30	12-AUG-14
EthylBenzene		0.0422	0.0357		mg/L	17	30	12-AUG-14
o-Xylene		0.0416	0.0356		mg/L	16	24	12-AUG-14
m+p-Xylene		0.0416	0.0346		mg/L	18	24	12-AUG-14
Styrene		0.0267	0.0226		mg/L	17	50	12-AUG-14
F1(C6-C10)		0.35	0.34		mg/L	3.0	30	12-AUG-14
WG1928137-2	LCS							
Benzene			117.5		%		70-130	12-AUG-14
Toluene			126.5		%		70-130	12-AUG-14
EthylBenzene			120.6		%		70-130	12-AUG-14
o-Xylene			128.4		%		70-130	12-AUG-14
m+p-Xylene			125.1		%		70-130	12-AUG-14
Styrene			120.0		%		70-130	12-AUG-14
WG1928137-3	LCS							
F1(C6-C10)			93.6		%		70-130	12-AUG-14
WG1928137-6	LCS							
Benzene			84.4		%		70-130	12-AUG-14
Toluene			88.3		%		70-130	12-AUG-14
EthylBenzene			80.0		%		70-130	12-AUG-14
o-Xylene			86.4		%		70-130	12-AUG-14
m+p-Xylene			82.1		%		70-130	12-AUG-14
Styrene			84.4		%		70-130	12-AUG-14
WG1928137-7	LCS							
F1(C6-C10)			82.2		%		70-130	12-AUG-14
WG1928137-1	MB							



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 2 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R2915907							
WG1928137-1	MB							
Benzene			<0.00050		mg/L		0.0005	12-AUG-14
Toluene			<0.00050		mg/L		0.0005	12-AUG-14
EthylBenzene			<0.00050		mg/L		0.0005	12-AUG-14
o-Xylene			<0.00050		mg/L		0.0005	12-AUG-14
m+p-Xylene			<0.00050		mg/L		0.0005	12-AUG-14
Styrene			<0.0010		mg/L		0.001	12-AUG-14
F1(C6-C10)			<0.10		mg/L		0.1	12-AUG-14
Surrogate: 1,4-Difluorobenzene (SS)			102.0		%		70-130	12-AUG-14
Surrogate: 4-Bromofluorobenzene (SS)			100.0		%		70-130	12-AUG-14
Surrogate: 3,4-Dichlorotoluene (SS)			92.0		%		70-130	12-AUG-14
WG1928137-5	MB							
Benzene			<0.00050		mg/L		0.0005	12-AUG-14
Toluene			<0.00050		mg/L		0.0005	12-AUG-14
EthylBenzene			<0.00050		mg/L		0.0005	12-AUG-14
o-Xylene			<0.00050		mg/L		0.0005	12-AUG-14
m+p-Xylene			<0.00050		mg/L		0.0005	12-AUG-14
Styrene			<0.0010		mg/L		0.001	12-AUG-14
F1(C6-C10)			<0.10		mg/L		0.1	12-AUG-14
Surrogate: 1,4-Difluorobenzene (SS)			101.0		%		70-130	12-AUG-14
Surrogate: 4-Bromofluorobenzene (SS)			98.0		%		70-130	12-AUG-14
Surrogate: 3,4-Dichlorotoluene (SS)			91.0		%		70-130	12-AUG-14
C-DIS-ORG-ED		Water						
Batch	R2924069							
WG1934716-3	CVS							
Dissolved Organic Carbon			119.0		%		80-160	20-AUG-14
WG1934716-4	DUP	L1499435-3						
Dissolved Organic Carbon		17.7	17.5		mg/L	1.0	20	20-AUG-14
WG1934716-2	LCS							
Dissolved Organic Carbon			97.3		%		80-120	20-AUG-14
WG1934716-1	MB							
Dissolved Organic Carbon			<1.0		mg/L		1	20-AUG-14
WG1934716-5	MS	L1499435-3						
Dissolved Organic Carbon			N/A	MS-B	%		-	20-AUG-14

CL-IC-ED **Water**



Environmental

Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 3 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-ED		Water						
Batch	R2912741							
WG1927719-17	DUP	L1499670-6						
Chloride (Cl)		41.4	41.2		mg/L	0.5	20	09-AUG-14
WG1927719-5	DUP	L1499575-5						
Chloride (Cl)		1.83	1.68		mg/L	8.4	20	09-AUG-14
WG1927719-9	DUP	L1499564-3						
Chloride (Cl)		133	134		mg/L	0.9	20	09-AUG-14
WG1927719-11	LCS							
Chloride (Cl)			103.1		%		90-110	09-AUG-14
WG1927719-15	LCS							
Chloride (Cl)			102.1		%		90-110	09-AUG-14
WG1927719-19	LCS							
Chloride (Cl)			101.7		%		90-110	09-AUG-14
WG1927719-2	LCS							
Chloride (Cl)			101.5		%		90-110	09-AUG-14
WG1927719-21	LCS							
Chloride (Cl)			101.3		%		90-110	09-AUG-14
WG1927719-3	LCS							
Chloride (Cl)			101.9		%		90-110	09-AUG-14
WG1927719-7	LCS							
Chloride (Cl)			102.7		%		90-110	09-AUG-14
WG1927719-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-12	MB							
Chloride (Cl)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-16	MB							
Chloride (Cl)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-20	MB							
Chloride (Cl)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-22	MB							
Chloride (Cl)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-4	MB							
Chloride (Cl)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-8	MB							
Chloride (Cl)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-10	MS	L1499564-3						
Chloride (Cl)			N/A	MS-B	%		-	09-AUG-14
WG1927719-18	MS	L1499670-6						
Chloride (Cl)			101.7		%		75-125	09-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 4 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-ED								
	Water							
Batch	R2912741							
WG1927719-6	MS	L1499575-5						
Chloride (Cl)			99.7		%		75-125	09-AUG-14
F2,F3,F4-ED								
	Water							
Batch	R2916974							
WG1928838-2	LCS							
F2 (>C10-C16)			110.9		%		65-135	12-AUG-14
F3 (C16-C34)			113.0		%		65-135	12-AUG-14
F4 (C34-C50)			112.2		%		65-135	12-AUG-14
WG1928838-5	LCS							
F2 (>C10-C16)			116.4		%		65-135	12-AUG-14
F3 (C16-C34)			119.1		%		65-135	12-AUG-14
F4 (C34-C50)			119.4		%		65-135	12-AUG-14
WG1928838-1	MB							
F2 (>C10-C16)			<0.25		mg/L		0.25	12-AUG-14
F3 (C16-C34)			<0.25		mg/L		0.25	12-AUG-14
F4 (C34-C50)			<0.25		mg/L		0.25	12-AUG-14
Surrogate: 2-Bromobenzotrifluoride			95.2		%		50-150	12-AUG-14
WG1928838-4	MB							
F2 (>C10-C16)			<0.25		mg/L		0.25	12-AUG-14
F3 (C16-C34)			<0.25		mg/L		0.25	12-AUG-14
F4 (C34-C50)			<0.25		mg/L		0.25	12-AUG-14
Surrogate: 2-Bromobenzotrifluoride			94.2		%		50-150	12-AUG-14
WG1928838-3	MS	L1498824-1						
F2 (>C10-C16)			106.5		%		50-150	12-AUG-14
F3 (C16-C34)			108.8		%		50-150	12-AUG-14
F4 (C34-C50)			109.0		%		50-150	12-AUG-14
WG1928838-6	MS	L1499441-3						
F2 (>C10-C16)			108.8		%		50-150	12-AUG-14
F3 (C16-C34)			119.4		%		50-150	12-AUG-14
F4 (C34-C50)			116.9		%		50-150	12-AUG-14
HG-D-L-CVAA-ED								
	Water							
Batch	R2925489							
WG1935834-3	DUP	L1499435-1						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	21-AUG-14
WG1935834-2	LCS							



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 5 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-L-CVAA-ED								
	Water							
Batch	R2925489							
WG1935834-2	LCS							
Mercury (Hg)-Dissolved			95.1		%		80-120	21-AUG-14
WG1935834-6	LCS							
Mercury (Hg)-Dissolved			90.9		%		80-120	21-AUG-14
WG1935834-1	MB							
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	21-AUG-14
WG1935834-5	MB							
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	21-AUG-14
WG1935834-4	MS	L1499435-1						
Mercury (Hg)-Dissolved			93.5		%		70-130	21-AUG-14
HG-T-L-CVAA-ED								
	Water							
Batch	R2925489							
WG1935850-3	DUP	L1499441-2						
Mercury (Hg)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	21-AUG-14
WG1935850-2	LCS							
Mercury (Hg)-Total			94.1		%		80-120	21-AUG-14
WG1935850-1	MB							
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	21-AUG-14
WG1935850-4	MS	L1499441-2						
Mercury (Hg)-Total			88.1		%		70-130	21-AUG-14
MET-D-CCMS-ED								
	Water							
Batch	R2925343							
WG1935610-14	CRM	ED-HIGH-WATRM						
Aluminum (Al)-Dissolved			101.7		%		80-120	21-AUG-14
Antimony (Sb)-Dissolved			94.7		%		80-120	21-AUG-14
Arsenic (As)-Dissolved			100.4		%		80-120	21-AUG-14
Barium (Ba)-Dissolved			104.2		%		80-120	21-AUG-14
Boron (B)-Dissolved			101.2		%		80-120	21-AUG-14
Cadmium (Cd)-Dissolved			106.8		%		80-120	21-AUG-14
Calcium (Ca)-Dissolved			104.8		%		80-120	21-AUG-14
Chromium (Cr)-Dissolved			101.7		%		80-120	21-AUG-14
Copper (Cu)-Dissolved			99.7		%		80-120	21-AUG-14
Lead (Pb)-Dissolved			98.9		%		80-120	21-AUG-14
Magnesium (Mg)-Dissolved			102.0		%		80-120	21-AUG-14
Manganese (Mn)-Dissolved			101.6		%		80-120	21-AUG-14
Nickel (Ni)-Dissolved			100.3		%		80-120	21-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 6 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2925343							
WG1935610-14 CRM		ED-HIGH-WATRM						
Potassium (K)-Dissolved			100.6		%		80-120	21-AUG-14
Selenium (Se)-Dissolved			103.8		%		80-120	21-AUG-14
Silicon (Si)-Dissolved			103.9		%		80-120	21-AUG-14
Silver (Ag)-Dissolved			101.4		%		80-120	21-AUG-14
Sodium (Na)-Dissolved			98.0		%		80-120	21-AUG-14
Uranium (U)-Dissolved			100.8		%		80-120	21-AUG-14
Zinc (Zn)-Dissolved			101.4		%		80-120	21-AUG-14
WG1935610-17 CRM		ED-HIGH-WATRM						
Aluminum (Al)-Dissolved			97.0		%		80-120	21-AUG-14
Antimony (Sb)-Dissolved			96.4		%		80-120	21-AUG-14
Arsenic (As)-Dissolved			93.6		%		80-120	21-AUG-14
Barium (Ba)-Dissolved			94.9		%		80-120	21-AUG-14
Boron (B)-Dissolved			95.9		%		80-120	21-AUG-14
Cadmium (Cd)-Dissolved			97.3		%		80-120	21-AUG-14
Calcium (Ca)-Dissolved			97.8		%		80-120	21-AUG-14
Chromium (Cr)-Dissolved			94.9		%		80-120	21-AUG-14
Copper (Cu)-Dissolved			93.4		%		80-120	21-AUG-14
Lead (Pb)-Dissolved			95.8		%		80-120	21-AUG-14
Magnesium (Mg)-Dissolved			101.2		%		80-120	21-AUG-14
Manganese (Mn)-Dissolved			92.6		%		80-120	21-AUG-14
Nickel (Ni)-Dissolved			94.8		%		80-120	21-AUG-14
Potassium (K)-Dissolved			92.2		%		80-120	21-AUG-14
Selenium (Se)-Dissolved			96.4		%		80-120	21-AUG-14
Silicon (Si)-Dissolved			89.4		%		80-120	21-AUG-14
Silver (Ag)-Dissolved			93.5		%		80-120	21-AUG-14
Sodium (Na)-Dissolved			97.3		%		80-120	21-AUG-14
Uranium (U)-Dissolved			94.8		%		80-120	21-AUG-14
Zinc (Zn)-Dissolved			93.2		%		80-120	21-AUG-14
WG1935610-2 CRM		ED-HIGH-WATRM						
Aluminum (Al)-Dissolved			101.7		%		80-120	21-AUG-14
Antimony (Sb)-Dissolved			94.7		%		80-120	21-AUG-14
Arsenic (As)-Dissolved			100.4		%		80-120	21-AUG-14
Barium (Ba)-Dissolved			104.2		%		80-120	21-AUG-14
Boron (B)-Dissolved			101.2		%		80-120	21-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 7 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2925343							
WG1935610-2 CRM	ED-HIGH-WATRM							
Cadmium (Cd)-Dissolved			106.8		%		80-120	21-AUG-14
Calcium (Ca)-Dissolved			104.9		%		80-120	21-AUG-14
Chromium (Cr)-Dissolved			101.6		%		80-120	21-AUG-14
Copper (Cu)-Dissolved			99.7		%		80-120	21-AUG-14
Lead (Pb)-Dissolved			98.9		%		80-120	21-AUG-14
Magnesium (Mg)-Dissolved			102.1		%		80-120	21-AUG-14
Manganese (Mn)-Dissolved			101.6		%		80-120	21-AUG-14
Nickel (Ni)-Dissolved			100.3		%		80-120	21-AUG-14
Potassium (K)-Dissolved			100.6		%		80-120	21-AUG-14
Selenium (Se)-Dissolved			103.8		%		80-120	21-AUG-14
Silicon (Si)-Dissolved			103.9		%		80-120	21-AUG-14
Silver (Ag)-Dissolved			101.4		%		80-120	21-AUG-14
Sodium (Na)-Dissolved			98.0		%		80-120	21-AUG-14
Uranium (U)-Dissolved			100.9		%		80-120	21-AUG-14
Zinc (Zn)-Dissolved			101.4		%		80-120	21-AUG-14
WG1935610-20 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			97.6		%		80-120	21-AUG-14
Antimony (Sb)-Dissolved			99.8		%		80-120	21-AUG-14
Arsenic (As)-Dissolved			93.4		%		80-120	21-AUG-14
Barium (Ba)-Dissolved			94.6		%		80-120	21-AUG-14
Boron (B)-Dissolved			97.9		%		80-120	21-AUG-14
Cadmium (Cd)-Dissolved			96.9		%		80-120	21-AUG-14
Calcium (Ca)-Dissolved			98.5		%		80-120	21-AUG-14
Chromium (Cr)-Dissolved			93.6		%		80-120	21-AUG-14
Copper (Cu)-Dissolved			92.3		%		80-120	21-AUG-14
Lead (Pb)-Dissolved			93.4		%		80-120	21-AUG-14
Magnesium (Mg)-Dissolved			101.3		%		80-120	21-AUG-14
Manganese (Mn)-Dissolved			93.2		%		80-120	21-AUG-14
Nickel (Ni)-Dissolved			93.7		%		80-120	21-AUG-14
Potassium (K)-Dissolved			91.7		%		80-120	21-AUG-14
Selenium (Se)-Dissolved			96.0		%		80-120	21-AUG-14
Silicon (Si)-Dissolved			86.1		%		80-120	21-AUG-14
Silver (Ag)-Dissolved			96.3		%		80-120	21-AUG-14
Sodium (Na)-Dissolved			98.9		%		80-120	21-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 8 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2925343							
WG1935610-20 CRM	ED-HIGH-WATRM							
Uranium (U)-Dissolved			94.4		%		80-120	21-AUG-14
Zinc (Zn)-Dissolved			93.0		%		80-120	21-AUG-14
WG1935610-4 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			98.7		%		80-120	21-AUG-14
Antimony (Sb)-Dissolved			95.1		%		80-120	21-AUG-14
Arsenic (As)-Dissolved			97.5		%		80-120	21-AUG-14
Barium (Ba)-Dissolved			96.8		%		80-120	21-AUG-14
Boron (B)-Dissolved			95.6		%		80-120	21-AUG-14
Cadmium (Cd)-Dissolved			108.1		%		80-120	21-AUG-14
Calcium (Ca)-Dissolved			98.8		%		80-120	21-AUG-14
Chromium (Cr)-Dissolved			100.2		%		80-120	21-AUG-14
Copper (Cu)-Dissolved			97.1		%		80-120	21-AUG-14
Lead (Pb)-Dissolved			101.0		%		80-120	21-AUG-14
Magnesium (Mg)-Dissolved			103.2		%		80-120	21-AUG-14
Manganese (Mn)-Dissolved			99.5		%		80-120	21-AUG-14
Nickel (Ni)-Dissolved			97.9		%		80-120	21-AUG-14
Potassium (K)-Dissolved			102.1		%		80-120	21-AUG-14
Selenium (Se)-Dissolved			99.3		%		80-120	21-AUG-14
Silicon (Si)-Dissolved			95.2		%		80-120	21-AUG-14
Silver (Ag)-Dissolved			98.6		%		80-120	21-AUG-14
Sodium (Na)-Dissolved			101.9		%		80-120	21-AUG-14
Uranium (U)-Dissolved			102.5		%		80-120	21-AUG-14
Zinc (Zn)-Dissolved			102.0		%		80-120	21-AUG-14
WG1935610-6 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			99.4		%		80-120	21-AUG-14
Antimony (Sb)-Dissolved			93.1		%		80-120	21-AUG-14
Arsenic (As)-Dissolved			97.6		%		80-120	21-AUG-14
Barium (Ba)-Dissolved			99.8		%		80-120	21-AUG-14
Boron (B)-Dissolved			93.7		%		80-120	21-AUG-14
Cadmium (Cd)-Dissolved			105.7		%		80-120	21-AUG-14
Calcium (Ca)-Dissolved			99.0		%		80-120	21-AUG-14
Chromium (Cr)-Dissolved			97.4		%		80-120	21-AUG-14
Copper (Cu)-Dissolved			97.6		%		80-120	21-AUG-14
Lead (Pb)-Dissolved			98.0		%		80-120	21-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 9 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2925343							
WG1935610-6 CRM	ED-HIGH-WATRM							
Magnesium (Mg)-Dissolved			100.5		%		80-120	21-AUG-14
Manganese (Mn)-Dissolved			98.8		%		80-120	21-AUG-14
Nickel (Ni)-Dissolved			99.6		%		80-120	21-AUG-14
Potassium (K)-Dissolved			93.3		%		80-120	21-AUG-14
Selenium (Se)-Dissolved			98.8		%		80-120	21-AUG-14
Silicon (Si)-Dissolved			95.5		%		80-120	21-AUG-14
Silver (Ag)-Dissolved			99.3		%		80-120	21-AUG-14
Sodium (Na)-Dissolved			98.0		%		80-120	21-AUG-14
Uranium (U)-Dissolved			98.1		%		80-120	21-AUG-14
Zinc (Zn)-Dissolved			100.0		%		80-120	21-AUG-14
WG1935610-8 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			98.7		%		80-120	21-AUG-14
Antimony (Sb)-Dissolved			95.7		%		80-120	21-AUG-14
Arsenic (As)-Dissolved			97.5		%		80-120	21-AUG-14
Barium (Ba)-Dissolved			100.4		%		80-120	21-AUG-14
Boron (B)-Dissolved			94.2		%		80-120	21-AUG-14
Cadmium (Cd)-Dissolved			109.0		%		80-120	21-AUG-14
Calcium (Ca)-Dissolved			99.0		%		80-120	21-AUG-14
Chromium (Cr)-Dissolved			99.0		%		80-120	21-AUG-14
Copper (Cu)-Dissolved			100.5		%		80-120	21-AUG-14
Lead (Pb)-Dissolved			97.2		%		80-120	21-AUG-14
Magnesium (Mg)-Dissolved			101.9		%		80-120	21-AUG-14
Manganese (Mn)-Dissolved			98.5		%		80-120	21-AUG-14
Nickel (Ni)-Dissolved			97.1		%		80-120	21-AUG-14
Potassium (K)-Dissolved			95.2		%		80-120	21-AUG-14
Selenium (Se)-Dissolved			97.9		%		80-120	21-AUG-14
Silicon (Si)-Dissolved			93.4		%		80-120	21-AUG-14
Silver (Ag)-Dissolved			98.8		%		80-120	21-AUG-14
Sodium (Na)-Dissolved			102.6		%		80-120	21-AUG-14
Uranium (U)-Dissolved			100.5		%		80-120	21-AUG-14
Zinc (Zn)-Dissolved			99.1		%		80-120	21-AUG-14
WG1935610-10 DUP	L1502799-5							
Aluminum (Al)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	21-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 10 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2925343							
WG1935610-10 DUP		L1502799-5						
Arsenic (As)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Barium (Ba)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	21-AUG-14
Boron (B)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	21-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-14
Calcium (Ca)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	21-AUG-14
Chromium (Cr)-Dissolved		0.00030	0.00032		mg/L	6.4	20	21-AUG-14
Copper (Cu)-Dissolved		0.00046	0.00047		mg/L	2.1	20	21-AUG-14
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	21-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	21-AUG-14
Magnesium (Mg)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	20	21-AUG-14
Manganese (Mn)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	21-AUG-14
Nickel (Ni)-Dissolved		0.00015	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Potassium (K)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	21-AUG-14
Selenium (Se)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Silicon (Si)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	21-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-14
Sodium (Na)-Dissolved		<1.0	<1.0	RPD-NA	mg/L	N/A	20	21-AUG-14
Uranium (U)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-14
Zinc (Zn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	21-AUG-14
WG1935610-11 DUP		L1501905-7						
Aluminum (Al)-Dissolved		0.0013	0.0014		mg/L	2.7	20	21-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Arsenic (As)-Dissolved		0.00110	0.00108		mg/L	2.2	20	21-AUG-14
Barium (Ba)-Dissolved		0.112	0.107		mg/L	4.2	20	21-AUG-14
Boron (B)-Dissolved		0.375	0.369		mg/L	1.5	20	21-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-14
Calcium (Ca)-Dissolved		65.2	66.8		mg/L	2.3	20	21-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Copper (Cu)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Iron (Fe)-Dissolved		6.03	6.12		mg/L	1.5	20	21-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	21-AUG-14
Magnesium (Mg)-Dissolved		18.2	18.0		mg/L	0.8	20	21-AUG-14
Manganese (Mn)-Dissolved		0.162	0.162		mg/L	0.3	20	21-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 11 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2925343							
WG1935610-11 DUP		L1501905-7						
Nickel (Ni)-Dissolved		0.00012	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Potassium (K)-Dissolved		2.55	2.47		mg/L	3.2	20	21-AUG-14
Selenium (Se)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Silicon (Si)-Dissolved		7.93	8.21		mg/L	3.5	20	21-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-14
Sodium (Na)-Dissolved		166	169		mg/L	1.6	20	21-AUG-14
Uranium (U)-Dissolved		0.000016	0.000016		mg/L	1.2	20	21-AUG-14
WG1935610-12 DUP		L1502822-2						
Aluminum (Al)-Dissolved		0.0024	0.0030	J	mg/L	0.0006	0.002	21-AUG-14
Antimony (Sb)-Dissolved		0.00012	0.00011		mg/L	4.5	20	21-AUG-14
Arsenic (As)-Dissolved		0.00122	0.00123		mg/L	0.7	20	21-AUG-14
Barium (Ba)-Dissolved		0.119	0.115		mg/L	2.8	20	21-AUG-14
Boron (B)-Dissolved		0.053	0.053		mg/L	0.4	20	21-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-14
Calcium (Ca)-Dissolved		74.9	75.8		mg/L	1.1	20	21-AUG-14
Chromium (Cr)-Dissolved		0.00023	0.00023		mg/L	1.9	20	21-AUG-14
Copper (Cu)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Iron (Fe)-Dissolved		0.095	0.095		mg/L	0.8	20	21-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	21-AUG-14
Magnesium (Mg)-Dissolved		38.5	37.6		mg/L	2.3	20	21-AUG-14
Manganese (Mn)-Dissolved		0.0191	0.0187		mg/L	2.4	20	21-AUG-14
Nickel (Ni)-Dissolved		0.00132	0.00122		mg/L	8.1	20	21-AUG-14
Potassium (K)-Dissolved		1.52	1.49		mg/L	1.7	20	21-AUG-14
Selenium (Se)-Dissolved		0.00013	0.00013		mg/L	0.1	20	21-AUG-14
Silicon (Si)-Dissolved		1.92	1.95		mg/L	1.5	20	21-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-14
Sodium (Na)-Dissolved		89.1	86.8		mg/L	2.7	20	21-AUG-14
Uranium (U)-Dissolved		0.000069	0.000069		mg/L	0.6	20	21-AUG-14
Zinc (Zn)-Dissolved		0.0012	0.0021	J	mg/L	0.0009	0.002	21-AUG-14
WG1935610-18 DUP		L1498443-1						
Aluminum (Al)-Dissolved		0.0122	0.0123		mg/L	0.1	20	21-AUG-14
Antimony (Sb)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	21-AUG-14
Arsenic (As)-Dissolved		0.00171	0.00175		mg/L	2.4	20	21-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 12 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2925343							
WG1935610-18	DUP	L1498443-1						
Barium (Ba)-Dissolved		0.0387	0.0391		mg/L	1.0	20	21-AUG-14
Boron (B)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	21-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-14
Calcium (Ca)-Dissolved		22.3	21.1		mg/L	5.8	20	21-AUG-14
Chromium (Cr)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	21-AUG-14
Copper (Cu)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	21-AUG-14
Iron (Fe)-Dissolved		1.93	1.95		mg/L	1.0	20	21-AUG-14
Lead (Pb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Magnesium (Mg)-Dissolved		4.98	4.96		mg/L	0.5	20	21-AUG-14
Manganese (Mn)-Dissolved		0.0843	0.0855		mg/L	1.4	20	21-AUG-14
Nickel (Ni)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	21-AUG-14
Potassium (K)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	21-AUG-14
Selenium (Se)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	21-AUG-14
Silicon (Si)-Dissolved		2.47	2.41		mg/L	2.6	20	21-AUG-14
Silver (Ag)-Dissolved		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	21-AUG-14
Sodium (Na)-Dissolved		2.6	2.6		mg/L	0.7	20	21-AUG-14
Uranium (U)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Zinc (Zn)-Dissolved		<0.0040	<0.0040	RPD-NA	mg/L	N/A	20	21-AUG-14
WG1935610-21	DUP	L1500102-2						
Aluminum (Al)-Dissolved		0.0098	0.0090		mg/L	7.7	20	21-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Arsenic (As)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Barium (Ba)-Dissolved		0.0522	0.0536		mg/L	2.5	20	21-AUG-14
Boron (B)-Dissolved		0.027	0.027		mg/L	0.9	20	21-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-14
Calcium (Ca)-Dissolved		59.5	60.8		mg/L	2.2	20	21-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-14
Copper (Cu)-Dissolved		0.00081	0.00079		mg/L	2.0	20	21-AUG-14
Iron (Fe)-Dissolved		0.013	0.012		mg/L	3.8	20	21-AUG-14
Lead (Pb)-Dissolved		0.000075	0.000077		mg/L	2.0	20	21-AUG-14
Magnesium (Mg)-Dissolved		19.6	19.8		mg/L	1.3	20	21-AUG-14
Manganese (Mn)-Dissolved		0.00435	0.00435		mg/L	0.1	20	21-AUG-14
Nickel (Ni)-Dissolved		0.00033	0.00033		mg/L	1.4	20	21-AUG-14



Environmental

Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 13 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2925343							
WG1935610-21	DUP	L1500102-2						
Potassium (K)-Dissolved		0.98	0.98		mg/L	0.0	20	21-AUG-14
Selenium (Se)-Dissolved		0.00103	0.00100		mg/L	2.9	20	21-AUG-14
Silicon (Si)-Dissolved		1.66	1.66		mg/L	0.4	20	21-AUG-14
Sodium (Na)-Dissolved		1.3	1.3		mg/L	0.5	20	21-AUG-14
Uranium (U)-Dissolved		0.000719	0.000724		mg/L	0.8	20	21-AUG-14
Zinc (Zn)-Dissolved		0.0304	0.0304		mg/L	0.1	20	21-AUG-14
WG1935610-9	DUP	L1502799-15						
Aluminum (Al)-Dissolved		0.104	0.109		mg/L	4.6	20	21-AUG-14
Antimony (Sb)-Dissolved		0.00099	0.00096		mg/L	3.0	20	21-AUG-14
Arsenic (As)-Dissolved		0.00155	0.00152		mg/L	1.7	20	21-AUG-14
Barium (Ba)-Dissolved		0.195	0.199		mg/L	1.9	20	21-AUG-14
Boron (B)-Dissolved		0.384	0.373		mg/L	3.0	20	21-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-14
Calcium (Ca)-Dissolved		37.1	37.8		mg/L	2.0	20	21-AUG-14
Chromium (Cr)-Dissolved		0.00028	0.00029		mg/L	3.6	20	21-AUG-14
Copper (Cu)-Dissolved		0.00129	0.00132		mg/L	2.6	20	21-AUG-14
Iron (Fe)-Dissolved		0.058	0.060		mg/L	2.2	20	21-AUG-14
Lead (Pb)-Dissolved		0.000075	0.000082		mg/L	8.5	20	21-AUG-14
Magnesium (Mg)-Dissolved		11.3	11.4		mg/L	0.6	20	21-AUG-14
Manganese (Mn)-Dissolved		0.000843	0.000792		mg/L	6.2	20	21-AUG-14
Nickel (Ni)-Dissolved		0.00424	0.00423		mg/L	0.2	20	21-AUG-14
Potassium (K)-Dissolved		10.0	9.72		mg/L	2.9	20	21-AUG-14
Selenium (Se)-Dissolved		0.00117	0.00120		mg/L	2.1	20	21-AUG-14
Silicon (Si)-Dissolved		0.748	0.755		mg/L	0.9	20	21-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-14
Sodium (Na)-Dissolved		191	186		mg/L	2.5	20	21-AUG-14
Uranium (U)-Dissolved		0.00263	0.00258		mg/L	1.9	20	21-AUG-14
Zinc (Zn)-Dissolved		0.0012	0.0018	J	mg/L	0.0006	0.002	21-AUG-14
WG1935610-1	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	21-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 14 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2925343							
WG1935610-1 MB								
Boron (B)-Dissolved			<0.010		mg/L		0.01	21-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	21-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	21-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	21-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	21-AUG-14
WG1935610-13 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	21-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	21-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	21-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	21-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	21-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 15 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2925343							
WG1935610-13 MB								
	Silicon (Si)-Dissolved		<0.050		mg/L		0.05	21-AUG-14
	Silver (Ag)-Dissolved		<0.000010		mg/L		0.00001	21-AUG-14
	Sodium (Na)-Dissolved		<0.050		mg/L		0.05	21-AUG-14
	Uranium (U)-Dissolved		<0.000010		mg/L		0.00001	21-AUG-14
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	21-AUG-14
WG1935610-16 MB								
	Aluminum (Al)-Dissolved		<0.0010		mg/L		0.001	21-AUG-14
	Antimony (Sb)-Dissolved		<0.00010		mg/L		0.0001	21-AUG-14
	Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	21-AUG-14
	Barium (Ba)-Dissolved		<0.000050		mg/L		0.00005	21-AUG-14
	Boron (B)-Dissolved		<0.010		mg/L		0.01	21-AUG-14
	Cadmium (Cd)-Dissolved		<0.000010		mg/L		0.00001	21-AUG-14
	Calcium (Ca)-Dissolved		<0.020		mg/L		0.02	21-AUG-14
	Chromium (Cr)-Dissolved		<0.00010		mg/L		0.0001	21-AUG-14
	Copper (Cu)-Dissolved		<0.00010		mg/L		0.0001	21-AUG-14
	Iron (Fe)-Dissolved		<0.010		mg/L		0.01	21-AUG-14
	Lead (Pb)-Dissolved		<0.000050		mg/L		0.00005	21-AUG-14
	Magnesium (Mg)-Dissolved		<0.0050		mg/L		0.005	21-AUG-14
	Manganese (Mn)-Dissolved		<0.000050		mg/L		0.00005	21-AUG-14
	Nickel (Ni)-Dissolved		<0.00010		mg/L		0.0001	21-AUG-14
	Potassium (K)-Dissolved		<0.050		mg/L		0.05	21-AUG-14
	Selenium (Se)-Dissolved		<0.00010		mg/L		0.0001	21-AUG-14
	Silicon (Si)-Dissolved		<0.050		mg/L		0.05	21-AUG-14
	Silver (Ag)-Dissolved		<0.000010		mg/L		0.00001	21-AUG-14
	Sodium (Na)-Dissolved		<0.050		mg/L		0.05	21-AUG-14
	Uranium (U)-Dissolved		<0.000010		mg/L		0.00001	21-AUG-14
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	21-AUG-14
WG1935610-19 MB								
	Aluminum (Al)-Dissolved		<0.0010		mg/L		0.001	21-AUG-14
	Antimony (Sb)-Dissolved		<0.00010		mg/L		0.0001	21-AUG-14
	Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	21-AUG-14
	Barium (Ba)-Dissolved		<0.000050		mg/L		0.00005	21-AUG-14
	Boron (B)-Dissolved		<0.010		mg/L		0.01	21-AUG-14
	Cadmium (Cd)-Dissolved		<0.000010		mg/L		0.00001	21-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 16 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2925343							
WG1935610-19 MB								
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	21-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	21-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	21-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	21-AUG-14
WG1935610-3 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	21-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	21-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	21-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	21-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	21-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 17 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2925343							
WG1935610-3 MB								
	Sodium (Na)-Dissolved		<0.050		mg/L		0.05	21-AUG-14
	Uranium (U)-Dissolved		<0.000010		mg/L		0.00001	21-AUG-14
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	21-AUG-14
WG1935610-5 MB								
	Aluminum (Al)-Dissolved		<0.0010		mg/L		0.001	21-AUG-14
	Antimony (Sb)-Dissolved		<0.00010		mg/L		0.0001	21-AUG-14
	Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	21-AUG-14
	Barium (Ba)-Dissolved		<0.000050		mg/L		0.00005	21-AUG-14
	Boron (B)-Dissolved		<0.010		mg/L		0.01	21-AUG-14
	Cadmium (Cd)-Dissolved		<0.000010		mg/L		0.00001	21-AUG-14
	Calcium (Ca)-Dissolved		<0.020		mg/L		0.02	21-AUG-14
	Chromium (Cr)-Dissolved		<0.00010		mg/L		0.0001	21-AUG-14
	Copper (Cu)-Dissolved		<0.00010		mg/L		0.0001	21-AUG-14
	Iron (Fe)-Dissolved		<0.010		mg/L		0.01	21-AUG-14
	Lead (Pb)-Dissolved		<0.000050		mg/L		0.00005	21-AUG-14
	Magnesium (Mg)-Dissolved		<0.0050		mg/L		0.005	21-AUG-14
	Manganese (Mn)-Dissolved		<0.000050		mg/L		0.00005	21-AUG-14
	Nickel (Ni)-Dissolved		<0.00010		mg/L		0.0001	21-AUG-14
	Potassium (K)-Dissolved		<0.050		mg/L		0.05	21-AUG-14
	Selenium (Se)-Dissolved		<0.00010		mg/L		0.0001	21-AUG-14
	Silicon (Si)-Dissolved		<0.050		mg/L		0.05	21-AUG-14
	Silver (Ag)-Dissolved		<0.000010		mg/L		0.00001	21-AUG-14
	Sodium (Na)-Dissolved		<0.050		mg/L		0.05	21-AUG-14
	Uranium (U)-Dissolved		<0.000010		mg/L		0.00001	21-AUG-14
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	21-AUG-14
WG1935610-7 MB								
	Aluminum (Al)-Dissolved		<0.0010		mg/L		0.001	21-AUG-14
	Antimony (Sb)-Dissolved		<0.00010		mg/L		0.0001	21-AUG-14
	Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	21-AUG-14
	Barium (Ba)-Dissolved		<0.000050		mg/L		0.00005	21-AUG-14
	Boron (B)-Dissolved		<0.010		mg/L		0.01	21-AUG-14
	Cadmium (Cd)-Dissolved		<0.000010		mg/L		0.00001	21-AUG-14
	Calcium (Ca)-Dissolved		<0.020		mg/L		0.02	21-AUG-14
	Chromium (Cr)-Dissolved		<0.00010		mg/L		0.0001	21-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 18 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2925343							
WG1935610-7	MB							
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	21-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	21-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	21-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	21-AUG-14
Batch	R2926360							
WG1936437-11	CRM							
		ED-HIGH-WATRM						
Aluminum (Al)-Dissolved			93.9		%		80-120	23-AUG-14
Antimony (Sb)-Dissolved			95.9		%		80-120	23-AUG-14
Arsenic (As)-Dissolved			92.4		%		80-120	23-AUG-14
Barium (Ba)-Dissolved			91.3		%		80-120	23-AUG-14
Boron (B)-Dissolved			97.1		%		80-120	23-AUG-14
Cadmium (Cd)-Dissolved			91.4		%		80-120	23-AUG-14
Calcium (Ca)-Dissolved			96.3		%		80-120	23-AUG-14
Chromium (Cr)-Dissolved			93.9		%		80-120	23-AUG-14
Copper (Cu)-Dissolved			91.2		%		80-120	23-AUG-14
Lead (Pb)-Dissolved			97.6		%		80-120	23-AUG-14
Magnesium (Mg)-Dissolved			90.5		%		80-120	23-AUG-14
Manganese (Mn)-Dissolved			93.1		%		80-120	23-AUG-14
Nickel (Ni)-Dissolved			91.8		%		80-120	23-AUG-14
Potassium (K)-Dissolved			91.2		%		80-120	23-AUG-14
Selenium (Se)-Dissolved			91.7		%		80-120	23-AUG-14
Silicon (Si)-Dissolved			86.8		%		80-120	23-AUG-14
Silver (Ag)-Dissolved			97.9		%		80-120	23-AUG-14
Sodium (Na)-Dissolved			99.2		%		80-120	23-AUG-14
Uranium (U)-Dissolved			97.2		%		80-120	23-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 19 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2926360							
WG1936437-11 CRM	ED-HIGH-WATRM							
Zinc (Zn)-Dissolved			91.0		%		80-120	23-AUG-14
WG1936437-14 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			96.8		%		80-120	23-AUG-14
Antimony (Sb)-Dissolved			97.3		%		80-120	23-AUG-14
Arsenic (As)-Dissolved			94.3		%		80-120	23-AUG-14
Barium (Ba)-Dissolved			92.6		%		80-120	23-AUG-14
Boron (B)-Dissolved			96.6		%		80-120	23-AUG-14
Cadmium (Cd)-Dissolved			92.1		%		80-120	23-AUG-14
Calcium (Ca)-Dissolved			96.6		%		80-120	23-AUG-14
Chromium (Cr)-Dissolved			94.1		%		80-120	23-AUG-14
Copper (Cu)-Dissolved			93.2		%		80-120	23-AUG-14
Lead (Pb)-Dissolved			98.4		%		80-120	23-AUG-14
Magnesium (Mg)-Dissolved			92.6		%		80-120	23-AUG-14
Manganese (Mn)-Dissolved			94.9		%		80-120	23-AUG-14
Nickel (Ni)-Dissolved			93.5		%		80-120	23-AUG-14
Potassium (K)-Dissolved			92.9		%		80-120	23-AUG-14
Selenium (Se)-Dissolved			93.0		%		80-120	23-AUG-14
Silicon (Si)-Dissolved			87.9		%		80-120	23-AUG-14
Silver (Ag)-Dissolved			98.4		%		80-120	23-AUG-14
Sodium (Na)-Dissolved			97.9		%		80-120	23-AUG-14
Uranium (U)-Dissolved			98.5		%		80-120	23-AUG-14
Zinc (Zn)-Dissolved			92.5		%		80-120	23-AUG-14
WG1936437-2 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			101.2		%		80-120	22-AUG-14
Antimony (Sb)-Dissolved			104.0		%		80-120	22-AUG-14
Arsenic (As)-Dissolved			98.7		%		80-120	22-AUG-14
Barium (Ba)-Dissolved			99.3		%		80-120	22-AUG-14
Boron (B)-Dissolved			104.9		%		80-120	22-AUG-14
Cadmium (Cd)-Dissolved			100.3		%		80-120	22-AUG-14
Calcium (Ca)-Dissolved			105.3		%		80-120	22-AUG-14
Chromium (Cr)-Dissolved			100.5		%		80-120	22-AUG-14
Copper (Cu)-Dissolved			100.2		%		80-120	22-AUG-14
Lead (Pb)-Dissolved			110.1		%		80-120	22-AUG-14
Magnesium (Mg)-Dissolved			102.5		%		80-120	22-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 20 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2926360							
WG1936437-2 CRM	ED-HIGH-WATRM							
Manganese (Mn)-Dissolved			101.7		%		80-120	22-AUG-14
Nickel (Ni)-Dissolved			99.3		%		80-120	22-AUG-14
Potassium (K)-Dissolved			99.1		%		80-120	22-AUG-14
Selenium (Se)-Dissolved			101.1		%		80-120	22-AUG-14
Silicon (Si)-Dissolved			97.4		%		80-120	22-AUG-14
Silver (Ag)-Dissolved			104.9		%		80-120	22-AUG-14
Sodium (Na)-Dissolved			109.4		%		80-120	22-AUG-14
Uranium (U)-Dissolved			102.6		%		80-120	22-AUG-14
Zinc (Zn)-Dissolved			102.4		%		80-120	22-AUG-14
WG1936437-4 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			102.6		%		80-120	22-AUG-14
Antimony (Sb)-Dissolved			107.2		%		80-120	22-AUG-14
Arsenic (As)-Dissolved			99.6		%		80-120	22-AUG-14
Barium (Ba)-Dissolved			94.5		%		80-120	22-AUG-14
Boron (B)-Dissolved			100.7		%		80-120	22-AUG-14
Cadmium (Cd)-Dissolved			100.4		%		80-120	22-AUG-14
Calcium (Ca)-Dissolved			103.9		%		80-120	22-AUG-14
Chromium (Cr)-Dissolved			102.1		%		80-120	22-AUG-14
Copper (Cu)-Dissolved			99.4		%		80-120	22-AUG-14
Lead (Pb)-Dissolved			108.2		%		80-120	22-AUG-14
Magnesium (Mg)-Dissolved			101.5		%		80-120	22-AUG-14
Manganese (Mn)-Dissolved			102.6		%		80-120	22-AUG-14
Nickel (Ni)-Dissolved			99.6		%		80-120	22-AUG-14
Potassium (K)-Dissolved			99.3		%		80-120	22-AUG-14
Selenium (Se)-Dissolved			103.1		%		80-120	22-AUG-14
Silicon (Si)-Dissolved			95.6		%		80-120	22-AUG-14
Silver (Ag)-Dissolved			106.1		%		80-120	22-AUG-14
Sodium (Na)-Dissolved			107.9		%		80-120	22-AUG-14
Uranium (U)-Dissolved			105.5		%		80-120	22-AUG-14
Zinc (Zn)-Dissolved			101.3		%		80-120	22-AUG-14
WG1936437-6 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			103.1		%		80-120	22-AUG-14
Antimony (Sb)-Dissolved			107.0		%		80-120	22-AUG-14
Arsenic (As)-Dissolved			100.6		%		80-120	22-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 21 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2926360							
WG1936437-6 CRM	ED-HIGH-WATRM							
Barium (Ba)-Dissolved			99.7		%		80-120	22-AUG-14
Boron (B)-Dissolved			99.8		%		80-120	22-AUG-14
Cadmium (Cd)-Dissolved			101.1		%		80-120	22-AUG-14
Calcium (Ca)-Dissolved			102.6		%		80-120	22-AUG-14
Chromium (Cr)-Dissolved			103.6		%		80-120	22-AUG-14
Copper (Cu)-Dissolved			100.3		%		80-120	22-AUG-14
Lead (Pb)-Dissolved			107.3		%		80-120	22-AUG-14
Magnesium (Mg)-Dissolved			100.4		%		80-120	22-AUG-14
Manganese (Mn)-Dissolved			103.9		%		80-120	22-AUG-14
Nickel (Ni)-Dissolved			102.3		%		80-120	22-AUG-14
Potassium (K)-Dissolved			99.9		%		80-120	22-AUG-14
Selenium (Se)-Dissolved			103.1		%		80-120	22-AUG-14
Silicon (Si)-Dissolved			98.6		%		80-120	22-AUG-14
Silver (Ag)-Dissolved			108.2		%		80-120	22-AUG-14
Sodium (Na)-Dissolved			106.3		%		80-120	22-AUG-14
Uranium (U)-Dissolved			101.2		%		80-120	22-AUG-14
Zinc (Zn)-Dissolved			101.2		%		80-120	22-AUG-14
WG1935610-11 DUP		L1501905-7						
Zinc (Zn)-Dissolved		0.0016	0.0011	J	mg/L	0.0004	0.002	22-AUG-14
WG1936437-12 DUP		L1499740-6						
Aluminum (Al)-Dissolved		0.0044	0.0034	J	mg/L	0.0010	0.002	23-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	23-AUG-14
Arsenic (As)-Dissolved		0.00039	0.00040		mg/L	2.0	20	23-AUG-14
Barium (Ba)-Dissolved		0.0724	0.0736		mg/L	1.7	20	23-AUG-14
Boron (B)-Dissolved		0.014	0.015		mg/L	3.8	20	23-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	23-AUG-14
Calcium (Ca)-Dissolved		15.8	15.9		mg/L	0.9	20	23-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	23-AUG-14
Copper (Cu)-Dissolved		0.00046	0.00051		mg/L	8.7	20	23-AUG-14
Iron (Fe)-Dissolved		0.077	0.077		mg/L	0.9	20	23-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	23-AUG-14
Magnesium (Mg)-Dissolved		4.72	4.60		mg/L	2.8	20	23-AUG-14
Manganese (Mn)-Dissolved		0.00659	0.00685		mg/L	3.8	20	23-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 22 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2926360							
WG1936437-12	DUP	L1499740-6						
Nickel (Ni)-Dissolved		0.00060	0.00061		mg/L	0.4	20	23-AUG-14
Potassium (K)-Dissolved		1.14	1.13		mg/L	0.9	20	23-AUG-14
Selenium (Se)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	23-AUG-14
Silicon (Si)-Dissolved		0.205	0.206		mg/L	0.4	20	23-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	23-AUG-14
Sodium (Na)-Dissolved		4.79	4.73		mg/L	1.2	20	23-AUG-14
Uranium (U)-Dissolved		0.000032	0.000035		mg/L	8.1	20	23-AUG-14
Zinc (Zn)-Dissolved		0.0096	0.0100		mg/L	4.6	20	23-AUG-14
WG1936437-15	DUP	L1500385-4						
Aluminum (Al)-Dissolved		0.0163	0.0162		mg/L	0.4	20	23-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	23-AUG-14
Arsenic (As)-Dissolved		0.00092	0.00101		mg/L	9.0	20	23-AUG-14
Barium (Ba)-Dissolved		0.0677	0.0705		mg/L	4.0	20	23-AUG-14
Boron (B)-Dissolved		0.208	0.211		mg/L	1.4	20	23-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	23-AUG-14
Calcium (Ca)-Dissolved		60.3	60.7		mg/L	0.7	20	23-AUG-14
Chromium (Cr)-Dissolved		0.00014	0.00014		mg/L	1.9	20	23-AUG-14
Copper (Cu)-Dissolved		0.00104	0.00100		mg/L	3.4	20	23-AUG-14
Iron (Fe)-Dissolved		0.959	0.948		mg/L	1.2	20	23-AUG-14
Lead (Pb)-Dissolved		0.000072	0.000069		mg/L	4.9	20	23-AUG-14
Magnesium (Mg)-Dissolved		21.9	21.8		mg/L	0.4	20	23-AUG-14
Manganese (Mn)-Dissolved		0.0785	0.0777		mg/L	1.0	20	23-AUG-14
Nickel (Ni)-Dissolved		0.00265	0.00271		mg/L	2.5	20	23-AUG-14
Potassium (K)-Dissolved		2.32	2.34		mg/L	0.8	20	23-AUG-14
Selenium (Se)-Dissolved		0.00013	0.00012		mg/L	8.4	20	23-AUG-14
Silicon (Si)-Dissolved		2.75	2.77		mg/L	0.8	20	23-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	23-AUG-14
Sodium (Na)-Dissolved		146	146		mg/L	0.1	20	23-AUG-14
Uranium (U)-Dissolved		0.000444	0.000444		mg/L	0.1	20	23-AUG-14
Zinc (Zn)-Dissolved		0.0026	0.0012	J	mg/L	0.0015	0.002	23-AUG-14
WG1936437-7	DUP	L1502256-3						
Aluminum (Al)-Dissolved		0.0093	0.0090		mg/L	4.1	20	22-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	22-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 23 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2926360							
WG1936437-7	DUP	L1502256-3						
Arsenic (As)-Dissolved		0.00014	0.00014		mg/L	2.2	20	22-AUG-14
Barium (Ba)-Dissolved		0.0372	0.0389		mg/L	4.5	20	22-AUG-14
Boron (B)-Dissolved		0.212	0.209		mg/L	1.5	20	22-AUG-14
Cadmium (Cd)-Dissolved		0.000017	0.000018		mg/L	5.4	20	22-AUG-14
Calcium (Ca)-Dissolved		109	107		mg/L	1.9	20	22-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	22-AUG-14
Copper (Cu)-Dissolved		0.00052	0.00051		mg/L	2.5	20	22-AUG-14
Iron (Fe)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	20	22-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	22-AUG-14
Magnesium (Mg)-Dissolved		64.6	63.4		mg/L	1.9	20	22-AUG-14
Manganese (Mn)-Dissolved		0.130	0.128		mg/L	1.8	20	22-AUG-14
Nickel (Ni)-Dissolved		0.00108	0.00105		mg/L	3.4	20	22-AUG-14
Potassium (K)-Dissolved		3.18	3.14		mg/L	1.2	20	22-AUG-14
Selenium (Se)-Dissolved		0.00010	<0.00010	RPD-NA	mg/L	N/A	20	22-AUG-14
Silicon (Si)-Dissolved		6.57	6.63		mg/L	0.9	20	22-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	22-AUG-14
Sodium (Na)-Dissolved		14.2	13.8		mg/L	2.9	20	22-AUG-14
Uranium (U)-Dissolved		0.000151	0.000147		mg/L	2.5	20	22-AUG-14
Zinc (Zn)-Dissolved		0.0017	0.0017		mg/L	2.1	20	22-AUG-14
WG1936437-8	DUP	L1503303-13						
Aluminum (Al)-Dissolved		0.0041	0.0049		mg/L	17	20	23-AUG-14
Antimony (Sb)-Dissolved		0.00012	0.00012		mg/L	2.8	20	23-AUG-14
Arsenic (As)-Dissolved		0.00018	0.00018		mg/L	0.7	20	23-AUG-14
Barium (Ba)-Dissolved		0.260	0.263		mg/L	1.3	20	23-AUG-14
Boron (B)-Dissolved		0.027	0.027		mg/L	2.8	20	23-AUG-14
Cadmium (Cd)-Dissolved		0.000011	0.000012		mg/L	12	20	23-AUG-14
Calcium (Ca)-Dissolved		76.3	81.5		mg/L	6.5	20	23-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	23-AUG-14
Copper (Cu)-Dissolved		0.00174	0.00173		mg/L	0.6	20	23-AUG-14
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	23-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	23-AUG-14
Magnesium (Mg)-Dissolved		18.1	17.9		mg/L	1.4	20	23-AUG-14
Manganese (Mn)-Dissolved		0.00149	0.00158		mg/L	6.0	20	23-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 24 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R2926360							
WG1936437-8	DUP	L1503303-13						
Nickel (Ni)-Dissolved		0.00079	0.00076		mg/L	4.8	20	23-AUG-14
Potassium (K)-Dissolved		2.54	2.57		mg/L	1.1	20	23-AUG-14
Selenium (Se)-Dissolved		<0.00010	0.00012	RPD-NA	mg/L	N/A	20	23-AUG-14
Silicon (Si)-Dissolved		5.61	5.54		mg/L	1.2	20	23-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	23-AUG-14
Sodium (Na)-Dissolved		12.2	11.9		mg/L	2.4	20	23-AUG-14
Uranium (U)-Dissolved		0.000590	0.000574		mg/L	2.8	20	23-AUG-14
Zinc (Zn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	23-AUG-14
WG1936437-9	DUP	L1503346-4						
Aluminum (Al)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	22-AUG-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	22-AUG-14
Arsenic (As)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	22-AUG-14
Barium (Ba)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	22-AUG-14
Boron (B)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	22-AUG-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	22-AUG-14
Calcium (Ca)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	22-AUG-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	22-AUG-14
Copper (Cu)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	22-AUG-14
Iron (Fe)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	20	22-AUG-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	22-AUG-14
Magnesium (Mg)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	20	22-AUG-14
Manganese (Mn)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	22-AUG-14
Nickel (Ni)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	22-AUG-14
Potassium (K)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	22-AUG-14
Selenium (Se)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	22-AUG-14
Silicon (Si)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	22-AUG-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	22-AUG-14
Sodium (Na)-Dissolved		<1.0	<1.0	RPD-NA	mg/L	N/A	20	22-AUG-14
Uranium (U)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	22-AUG-14
Zinc (Zn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	22-AUG-14
WG1936437-1	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	22-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 25 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2926360							
WG1936437-1 MB								
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	22-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	22-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	22-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	22-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	22-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	22-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	22-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	22-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	22-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	22-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	22-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	22-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	22-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	22-AUG-14
WG1936437-10 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	23-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	23-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	23-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	23-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	23-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	23-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	23-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	23-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	23-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	23-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	23-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	23-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	23-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	23-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 26 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2926360							
WG1936437-10 MB								
Potassium (K)-Dissolved			<0.050		mg/L		0.05	23-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	23-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	23-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	23-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	23-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	23-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	23-AUG-14
WG1936437-13 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	23-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	23-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	23-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	23-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	23-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	23-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	23-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	23-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	23-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	23-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	23-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	23-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	23-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	23-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	23-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	23-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	23-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	23-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	23-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	23-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	23-AUG-14
WG1936437-3 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	22-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	22-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 27 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2926360							
WG1936437-3	MB							
Boron (B)-Dissolved			<0.010		mg/L		0.01	22-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	22-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	22-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	22-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	22-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	22-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	22-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	22-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	22-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	22-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	22-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	22-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	22-AUG-14
WG1936437-5	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	22-AUG-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	22-AUG-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	22-AUG-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	22-AUG-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	22-AUG-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	22-AUG-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	22-AUG-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	22-AUG-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	22-AUG-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	22-AUG-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 28 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R2926360							
WG1936437-5 MB								
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	22-AUG-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	22-AUG-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	22-AUG-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	22-AUG-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	22-AUG-14
MET-T-CCMS-ED		Water						
Batch	R2917038							
WG1928270-5 DUP	L1499123-1							
Aluminum (Al)-Total		0.053	0.075	J	mg/L	0.023	0.03	13-AUG-14
Antimony (Sb)-Total		0.00061	0.00066		mg/L	7.4	20	13-AUG-14
Arsenic (As)-Total		0.00167	0.00162		mg/L	3.2	20	13-AUG-14
Barium (Ba)-Total		0.179	0.189		mg/L	5.6	20	13-AUG-14
Boron (B)-Total		0.071	0.071		mg/L	0.2	20	13-AUG-14
Cadmium (Cd)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Calcium (Ca)-Total		54.7	51.6		mg/L	5.9	20	13-AUG-14
Chromium (Cr)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-AUG-14
Copper (Cu)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-AUG-14
Iron (Fe)-Total		0.065	0.078		mg/L	18	20	13-AUG-14
Lead (Pb)-Total		<0.00025	<0.00025	RPD-NA	mg/L	N/A	20	13-AUG-14
Magnesium (Mg)-Total		13.1	13.5		mg/L	2.9	20	13-AUG-14
Manganese (Mn)-Total		0.0270	0.0275		mg/L	1.7	20	13-AUG-14
Nickel (Ni)-Total		0.00157	0.00165		mg/L	5.5	20	13-AUG-14
Potassium (K)-Total		5.74	5.77		mg/L	0.5	20	13-AUG-14
Selenium (Se)-Total		0.00266	0.00252		mg/L	5.4	20	13-AUG-14
Silicon (Si)-Total		2.73	2.72		mg/L	0.5	20	13-AUG-14
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Sodium (Na)-Total		132	130		mg/L	1.2	20	13-AUG-14
Uranium (U)-Total		0.00899	0.00890		mg/L	0.9	20	13-AUG-14
Zinc (Zn)-Total		<0.015	<0.015	RPD-NA	mg/L	N/A	20	13-AUG-14
WG1928270-6 DUP	L1499644-1							
Aluminum (Al)-Total		0.521	0.512		mg/L	1.7	20	13-AUG-14
Antimony (Sb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-AUG-14
Arsenic (As)-Total		0.00198	0.00186		mg/L	5.9	20	13-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 29 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R2917038							
WG1928270-6	DUP	L1499644-1						
Barium (Ba)-Total		0.232	0.237		mg/L	1.8	20	13-AUG-14
Boron (B)-Total		0.061	0.062		mg/L	2.1	20	13-AUG-14
Cadmium (Cd)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Calcium (Ca)-Total		146	145		mg/L	0.5	20	13-AUG-14
Chromium (Cr)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-AUG-14
Copper (Cu)-Total		0.00343	0.00332		mg/L	3.2	20	13-AUG-14
Iron (Fe)-Total		0.086	0.074		mg/L	15	20	13-AUG-14
Lead (Pb)-Total		<0.00025	<0.00025	RPD-NA	mg/L	N/A	20	13-AUG-14
Magnesium (Mg)-Total		44.4	42.3		mg/L	4.7	20	13-AUG-14
Manganese (Mn)-Total		0.0180	0.0177		mg/L	1.7	20	13-AUG-14
Nickel (Ni)-Total		0.00260	0.00250		mg/L	3.9	20	13-AUG-14
Potassium (K)-Total		4.57	4.50		mg/L	1.5	20	13-AUG-14
Selenium (Se)-Total		0.00565	0.00528		mg/L	6.8	20	13-AUG-14
Silicon (Si)-Total		2.05	2.04		mg/L	0.5	20	13-AUG-14
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-14
Sodium (Na)-Total		110	109		mg/L	0.8	20	13-AUG-14
Uranium (U)-Total		0.00198	0.00200		mg/L	1.0	20	13-AUG-14
Zinc (Zn)-Total		<0.015	<0.015	RPD-NA	mg/L	N/A	20	13-AUG-14
WG1928270-4	LCS							
Aluminum (Al)-Total			104.6		%		70-130	13-AUG-14
Antimony (Sb)-Total			99.8		%		70-130	13-AUG-14
Arsenic (As)-Total			101.6		%		70-130	13-AUG-14
Barium (Ba)-Total			105.8		%		70-130	13-AUG-14
Boron (B)-Total			98.6		%		70-130	13-AUG-14
Cadmium (Cd)-Total			104.5		%		70-130	13-AUG-14
Calcium (Ca)-Total			103.0		%		70-130	13-AUG-14
Chromium (Cr)-Total			102.5		%		70-130	13-AUG-14
Copper (Cu)-Total			100.1		%		70-130	13-AUG-14
Iron (Fe)-Total			102.1		%		70-130	13-AUG-14
Lead (Pb)-Total			99.9		%		70-130	13-AUG-14
Magnesium (Mg)-Total			109.1		%		70-130	13-AUG-14
Manganese (Mn)-Total			104.0		%		70-130	13-AUG-14
Nickel (Ni)-Total			102.9		%		70-130	13-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 30 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2917038							
WG1928270-4 LCS								
Potassium (K)-Total			103.5		%		70-130	13-AUG-14
Selenium (Se)-Total			102.1		%		70-130	13-AUG-14
Silicon (Si)-Total			94.4		%		70-130	13-AUG-14
Silver (Ag)-Total			100.1		%		70-130	13-AUG-14
Sodium (Na)-Total			113.8		%		70-130	13-AUG-14
Uranium (U)-Total			95.7		%		70-130	13-AUG-14
Zinc (Zn)-Total			108.1		%		70-130	13-AUG-14
WG1928270-3 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	13-AUG-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Barium (Ba)-Total			<0.000050		mg/L		0.00005	13-AUG-14
Boron (B)-Total			<0.010		mg/L		0.01	13-AUG-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	13-AUG-14
Calcium (Ca)-Total			<0.020		mg/L		0.02	13-AUG-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Copper (Cu)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Iron (Fe)-Total			<0.010		mg/L		0.01	13-AUG-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	13-AUG-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	13-AUG-14
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	13-AUG-14
Nickel (Ni)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Potassium (K)-Total			<0.050		mg/L		0.05	13-AUG-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Silicon (Si)-Total			<0.050		mg/L		0.05	13-AUG-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	13-AUG-14
Sodium (Na)-Total			<0.050		mg/L		0.05	13-AUG-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	13-AUG-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	13-AUG-14
WG1928398-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	13-AUG-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Barium (Ba)-Total			<0.000050		mg/L		0.00005	13-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 31 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R2917038							
WG1928398-1	MB							
Boron (B)-Total			<0.010		mg/L		0.01	13-AUG-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	13-AUG-14
Calcium (Ca)-Total			<0.020		mg/L		0.02	13-AUG-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Copper (Cu)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Iron (Fe)-Total			<0.010		mg/L		0.01	13-AUG-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	13-AUG-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	13-AUG-14
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	13-AUG-14
Nickel (Ni)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Potassium (K)-Total			<0.050		mg/L		0.05	13-AUG-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	13-AUG-14
Silicon (Si)-Total			<0.050		mg/L		0.05	13-AUG-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	13-AUG-14
Sodium (Na)-Total			<0.050		mg/L		0.05	13-AUG-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	13-AUG-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	13-AUG-14
NAPHTHENIC-ACID-FM		Water						
Batch	R2933378							
WG1935429-3	DUP	L1499441-3						
Naphthenic Acids		<1.0	<1.0	RPD-NA	mg/L	N/A	30	29-AUG-14
WG1935429-4	LCS							
Naphthenic Acids			72.0		%		70-130	29-AUG-14
WG1935429-1	MB							
Naphthenic Acids			<1.0		mg/L		1	29-AUG-14
WG1935429-2	MS	L1499441-2						
Naphthenic Acids			89.3		%		50-150	29-AUG-14
NH3-CFA-ED		Water						
Batch	R2923049							
WG1933578-10	DUP	L1504020-1						
Ammonia, Total (as N)		0.433	0.460		mg/L	6.0	20	19-AUG-14
WG1933578-6	DUP	L1498418-9						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	19-AUG-14
WG1933578-8	DUP	L1501286-7						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	19-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 32 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-CFA-ED		Water						
Batch	R2923049							
WG1933578-2	LCS							
Ammonia, Total (as N)			100.5		%		85-115	19-AUG-14
WG1933578-1	MB							
Ammonia, Total (as N)			<0.050		mg/L		0.05	19-AUG-14
WG1933578-11	MS	L1495802-8						
Ammonia, Total (as N)			102.6		%		75-125	19-AUG-14
WG1933578-4	MS	L1501019-2						
Ammonia, Total (as N)			100.7		%		75-125	19-AUG-14
WG1933578-7	MS	L1500991-5						
Ammonia, Total (as N)			99.7		%		75-125	19-AUG-14
WG1933578-9	MS	L1501875-2						
Ammonia, Total (as N)			101.0		%		75-125	19-AUG-14
NO2-IC-ED		Water						
Batch	R2912741							
WG1927719-13	DUP	L1499490-2						
Nitrite (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	09-AUG-14
WG1927719-17	DUP	L1499670-6						
Nitrite (as N)		0.033	0.034		mg/L	2.1	20	09-AUG-14
WG1927719-5	DUP	L1499575-5						
Nitrite (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	09-AUG-14
WG1927719-9	DUP	L1499564-3						
Nitrite (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	09-AUG-14
WG1927719-11	LCS							
Nitrite (as N)			91.2		%		90-110	09-AUG-14
WG1927719-15	LCS							
Nitrite (as N)			92.5		%		90-110	09-AUG-14
WG1927719-19	LCS							
Nitrite (as N)			90.1		%		90-110	09-AUG-14
WG1927719-2	LCS							
Nitrite (as N)			94.4		%		90-110	09-AUG-14
WG1927719-21	LCS							
Nitrite (as N)			94.6		%		90-110	09-AUG-14
WG1927719-3	LCS							
Nitrite (as N)			90.7		%		90-110	09-AUG-14
WG1927719-7	LCS							
Nitrite (as N)			90.3		%		90-110	09-AUG-14
WG1927719-1	MB							
Nitrite (as N)			<0.020		mg/L		0.02	09-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 33 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-ED		Water						
Batch	R2912741							
WG1927719-12	MB							
Nitrite (as N)			<0.020		mg/L		0.02	09-AUG-14
WG1927719-16	MB							
Nitrite (as N)			<0.020		mg/L		0.02	09-AUG-14
WG1927719-20	MB							
Nitrite (as N)			<0.020		mg/L		0.02	09-AUG-14
WG1927719-22	MB							
Nitrite (as N)			<0.020		mg/L		0.02	09-AUG-14
WG1927719-4	MB							
Nitrite (as N)			<0.020		mg/L		0.02	09-AUG-14
WG1927719-8	MB							
Nitrite (as N)			<0.020		mg/L		0.02	09-AUG-14
WG1927719-10	MS	L1499564-3						
Nitrite (as N)			78.5		%		75-125	09-AUG-14
WG1927719-14	MS	L1499490-2						
Nitrite (as N)			82.9		%		75-125	09-AUG-14
WG1927719-18	MS	L1499670-6						
Nitrite (as N)			98.4		%		75-125	09-AUG-14
NO3-IC-ED		Water						
Batch	R2912741							
WG1927719-13	DUP	L1499490-2						
Nitrate (as N)		24.6	24.5		mg/L	0.1	20	09-AUG-14
WG1927719-17	DUP	L1499670-6						
Nitrate (as N)		0.769	0.791		mg/L	2.7	20	09-AUG-14
WG1927719-5	DUP	L1499575-5						
Nitrate (as N)		0.531	0.532		mg/L	0.1	20	09-AUG-14
WG1927719-9	DUP	L1499564-3						
Nitrate (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	09-AUG-14
WG1927719-11	LCS							
Nitrate (as N)			104.5		%		90-110	09-AUG-14
WG1927719-15	LCS							
Nitrate (as N)			107.0		%		90-110	09-AUG-14
WG1927719-19	LCS							
Nitrate (as N)			105.4		%		90-110	09-AUG-14
WG1927719-2	LCS							
Nitrate (as N)			98.9		%		90-110	09-AUG-14
WG1927719-21	LCS							
Nitrate (as N)			102.1		%		90-110	09-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 34 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-ED		Water						
Batch	R2912741							
WG1927719-3	LCS							
Nitrate (as N)			105.6		%		90-110	09-AUG-14
WG1927719-7	LCS							
Nitrate (as N)			105.0		%		90-110	09-AUG-14
WG1927719-1	MB							
Nitrate (as N)			<0.050		mg/L		0.05	09-AUG-14
WG1927719-16	MB							
Nitrate (as N)			<0.050		mg/L		0.05	09-AUG-14
WG1927719-20	MB							
Nitrate (as N)			<0.050		mg/L		0.05	09-AUG-14
WG1927719-22	MB							
Nitrate (as N)			<0.050		mg/L		0.05	09-AUG-14
WG1927719-4	MB							
Nitrate (as N)			<0.050		mg/L		0.05	09-AUG-14
WG1927719-8	MB							
Nitrate (as N)			<0.050		mg/L		0.05	09-AUG-14
WG1927719-10	MS	L1499564-3						
Nitrate (as N)			100.1		%		75-125	09-AUG-14
WG1927719-14	MS	L1499490-2						
Nitrate (as N)			N/A	MS-B	%		-	09-AUG-14
WG1927719-18	MS	L1499670-6						
Nitrate (as N)			104.7		%		75-125	09-AUG-14
WG1927719-6	MS	L1499575-5						
Nitrate (as N)			96.0		%		75-125	09-AUG-14
PAH-ABT1-CL		Water						
Batch	R2924297							
WG1934912-2	LCS							
Acenaphthene			85.7		%		60-130	19-AUG-14
Acenaphthylene			94.0		%		60-130	19-AUG-14
Anthracene			95.4		%		60-130	19-AUG-14
Fluoranthene			88.8		%		60-130	19-AUG-14
Fluorene			85.8		%		60-130	19-AUG-14
Naphthalene			88.2		%		50-130	19-AUG-14
Phenanthrene			92.1		%		60-130	19-AUG-14
Pyrene			96.1		%		60-130	19-AUG-14
Benzo(a)anthracene			93.2		%		60-130	19-AUG-14
Benzo(k)fluoranthene			86.7		%		60-130	19-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 35 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch	R2924297							
WG1934912-2	LCS							
Benzo(b&j)fluoranthene			88.6		%		60-130	19-AUG-14
Benzo(g,h,i)perylene			90.3		%		60-130	19-AUG-14
Benzo(a)pyrene			87.0		%		60-130	19-AUG-14
Chrysene			89.8		%		60-130	19-AUG-14
Dibenzo(a,h)anthracene			90.8		%		60-130	19-AUG-14
Indeno(1,2,3-cd)pyrene			88.0		%		60-130	19-AUG-14
WG1934912-1	MB							
Acenaphthene			<0.000020		mg/L		0.00002	19-AUG-14
Acenaphthylene			<0.000020		mg/L		0.00002	19-AUG-14
Anthracene			<0.000010		mg/L		0.00001	19-AUG-14
Fluoranthene			<0.000020		mg/L		0.00002	19-AUG-14
Fluorene			<0.000020		mg/L		0.00002	19-AUG-14
Naphthalene			<0.000050		mg/L		0.00005	19-AUG-14
Phenanthrene			<0.000050		mg/L		0.00005	19-AUG-14
Pyrene			<0.000010		mg/L		0.00001	19-AUG-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	19-AUG-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	19-AUG-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	19-AUG-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	19-AUG-14
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	19-AUG-14
Chrysene			<0.000020		mg/L		0.00002	19-AUG-14
Dibenzo(a,h)anthracene			<0.0000050		mg/L		0.000005	19-AUG-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	19-AUG-14
Surrogate: d10-Acenaphthene			85.2		%		60-130	19-AUG-14
Surrogate: d10-Phenanthrene			90.6		%		60-130	19-AUG-14
Surrogate: d12-Chrysene			90.6		%		60-130	19-AUG-14
PH/EC/ALK-ED		Water						
Batch	R2915317							
WG1927745-6	DUP							
	L1499399-1							
pH	8.16		8.17	J	pH	0.01	0.3	10-AUG-14
Conductivity (EC)	504		505		uS/cm	0.2	10	10-AUG-14
Bicarbonate (HCO3)	136		136		mg/L	0.0	25	10-AUG-14
Carbonate (CO3)	<5.0		<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14
Hydroxide (OH)	<5.0		<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 36 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R2915317							
WG1927745-6	DUP	L1499399-1						
Alkalinity, Total (as CaCO3)		112	112		mg/L	0.0	20	10-AUG-14
WG1927745-7	DUP	L1499575-5						
pH		7.96	7.99	J	pH	0.03	0.3	10-AUG-14
Conductivity (EC)		1670	1710		uS/cm	2.4	10	10-AUG-14
Bicarbonate (HCO3)		723	759		mg/L	4.9	25	10-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14
Alkalinity, Total (as CaCO3)		592	622		mg/L	4.9	20	10-AUG-14
WG1927745-8	DUP	L1499564-3						
pH		7.98	7.98	J	pH	0.00	0.3	10-AUG-14
Conductivity (EC)		3460	3450		uS/cm	0.3	10	10-AUG-14
Bicarbonate (HCO3)		491	497		mg/L	1.2	25	10-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14
Alkalinity, Total (as CaCO3)		403	407		mg/L	1.2	20	10-AUG-14
WG1927745-9	DUP	L1499041-1						
pH		8.01	8.02	J	pH	0.01	0.3	10-AUG-14
Conductivity (EC)		7600	7600		uS/cm	0.0	10	10-AUG-14
Bicarbonate (HCO3)		618	625		mg/L	1.0	25	10-AUG-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	10-AUG-14
Alkalinity, Total (as CaCO3)		507	512		mg/L	1.0	20	10-AUG-14
WG1927745-11	LCS							
Conductivity (EC)			98.7		%		90-110	10-AUG-14
WG1927745-12	LCS							
pH			6.99		pH		6.7-7.3	10-AUG-14
WG1927745-13	LCS							
Alkalinity, Total (as CaCO3)			98.3		%		85-115	10-AUG-14
WG1927745-14	LCS							
Conductivity (EC)			96.9		%		90-110	10-AUG-14
WG1927745-16	LCS							
Conductivity (EC)			98.0		%		90-110	10-AUG-14
WG1927745-17	LCS							
pH			6.98		pH		6.7-7.3	10-AUG-14
WG1927745-18	LCS							



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 37 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R2915317							
WG1927745-18	LCS							
Alkalinity, Total (as CaCO3)			99.0		%		85-115	10-AUG-14
WG1927745-19	LCS							
Conductivity (EC)			96.3		%		90-110	10-AUG-14
WG1927745-2	LCS							
Conductivity (EC)			99.4		%		90-110	12-AUG-14
WG1927745-21	LCS							
Conductivity (EC)			97.3		%		90-110	10-AUG-14
WG1927745-22	LCS							
pH			6.98		pH		6.7-7.3	10-AUG-14
WG1927745-23	LCS							
Alkalinity, Total (as CaCO3)			98.7		%		85-115	10-AUG-14
WG1927745-3	LCS							
pH			7.00		pH		6.7-7.3	12-AUG-14
WG1927745-4	LCS							
Alkalinity, Total (as CaCO3)			97.6		%		85-115	12-AUG-14
WG1927745-5	LCS							
Conductivity (EC)			97.6		%		90-110	12-AUG-14
WG1927745-1	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	12-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	12-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	12-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	12-AUG-14
WG1927745-10	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	10-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	10-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	10-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	10-AUG-14
WG1927745-15	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	10-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	10-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	10-AUG-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	10-AUG-14
WG1927745-20	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	10-AUG-14
Carbonate (CO3)			<5.0		mg/L		5	10-AUG-14
Hydroxide (OH)			<5.0		mg/L		5	10-AUG-14



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 38 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R2915317							
WG1927745-20 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	10-AUG-14
PHENOLS-4AAP-ED		Water						
Batch	R2925385							
WG1935847-4 DUP	L1492518-14							
Phenols (4AAP)		0.0033	0.0031		mg/L	6.3	15	21-AUG-14
WG1935847-5 DUP	L1502619-2							
Phenols (4AAP)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	15	21-AUG-14
WG1935847-6 DUP	L1502158-2							
Phenols (4AAP)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	15	21-AUG-14
WG1935847-7 DUP	L1495802-4							
Phenols (4AAP)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	15	21-AUG-14
WG1935847-8 DUP	L1500196-1							
Phenols (4AAP)		0.0063	0.0077	J	mg/L	0.0014	0.002	21-AUG-14
WG1935847-3 LCS								
Phenols (4AAP)			98.0		%		85-115	21-AUG-14
WG1935847-2 MB								
Phenols (4AAP)			<0.0010		mg/L		0.001	21-AUG-14
WG1935847-9 MS	L1499883-3							
Phenols (4AAP)			103.0		%		75-125	21-AUG-14
Batch	R2926240							
WG1936593-4 DUP	L1499745-1							
Phenols (4AAP)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	15	22-AUG-14
WG1936593-6 DUP	L1500121-6							
Phenols (4AAP)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	15	22-AUG-14
WG1936593-7 DUP	L1500121-15							
Phenols (4AAP)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	15	22-AUG-14
WG1936593-3 LCS								
Phenols (4AAP)			108.0		%		85-115	22-AUG-14
WG1936593-2 MB								
Phenols (4AAP)			<0.0010		mg/L		0.001	22-AUG-14
WG1936593-5 MS	L1495506-9							
Phenols (4AAP)			108.0		%		75-125	22-AUG-14
SO4-IC-ED	Water							



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 39 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-ED		Water						
Batch	R2912741							
WG1927719-17	DUP	L1499670-6						
Sulfate (SO4)		18.4	18.7		mg/L	1.5	20	09-AUG-14
WG1927719-5	DUP	L1499575-5						
Sulfate (SO4)		407	407		mg/L	0.0	20	09-AUG-14
WG1927719-11	LCS							
Sulfate (SO4)			103.3		%		90-110	09-AUG-14
WG1927719-15	LCS							
Sulfate (SO4)			102.9		%		90-110	09-AUG-14
WG1927719-19	LCS							
Sulfate (SO4)			102.5		%		90-110	09-AUG-14
WG1927719-2	LCS							
Sulfate (SO4)			101.8		%		90-110	09-AUG-14
WG1927719-21	LCS							
Sulfate (SO4)			101.7		%		90-110	09-AUG-14
WG1927719-3	LCS							
Sulfate (SO4)			102.8		%		90-110	09-AUG-14
WG1927719-7	LCS							
Sulfate (SO4)			103.3		%		90-110	09-AUG-14
WG1927719-1	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-12	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-16	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-20	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-22	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-4	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-8	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	09-AUG-14
WG1927719-18	MS	L1499670-6						
Sulfate (SO4)			104.2		%		75-125	09-AUG-14
WG1927719-6	MS	L1499575-5						
Sulfate (SO4)			N/A	MS-B	%		-	09-AUG-14
SOLIDS-TDS-ED		Water						



Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Page 40 of 42

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-ED		Water						
Batch	R2917950							
WG1929586-3	DUP	L1498881-3						
Total Dissolved Solids		210	205		mg/L	2.4	20	13-AUG-14
WG1929586-4	DUP	L1500102-4						
Total Dissolved Solids		251	263		mg/L	4.7	20	13-AUG-14
WG1929586-2	LCS							
Total Dissolved Solids			98.1		%		85-115	13-AUG-14
WG1929586-1	MB							
Total Dissolved Solids			<10		mg/L		10	13-AUG-14
TURBIDITY-ED		Water						
Batch	R2917062							
WG1927468-3	DUP	L1498881-1						
Turbidity		4.12	4.10		NTU	0.5	15	09-AUG-14
WG1927468-2	LCS							
Turbidity			100.7		%		70-130	09-AUG-14
WG1927468-1	MB							
Turbidity			<0.10		NTU		0.1	09-AUG-14
Batch	R2917244							
WG1929996-3	DUP	L1501069-1						
Turbidity		0.72	0.74		NTU	2.8	15	13-AUG-14
WG1929996-4	DUP	L1500733-35						
Turbidity		<0.10	<0.10	RPD-NA	NTU	N/A	15	13-AUG-14
WG1929996-5	DUP	L1500733-34						
Turbidity		<0.10	<0.10	RPD-NA	NTU	N/A	15	13-AUG-14
WG1929996-2	LCS							
Turbidity			98.6		%		70-130	13-AUG-14
WG1929996-1	MB							
Turbidity			<0.10		NTU		0.1	13-AUG-14

Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Page 41 of 42

Contact: SUE RAYNARD

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L1499441

Report Date: 29-AUG-14

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Page 42 of 42

Contact: SUE RAYNARD

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Turbidity	3	08-AUG-14 13:32	13-AUG-14 00:00	48	107	hours	EHT

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1499441 were received on 08-AUG-14 14:31.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



ALS 140818-09 (14-CFU)

CONFIDENTIAL ANALYSIS REPORT

REPORT #: 140818-09

WO #: 14-CFU

PO #: L1499441

CLIENT: ALS Laboratory Group - Edmonton
9936-67 Avenue
Edmonton, AB
T6E 0P5

ATTENTION: ALSED Reporting
Tel: (780) 413-5227
Fax: (780) 437-2311

SAMPLE DESCRIPTION: Water Samples

DATE AND TIME OF SAMPLE COLLECTION: August 08, 2014

DATE AND TIME OF SAMPLE RECEIPT: August 09, 2014/14:44

SAMPLE TEMPERATURE WHEN RECEIVED: 4.5° Celsius

TEST PERFORMED:

Iron Related Bacteria
Sulfate Reducing Bacteria
Iron Related Bacteria [P/A]
Sulfate Reducing Bacteria [P/A]

TEST START DATE: August 09, 2014/15:15

DATE COMPLETED: August 18, 2014

CERTIFICATE OF ANALYSIS: See Page 2

QUALITY CONTROL DATA: See Attached Appendix 1

The report shall not be reproduced, except in full, without the written authority of PBR Laboratories Inc.

Certificate of Analysis

PBR ID	Sample #	Client ID	Lot #	Test	Protocol	Quantity Analyzed	*DF	Result	Units	Note
14-CFU-01	L1499441-2	16053140808039		Iron Related Bacteria	BART	15 ml		9.0×10^3	CFU/ml	1
				Sulfate Reducing Bacteria	BART	15 ml		1.8×10^4	CFU/ml	1
14-CFU-02	L1499441-3	16053140808040		Iron Related Bacteria [P/A]	BART	15 ml		Absent		
				Sulfate Reducing Bacteria [P/A]	BART	15 ml		Absent		

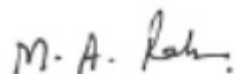
*DF - Dilution Factor used for analysis

Notes

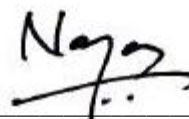
1 CFU = Colony Forming Unit.

BART results represent the Approximate Population only.

The reported results apply only to the items tested.



Abdul Rahman Mohammed (Analyst)
Date: Aug 18 2014



Approved By: _____

Narayan Pokharel, Ph.D.
Date: Aug 18 2014





P|B|R
Laboratories Inc.

ALS 140818-09 (14-CFU)

APPENDIX 1

Quality Control Data for Iron Related Bacteria (BART)

Controls	Organism/Medium	Result
Sterility (media blank)	BART medium	Pass
Positive	Acidithiobacillus ferrooxidans	Pass
Negative	D/W Sterile	Pass

Quality Control Data for Sulfate Reducing Bacteria (BART)

Controls	Organism/Medium	Result
Sterility	BART medium	Pass
Positive	SRB	Pass
Negative	D/W Sterile	Pass

Quality Control Data for Iron Related Bacteria [P/A] (BART)

Controls	Organism/Medium	Result
Sterility	BART Medium	Pass
Positive	Acidithiobacillus ferrooxidans	Pass
Negative	D/W sterile	Pass

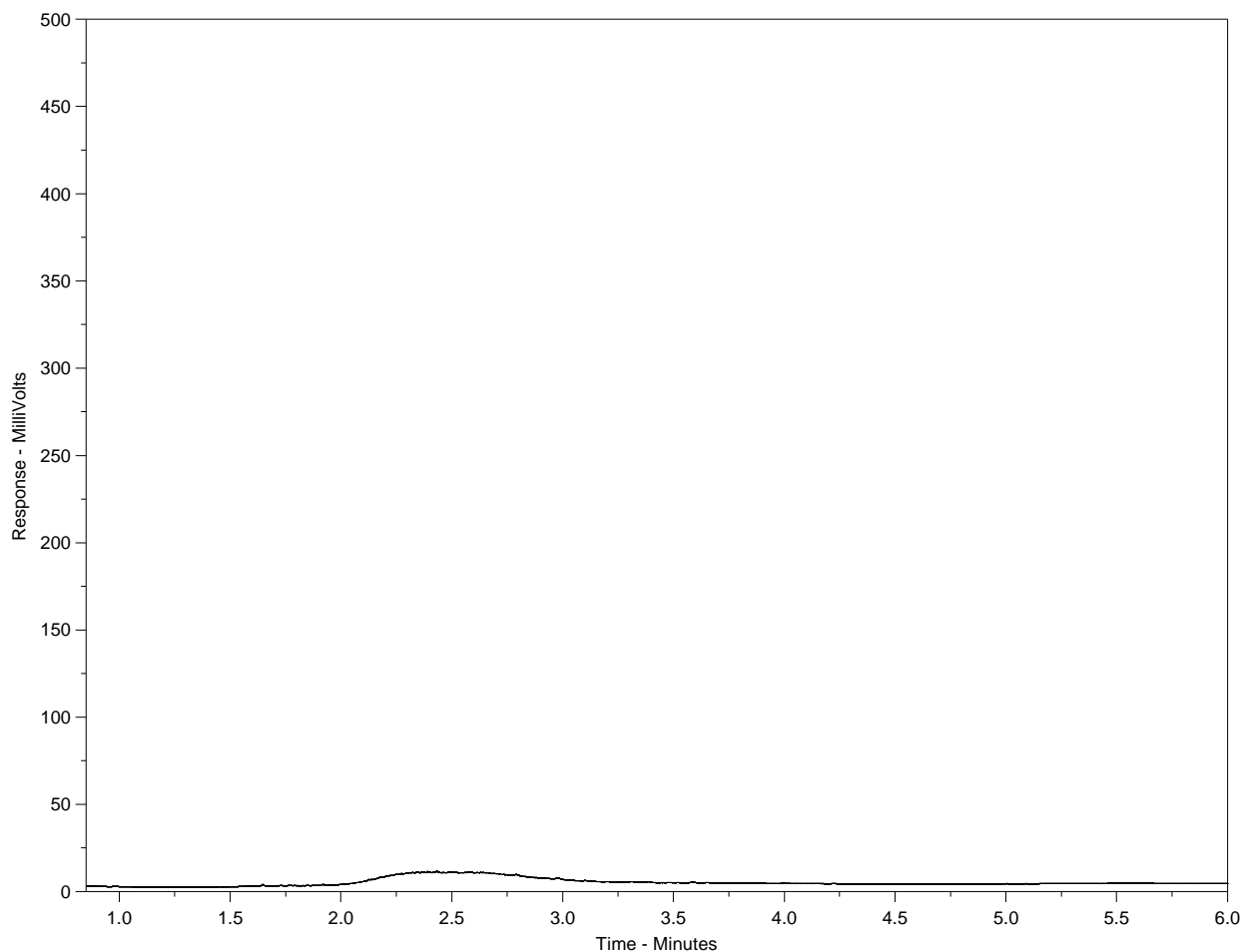
Quality Control Data for Sulfate Reducing Bacteria [P/A] (BART)

Controls	Organism/Medium	Result
Sterility	BART medium	Pass
Positive	SRB	Pass
Negative	D/W sterile	Pass

Hydrocarbon Distribution Report



ALS Sample ID: L1499441-2
Client ID: 16053140808039



F2		F3		F4		F4	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	1067°F				
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

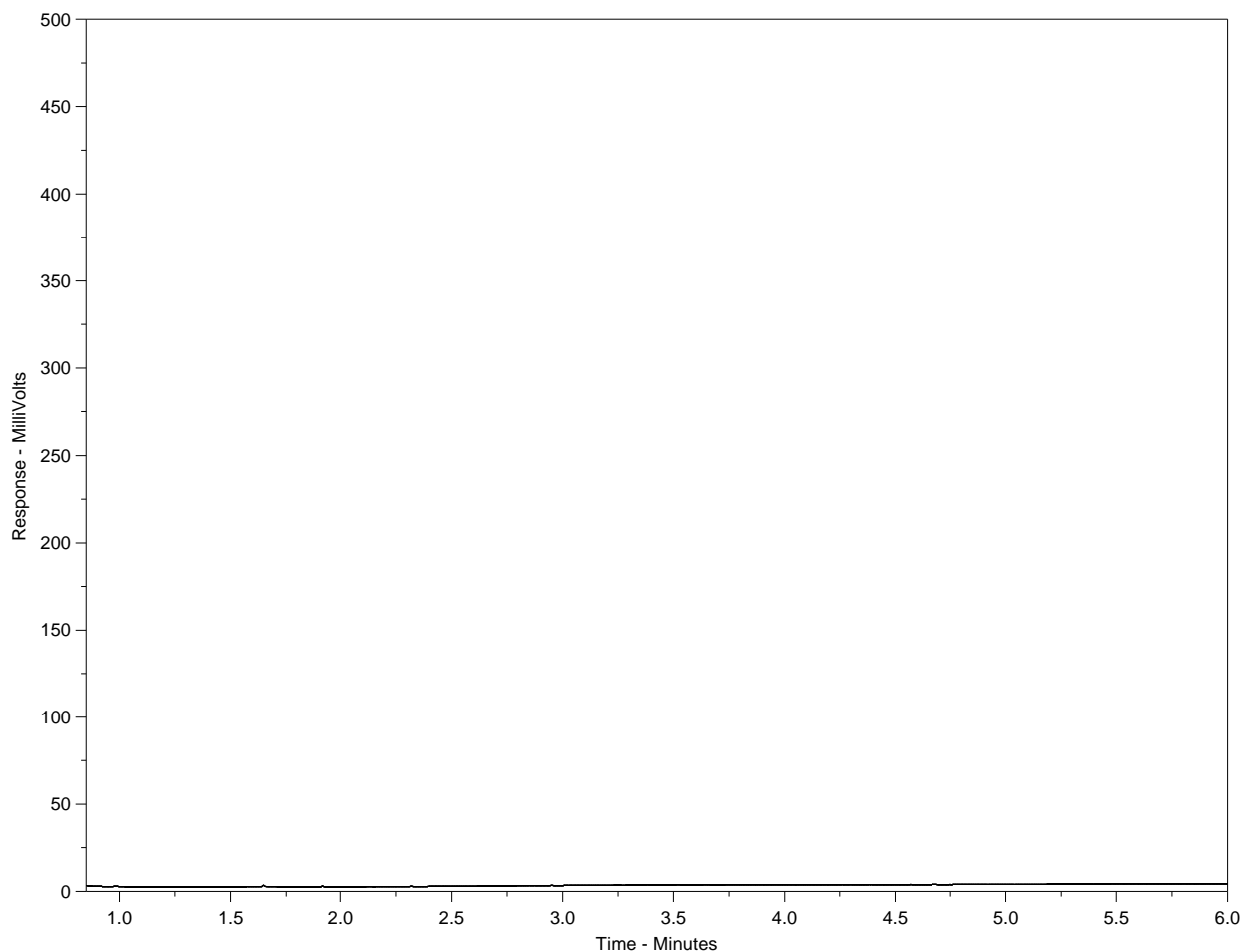
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L1499441-3
Client ID: 16053140808040



F2		F3		F4		F4	
nC10	nC16	nC34	nC50				
174°C	287°C	481°C	575°C				
346°F	549°F	898°F	1067°F				
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.



Matrix Solutions Inc.
ATTN: SUE RAYNARD
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Date Received: 29-OCT-14
Report Date: 12-NOV-14 17:27 (MT)
Version: FINAL

Client Phone: 403-513-2275

Certificate of Analysis

Lab Work Order #: L1539572
Project P.O. #: NOT SUBMITTED
Job Reference: 16053-502 NAOS GUM
C of C Numbers: M050661
Legal Site Desc: site 2 (08-11-090-12 w4m)

Nicole Thibault
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1539572-1 16053141028001									
Sampled By: jl/bp on 28-OCT-14 @ 12:44									
Matrix: h2o									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		31-OCT-14	R3038028
Toluene	<0.00050	-		0.00050	mg/L	-		31-OCT-14	R3038028
EthylBenzene	<0.00050	-		0.00050	mg/L	-		31-OCT-14	R3038028
o-Xylene	<0.00050	-		0.00050	mg/L	-		31-OCT-14	R3038028
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		31-OCT-14	R3038028
Styrene	<0.0010	-		0.0010	mg/L	-		31-OCT-14	R3038028
F1(C6-C10)	<0.10	-		0.10	mg/L	-		31-OCT-14	R3038028
F1-BTEX	<0.10	-		0.10	mg/L	-		31-OCT-14	R3038028
Xylenes	<0.00071	-		0.00071	mg/L	-		31-OCT-14	R3038028
Surr: 1,4-Difluorobenzene (SS)	101.9	-		N/A	%	-		31-OCT-14	R3038028
Surr: 4-Bromofluorobenzene (SS)	87.8	-		N/A	%	-		31-OCT-14	R3038028
Surr: 3,4-Dichlorotoluene (SS)	98.9	-		N/A	%	-		31-OCT-14	R3038028
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	31-OCT-14	31-OCT-14	R3041632
F3 (C16-C34)	0.36	+/-0.13		0.25	mg/L	0	31-OCT-14	31-OCT-14	R3041632
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	31-OCT-14	31-OCT-14	R3041632
Surr: 2-Bromobenzotrifluoride	106.5	-		N/A	%	-	31-OCT-14	31-OCT-14	R3041632
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	0.0000054	+/-0.0000042		0.000005 0	mg/L	0		05-NOV-14	R3053628
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	1.40	+/-0.22		0.0030	mg/L	0		07-NOV-14	R3060749
Antimony (Sb)-Total	<0.00040	-		0.00040	mg/L	-		07-NOV-14	R3060749
Arsenic (As)-Total	0.0116	+/-0.0013		0.00040	mg/L	0		07-NOV-14	R3060749
Barium (Ba)-Total	0.0552	+/-0.0062		0.0050	mg/L	0		07-NOV-14	R3060749
Boron (B)-Total	2.75	+/-0.44		0.050	mg/L	0		07-NOV-14	R3060749
Cadmium (Cd)-Total	<0.00020	-		0.00020	mg/L	-		07-NOV-14	R3060749
Calcium (Ca)-Total	1.72	+/-0.21		0.50	mg/L	0		07-NOV-14	R3060749
Chromium (Cr)-Total	<0.0050	-		0.0050	mg/L	-		07-NOV-14	R3060749
Copper (Cu)-Total	0.0196	+/-0.0023		0.0010	mg/L	0		07-NOV-14	R3060749
Iron (Fe)-Total	24.4	+/-3.9		0.010	mg/L	0		07-NOV-14	R3060749
Lead (Pb)-Total	0.0153	+/-0.0024		0.00010	mg/L	0		07-NOV-14	R3060749
Magnesium (Mg)-Total	1.20	+/-0.15		0.10	mg/L	0		07-NOV-14	R3060749
Manganese (Mn)-Total	0.266	+/-0.027		0.0020	mg/L	0		07-NOV-14	R3060749
Nickel (Ni)-Total	0.0055	+/-0.0006		0.0020	mg/L	0		07-NOV-14	R3060749
Potassium (K)-Total	2.59	+/-0.32		0.10	mg/L	0		07-NOV-14	R3060749
Selenium (Se)-Total	<0.00040	-		0.00040	mg/L	-		07-NOV-14	R3060749
Silicon (Si)-Total	5.85	+/-1.2		0.050	mg/L	0		07-NOV-14	R3060749
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		07-NOV-14	R3060749
Sodium (Na)-Total	389	+/-48		1.0	mg/L	0		07-NOV-14	R3060749
Uranium (U)-Total	0.00021	+/-0.00003		0.00010	mg/L	0		07-NOV-14	R3060749
Zinc (Zn)-Total	0.328	+/-0.050		0.0040	mg/L	0		07-NOV-14	R3060749
Miscellaneous Parameters									
Ammonia, Total (as N)	1.09	-		0.050	mg/L	-		06-NOV-14	R3054991
Dissolved Organic Carbon	6.8	+/-0.9		1.0	mg/L	0		06-NOV-14	R3058368
Naphthenic Acids	1.1	+/-0.4		1.0	mg/L	0	05-NOV-14	06-NOV-14	R3056249
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		12-NOV-14	R3070110
Total Dissolved Solids	944	+/-63		10	mg/L	0		31-OCT-14	R3041659
Silicon (as SiO2)-Total	12.5	-		0.11	mg/L	-		07-NOV-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1539572-1 16053141028001									
Sampled By: jl/bp on 28-OCT-14 @ 12:44									
Matrix: h2o									
Turbidity	103	+/-5.7		0.10	NTU	0		30-OCT-14	R3041958
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Anthracene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Fluoranthene	<0.000020	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Fluorene	<0.000020	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Naphthalene	0.000061	-		0.000050	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Phenanthrene	<0.000050	-		0.000050	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Pyrene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Benzo(a)pyrene	<0.0000050	-		0.000005	mg/L	-	31-OCT-14	01-NOV-14	R3045490
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	31-OCT-14	01-NOV-14	R3045490
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Surr: d10-Acenaphthene	99.5	-		N/A	%	-	31-OCT-14	01-NOV-14	R3045490
Surr: d10-Phenanthrene	96.3	-		N/A	%	-	31-OCT-14	01-NOV-14	R3045490
Surr: d12-Chrysene	81.9	-		N/A	%	-	31-OCT-14	01-NOV-14	R3045490
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	3.40	+/-0.22		0.50	mg/L	0		31-OCT-14	R3040389
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		07-NOV-14	R3060729
Antimony (Sb)-Dissolved	<0.00040	-	DLM	0.00040	mg/L	-		07-NOV-14	R3060729
Arsenic (As)-Dissolved	0.00123	+/-0.00013	DLM	0.00040	mg/L	0		07-NOV-14	R3060729
Barium (Ba)-Dissolved	0.0142	+/-0.0012	DLM	0.0050	mg/L	0		07-NOV-14	R3060729
Boron (B)-Dissolved	2.21	+/-0.27	DLM	0.050	mg/L	0		07-NOV-14	R3060729
Cadmium (Cd)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		07-NOV-14	R3060729
Calcium (Ca)-Dissolved	1.14	+/-0.16	DLM	0.50	mg/L	0		07-NOV-14	R3060729
Chromium (Cr)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		07-NOV-14	R3060729
Copper (Cu)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		07-NOV-14	R3060729
Iron (Fe)-Dissolved	0.046	+/-0.004	DLM	0.020	mg/L	0		07-NOV-14	R3060729
Lead (Pb)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		07-NOV-14	R3060729
Magnesium (Mg)-Dissolved	0.56	+/-0.04	DLM	0.10	mg/L	0		07-NOV-14	R3060729
Manganese (Mn)-Dissolved	0.0094	+/-0.0006	DLM	0.0020	mg/L	0		07-NOV-14	R3060729
Nickel (Ni)-Dissolved	<0.0020	-	DLM	0.0020	mg/L	-		07-NOV-14	R3060729
Potassium (K)-Dissolved	3.01	+/-0.23	DLM	0.10	mg/L	0		07-NOV-14	R3060729
Selenium (Se)-Dissolved	<0.00040	-	DLM	0.00040	mg/L	-		07-NOV-14	R3060729
Silicon (Si)-Dissolved	2.14	+/-0.18	DLM	0.10	mg/L	0		07-NOV-14	R3060729
Silver (Ag)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		07-NOV-14	R3060729
Sodium (Na)-Dissolved	371	+/-26	DLM	1.0	mg/L	0		07-NOV-14	R3060729
Uranium (U)-Dissolved	0.00013	+/-0.00001	DLM	0.00010	mg/L	0		07-NOV-14	R3060729
Zinc (Zn)-Dissolved	<0.0030	-	DLM	0.0030	mg/L	-		07-NOV-14	R3060729
Ion Balance Calculation									
Ion Balance	92.0	-			%	-		07-NOV-14	
TDS (Calculated)	947	-			mg/L	-		07-NOV-14	
Hardness (as CaCO3)	5.2	-			mg/L	-		07-NOV-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1539572-1 16053141028001 Sampled By: jl/bp on 28-OCT-14 @ 12:44 Matrix: h2o									
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.000005 0	mg/L	-		05-NOV-14	R3053628
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		31-OCT-14	R3040389
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		06-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		31-OCT-14	R3040389
Sulfate by IC									
Sulfate (SO4)	95.2	+/-5.4		0.50	mg/L	0		31-OCT-14	R3040389
pH, Conductivity and Total Alkalinity									
pH	9.20	+/-0.01		0.10	pH	0		06-NOV-14	R3054968
Conductivity (EC)	1550	+/-77		0.20	uS/cm	0		06-NOV-14	R3054968
Bicarbonate (HCO3)	717	+/-27		5.0	mg/L	0		06-NOV-14	R3054968
Carbonate (CO3)	120	+/-16		5.0	mg/L	0		06-NOV-14	R3054968
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		06-NOV-14	R3054968
Alkalinity, Total (as CaCO3)	787	+/-49		2.0	mg/L	0		06-NOV-14	R3054968
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	4.58	-		0.21	mg/L	-		07-NOV-14	
L1539572-2 16053141028002 Sampled By: jl/bp on 28-OCT-14 @ 14:15 Matrix: h2o									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		31-OCT-14	R3038028
Toluene	<0.00050	-		0.00050	mg/L	-		31-OCT-14	R3038028
EthylBenzene	<0.00050	-		0.00050	mg/L	-		31-OCT-14	R3038028
o-Xylene	<0.00050	-		0.00050	mg/L	-		31-OCT-14	R3038028
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		31-OCT-14	R3038028
Styrene	<0.0010	-		0.0010	mg/L	-		31-OCT-14	R3038028
F1(C6-C10)	<0.10	-		0.10	mg/L	-		31-OCT-14	R3038028
F1-BTEX	<0.10	-		0.10	mg/L	-		31-OCT-14	R3038028
Xylenes	<0.00071	-		0.00071	mg/L	-		31-OCT-14	R3038028
Surr: 1,4-Difluorobenzene (SS)	100.7	-		N/A	%	-		31-OCT-14	R3038028
Surr: 4-Bromofluorobenzene (SS)	87.8	-		N/A	%	-		31-OCT-14	R3038028
Surr: 3,4-Dichlorotoluene (SS)	93.5	-		N/A	%	-		31-OCT-14	R3038028
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	31-OCT-14	31-OCT-14	R3041632
F3 (C16-C34)	0.41	+/-0.14		0.25	mg/L	0	31-OCT-14	31-OCT-14	R3041632
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	31-OCT-14	31-OCT-14	R3041632
Surr: 2-Bromobenzotrifluoride	107.4	-		N/A	%	-	31-OCT-14	31-OCT-14	R3041632
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.000005 0	mg/L	-		05-NOV-14	R3053628
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.197	+/-0.032		0.0030	mg/L	0		07-NOV-14	R3060749
Antimony (Sb)-Total	0.00041	+/-0.00008		0.00040	mg/L	0		07-NOV-14	R3060749
Arsenic (As)-Total	0.00468	+/-0.00055		0.00040	mg/L	0		07-NOV-14	R3060749
Barium (Ba)-Total	0.111	+/-0.012		0.0050	mg/L	0		07-NOV-14	R3060749
Boron (B)-Total	<0.050	-		0.050	mg/L	-		07-NOV-14	R3060749

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1539572-2 16053141028002									
Sampled By: jl/bp on 28-OCT-14 @ 14:15									
Matrix: h2o									
Total Metals in Water by CRC ICPMS									
Cadmium (Cd)-Total	<0.00020	-		0.00020	mg/L	-		07-NOV-14	R3060749
Calcium (Ca)-Total	64.5	+/-7.6		0.50	mg/L	0		07-NOV-14	R3060749
Chromium (Cr)-Total	0.0121	+/-0.0018		0.0050	mg/L	0		07-NOV-14	R3060749
Copper (Cu)-Total	0.0495	+/-0.0058		0.0010	mg/L	0		07-NOV-14	R3060749
Iron (Fe)-Total	30.7	+/-4.9		0.010	mg/L	0		07-NOV-14	R3060749
Lead (Pb)-Total	0.0521	+/-0.0082		0.00010	mg/L	0		07-NOV-14	R3060749
Magnesium (Mg)-Total	6.13	+/-0.74		0.10	mg/L	0		07-NOV-14	R3060749
Manganese (Mn)-Total	0.513	+/-0.052		0.0020	mg/L	0		07-NOV-14	R3060749
Nickel (Ni)-Total	0.0232	+/-0.0025		0.0020	mg/L	0		07-NOV-14	R3060749
Potassium (K)-Total	0.70	+/-0.08		0.10	mg/L	0		07-NOV-14	R3060749
Selenium (Se)-Total	<0.00040	-		0.00040	mg/L	-		07-NOV-14	R3060749
Silicon (Si)-Total	2.09	+/-0.41		0.050	mg/L	0		07-NOV-14	R3060749
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		07-NOV-14	R3060749
Sodium (Na)-Total	3.2	+/-0.4		1.0	mg/L	0		07-NOV-14	R3060749
Uranium (U)-Total	0.00012	+/-0.00002		0.00010	mg/L	0		07-NOV-14	R3060749
Zinc (Zn)-Total	0.116	+/-0.018		0.0040	mg/L	0		07-NOV-14	R3060749
Miscellaneous Parameters									
Ammonia, Total (as N)	0.107	-		0.050	mg/L	-		06-NOV-14	R3054991
Dissolved Organic Carbon	3.4	+/-0.6		1.0	mg/L	0		07-NOV-14	R3058368
Naphthenic Acids	<1.0	-		1.0	mg/L	-	05-NOV-14	06-NOV-14	R3056249
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		12-NOV-14	R3070110
Total Dissolved Solids	211	+/-15		10	mg/L	0		31-OCT-14	R3041659
Silicon (as SiO2)-Total	4.47	-		0.11	mg/L	-		07-NOV-14	
Turbidity	182	+/-10		0.10	NTU	0		30-OCT-14	R3041958
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Anthracene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Fluoranthene	<0.000020	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Fluorene	<0.000020	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Naphthalene	0.000071	-		0.000050	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Phenanthrene	<0.000050	-		0.000050	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Pyrene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Benzo(a)pyrene	<0.0000050	-		0.000005	mg/L	-	31-OCT-14	01-NOV-14	R3045490
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	31-OCT-14	01-NOV-14	R3045490
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Surr: d10-Acenaphthene	99.6	-		N/A	%	-	31-OCT-14	01-NOV-14	R3045490
Surr: d10-Phenanthrene	91.5	-		N/A	%	-	31-OCT-14	01-NOV-14	R3045490
Surr: d12-Chrysene	76.4	-		N/A	%	-	31-OCT-14	01-NOV-14	R3045490
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	<0.50	-		0.50	mg/L	-		31-OCT-14	R3040389
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-		07-NOV-14	R3060729

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1539572-2 16053141028002 Sampled By: jl/bp on 28-OCT-14 @ 14:15 Matrix: h2o									
Dissolved Metals in Water by CRC ICPMS									
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-		07-NOV-14	R3060729
Arsenic (As)-Dissolved	0.00048	+/-0.00005		0.00040	mg/L	0		07-NOV-14	R3060729
Barium (Ba)-Dissolved	0.112	+/-0.0097		0.0050	mg/L	0		07-NOV-14	R3060729
Boron (B)-Dissolved	<0.050	-		0.050	mg/L	-		07-NOV-14	R3060729
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		07-NOV-14	R3060729
Calcium (Ca)-Dissolved	64.0	+/-8.7	RRV	0.50	mg/L	0		07-NOV-14	R3060729
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		07-NOV-14	R3060729
Copper (Cu)-Dissolved	<0.0010	-		0.0010	mg/L	-		07-NOV-14	R3060729
Iron (Fe)-Dissolved	3.61	+/-0.33		0.010	mg/L	0		07-NOV-14	R3060729
Lead (Pb)-Dissolved	<0.00010	-		0.00010	mg/L	-		07-NOV-14	R3060729
Magnesium (Mg)-Dissolved	5.56	+/-0.43	RRV	0.10	mg/L	0		07-NOV-14	R3060729
Manganese (Mn)-Dissolved	0.261	+/-0.018		0.0020	mg/L	0		07-NOV-14	R3060729
Nickel (Ni)-Dissolved	<0.0020	-		0.0020	mg/L	-		07-NOV-14	R3060729
Potassium (K)-Dissolved	0.65	+/-0.05	RRV	0.10	mg/L	0		07-NOV-14	R3060729
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-		07-NOV-14	R3060729
Silicon (Si)-Dissolved	2.22	+/-0.19		0.050	mg/L	0		07-NOV-14	R3060729
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		07-NOV-14	R3060729
Sodium (Na)-Dissolved	3.2	+/-0.2	RRV	1.0	mg/L	0		07-NOV-14	R3060729
Uranium (U)-Dissolved	<0.00010	-		0.00010	mg/L	-		07-NOV-14	R3060729
Zinc (Zn)-Dissolved	0.0033	+/-0.0005		0.0030	mg/L	0		07-NOV-14	R3060729
Ion Balance Calculation									
Ion Balance	101	-			%	-		12-NOV-14	
TDS (Calculated)	187	-			mg/L	-		12-NOV-14	
Hardness (as CaCO3)	183	-			mg/L	-		12-NOV-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		05-NOV-14	R3053628
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		31-OCT-14	R3040389
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		06-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		31-OCT-14	R3040389
Sulfate by IC									
Sulfate (SO4)	1.86	+/-0.15		0.50	mg/L	0		31-OCT-14	R3040389
pH, Conductivity and Total Alkalinity									
pH	7.94	+/-0.01		0.10	pH	0		12-NOV-14	R3068828
Conductivity (EC)	342	+/-17		0.20	uS/cm	0		12-NOV-14	R3068828
Bicarbonate (HCO3)	227	+/-9.4		5.0	mg/L	0		12-NOV-14	R3068828
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		12-NOV-14	R3068828
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		12-NOV-14	R3068828
Alkalinity, Total (as CaCO3)	186	+/-12		2.0	mg/L	0		12-NOV-14	R3068828
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	4.74	-		0.11	mg/L	-		07-NOV-14	
L1539572-3 16053141028003 Sampled By: jl/bp on 28-OCT-14 @ 12:44 Matrix: h2o									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		31-OCT-14	R3038028
Toluene	<0.00050	-		0.00050	mg/L	-		31-OCT-14	R3038028

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1539572-3 16053141028003									
Sampled By: jl/bp on 28-OCT-14 @ 12:44									
Matrix: h2o									
BTEX, Styrene and F1 (C6-C10)									
EthylBenzene	<0.00050	-		0.00050	mg/L	-		31-OCT-14	R3038028
o-Xylene	<0.00050	-		0.00050	mg/L	-		31-OCT-14	R3038028
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		31-OCT-14	R3038028
Styrene	<0.0010	-		0.0010	mg/L	-		31-OCT-14	R3038028
F1(C6-C10)	<0.10	-		0.10	mg/L	-		31-OCT-14	R3038028
F1-BTEX	<0.10	-		0.10	mg/L	-		31-OCT-14	R3038028
Xylenes	<0.00071	-		0.00071	mg/L	-		31-OCT-14	R3038028
Surr: 1,4-Difluorobenzene (SS)	98.8	-		N/A	%	-		31-OCT-14	R3038028
Surr: 4-Bromofluorobenzene (SS)	89.8	-		N/A	%	-		31-OCT-14	R3038028
Surr: 3,4-Dichlorotoluene (SS)	94.5	-		N/A	%	-		31-OCT-14	R3038028
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	31-OCT-14	31-OCT-14	R3041632
F3 (C16-C34)	0.43	+/-0.14		0.25	mg/L	0	31-OCT-14	31-OCT-14	R3041632
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	31-OCT-14	31-OCT-14	R3041632
Surr: 2-Bromobenzotrifluoride	98.9	-		N/A	%	-	31-OCT-14	31-OCT-14	R3041632
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		05-NOV-14	R3053628
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	1.25	+/-0.20		0.0030	mg/L	0		07-NOV-14	R3060749
Antimony (Sb)-Total	<0.00040	-		0.00040	mg/L	-		07-NOV-14	R3060749
Arsenic (As)-Total	0.0111	+/-0.0013		0.00040	mg/L	0		07-NOV-14	R3060749
Barium (Ba)-Total	0.0506	+/-0.0057		0.0050	mg/L	0		07-NOV-14	R3060749
Boron (B)-Total	2.67	+/-0.43		0.050	mg/L	0		07-NOV-14	R3060749
Cadmium (Cd)-Total	<0.00020	-		0.00020	mg/L	-		07-NOV-14	R3060749
Calcium (Ca)-Total	1.73	+/-0.21		0.50	mg/L	0		07-NOV-14	R3060749
Chromium (Cr)-Total	<0.0050	-		0.0050	mg/L	-		07-NOV-14	R3060749
Copper (Cu)-Total	0.0188	+/-0.0022		0.0010	mg/L	0		07-NOV-14	R3060749
Iron (Fe)-Total	23.3	+/-3.7		0.010	mg/L	0		07-NOV-14	R3060749
Lead (Pb)-Total	0.0150	+/-0.0024		0.00010	mg/L	0		07-NOV-14	R3060749
Magnesium (Mg)-Total	1.12	+/-0.14		0.10	mg/L	0		07-NOV-14	R3060749
Manganese (Mn)-Total	0.251	+/-0.025		0.0020	mg/L	0		07-NOV-14	R3060749
Nickel (Ni)-Total	0.0052	+/-0.0006		0.0020	mg/L	0		07-NOV-14	R3060749
Potassium (K)-Total	2.46	+/-0.30		0.10	mg/L	0		07-NOV-14	R3060749
Selenium (Se)-Total	<0.00040	-		0.00040	mg/L	-		07-NOV-14	R3060749
Silicon (Si)-Total	5.15	+/-1.0		0.050	mg/L	0		07-NOV-14	R3060749
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		07-NOV-14	R3060749
Sodium (Na)-Total	390	+/-48		1.0	mg/L	0		07-NOV-14	R3060749
Uranium (U)-Total	0.00019	+/-0.00003		0.00010	mg/L	0		07-NOV-14	R3060749
Zinc (Zn)-Total	0.308	+/-0.047		0.0040	mg/L	0		07-NOV-14	R3060749
Miscellaneous Parameters									
Ammonia, Total (as N)	0.998	-		0.050	mg/L	-		06-NOV-14	R3054991
Dissolved Organic Carbon	6.6	+/-0.9		1.0	mg/L	0		07-NOV-14	R3058368
Naphthenic Acids	<1.0	-		1.0	mg/L	-	05-NOV-14	06-NOV-14	R3056249
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		12-NOV-14	R3070110
Total Dissolved Solids	954	+/-64		10	mg/L	0		31-OCT-14	R3041659
Silicon (as SiO2)-Total	11.0	-		0.11	mg/L	-		07-NOV-14	
Turbidity	98.0	+/-5.4		0.10	NTU	0		30-OCT-14	R3041958
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1539572-3 16053141028003									
Sampled By: jl/bp on 28-OCT-14 @ 12:44									
Matrix: h2o									
PAH & Carcinogenic PAH List									
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Anthracene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Fluoranthene	<0.000020	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Fluorene	<0.000020	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Naphthalene	<0.000050	-		0.000050	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Phenanthrene	<0.000050	-		0.000050	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Pyrene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Benzo(a)pyrene	<0.000050	-		0.000005	mg/L	-	31-OCT-14	01-NOV-14	R3045490
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Dibenzo(a,h)anthracene	<0.000050	-		0.000005	mg/L	-	31-OCT-14	01-NOV-14	R3045490
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Surr: d10-Acenaphthene	98.4	-		N/A	%	-	31-OCT-14	01-NOV-14	R3045490
Surr: d10-Phenanthrene	96.1	-		N/A	%	-	31-OCT-14	01-NOV-14	R3045490
Surr: d12-Chrysene	82.3	-		N/A	%	-	31-OCT-14	01-NOV-14	R3045490
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	3.36	+/-0.21		0.50	mg/L	0		31-OCT-14	R3040389
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		07-NOV-14	R3060729
Antimony (Sb)-Dissolved	<0.00040	-	DLM	0.00040	mg/L	-		07-NOV-14	R3060729
Arsenic (As)-Dissolved	0.00122	+/-0.00013	DLM	0.00040	mg/L	0		07-NOV-14	R3060729
Barium (Ba)-Dissolved	0.0148	+/-0.0013	DLM	0.0050	mg/L	0		07-NOV-14	R3060729
Boron (B)-Dissolved	2.19	+/-0.27	DLM	0.050	mg/L	0		07-NOV-14	R3060729
Cadmium (Cd)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		07-NOV-14	R3060729
Calcium (Ca)-Dissolved	1.10	+/-0.15	DLM	0.50	mg/L	0		07-NOV-14	R3060729
Chromium (Cr)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		07-NOV-14	R3060729
Copper (Cu)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		07-NOV-14	R3060729
Iron (Fe)-Dissolved	0.056	+/-0.005	DLM	0.020	mg/L	0		07-NOV-14	R3060729
Lead (Pb)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		07-NOV-14	R3060729
Magnesium (Mg)-Dissolved	0.57	+/-0.04	DLM	0.10	mg/L	0		07-NOV-14	R3060729
Manganese (Mn)-Dissolved	0.0109	+/-0.0007	DLM	0.0020	mg/L	0		07-NOV-14	R3060729
Nickel (Ni)-Dissolved	<0.0020	-	DLM	0.0020	mg/L	-		07-NOV-14	R3060729
Potassium (K)-Dissolved	2.99	+/-0.23	DLM	0.10	mg/L	0		07-NOV-14	R3060729
Selenium (Se)-Dissolved	<0.00040	-	DLM	0.00040	mg/L	-		07-NOV-14	R3060729
Silicon (Si)-Dissolved	2.18	+/-0.18	DLM	0.10	mg/L	0		07-NOV-14	R3060729
Silver (Ag)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		07-NOV-14	R3060729
Sodium (Na)-Dissolved	373	+/-26	DLM	1.0	mg/L	0		07-NOV-14	R3060729
Uranium (U)-Dissolved	0.00012	+/-0.00001	DLM	0.00010	mg/L	0		07-NOV-14	R3060729
Zinc (Zn)-Dissolved	<0.0030	-	DLM	0.0030	mg/L	-		07-NOV-14	R3060729
Ion Balance Calculation									
Ion Balance	94.2	-			%	-		07-NOV-14	
TDS (Calculated)	938	-			mg/L	-		07-NOV-14	
Hardness (as CaCO3)	5.1	-			mg/L	-		07-NOV-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	0.0000064	-		0.000005	mg/L	-		05-NOV-14	R3053628

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1539572-3 16053141028003 Sampled By: jl/bp on 28-OCT-14 @ 12:44 Matrix: h2o									
Mercury (Hg) - Dissolved									
				0					
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		31-OCT-14	R3040389
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		06-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		31-OCT-14	R3040389
Sulfate by IC									
Sulfate (SO4)	95.3	+/-5.4		0.50	mg/L	0		31-OCT-14	R3040389
pH, Conductivity and Total Alkalinity									
pH	9.19	+/-0.01		0.10	pH	0		06-NOV-14	R3054968
Conductivity (EC)	1530	+/-76		0.20	uS/cm	0		06-NOV-14	R3054968
Bicarbonate (HCO3)	708	+/-27		5.0	mg/L	0		06-NOV-14	R3054968
Carbonate (CO3)	114	+/-15		5.0	mg/L	0		06-NOV-14	R3054968
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		06-NOV-14	R3054968
Alkalinity, Total (as CaCO3)	770	+/-48		2.0	mg/L	0		06-NOV-14	R3054968
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	4.66	-		0.21	mg/L	-		07-NOV-14	
L1539572-4 16053141028004 Sampled By: jl/bp on 28-OCT-14 @ 15:15 Matrix: h2o									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		31-OCT-14	R3038028
Toluene	<0.00050	-		0.00050	mg/L	-		31-OCT-14	R3038028
EthylBenzene	<0.00050	-		0.00050	mg/L	-		31-OCT-14	R3038028
o-Xylene	<0.00050	-		0.00050	mg/L	-		31-OCT-14	R3038028
m+p-Xylene	0.00068	-		0.00050	mg/L	-		31-OCT-14	R3038028
Styrene	<0.0010	-		0.0010	mg/L	-		31-OCT-14	R3038028
F1(C6-C10)	<0.10	-		0.10	mg/L	-		31-OCT-14	R3038028
F1-BTEX	<0.10	-		0.10	mg/L	-		31-OCT-14	R3038028
Xylenes	<0.00071	-		0.00071	mg/L	-		31-OCT-14	R3038028
Surr:	1,4-Difluorobenzene (SS)	98.5	-	N/A	%	-		31-OCT-14	R3038028
Surr:	4-Bromofluorobenzene (SS)	88.9	-	N/A	%	-		31-OCT-14	R3038028
Surr:	3,4-Dichlorotoluene (SS)	98.1	-	N/A	%	-		31-OCT-14	R3038028
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	31-OCT-14	31-OCT-14	R3041632
F3 (C16-C34)	0.37	+/-0.13		0.25	mg/L	0	31-OCT-14	31-OCT-14	R3041632
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	31-OCT-14	31-OCT-14	R3041632
Surr:	2-Bromobenzotrifluoride	111.1	-	N/A	%	-	31-OCT-14	31-OCT-14	R3041632
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	0.0000051	+/-0.0000042		0.0000050	mg/L	0		07-NOV-14	R3053628
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.983	+/-0.16		0.0030	mg/L	0		07-NOV-14	R3060749
Antimony (Sb)-Total	0.00043	+/-0.00009		0.00040	mg/L	0		07-NOV-14	R3060749
Arsenic (As)-Total	0.00843	+/-0.00098		0.00040	mg/L	0		07-NOV-14	R3060749
Barium (Ba)-Total	0.0165	+/-0.0019		0.0050	mg/L	0		07-NOV-14	R3060749
Boron (B)-Total	1.33	+/-0.21		0.050	mg/L	0		07-NOV-14	R3060749
Cadmium (Cd)-Total	<0.00020	-		0.00020	mg/L	-		07-NOV-14	R3060749

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1539572-4 16053141028004									
Sampled By: jl/bp on 28-OCT-14 @ 15:15									
Matrix: h2o									
Total Metals in Water by CRC ICPMS									
Calcium (Ca)-Total	9.87	+/-1.2		0.50	mg/L	0		07-NOV-14	R3060749
Chromium (Cr)-Total	0.0306	+/-0.0044		0.0050	mg/L	0		07-NOV-14	R3060749
Copper (Cu)-Total	0.0219	+/-0.0026		0.0010	mg/L	0		07-NOV-14	R3060749
Iron (Fe)-Total	30.7	+/-4.9		0.010	mg/L	0		07-NOV-14	R3060749
Lead (Pb)-Total	0.0377	+/-0.0060		0.00010	mg/L	0		07-NOV-14	R3060749
Magnesium (Mg)-Total	3.95	+/-0.48		0.10	mg/L	0		07-NOV-14	R3060749
Manganese (Mn)-Total	0.517	+/-0.052		0.0020	mg/L	0		07-NOV-14	R3060749
Nickel (Ni)-Total	0.0081	+/-0.0009		0.0020	mg/L	0		07-NOV-14	R3060749
Potassium (K)-Total	4.02	+/-0.49		0.10	mg/L	0		07-NOV-14	R3060749
Selenium (Se)-Total	<0.00040	-		0.00040	mg/L	-		07-NOV-14	R3060749
Silicon (Si)-Total	3.26	+/-0.65		0.050	mg/L	0		07-NOV-14	R3060749
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		07-NOV-14	R3060749
Sodium (Na)-Total	199	+/-24		1.0	mg/L	0		07-NOV-14	R3060749
Uranium (U)-Total	0.00013	+/-0.00002		0.00010	mg/L	0		07-NOV-14	R3060749
Zinc (Zn)-Total	0.212	+/-0.033		0.0040	mg/L	0		07-NOV-14	R3060749
Miscellaneous Parameters									
Ammonia, Total (as N)	1.24	-		0.050	mg/L	-		06-NOV-14	R3054991
Dissolved Organic Carbon	13.5	+/-1.6		1.0	mg/L	0		07-NOV-14	R3058368
Naphthenic Acids	<1.0	-		1.0	mg/L	-	05-NOV-14	06-NOV-14	R3056249
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		12-NOV-14	R3070110
Total Dissolved Solids	543	+/-36		10	mg/L	0		31-OCT-14	R3041659
Silicon (as SiO2)-Total	6.98	-		0.11	mg/L	-		07-NOV-14	
Turbidity	215	+/-12		0.10	NTU	0		30-OCT-14	R3041958
PAH & Carcinogenic PAH List									
Acenaphthene	0.000025	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Anthracene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Fluoranthene	<0.000020	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Fluorene	<0.000020	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Naphthalene	0.000054	-		0.000050	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Phenanthrene	<0.000050	-		0.000050	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Pyrene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Benzo(a)pyrene	<0.0000050	-		0.000005	mg/L	-	31-OCT-14	01-NOV-14	R3045490
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	31-OCT-14	01-NOV-14	R3045490
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	31-OCT-14	01-NOV-14	R3045490
Surr: d10-Acenaphthene	95.6	-		N/A	%	-	31-OCT-14	01-NOV-14	R3045490
Surr: d10-Phenanthrene	88.7	-		N/A	%	-	31-OCT-14	01-NOV-14	R3045490
Surr: d12-Chrysene	68.0	-		N/A	%	-	31-OCT-14	01-NOV-14	R3045490
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	1.86	+/-0.14		0.50	mg/L	0		31-OCT-14	R3040389
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-		07-NOV-14	R3060729
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-		07-NOV-14	R3060729

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1539572-4 16053141028004									
Sampled By: jl/bp on 28-OCT-14 @ 15:15									
Matrix: h2o									
Dissolved Metals in Water by CRC ICPMS									
Arsenic (As)-Dissolved	0.00123	+/-0.00013		0.00040	mg/L	0		07-NOV-14	R3060729
Barium (Ba)-Dissolved	<0.0050	-		0.0050	mg/L	-		07-NOV-14	R3060729
Boron (B)-Dissolved	1.23	+/-0.15		0.050	mg/L	0		07-NOV-14	R3060729
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		07-NOV-14	R3060729
Calcium (Ca)-Dissolved	9.26	+/-1.3		0.50	mg/L	0		07-NOV-14	R3060729
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		07-NOV-14	R3060729
Copper (Cu)-Dissolved	<0.0010	-		0.0010	mg/L	-		07-NOV-14	R3060729
Iron (Fe)-Dissolved	0.012	+/-0.001		0.010	mg/L	0		07-NOV-14	R3060729
Lead (Pb)-Dissolved	<0.00010	-		0.00010	mg/L	-		07-NOV-14	R3060729
Magnesium (Mg)-Dissolved	3.69	+/-0.29		0.10	mg/L	0		07-NOV-14	R3060729
Manganese (Mn)-Dissolved	0.0709	+/-0.0048		0.0020	mg/L	0		07-NOV-14	R3060729
Nickel (Ni)-Dissolved	<0.0020	-		0.0020	mg/L	-		07-NOV-14	R3060729
Potassium (K)-Dissolved	3.87	+/-0.30		0.10	mg/L	0		07-NOV-14	R3060729
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-		07-NOV-14	R3060729
Silicon (Si)-Dissolved	0.907	+/-0.076		0.050	mg/L	0		07-NOV-14	R3060729
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		07-NOV-14	R3060729
Sodium (Na)-Dissolved	201	+/-14		1.0	mg/L	0		07-NOV-14	R3060729
Uranium (U)-Dissolved	<0.00010	-		0.00010	mg/L	-		07-NOV-14	R3060729
Zinc (Zn)-Dissolved	<0.0030	-		0.0030	mg/L	-		07-NOV-14	R3060729
Ion Balance Calculation									
Ion Balance	97.3	-			%	-		07-NOV-14	
TDS (Calculated)	521	-			mg/L	-		07-NOV-14	
Hardness (as CaCO3)	38.3	-			mg/L	-		07-NOV-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		07-NOV-14	R3053628
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		31-OCT-14	R3040389
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		06-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		31-OCT-14	R3040389
Sulfate by IC									
Sulfate (SO4)	10.7	+/-0.62		0.50	mg/L	0		31-OCT-14	R3040389
pH, Conductivity and Total Alkalinity									
pH	8.86	+/-0.01		0.10	pH	0		06-NOV-14	R3054968
Conductivity (EC)	846	+/-42		0.20	uS/cm	0		06-NOV-14	R3054968
Bicarbonate (HCO3)	514	+/-20		5.0	mg/L	0		06-NOV-14	R3054968
Carbonate (CO3)	38.1	+/-5.8		5.0	mg/L	0		06-NOV-14	R3054968
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		06-NOV-14	R3054968
Alkalinity, Total (as CaCO3)	485	+/-31		2.0	mg/L	0		06-NOV-14	R3054968
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	1.94	-		0.11	mg/L	-		07-NOV-14	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Mercury (Hg)-Total	DLM	
Duplicate	Aluminum (Al)-Total	DLM	
Duplicate	Antimony (Sb)-Total	DLM	
Duplicate	Arsenic (As)-Total	DLM	
Duplicate	Barium (Ba)-Total	DLM	
Duplicate	Boron (B)-Total	DLM	
Duplicate	Cadmium (Cd)-Total	DLM	
Duplicate	Calcium (Ca)-Total	DLM	
Duplicate	Chromium (Cr)-Total	DLM	
Duplicate	Copper (Cu)-Total	DLM	
Duplicate	Iron (Fe)-Total	DLM	
Duplicate	Lead (Pb)-Total	DLM	
Duplicate	Magnesium (Mg)-Total	DLM	
Duplicate	Manganese (Mn)-Total	DLM	
Duplicate	Potassium (K)-Total	DLM	
Duplicate	Selenium (Se)-Total	DLM	
Duplicate	Silicon (Si)-Total	DLM	
Duplicate	Silver (Ag)-Total	DLM	
Duplicate	Sodium (Na)-Total	DLM	
Duplicate	Uranium (U)-Total	DLM	
Duplicate	Zinc (Zn)-Total	DLM	
Matrix Spike	Chloride (Cl)	MS-B	
Matrix Spike	Dissolved Organic Carbon	MS-B	

Sample Parameter Qualifier Key:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
BTXS,F1-ED	Water	BTEX, Styrene and F1 (C6-C10)		EPA 5021/8015&8260 GC-MS & FID
C-DIS-ORG-ED	Water	Dissolved Organic Carbon		APHA 5310 B-Instrumental
CL-IC-ED	Water	Chloride by IC		APHA 4110 B-ION CHROMATOGRAPHY
F2,F3,F4-ED	Water	F2, F3, F4		EPA 3510/CCME PHC CWS-GC-FID
HG-D-L-CVAA-ED	Water	Mercury (Hg) - Dissolved		EPA 245.7 / EPA 245.1
HG-T-L-CVAA-ED	Water	Mercury (Hg)		EPA 245.7 / EPA 245.1
IONBALANCE-ED	Water	Ion Balance Calculation		APHA 1030E
MET-D-CCMS-ED	Water	Dissolved Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
NAPHTHENIC-ACID-FM	Water	Naphthenic Acids by FTIR		Naphthenic Acids by FTIR, Syncrude, 1994

Dissolved naphthenic acids are solvent extracted from acidified aqueous samples using Dichloromethane prior to quantitation by Fourier Transform Infra-Red spectroscopy. Note that FTIR is not uniquely selective to naphthenic acids. If present, other carboxylic acids (e.g. humic acids, fulvic acids) may also be detected by this method.

NH3-CFA-ED	Water	Ammonia in Water by Colour		APHA 4500 NH3-NITROGEN (AMMONIA)
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This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.

NO2+NO3-CALC-ED	Water	Nitrate+Nitrite		CALCULATION
NO2-IC-ED	Water	Nitrite as N by IC		APHA 4110 B-ION CHROMATOGRAPHY

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
NO3-IC-ED	Water	Nitrate as N by IC		APHA 4110 B-ION CHROMATOGRAPHY
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
PAH-ABT1-CL	Water	PAH & Carcinogenic PAH List		EPA 3510/8270-GC/MS
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity		APHA 4500-H, 2510, 2320
All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)				
PHENOLS-4AAP-ED	Water	Phenols (4AAP)		AB ENV.06537-COLORIMETRIC
This analysis is carried out using procedures adapted from ENVIRODAT VMV 06537 689, Method Code 154, in "Methods Manual for Chemical Analysis of Water and Wastes" published by the Alberta Environmental Centre. This automated method is based on the distillation of phenol and subsequent reaction of the distillate with alkaline ferricyanide and 4-aminoantipyrine to form a red complex which is measured at 505 nm.				
SIO2-D-CALC-ED	Water	Dissolved Silicon (reported as Silica)		CALCULATION
SIO2-T-CALC-ED	Water	Total Silicon (reported as Silica)		CALCULATION
SO4-IC-ED	Water	Sulfate by IC		APHA 4110 B-ION CHROMATOGRAPHY
SOLIDS-TDS-ED	Water	Total Dissolved Solids		APHA 2540 C
TURBIDITY-ED	Water	Turbidity		APHA 2130 B-Nephelometer

** The indicated Method Reference is the closest nationally or internationally recognized reference for the applicable ALS test method. ALS methods may incorporate modifications from the specified reference to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
FM	ALS ENVIRONMENTAL - FORT MCMURRAY, ALBERTA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

M050661

GLOSSARY OF REPORT TERMS

Surr - Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

MU: Measurement Uncertainty. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 which gives a level of confidence of approximately 95%.

Bias: The reported method bias is the average long term deviation from the target value for a long term reference or control sample, measured in percent.

Zero values indicate no detectable method bias.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 1 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R3038028							
WG1985184-2	LCS							
Benzene			84.6		%		70-130	31-OCT-14
Toluene			86.4		%		70-130	31-OCT-14
EthylBenzene			81.3		%		70-130	31-OCT-14
o-Xylene			81.2		%		70-130	31-OCT-14
m+p-Xylene			86.6		%		70-130	31-OCT-14
Styrene			80.8		%		70-130	31-OCT-14
WG1985184-3	LCS							
F1(C6-C10)			98.5		%		70-130	31-OCT-14
WG1985184-5	LCS							
Benzene			88.5		%		70-130	31-OCT-14
Toluene			95.4		%		70-130	31-OCT-14
EthylBenzene			87.5		%		70-130	31-OCT-14
o-Xylene			88.9		%		70-130	31-OCT-14
m+p-Xylene			96.1		%		70-130	31-OCT-14
Styrene			91.8		%		70-130	31-OCT-14
WG1985184-6	LCS							
F1(C6-C10)			97.4		%		70-130	31-OCT-14
WG1985184-1	MB							
Benzene			<0.00050		mg/L		0.0005	31-OCT-14
Toluene			<0.00050		mg/L		0.0005	31-OCT-14
EthylBenzene			<0.00050		mg/L		0.0005	31-OCT-14
o-Xylene			<0.00050		mg/L		0.0005	31-OCT-14
m+p-Xylene			<0.00050		mg/L		0.0005	31-OCT-14
Styrene			<0.0010		mg/L		0.001	31-OCT-14
F1(C6-C10)			<0.10		mg/L		0.1	31-OCT-14
Surrogate: 1,4-Difluorobenzene (SS)			100.1		%		70-130	31-OCT-14
Surrogate: 4-Bromofluorobenzene (SS)			90.7		%		70-130	31-OCT-14
Surrogate: 3,4-Dichlorotoluene (SS)			100.7		%		70-130	31-OCT-14
WG1985184-4	MB							
Benzene			<0.00050		mg/L		0.0005	31-OCT-14
Toluene			<0.00050		mg/L		0.0005	31-OCT-14
EthylBenzene			<0.00050		mg/L		0.0005	31-OCT-14
o-Xylene			<0.00050		mg/L		0.0005	31-OCT-14
m+p-Xylene			<0.00050		mg/L		0.0005	31-OCT-14
							0.001	



Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 2 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R3038028							
WG1985184-4	MB							
Styrene			<0.0010		mg/L		0.001	31-OCT-14
F1(C6-C10)			<0.10		mg/L		0.1	31-OCT-14
Surrogate: 1,4-Difluorobenzene (SS)			101.0		%		70-130	31-OCT-14
Surrogate: 4-Bromofluorobenzene (SS)			85.1		%		70-130	31-OCT-14
Surrogate: 3,4-Dichlorotoluene (SS)			101.6		%		70-130	31-OCT-14
C-DIS-ORG-ED		Water						
Batch	R3058368							
WG1990871-3	CVS							
Dissolved Organic Carbon			120.4		%		80-160	06-NOV-14
WG1990871-4	DUP	L1538176-1						
Dissolved Organic Carbon		<1.0	<1.0	RPD-NA	mg/L	N/A	20	06-NOV-14
WG1990871-6	DUP	L1540324-4						
Dissolved Organic Carbon		22.9	23.2		mg/L	1.4	20	07-NOV-14
WG1990871-2	LCS							
Dissolved Organic Carbon			93.5		%		80-120	06-NOV-14
WG1990871-1	MB							
Dissolved Organic Carbon			<1.0		mg/L		1	06-NOV-14
WG1990871-5	MS	L1538176-1						
Dissolved Organic Carbon			99.3		%		70-130	06-NOV-14
WG1990871-7	MS	L1540324-4						
Dissolved Organic Carbon			N/A	MS-B	%		-	07-NOV-14
CL-IC-ED		Water						
Batch	R3040389							
WG1985805-13	DUP	L1540318-3						
Chloride (Cl)		27.3	27.3		mg/L	0.2	20	31-OCT-14
WG1985805-17	DUP	L1539572-3						
Chloride (Cl)		3.36	3.36		mg/L	0.1	20	31-OCT-14
WG1985805-5	DUP	L1539942-9						
Chloride (Cl)		225	224		mg/L	0.1	20	31-OCT-14
WG1985805-11	LCS							
Chloride (Cl)			92.4		%		90-110	31-OCT-14
WG1985805-15	LCS							
Chloride (Cl)			102.1		%		90-110	31-OCT-14
WG1985805-19	LCS							
Chloride (Cl)			102.4		%		90-110	31-OCT-14
WG1985805-2	LCS							



Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 3 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-ED		Water						
Batch	R3040389							
WG1985805-2	LCS							
Chloride (Cl)			101.8		%		90-110	31-OCT-14
WG1985805-3	LCS							
Chloride (Cl)			101.7		%		90-110	31-OCT-14
WG1985805-7	LCS							
Chloride (Cl)			101.9		%		90-110	31-OCT-14
WG1985805-9	LCS							
Chloride (Cl)			102.0		%		90-110	31-OCT-14
WG1985805-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	31-OCT-14
WG1985805-10	MB							
Chloride (Cl)			<0.50		mg/L		0.5	31-OCT-14
WG1985805-12	MB							
Chloride (Cl)			<0.50		mg/L		0.5	31-OCT-14
WG1985805-16	MB							
Chloride (Cl)			<0.50		mg/L		0.5	31-OCT-14
WG1985805-20	MB							
Chloride (Cl)			<0.50		mg/L		0.5	31-OCT-14
WG1985805-4	MB							
Chloride (Cl)			<0.50		mg/L		0.5	31-OCT-14
WG1985805-8	MB							
Chloride (Cl)			<0.50		mg/L		0.5	31-OCT-14
WG1985805-14	MS	L1540318-3						
Chloride (Cl)			98.5		%		75-125	31-OCT-14
WG1985805-18	MS	L1539572-3						
Chloride (Cl)			99.1		%		75-125	31-OCT-14
WG1985805-6	MS	L1539942-9						
Chloride (Cl)			N/A	MS-B	%		-	31-OCT-14
F2,F3,F4-ED		Water						
Batch	R3041632							
WG1985149-2	LCS							
F2 (>C10-C16)			99.4		%		70-130	31-OCT-14
F3 (C16-C34)			98.8		%		70-130	31-OCT-14
F4 (C34-C50)			99.5		%		70-130	31-OCT-14
WG1985149-5	LCS							
F2 (>C10-C16)			92.7		%		70-130	31-OCT-14
F3 (C16-C34)			93.5		%		70-130	31-OCT-14
F4 (C34-C50)			93.4		%		70-130	31-OCT-14



Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 4 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F2,F3,F4-ED		Water						
Batch	R3041632							
WG1985149-1	MB							
F2 (>C10-C16)			<0.25		mg/L		0.25	31-OCT-14
F3 (C16-C34)			<0.25		mg/L		0.25	31-OCT-14
F4 (C34-C50)			<0.25		mg/L		0.25	31-OCT-14
Surrogate: 2-Bromobenzotrifluoride			105.0		%		60-140	31-OCT-14
WG1985149-4	MB							
F2 (>C10-C16)			<0.25		mg/L		0.25	31-OCT-14
F3 (C16-C34)			<0.25		mg/L		0.25	31-OCT-14
F4 (C34-C50)			<0.25		mg/L		0.25	31-OCT-14
Surrogate: 2-Bromobenzotrifluoride			108.3		%		60-140	31-OCT-14
WG1985149-3	MS	L1539572-1						
F2 (>C10-C16)			95.7		%		60-140	31-OCT-14
F3 (C16-C34)			101.0		%		60-140	31-OCT-14
F4 (C34-C50)			101.8		%		60-140	31-OCT-14
HG-D-L-CVAA-ED		Water						
Batch	R3053628							
WG1989411-3	DUP	L1537041-1						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	05-NOV-14
WG1989411-2	LCS							
Mercury (Hg)-Dissolved			92.2		%		80-120	05-NOV-14
WG1989411-1	MB							
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	05-NOV-14
WG1989411-4	MS	L1537041-1						
Mercury (Hg)-Dissolved			89.6		%		70-130	05-NOV-14
HG-T-L-CVAA-ED		Water						
Batch	R3053628							
WG1989419-3	DUP	L1539572-1						
Mercury (Hg)-Total		0.0000054	<0.0000050	RPD-NA	mg/L	N/A	20	05-NOV-14
WG1989419-7	DUP	L1540949-1						
Mercury (Hg)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	07-NOV-14
WG1989419-2	LCS							
Mercury (Hg)-Total			91.4		%		80-120	05-NOV-14
WG1989419-6	LCS							
Mercury (Hg)-Total			84.7		%		80-120	05-NOV-14
WG1989419-1	MB							
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	05-NOV-14
WG1989419-5	MB							



Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 5 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-L-CVAA-ED								
	Water							
Batch	R3053628							
WG1989419-5 MB								
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	05-NOV-14
WG1989419-4 MS		L1539572-1						
Mercury (Hg)-Total			83.9		%		70-130	05-NOV-14
WG1989419-8 MS		L1540949-1						
Mercury (Hg)-Total			80.1		%		70-130	07-NOV-14
MET-D-CCMS-ED								
	Water							
Batch	R3060729							
WG1991202-11 CRM		ED-HIGH-WATRM						
Aluminum (Al)-Dissolved			108.2		%		80-120	07-NOV-14
Antimony (Sb)-Dissolved			91.6		%		80-120	07-NOV-14
Arsenic (As)-Dissolved			94.6		%		80-120	07-NOV-14
Barium (Ba)-Dissolved			108.0		%		80-120	07-NOV-14
Boron (B)-Dissolved			91.9		%		80-120	07-NOV-14
Cadmium (Cd)-Dissolved			104.1		%		80-120	07-NOV-14
Calcium (Ca)-Dissolved			101.0		%		80-120	07-NOV-14
Chromium (Cr)-Dissolved			104.0		%		80-120	07-NOV-14
Copper (Cu)-Dissolved			101.9		%		80-120	07-NOV-14
Iron (Fe)-Dissolved			96.2		%		80-120	07-NOV-14
Lead (Pb)-Dissolved			102.7		%		80-120	07-NOV-14
Magnesium (Mg)-Dissolved			104.4		%		80-120	07-NOV-14
Manganese (Mn)-Dissolved			104.1		%		80-120	07-NOV-14
Nickel (Ni)-Dissolved			106.0		%		80-120	07-NOV-14
Potassium (K)-Dissolved			116.5		%		80-120	07-NOV-14
Selenium (Se)-Dissolved			90.6		%		80-120	07-NOV-14
Silicon (Si)-Dissolved			97.1		%		80-120	07-NOV-14
Silver (Ag)-Dissolved			99.2		%		80-120	07-NOV-14
Sodium (Na)-Dissolved			108.8		%		80-120	07-NOV-14
Uranium (U)-Dissolved			97.4		%		80-120	07-NOV-14
Zinc (Zn)-Dissolved			106.2		%		80-120	07-NOV-14
WG1991202-14 CRM		ED-HIGH-WATRM						
Aluminum (Al)-Dissolved			104.3		%		80-120	07-NOV-14
Antimony (Sb)-Dissolved			92.3		%		80-120	07-NOV-14
Arsenic (As)-Dissolved			90.1		%		80-120	07-NOV-14
Barium (Ba)-Dissolved			105.1		%		80-120	07-NOV-14



Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 6 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R3060729							
WG1991202-14 CRM	ED-HIGH-WATRM							
Boron (B)-Dissolved			90.7		%		80-120	07-NOV-14
Cadmium (Cd)-Dissolved			99.5		%		80-120	07-NOV-14
Calcium (Ca)-Dissolved			100.6		%		80-120	07-NOV-14
Chromium (Cr)-Dissolved			99.4		%		80-120	07-NOV-14
Copper (Cu)-Dissolved			97.9		%		80-120	07-NOV-14
Iron (Fe)-Dissolved			93.0		%		80-120	07-NOV-14
Lead (Pb)-Dissolved			99.7		%		80-120	07-NOV-14
Magnesium (Mg)-Dissolved			104.8		%		80-120	07-NOV-14
Manganese (Mn)-Dissolved			99.1		%		80-120	07-NOV-14
Nickel (Ni)-Dissolved			100.2		%		80-120	07-NOV-14
Potassium (K)-Dissolved			105.5		%		80-120	07-NOV-14
Selenium (Se)-Dissolved			88.6		%		80-120	07-NOV-14
Silicon (Si)-Dissolved			97.3		%		80-120	07-NOV-14
Silver (Ag)-Dissolved			97.0		%		80-120	07-NOV-14
Sodium (Na)-Dissolved			108.7		%		80-120	07-NOV-14
Uranium (U)-Dissolved			93.4		%		80-120	07-NOV-14
Zinc (Zn)-Dissolved			103.0		%		80-120	07-NOV-14
WG1991202-2 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			106.9		%		80-120	07-NOV-14
Antimony (Sb)-Dissolved			92.5		%		80-120	07-NOV-14
Arsenic (As)-Dissolved			89.2		%		80-120	07-NOV-14
Barium (Ba)-Dissolved			105.6		%		80-120	07-NOV-14
Boron (B)-Dissolved			90.4		%		80-120	07-NOV-14
Cadmium (Cd)-Dissolved			98.9		%		80-120	07-NOV-14
Calcium (Ca)-Dissolved			97.4		%		80-120	07-NOV-14
Chromium (Cr)-Dissolved			100.5		%		80-120	07-NOV-14
Copper (Cu)-Dissolved			99.0		%		80-120	07-NOV-14
Iron (Fe)-Dissolved			96.1		%		80-120	07-NOV-14
Lead (Pb)-Dissolved			103.6		%		80-120	07-NOV-14
Magnesium (Mg)-Dissolved			103.8		%		80-120	07-NOV-14
Manganese (Mn)-Dissolved			99.4		%		80-120	07-NOV-14
Nickel (Ni)-Dissolved			102.7		%		80-120	07-NOV-14
Potassium (K)-Dissolved			107.0		%		80-120	07-NOV-14
Selenium (Se)-Dissolved			92.1		%		80-120	07-NOV-14



Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 7 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R3060729							
WG1991202-2 CRM	ED-HIGH-WATRM							
Silicon (Si)-Dissolved			101.2		%		80-120	07-NOV-14
Silver (Ag)-Dissolved			98.4		%		80-120	07-NOV-14
Sodium (Na)-Dissolved			102.6		%		80-120	07-NOV-14
Uranium (U)-Dissolved			103.2		%		80-120	07-NOV-14
Zinc (Zn)-Dissolved			103.8		%		80-120	07-NOV-14
WG1991202-5 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			106.7		%		80-120	07-NOV-14
Antimony (Sb)-Dissolved			91.2		%		80-120	07-NOV-14
Arsenic (As)-Dissolved			89.3		%		80-120	07-NOV-14
Barium (Ba)-Dissolved			105.5		%		80-120	07-NOV-14
Boron (B)-Dissolved			91.2		%		80-120	07-NOV-14
Cadmium (Cd)-Dissolved			98.8		%		80-120	07-NOV-14
Calcium (Ca)-Dissolved			97.5		%		80-120	07-NOV-14
Chromium (Cr)-Dissolved			101.5		%		80-120	07-NOV-14
Copper (Cu)-Dissolved			100.4		%		80-120	07-NOV-14
Iron (Fe)-Dissolved			95.7		%		80-120	07-NOV-14
Lead (Pb)-Dissolved			101.0		%		80-120	07-NOV-14
Magnesium (Mg)-Dissolved			100.2		%		80-120	07-NOV-14
Manganese (Mn)-Dissolved			99.3		%		80-120	07-NOV-14
Nickel (Ni)-Dissolved			102.8		%		80-120	07-NOV-14
Potassium (K)-Dissolved			106.1		%		80-120	07-NOV-14
Selenium (Se)-Dissolved			91.6		%		80-120	07-NOV-14
Silicon (Si)-Dissolved			100.7		%		80-120	07-NOV-14
Silver (Ag)-Dissolved			96.1		%		80-120	07-NOV-14
Sodium (Na)-Dissolved			105.9		%		80-120	07-NOV-14
Uranium (U)-Dissolved			101.4		%		80-120	07-NOV-14
Zinc (Zn)-Dissolved			105.1		%		80-120	07-NOV-14
WG1991202-8 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			102.2		%		80-120	07-NOV-14
Antimony (Sb)-Dissolved			87.4		%		80-120	07-NOV-14
Arsenic (As)-Dissolved			88.4		%		80-120	07-NOV-14
Barium (Ba)-Dissolved			102.2		%		80-120	07-NOV-14
Boron (B)-Dissolved			89.6		%		80-120	07-NOV-14
Cadmium (Cd)-Dissolved			99.6		%		80-120	07-NOV-14



Environmental

Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 8 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R3060729							
WG1991202-8 CRM	ED-HIGH-WATRM							
Calcium (Ca)-Dissolved			98.9		%		80-120	07-NOV-14
Chromium (Cr)-Dissolved			98.0		%		80-120	07-NOV-14
Copper (Cu)-Dissolved			96.9		%		80-120	07-NOV-14
Iron (Fe)-Dissolved			92.3		%		80-120	07-NOV-14
Lead (Pb)-Dissolved			99.4		%		80-120	07-NOV-14
Magnesium (Mg)-Dissolved			103.2		%		80-120	07-NOV-14
Manganese (Mn)-Dissolved			96.5		%		80-120	07-NOV-14
Nickel (Ni)-Dissolved			99.2		%		80-120	07-NOV-14
Potassium (K)-Dissolved			105.5		%		80-120	07-NOV-14
Selenium (Se)-Dissolved			86.8		%		80-120	07-NOV-14
Silicon (Si)-Dissolved			94.5		%		80-120	07-NOV-14
Silver (Ag)-Dissolved			95.8		%		80-120	07-NOV-14
Sodium (Na)-Dissolved			103.7		%		80-120	07-NOV-14
Uranium (U)-Dissolved			93.7		%		80-120	07-NOV-14
Zinc (Zn)-Dissolved			100.7		%		80-120	07-NOV-14
WG1991202-12 DUP		L1540304-6						
Aluminum (Al)-Dissolved		0.0034	0.0035		mg/L	3.0	20	08-NOV-14
Antimony (Sb)-Dissolved		0.00049	0.00052		mg/L	6.3	20	08-NOV-14
Arsenic (As)-Dissolved		0.00208	0.00211		mg/L	1.6	20	08-NOV-14
Barium (Ba)-Dissolved		0.186	0.186		mg/L	0.1	20	08-NOV-14
Boron (B)-Dissolved		0.663	0.691		mg/L	4.1	20	08-NOV-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	08-NOV-14
Calcium (Ca)-Dissolved		128	129		mg/L	1.0	20	08-NOV-14
Chromium (Cr)-Dissolved		0.00012	0.00013		mg/L	7.1	20	08-NOV-14
Copper (Cu)-Dissolved		0.00027	0.00025		mg/L	7.7	20	08-NOV-14
Iron (Fe)-Dissolved		0.786	0.781		mg/L	0.6	20	08-NOV-14
Lead (Pb)-Dissolved		0.000052	<0.000050	RPD-NA	mg/L	N/A	20	08-NOV-14
Magnesium (Mg)-Dissolved		39.1	39.1		mg/L	0.1	20	08-NOV-14
Manganese (Mn)-Dissolved		2.42	2.36		mg/L	2.7	20	08-NOV-14
Nickel (Ni)-Dissolved		0.0209	0.0209		mg/L	0.0	20	08-NOV-14
Potassium (K)-Dissolved		7.37	7.43		mg/L	0.9	20	08-NOV-14
Selenium (Se)-Dissolved		0.00018	0.00021		mg/L	19	20	08-NOV-14
Silicon (Si)-Dissolved		8.41	8.32		mg/L	1.1	20	08-NOV-14



Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 9 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R3060729							
WG1991202-12 DUP		L1540304-6						
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	08-NOV-14
Sodium (Na)-Dissolved		136	141		mg/L	4.1	20	08-NOV-14
Uranium (U)-Dissolved		0.0121	0.0117		mg/L	2.7	20	08-NOV-14
Zinc (Zn)-Dissolved		0.0062	0.0053		mg/L	16	20	08-NOV-14
WG1991202-15 DUP		L1537949-5						
Aluminum (Al)-Dissolved		0.0023	0.0023		mg/L	0.5	20	08-NOV-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	08-NOV-14
Arsenic (As)-Dissolved		0.00049	0.00049		mg/L	1.7	20	08-NOV-14
Barium (Ba)-Dissolved		0.0193	0.0197		mg/L	1.9	20	08-NOV-14
Boron (B)-Dissolved		0.015	0.015		mg/L	0.5	20	08-NOV-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	08-NOV-14
Calcium (Ca)-Dissolved		28.5	28.4		mg/L	0.4	20	08-NOV-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	08-NOV-14
Copper (Cu)-Dissolved		0.00047	0.00048		mg/L	3.7	20	08-NOV-14
Iron (Fe)-Dissolved		0.156	0.155		mg/L	0.6	20	08-NOV-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	08-NOV-14
Magnesium (Mg)-Dissolved		8.81	8.91		mg/L	1.1	20	08-NOV-14
Manganese (Mn)-Dissolved		0.0778	0.0769		mg/L	1.2	20	08-NOV-14
Nickel (Ni)-Dissolved		0.00024	0.00025		mg/L	3.6	20	08-NOV-14
Potassium (K)-Dissolved		0.86	0.85		mg/L	1.0	20	08-NOV-14
Selenium (Se)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	08-NOV-14
Silicon (Si)-Dissolved		2.83	2.76		mg/L	2.2	20	08-NOV-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	08-NOV-14
Sodium (Na)-Dissolved		3.5	3.4		mg/L	2.8	20	08-NOV-14
Uranium (U)-Dissolved		0.000029	0.000029		mg/L	0.0	20	08-NOV-14
Zinc (Zn)-Dissolved		0.0058	<0.0050	RPD-NA	mg/L	N/A	20	08-NOV-14
WG1991202-3 DUP		L1540000-1						
Aluminum (Al)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	07-NOV-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-NOV-14
Arsenic (As)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-NOV-14
Barium (Ba)-Dissolved		0.000146	0.000153		mg/L	4.7	20	07-NOV-14
Boron (B)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	07-NOV-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	07-NOV-14



Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 10 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R3060729							
WG1991202-3	DUP	L1540000-1						
Calcium (Ca)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	07-NOV-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-NOV-14
Copper (Cu)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-NOV-14
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	07-NOV-14
Lead (Pb)-Dissolved		<0.000050	0.000089	RPD-NA	mg/L	N/A	20	07-NOV-14
Magnesium (Mg)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	20	07-NOV-14
Nickel (Ni)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-NOV-14
Potassium (K)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	07-NOV-14
Selenium (Se)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-NOV-14
Silicon (Si)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	07-NOV-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	07-NOV-14
Sodium (Na)-Dissolved		<1.0	<1.0	RPD-NA	mg/L	N/A	20	07-NOV-14
Uranium (U)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	07-NOV-14
Zinc (Zn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	07-NOV-14
WG1991202-6	DUP	L1540808-1						
Aluminum (Al)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	07-NOV-14
Antimony (Sb)-Dissolved		0.00020	0.00021		mg/L	2.1	20	07-NOV-14
Arsenic (As)-Dissolved		0.0199	0.0197		mg/L	0.9	20	07-NOV-14
Barium (Ba)-Dissolved		0.0393	0.0381		mg/L	3.1	20	07-NOV-14
Boron (B)-Dissolved		0.186	0.194		mg/L	3.9	20	07-NOV-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	07-NOV-14
Calcium (Ca)-Dissolved		91.8	93.8		mg/L	2.1	20	07-NOV-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-NOV-14
Copper (Cu)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-NOV-14
Iron (Fe)-Dissolved		0.706	0.704		mg/L	0.3	20	07-NOV-14
Lead (Pb)-Dissolved		0.000074	0.000072		mg/L	3.3	20	07-NOV-14
Magnesium (Mg)-Dissolved		29.9	28.9		mg/L	3.3	20	07-NOV-14
Manganese (Mn)-Dissolved		0.444	0.457		mg/L	3.0	20	07-NOV-14
Nickel (Ni)-Dissolved		0.00177	0.00175		mg/L	1.0	20	07-NOV-14
Potassium (K)-Dissolved		6.70	6.59		mg/L	1.7	20	07-NOV-14
Selenium (Se)-Dissolved		0.00015	0.00015		mg/L	3.3	20	07-NOV-14
Silicon (Si)-Dissolved		8.93	8.78		mg/L	1.8	20	07-NOV-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	07-NOV-14



Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 11 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R3060729							
WG1991202-6	DUP	L1540808-1						
Sodium (Na)-Dissolved		130	130		mg/L	0.2	20	07-NOV-14
Uranium (U)-Dissolved		0.00316	0.00317		mg/L	0.3	20	07-NOV-14
Zinc (Zn)-Dissolved		0.0022	0.0022		mg/L	2.9	20	07-NOV-14
WG1991202-1	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	07-NOV-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	07-NOV-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	07-NOV-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	07-NOV-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	07-NOV-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	07-NOV-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	07-NOV-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	07-NOV-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	07-NOV-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	07-NOV-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	07-NOV-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	07-NOV-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	07-NOV-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	07-NOV-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	07-NOV-14
WG1991202-10	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	07-NOV-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	07-NOV-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	07-NOV-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	07-NOV-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	07-NOV-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14



Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 12 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R3060729							
WG1991202-10 MB								
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	07-NOV-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	07-NOV-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	07-NOV-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	07-NOV-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	07-NOV-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	07-NOV-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	07-NOV-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	07-NOV-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	07-NOV-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	07-NOV-14
WG1991202-13 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	07-NOV-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	07-NOV-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	07-NOV-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	07-NOV-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	07-NOV-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	07-NOV-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	07-NOV-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	07-NOV-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	07-NOV-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	07-NOV-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	07-NOV-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	07-NOV-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	07-NOV-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	07-NOV-14



Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 13 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R3060729							
WG1991202-13 MB								
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	07-NOV-14
WG1991202-4 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	07-NOV-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	07-NOV-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	07-NOV-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	07-NOV-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	07-NOV-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	07-NOV-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	07-NOV-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	07-NOV-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	07-NOV-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	07-NOV-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	07-NOV-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	07-NOV-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	07-NOV-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	07-NOV-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	07-NOV-14
WG1991202-7 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	07-NOV-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	07-NOV-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	07-NOV-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	07-NOV-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	07-NOV-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	07-NOV-14



Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 14 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch R3060729								
WG1991202-7 MB								
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	07-NOV-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	07-NOV-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	07-NOV-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	07-NOV-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	07-NOV-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	07-NOV-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	07-NOV-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	07-NOV-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	07-NOV-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	07-NOV-14
MET-T-CCMS-ED		Water						
Batch R3060749								
WG1987792-3 DUP		L1539964-13						
Aluminum (Al)-Total		<0.0060	0.0075	RPD-NA	mg/L	N/A	20	07-NOV-14
Antimony (Sb)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	07-NOV-14
Arsenic (As)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	07-NOV-14
Barium (Ba)-Total		0.113	0.108		mg/L	4.4	20	07-NOV-14
Boron (B)-Total		2.01	1.96		mg/L	2.5	20	07-NOV-14
Cadmium (Cd)-Total		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	07-NOV-14
Calcium (Ca)-Total		29.9	28.5		mg/L	4.8	20	07-NOV-14
Chromium (Cr)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	07-NOV-14
Copper (Cu)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	07-NOV-14
Iron (Fe)-Total		1.60	1.59		mg/L	0.2	20	07-NOV-14
Lead (Pb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-NOV-14
Magnesium (Mg)-Total		19.5	20.0		mg/L	2.5	20	07-NOV-14
Manganese (Mn)-Total		0.0632	0.0648		mg/L	2.5	20	07-NOV-14
Potassium (K)-Total		13.3	13.4		mg/L	0.7	20	07-NOV-14
Selenium (Se)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	07-NOV-14
Silicon (Si)-Total		3.01	3.05		mg/L	1.3	20	07-NOV-14
Silver (Ag)-Total		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	07-NOV-14
Sodium (Na)-Total		438	435		mg/L	0.6	20	07-NOV-14
Uranium (U)-Total		0.000029	0.000026		mg/L	14	20	07-NOV-14



Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 15 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R3060749							
WG1987792-3	DUP	L1539964-13						
Zinc (Zn)-Total		<0.0060	<0.0060	RPD-NA	mg/L	N/A	20	07-NOV-14
WG1987792-6	DUP	L1540004-6						
Aluminum (Al)-Total		0.0320	0.0314		mg/L	1.8	20	07-NOV-14
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-NOV-14
Arsenic (As)-Total		0.00033	0.00036		mg/L	9.0	20	07-NOV-14
Barium (Ba)-Total		0.0356	0.0359		mg/L	1.1	20	07-NOV-14
Boron (B)-Total		0.036	0.035		mg/L	1.2	20	07-NOV-14
Cadmium (Cd)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	07-NOV-14
Calcium (Ca)-Total		42.5	41.0		mg/L	3.7	20	07-NOV-14
Chromium (Cr)-Total		0.00013	0.00013		mg/L	3.4	20	07-NOV-14
Copper (Cu)-Total		0.00012	0.00011		mg/L	7.8	20	07-NOV-14
Iron (Fe)-Total		1.09	1.11		mg/L	1.5	20	07-NOV-14
Lead (Pb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	07-NOV-14
Magnesium (Mg)-Total		12.7	12.6		mg/L	0.7	20	07-NOV-14
Manganese (Mn)-Total		0.0395	0.0395		mg/L	0.0	20	07-NOV-14
Nickel (Ni)-Total		0.00053	0.00055		mg/L	2.8	20	07-NOV-14
Potassium (K)-Total		1.81	1.83		mg/L	0.9	20	07-NOV-14
Selenium (Se)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-NOV-14
Silicon (Si)-Total		4.17	4.25		mg/L	1.8	20	07-NOV-14
Silver (Ag)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	07-NOV-14
Sodium (Na)-Total		11.4	11.7		mg/L	3.1	20	07-NOV-14
Uranium (U)-Total		0.000055	0.000054		mg/L	1.4	20	07-NOV-14
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	07-NOV-14
WG1987792-5	LCS							
Aluminum (Al)-Total			108.9		%		70-130	07-NOV-14
Antimony (Sb)-Total			100.2		%		70-130	07-NOV-14
Arsenic (As)-Total			94.4		%		70-130	07-NOV-14
Barium (Ba)-Total			105.9		%		70-130	07-NOV-14
Boron (B)-Total			108.1		%		70-130	07-NOV-14
Cadmium (Cd)-Total			104.0		%		70-130	07-NOV-14
Calcium (Ca)-Total			102.0		%		70-130	07-NOV-14
Chromium (Cr)-Total			105.6		%		70-130	07-NOV-14
Copper (Cu)-Total			102.8		%		70-130	07-NOV-14



Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 16 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R3060749							
WG1987792-5	LCS							
Iron (Fe)-Total			99.8		%		70-130	07-NOV-14
Lead (Pb)-Total			106.0		%		70-130	07-NOV-14
Magnesium (Mg)-Total			109.3		%		70-130	07-NOV-14
Manganese (Mn)-Total			108.9		%		70-130	07-NOV-14
Nickel (Ni)-Total			104.8		%		70-130	07-NOV-14
Potassium (K)-Total			110.4		%		70-130	07-NOV-14
Selenium (Se)-Total			94.3		%		70-130	07-NOV-14
Silicon (Si)-Total			109.4		%		70-130	07-NOV-14
Silver (Ag)-Total			107.3		%		70-130	07-NOV-14
Sodium (Na)-Total			117.0		%		70-130	07-NOV-14
Uranium (U)-Total			103.2		%		70-130	07-NOV-14
Zinc (Zn)-Total			104.4		%		70-130	07-NOV-14
WG1987792-4	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	07-NOV-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	07-NOV-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	07-NOV-14
Barium (Ba)-Total			<0.000050		mg/L		0.00005	07-NOV-14
Boron (B)-Total			<0.010		mg/L		0.01	07-NOV-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	07-NOV-14
Calcium (Ca)-Total			<0.020		mg/L		0.02	07-NOV-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	07-NOV-14
Iron (Fe)-Total			<0.010		mg/L		0.01	07-NOV-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	07-NOV-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	07-NOV-14
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	07-NOV-14
Nickel (Ni)-Total			<0.00010		mg/L		0.0001	07-NOV-14
Potassium (K)-Total			<0.050		mg/L		0.05	07-NOV-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	07-NOV-14
Silicon (Si)-Total			<0.050		mg/L		0.05	07-NOV-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	07-NOV-14
Sodium (Na)-Total			<0.050		mg/L		0.05	07-NOV-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	07-NOV-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	07-NOV-14
NAPHTHENIC-ACID-FM		Water						



Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 17 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NAPHTHENIC-ACID-FM								
	Water							
Batch	R3056249							
WG1989281-11	DUP	L1540000-8						
Naphthenic Acids		2.1	1.9		mg/L	10	30	06-NOV-14
WG1989281-3	DUP	L1539589-3						
Naphthenic Acids		<1.0	<1.0	RPD-NA	mg/L	N/A	30	06-NOV-14
WG1989281-7	DUP	L1539999-3						
Naphthenic Acids		<1.0	<1.0	RPD-NA	mg/L	N/A	30	06-NOV-14
WG1989281-12	LCS							
Naphthenic Acids			88.9		%		70-130	06-NOV-14
WG1989281-4	LCS							
Naphthenic Acids			91.3		%		70-130	06-NOV-14
WG1989281-8	LCS							
Naphthenic Acids			100.0		%		70-130	06-NOV-14
WG1989281-1	MB							
Naphthenic Acids			<1.0		mg/L		1	06-NOV-14
WG1989281-5	MB							
Naphthenic Acids			<1.0		mg/L		1	06-NOV-14
WG1989281-9	MB							
Naphthenic Acids			<1.0		mg/L		1	06-NOV-14
WG1989281-10	MS	L1540000-7						
Naphthenic Acids			96.5		%		50-150	06-NOV-14
WG1989281-2	MS	L1539589-2						
Naphthenic Acids			104.2		%		50-150	06-NOV-14
WG1989281-6	MS	L1539999-2						
Naphthenic Acids			97.0		%		50-150	06-NOV-14
NH3-CFA-ED								
	Water							
Batch	R3054991							
WG1990079-11	DUP	L1543319-1						
Ammonia, Total (as N)		0.469	0.473		mg/L	0.8	20	06-NOV-14
WG1990079-5	DUP	L1537041-1						
Ammonia, Total (as N)		0.117	0.104		mg/L	12	20	06-NOV-14
WG1990079-7	DUP	L1540569-2						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	06-NOV-14
WG1990079-9	DUP	L1537949-1						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	06-NOV-14
WG1990079-2	LCS							
Ammonia, Total (as N)			99.4		%		85-115	06-NOV-14
WG1990079-1	MB							
Ammonia, Total (as N)			<0.050		mg/L		0.05	06-NOV-14



Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 19 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-ED		Water						
Batch	R3040389							
WG1985805-4	MB							
Nitrite (as N)			<0.020		mg/L		0.02	31-OCT-14
WG1985805-8	MB							
Nitrite (as N)			<0.020		mg/L		0.02	31-OCT-14
WG1985805-14	MS	L1540318-3						
Nitrite (as N)			99.8		%		75-125	31-OCT-14
WG1985805-18	MS	L1539572-3						
Nitrite (as N)			104.0		%		75-125	31-OCT-14
WG1985805-6	MS	L1539942-9						
Nitrite (as N)			104.4		%		75-125	31-OCT-14
NO3-IC-ED		Water						
Batch	R3040389							
WG1985805-13	DUP	L1540318-3						
Nitrate (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	31-OCT-14
WG1985805-17	DUP	L1539572-3						
Nitrate (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	31-OCT-14
WG1985805-5	DUP	L1539942-9						
Nitrate (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	31-OCT-14
WG1985805-11	LCS							
Nitrate (as N)			99.8		%		90-110	31-OCT-14
WG1985805-15	LCS							
Nitrate (as N)			95.7		%		90-110	31-OCT-14
WG1985805-19	LCS							
Nitrate (as N)			96.1		%		90-110	31-OCT-14
WG1985805-2	LCS							
Nitrate (as N)			103.0		%		90-110	31-OCT-14
WG1985805-3	LCS							
Nitrate (as N)			96.1		%		90-110	31-OCT-14
WG1985805-7	LCS							
Nitrate (as N)			96.3		%		90-110	31-OCT-14
WG1985805-9	LCS							
Nitrate (as N)			101.4		%		90-110	31-OCT-14
WG1985805-1	MB							
Nitrate (as N)			<0.050		mg/L		0.05	31-OCT-14
WG1985805-10	MB							
Nitrate (as N)			<0.050		mg/L		0.05	31-OCT-14
WG1985805-12	MB							
Nitrate (as N)			<0.050		mg/L		0.05	31-OCT-14



Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 20 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-ED		Water						
Batch	R3040389							
WG1985805-16 MB								
Nitrate (as N)			<0.050		mg/L		0.05	31-OCT-14
WG1985805-20 MB								
Nitrate (as N)			<0.050		mg/L		0.05	31-OCT-14
WG1985805-4 MB								
Nitrate (as N)			<0.050		mg/L		0.05	31-OCT-14
WG1985805-8 MB								
Nitrate (as N)			<0.050		mg/L		0.05	31-OCT-14
WG1985805-14 MS		L1540318-3						
Nitrate (as N)			91.1		%		75-125	31-OCT-14
WG1985805-18 MS		L1539572-3						
Nitrate (as N)			94.3		%		75-125	31-OCT-14
WG1985805-6 MS		L1539942-9						
Nitrate (as N)			87.8		%		75-125	31-OCT-14
PAH-ABT1-CL		Water						
Batch	R3045490							
WG1987617-1 LCS								
Acenaphthene			97.9		%		60-130	31-OCT-14
Acenaphthylene			101.7		%		60-130	31-OCT-14
Anthracene			98.5		%		60-130	31-OCT-14
Fluoranthene			97.1		%		60-130	31-OCT-14
Fluorene			99.5		%		60-130	31-OCT-14
Naphthalene			100.1		%		50-130	31-OCT-14
Phenanthrene			95.2		%		60-130	31-OCT-14
Pyrene			98.1		%		60-130	31-OCT-14
Benzo(a)anthracene			98.1		%		60-130	31-OCT-14
Benzo(k)fluoranthene			96.5		%		60-130	31-OCT-14
Benzo(b&j)fluoranthene			95.9		%		60-130	31-OCT-14
Benzo(g,h,i)perylene			102.6		%		60-130	31-OCT-14
Benzo(a)pyrene			102.9		%		60-130	31-OCT-14
Chrysene			95.8		%		60-130	31-OCT-14
Dibenzo(a,h)anthracene			102.7		%		60-130	31-OCT-14
Indeno(1,2,3-cd)pyrene			100.9		%		60-130	31-OCT-14
WG1987617-3 LCS								
Acenaphthene			118.4		%		60-130	02-NOV-14
Acenaphthylene			122.6		%		60-130	02-NOV-14



Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 21 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch	R3045490							
WG1987617-3	LCS							
Anthracene			116.2		%		60-130	02-NOV-14
Fluoranthene			120.4		%		60-130	02-NOV-14
Fluorene			120.3		%		60-130	02-NOV-14
Naphthalene			120.2		%		50-130	02-NOV-14
Phenanthrene			113.2		%		60-130	02-NOV-14
Pyrene			123.1		%		60-130	02-NOV-14
Benzo(a)anthracene			120.0		%		60-130	02-NOV-14
Benzo(k)fluoranthene			119.0		%		60-130	02-NOV-14
Benzo(b&j)fluoranthene			118.5		%		60-130	02-NOV-14
Benzo(g,h,i)perylene			124.9		%		60-130	02-NOV-14
Benzo(a)pyrene			122.9		%		60-130	02-NOV-14
Chrysene			116.7		%		60-130	02-NOV-14
Dibenzo(a,h)anthracene			123.7		%		60-130	02-NOV-14
Indeno(1,2,3-cd)pyrene			116.6		%		60-130	02-NOV-14
WG1987617-2	MB							
Acenaphthene			<0.000020		mg/L		0.00002	02-NOV-14
Acenaphthylene			<0.000020		mg/L		0.00002	02-NOV-14
Anthracene			<0.000010		mg/L		0.00001	02-NOV-14
Fluoranthene			<0.000020		mg/L		0.00002	02-NOV-14
Fluorene			<0.000020		mg/L		0.00002	02-NOV-14
Naphthalene			<0.000050		mg/L		0.00005	02-NOV-14
Phenanthrene			<0.000050		mg/L		0.00005	02-NOV-14
Pyrene			<0.000010		mg/L		0.00001	02-NOV-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	02-NOV-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	02-NOV-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	02-NOV-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	02-NOV-14
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	02-NOV-14
Chrysene			<0.000020		mg/L		0.00002	02-NOV-14
Dibenzo(a,h)anthracene			<0.0000050		mg/L		0.000005	02-NOV-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	02-NOV-14
Surrogate: d10-Acenaphthene			115.9		%		60-130	02-NOV-14
Surrogate: d10-Phenanthrene			108.7		%		60-130	02-NOV-14
Surrogate: d12-Chrysene			99.7		%		60-130	02-NOV-14



Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 22 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R3054968							
WG1990131-7	DUP	L1540974-1						
pH		7.83	7.84	J	pH	0.01	0.3	06-NOV-14
Conductivity (EC)		2640	2620		uS/cm	0.8	10	06-NOV-14
Bicarbonate (HCO3)		747	730		mg/L	2.3	25	06-NOV-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	06-NOV-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	06-NOV-14
Alkalinity, Total (as CaCO3)		612	598		mg/L	2.3	20	06-NOV-14
WG1990131-2	LCS							
Conductivity (EC)			97.1		%		90-110	06-NOV-14
WG1990131-3	LCS							
pH			6.06		pH		5.9-6.1	06-NOV-14
WG1990131-32	LCS							
Conductivity (EC)			96.1		%		90-110	06-NOV-14
WG1990131-33	LCS							
pH			6.03		pH		5.9-6.1	06-NOV-14
WG1990131-34	LCS							
Alkalinity, Total (as CaCO3)			103.5		%		85-115	06-NOV-14
WG1990131-35	LCS							
Conductivity (EC)			91.7		%		90-110	06-NOV-14
WG1990131-37	LCS							
Conductivity (EC)			99.8		%		90-110	06-NOV-14
WG1990131-38	LCS							
pH			6.04		pH		5.9-6.1	06-NOV-14
WG1990131-39	LCS							
Alkalinity, Total (as CaCO3)			104.4		%		85-115	06-NOV-14
WG1990131-4	LCS							
Alkalinity, Total (as CaCO3)			101.5		%		85-115	06-NOV-14
WG1990131-40	LCS							
Conductivity (EC)			97.8		%		90-110	06-NOV-14
WG1990131-42	LCS							
Conductivity (EC)			99.3		%		90-110	06-NOV-14
WG1990131-43	LCS							
pH			6.04		pH		5.9-6.1	06-NOV-14
WG1990131-44	LCS							
Alkalinity, Total (as CaCO3)			103.0		%		85-115	06-NOV-14
WG1990131-45	LCS							
Conductivity (EC)			97.4		%		90-110	06-NOV-14
WG1990131-47	LCS							



Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 23 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R3054968							
WG1990131-47	LCS							
Conductivity (EC)			98.2		%		90-110	06-NOV-14
WG1990131-48	LCS							
pH			6.06		pH		5.9-6.1	06-NOV-14
WG1990131-49	LCS							
Alkalinity, Total (as CaCO3)			102.5		%		85-115	06-NOV-14
WG1990131-5	LCS							
Conductivity (EC)			93.5		%		90-110	06-NOV-14
WG1990131-50	LCS							
Conductivity (EC)			96.0		%		90-110	06-NOV-14
WG1990131-52	LCS							
Conductivity (EC)			97.6		%		90-110	07-NOV-14
WG1990131-53	LCS							
pH			6.04		pH		5.9-6.1	07-NOV-14
WG1990131-54	LCS							
Alkalinity, Total (as CaCO3)			105.9		%		85-115	07-NOV-14
WG1990131-55	LCS							
Conductivity (EC)			95.6		%		90-110	07-NOV-14
WG1990131-1	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	06-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	06-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	06-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	06-NOV-14
WG1990131-31	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	06-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	06-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	06-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	06-NOV-14
WG1990131-36	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	06-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	06-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	06-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	06-NOV-14
WG1990131-41	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	06-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	06-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	06-NOV-14



Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 24 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R3054968							
WG1990131-41 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	06-NOV-14
WG1990131-46 MB								
Bicarbonate (HCO3)			<5.0		mg/L		5	06-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	06-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	06-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	06-NOV-14
WG1990131-51 MB								
Bicarbonate (HCO3)			<5.0		mg/L		5	07-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	07-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	07-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	07-NOV-14
Batch	R3068828							
WG1993884-2 LCS								
Conductivity (EC)			97.5		%		90-110	12-NOV-14
WG1993884-3 LCS								
pH			6.06		pH		5.9-6.1	12-NOV-14
WG1993884-4 LCS								
Alkalinity, Total (as CaCO3)			104.4		%		85-115	12-NOV-14
WG1993884-5 LCS								
Conductivity (EC)			96.4		%		90-110	12-NOV-14
WG1993884-1 MB								
Bicarbonate (HCO3)			<5.0		mg/L		5	12-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	12-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	12-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	12-NOV-14
PHENOLS-4AAP-ED		Water						
Batch	R3070110							
WG1994182-2 LCS								
Phenols (4AAP)			95.0		%		85-115	12-NOV-14
WG1994182-1 MB								
Phenols (4AAP)			<0.0010		mg/L		0.001	12-NOV-14
SO4-IC-ED		Water						
Batch	R3040389							
WG1985805-13 DUP								
Sulfate (SO4)		L1540318-3	67.8		mg/L	0.5	20	31-OCT-14
		68.1						
WG1985805-17 DUP								
		L1539572-3						



Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Page 26 of 28

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-ED		Water						
Batch	R3041659							
WG1986375-3	DUP	L1539409-1						
Total Dissolved Solids		3140	3130		mg/L	0.5	20	31-OCT-14
WG1986375-4	DUP	L1539586-4						
Total Dissolved Solids		964	931		mg/L	3.5	20	31-OCT-14
WG1986375-2	LCS							
Total Dissolved Solids			100.5		%		85-115	31-OCT-14
WG1986375-1	MB							
Total Dissolved Solids			<10		mg/L		10	31-OCT-14
TURBIDITY-ED		Water						
Batch	R3041958							
WG1985093-3	DUP	L1539638-1						
Turbidity		0.23	0.24		NTU	3.4	15	30-OCT-14
WG1985093-2	LCS							
Turbidity			98.6		%		70-130	30-OCT-14
WG1985093-1	MB							
Turbidity			<0.10		NTU		0.1	30-OCT-14

Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Page 27 of 28

Legend:

Limit ALS Control Limit (Data Quality Objectives)
DUP Duplicate
RPD Relative Percent Difference
N/A Not Available
LCS Laboratory Control Sample
SRM Standard Reference Material
MS Matrix Spike
MSD Matrix Spike Duplicate
ADE Average Desorption Efficiency
MB Method Blank
IRM Internal Reference Material
CRM Certified Reference Material
CCV Continuing Calibration Verification
CVS Calibration Verification Standard
LCSD Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects.
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L1539572

Report Date: 12-NOV-14

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Page 28 of 28

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Anions and Nutrients							
Nitrate as N by IC							
	1	28-OCT-14 12:44	31-OCT-14 08:00	48	67	hours	EHT
	2	28-OCT-14 14:15	31-OCT-14 08:00	48	66	hours	EHT
	3	28-OCT-14 12:44	31-OCT-14 08:00	48	67	hours	EHT
	4	28-OCT-14 15:15	31-OCT-14 08:00	48	65	hours	EHT
Nitrite as N by IC							
	1	28-OCT-14 12:44	31-OCT-14 08:00	48	67	hours	EHT
	2	28-OCT-14 14:15	31-OCT-14 08:00	48	66	hours	EHT
	3	28-OCT-14 12:44	31-OCT-14 08:00	48	67	hours	EHT
	4	28-OCT-14 15:15	31-OCT-14 08:00	48	65	hours	EHT
pH, Conductivity and Total Alkalinity							
	2	28-OCT-14 14:15	12-NOV-14 07:44	14	15	days	EHT

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1539572 were received on 29-OCT-14 10:22.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



Matrix Solutions Inc.
ATTN: AKIN OWOJORI
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Date Received: 30-OCT-14
Report Date: 13-NOV-14 15:34 (MT)
Version: FINAL

Client Phone: 403-513-2275

Certificate of Analysis

Lab Work Order #: L1540624
Project P.O. #: NOT SUBMITTED
Job Reference: 16053-502 NAOS GWM
C of C Numbers: M050684
Legal Site Desc: site 1 & 7

Nicole Thibault
Account Manager

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ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1540624-1 16053141029005									
Sampled By: bp/jl on 29-OCT-14 @ 11:06									
Matrix: h2o									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Toluene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
EthylBenzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
o-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Styrene	<0.0010	-		0.0010	mg/L	-		06-NOV-14	R3048650
F1(C6-C10)	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
F1-BTEX	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
Xylenes	<0.00071	-		0.00071	mg/L	-		06-NOV-14	R3048650
Surr: 1,4-Difluorobenzene (SS)	98.4	-		N/A	%	-		06-NOV-14	R3048650
Surr: 4-Bromofluorobenzene (SS)	90.7	-		N/A	%	-		06-NOV-14	R3048650
Surr: 3,4-Dichlorotoluene (SS)	104.4	-		N/A	%	-		06-NOV-14	R3048650
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	04-NOV-14	04-NOV-14	R3052508
F3 (C16-C34)	1.20	+/-0.30		0.25	mg/L	0	04-NOV-14	04-NOV-14	R3052508
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	04-NOV-14	04-NOV-14	R3052508
Surr: 2-Bromobenzotrifluoride	101.2	-		N/A	%	-	04-NOV-14	04-NOV-14	R3052508
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		07-NOV-14	R3059288
				0					
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.018	+/-0.004	DLM	0.015	mg/L	0		08-NOV-14	R3060749
Antimony (Sb)-Total	<0.00050	-	DLM	0.00050	mg/L	-		08-NOV-14	R3060749
Arsenic (As)-Total	<0.00050	-	DLM	0.00050	mg/L	-		08-NOV-14	R3060749
Barium (Ba)-Total	0.0148	+/-0.0017	DLM	0.0050	mg/L	0		08-NOV-14	R3060749
Boron (B)-Total	4.77	+/-0.76	DLM	0.050	mg/L	0		08-NOV-14	R3060749
Cadmium (Cd)-Total	<0.00020	-	DLM	0.00020	mg/L	-		08-NOV-14	R3060749
Calcium (Ca)-Total	0.99	+/-0.12	DLM	0.50	mg/L	0		08-NOV-14	R3060749
Chromium (Cr)-Total	<0.0050	-	DLM	0.0050	mg/L	-		08-NOV-14	R3060749
Copper (Cu)-Total	0.0060	+/-0.0007	DLM	0.0010	mg/L	0		08-NOV-14	R3060749
Iron (Fe)-Total	6.15	+/-0.97	DLM	0.050	mg/L	0		08-NOV-14	R3060749
Lead (Pb)-Total	0.00287	+/-0.00046	DLM	0.00025	mg/L	0		08-NOV-14	R3060749
Magnesium (Mg)-Total	15.1	+/-1.8	DLM	0.10	mg/L	0		08-NOV-14	R3060749
Manganese (Mn)-Total	0.0740	+/-0.0075	DLM	0.0020	mg/L	0		08-NOV-14	R3060749
Nickel (Ni)-Total	<0.0020	-	DLM	0.0020	mg/L	-		08-NOV-14	R3060749
Potassium (K)-Total	18.2	+/-2.2	DLM	0.25	mg/L	0		08-NOV-14	R3060749
Selenium (Se)-Total	<0.00050	-	DLM	0.00050	mg/L	-		08-NOV-14	R3060749
Silicon (Si)-Total	0.91	+/-0.18	DLM	0.25	mg/L	0		08-NOV-14	R3060749
Silver (Ag)-Total	<0.00040	-	DLM	0.00040	mg/L	-		08-NOV-14	R3060749
Sodium (Na)-Total	2650	+/-320		1.0	mg/L	0		09-NOV-14	R3062470
Uranium (U)-Total	<0.00010	-	DLM	0.00010	mg/L	-		08-NOV-14	R3060749
Zinc (Zn)-Total	<0.015	-	DLM	0.015	mg/L	-		08-NOV-14	R3060749
Miscellaneous Parameters									
Ammonia, Total (as N)	4.08	-		0.050	mg/L	-		06-NOV-14	R3054991
Dissolved Organic Carbon	24.2	+/-2.6		1.0	mg/L	0		10-NOV-14	R3064935
Naphthenic Acids	10.5	+/-1.9	D	1.0	mg/L	0	07-NOV-14	07-NOV-14	R3061749
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		12-NOV-14	R3070110
Total Dissolved Solids	6640	+/-440		10	mg/L	0		02-NOV-14	R3043730
Silicon (as SiO2)-Total	1.94	-		0.53	mg/L	-		09-NOV-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1540624-1 16053141029005									
Sampled By: bp/jl on 29-OCT-14 @ 11:06									
Matrix: h2o									
Turbidity	3.71	+/-0.25		0.10	NTU	0		31-OCT-14	R3041972
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Anthracene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Fluoranthene	<0.000020	-		0.000020	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Fluorene	<0.000020	-		0.000020	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Naphthalene	0.000066	-		0.000050	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Phenanthrene	<0.000050	-		0.000050	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Pyrene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Benzo(a)pyrene	<0.0000050	-		0.000005	mg/L	-	03-NOV-14	04-NOV-14	R3049633
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	03-NOV-14	04-NOV-14	R3049633
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Surr: d10-Acenaphthene	105.3	-		N/A	%	-	03-NOV-14	04-NOV-14	R3049633
Surr: d10-Phenanthrene	105.7	-		N/A	%	-	03-NOV-14	04-NOV-14	R3049633
Surr: d12-Chrysene	99.8	-		N/A	%	-	03-NOV-14	04-NOV-14	R3049633
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	2870	+/-160	DLM	5.0	mg/L	0		01-NOV-14	R3042255
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.10	-	DLM	0.10	mg/L	-		09-NOV-14	R3062471
Antimony (Sb)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		09-NOV-14	R3062471
Arsenic (As)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		09-NOV-14	R3062471
Barium (Ba)-Dissolved	0.0116	+/-0.0010	DLM	0.0050	mg/L	0		09-NOV-14	R3062471
Boron (B)-Dissolved	6.0	+/-0.7	DLM	1.0	mg/L	0		09-NOV-14	R3062471
Cadmium (Cd)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		09-NOV-14	R3062471
Calcium (Ca)-Dissolved	<2.0	-	DLM	2.0	mg/L	-		09-NOV-14	R3062471
Chromium (Cr)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		09-NOV-14	R3062471
Copper (Cu)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		09-NOV-14	R3062471
Iron (Fe)-Dissolved	<1.0	-	DLM	1.0	mg/L	-		09-NOV-14	R3062471
Lead (Pb)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		09-NOV-14	R3062471
Magnesium (Mg)-Dissolved	14.1	+/-1.1	DLM	0.50	mg/L	0		09-NOV-14	R3062471
Manganese (Mn)-Dissolved	0.0133	+/-0.0009	DLM	0.0050	mg/L	0		09-NOV-14	R3062471
Nickel (Ni)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		09-NOV-14	R3062471
Potassium (K)-Dissolved	16.7	+/-1.3	DLM	5.0	mg/L	0		09-NOV-14	R3062471
Selenium (Se)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		09-NOV-14	R3062471
Silicon (Si)-Dissolved	<5.0	-	DLM	5.0	mg/L	-		09-NOV-14	R3062471
Silver (Ag)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		09-NOV-14	R3062471
Sodium (Na)-Dissolved	2820	+/-200	DLM	5.0	mg/L	0		09-NOV-14	R3062471
Uranium (U)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		09-NOV-14	R3062471
Zinc (Zn)-Dissolved	<0.10	-	DLM	0.10	mg/L	-		09-NOV-14	R3062471
Ion Balance Calculation									
Ion Balance	96.8	-			%	-		09-NOV-14	
TDS (Calculated)	7150	-			mg/L	-		09-NOV-14	
Hardness (as CaCO3)	58.1	-			mg/L	-		09-NOV-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1540624-1 16053141029005 Sampled By: bp/jl on 29-OCT-14 @ 11:06 Matrix: h2o									
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.000005 0	mg/L	-		07-NOV-14	R3059288
Nitrate as N by IC									
Nitrate (as N)	<0.50	-	DLM	0.50	mg/L	-		01-NOV-14	R3042255
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.54	-		0.54	mg/L	-		05-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.20	-	DLM	0.20	mg/L	-		01-NOV-14	R3042255
Sulfate by IC									
Sulfate (SO4)	<5.0	-	DLM	5.0	mg/L	-		01-NOV-14	R3042255
pH, Conductivity and Total Alkalinity									
pH	9.21	+/-0.01		0.10	pH	0		08-NOV-14	R3060009
Conductivity (EC)	11300	+/-570		0.20	uS/cm	0		08-NOV-14	R3060009
Bicarbonate (HCO3)	2090	+/-78		5.0	mg/L	0		08-NOV-14	R3060009
Carbonate (CO3)	402	+/-51		5.0	mg/L	0		08-NOV-14	R3060009
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		08-NOV-14	R3060009
Alkalinity, Total (as CaCO3)	2390	+/-150		2.0	mg/L	0		08-NOV-14	R3060009
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	<11	-		11	mg/L	-		09-NOV-14	
L1540624-2 16053141029006 Sampled By: bp/jl on 29-OCT-14 @ 12:08 Matrix: h2o									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Toluene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
EthylBenzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
o-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Styrene	<0.0010	-		0.0010	mg/L	-		06-NOV-14	R3048650
F1(C6-C10)	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
F1-BTEX	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
Xylenes	<0.00071	-		0.00071	mg/L	-		06-NOV-14	R3048650
Surr: 1,4-Difluorobenzene (SS)	97.3	-		N/A	%	-		06-NOV-14	R3048650
Surr: 4-Bromofluorobenzene (SS)	92.0	-		N/A	%	-		06-NOV-14	R3048650
Surr: 3,4-Dichlorotoluene (SS)	106.7	-		N/A	%	-		06-NOV-14	R3048650
F2, F3, F4									
F2 (>C10-C16)	0.74	+/-0.19		0.25	mg/L	0	04-NOV-14	04-NOV-14	R3052508
F3 (C16-C34)	0.52	+/-0.16		0.25	mg/L	0	04-NOV-14	04-NOV-14	R3052508
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	04-NOV-14	04-NOV-14	R3052508
Surr: 2-Bromobenzotrifluoride	104.2	-		N/A	%	-	04-NOV-14	04-NOV-14	R3052508
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	0.0000157	+/-0.0000048	RRV	0.000005 0	mg/L	0		07-NOV-14	R3059288
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.761	+/-0.12	DLM	0.015	mg/L	0		08-NOV-14	R3060749
Antimony (Sb)-Total	<0.00050	-	DLM	0.00050	mg/L	-		08-NOV-14	R3060749
Arsenic (As)-Total	0.00253	+/-0.00030	DLM	0.00050	mg/L	0		08-NOV-14	R3060749
Barium (Ba)-Total	0.0760	+/-0.0085	DLM	0.0050	mg/L	0		08-NOV-14	R3060749
Boron (B)-Total	0.156	+/-0.025	DLM	0.050	mg/L	0		08-NOV-14	R3060749

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1540624-2 16053141029006									
Sampled By: bp/jl on 29-OCT-14 @ 12:08									
Matrix: h2o									
Total Metals in Water by CRC ICPMS									
Cadmium (Cd)-Total	0.00054	+/-0.00010	DLM	0.00020	mg/L	0		08-NOV-14	R3060749
Calcium (Ca)-Total	37.5	+/-4.4	DLM	0.50	mg/L	0		08-NOV-14	R3060749
Chromium (Cr)-Total	<0.0050	-	DLM	0.0050	mg/L	-		08-NOV-14	R3060749
Copper (Cu)-Total	0.0029	+/-0.0004	DLM	0.0010	mg/L	0		08-NOV-14	R3060749
Iron (Fe)-Total	4.35	+/-0.69	DLM	0.050	mg/L	0		08-NOV-14	R3060749
Lead (Pb)-Total	0.00550	+/-0.00087	DLM	0.00025	mg/L	0		08-NOV-14	R3060749
Magnesium (Mg)-Total	71.6	+/-8.7	DLM	0.10	mg/L	0		08-NOV-14	R3060749
Manganese (Mn)-Total	0.219	+/-0.022	DLM	0.0020	mg/L	0		08-NOV-14	R3060749
Nickel (Ni)-Total	0.0037	+/-0.0004	DLM	0.0020	mg/L	0		08-NOV-14	R3060749
Potassium (K)-Total	3.76	+/-0.46	DLM	0.25	mg/L	0		08-NOV-14	R3060749
Selenium (Se)-Total	<0.00050	-	DLM	0.00050	mg/L	-		08-NOV-14	R3060749
Silicon (Si)-Total	7.01	+/-1.4	DLM	0.25	mg/L	0		08-NOV-14	R3060749
Silver (Ag)-Total	<0.00040	-	DLM	0.00040	mg/L	-		08-NOV-14	R3060749
Sodium (Na)-Total	49.9	+/-6.1	DLM	1.0	mg/L	0		08-NOV-14	R3060749
Uranium (U)-Total	0.00055	+/-0.00008	DLM	0.00010	mg/L	0		08-NOV-14	R3060749
Zinc (Zn)-Total	0.115	+/-0.018	DLM	0.015	mg/L	0		08-NOV-14	R3060749
Miscellaneous Parameters									
Ammonia, Total (as N)	0.711	-		0.050	mg/L	-		06-NOV-14	R3054991
Dissolved Organic Carbon	13.3	+/-1.6		1.0	mg/L	0		07-NOV-14	R3063170
Naphthenic Acids	2.3	+/-0.5	D	1.0	mg/L	0	07-NOV-14	07-NOV-14	R3061749
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		12-NOV-14	R3070110
Total Dissolved Solids	509	+/-34		10	mg/L	0		02-NOV-14	R3043730
Silicon (as SiO2)-Total	15.0	-		0.53	mg/L	-		08-NOV-14	
Turbidity	50.3	+/-2.8		0.10	NTU	0		31-OCT-14	R3041972
PAH & Carcinogenic PAH List									
Acenaphthene	0.000065	-		0.000020	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Acenaphthylene	<0.000030	-	DLM	0.000030	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Anthracene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Fluoranthene	<0.000020	-		0.000020	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Fluorene	0.000049	-		0.000020	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Naphthalene	0.00127	-		0.000050	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Phenanthrene	<0.000050	-		0.000050	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Pyrene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Benzo(a)pyrene	<0.0000050	-		0.000005	mg/L	-	03-NOV-14	04-NOV-14	R3049633
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	03-NOV-14	04-NOV-14	R3049633
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Surr: d10-Acenaphthene	91.9	-		N/A	%	-	03-NOV-14	04-NOV-14	R3049633
Surr: d10-Phenanthrene	93.9	-		N/A	%	-	03-NOV-14	04-NOV-14	R3049633
Surr: d12-Chrysene	77.7	-		N/A	%	-	03-NOV-14	04-NOV-14	R3049633
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	13.6	+/-0.78		0.50	mg/L	0		01-NOV-14	R3042255
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-		09-NOV-14	R3062471

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1540624-2 16053141029006									
Sampled By: bp/jl on 29-OCT-14 @ 12:08									
Matrix: h2o									
Dissolved Metals in Water by CRC ICPMS									
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-		09-NOV-14	R3062471
Arsenic (As)-Dissolved	0.00193	+/-0.00020		0.00040	mg/L	0		09-NOV-14	R3062471
Barium (Ba)-Dissolved	0.0581	+/-0.0050		0.0050	mg/L	0		09-NOV-14	R3062471
Boron (B)-Dissolved	0.194	+/-0.023		0.050	mg/L	0		09-NOV-14	R3062471
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		09-NOV-14	R3062471
Calcium (Ca)-Dissolved	43.2	+/-5.9		0.50	mg/L	0		09-NOV-14	R3062471
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		09-NOV-14	R3062471
Copper (Cu)-Dissolved	<0.0010	-		0.0010	mg/L	-		09-NOV-14	R3062471
Iron (Fe)-Dissolved	0.149	+/-0.013		0.010	mg/L	0		09-NOV-14	R3062471
Lead (Pb)-Dissolved	<0.00010	-		0.00010	mg/L	-		09-NOV-14	R3062471
Magnesium (Mg)-Dissolved	71.0	+/-5.5		0.10	mg/L	0		09-NOV-14	R3062471
Manganese (Mn)-Dissolved	0.189	+/-0.013		0.0020	mg/L	0		09-NOV-14	R3062471
Nickel (Ni)-Dissolved	<0.0020	-		0.0020	mg/L	-		09-NOV-14	R3062471
Potassium (K)-Dissolved	3.59	+/-0.28		0.10	mg/L	0		09-NOV-14	R3062471
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-		09-NOV-14	R3062471
Silicon (Si)-Dissolved	5.23	+/-0.44		0.050	mg/L	0		09-NOV-14	R3062471
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		09-NOV-14	R3062471
Sodium (Na)-Dissolved	54.3	+/-3.8		1.0	mg/L	0		09-NOV-14	R3062471
Uranium (U)-Dissolved	0.00038	+/-0.00004		0.00010	mg/L	0		09-NOV-14	R3062471
Zinc (Zn)-Dissolved	<0.0030	-		0.0030	mg/L	-		09-NOV-14	R3062471
Ion Balance Calculation									
Ion Balance	98.2	-			%	-		09-NOV-14	
TDS (Calculated)	495	-			mg/L	-		09-NOV-14	
Hardness (as CaCO3)	400	-			mg/L	-		09-NOV-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	0.0000559	-	RRV	0.0000050	mg/L	-		07-NOV-14	R3059288
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		01-NOV-14	R3042255
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		05-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		01-NOV-14	R3042255
Sulfate by IC									
Sulfate (SO4)	0.62	+/-0.10		0.50	mg/L	0		01-NOV-14	R3042255
pH, Conductivity and Total Alkalinity									
pH	8.86	+/-0.01		0.10	pH	0		08-NOV-14	R3060009
Conductivity (EC)	830	+/-42		0.20	uS/cm	0		08-NOV-14	R3060009
Bicarbonate (HCO3)	503	+/-19		5.0	mg/L	0		08-NOV-14	R3060009
Carbonate (CO3)	61.8	+/-8.7		5.0	mg/L	0		08-NOV-14	R3060009
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		08-NOV-14	R3060009
Alkalinity, Total (as CaCO3)	515	+/-32		2.0	mg/L	0		08-NOV-14	R3060009
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	11.2	-		0.11	mg/L	-		09-NOV-14	
L1540624-3 16053141029007									
Sampled By: bp/jl on 29-OCT-14 @ 14:55									
Matrix: h2o									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Toluene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1540624-3 16053141029007									
Sampled By: bp/jl on 29-OCT-14 @ 14:55									
Matrix: h2o									
BTEX, Styrene and F1 (C6-C10)									
EthylBenzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
o-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Styrene	<0.0010	-		0.0010	mg/L	-		06-NOV-14	R3048650
F1(C6-C10)	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
F1-BTEX	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
Xylenes	<0.00071	-		0.00071	mg/L	-		06-NOV-14	R3048650
Surr: 1,4-Difluorobenzene (SS)	98.6	-		N/A	%	-		06-NOV-14	R3048650
Surr: 4-Bromofluorobenzene (SS)	90.2	-		N/A	%	-		06-NOV-14	R3048650
Surr: 3,4-Dichlorotoluene (SS)	103.3	-		N/A	%	-		06-NOV-14	R3048650
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	04-NOV-14	04-NOV-14	R3052508
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	04-NOV-14	04-NOV-14	R3052508
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	04-NOV-14	04-NOV-14	R3052508
Surr: 2-Bromobenzotrifluoride	99.5	-		N/A	%	-	04-NOV-14	04-NOV-14	R3052508
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	0.0000127	+/-0.0000046	RRV	0.0000050	mg/L	0		07-NOV-14	R3059288
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.034	+/-0.006	DLM	0.015	mg/L	0		08-NOV-14	R3060749
Antimony (Sb)-Total	<0.00050	-	DLM	0.00050	mg/L	-		08-NOV-14	R3060749
Arsenic (As)-Total	<0.00050	-	DLM	0.00050	mg/L	-		08-NOV-14	R3060749
Barium (Ba)-Total	2.12	+/-0.24	DLM	0.0050	mg/L	0		08-NOV-14	R3060749
Boron (B)-Total	3.96	+/-0.63	DLM	0.050	mg/L	0		08-NOV-14	R3060749
Cadmium (Cd)-Total	<0.00020	-	DLM	0.00020	mg/L	-		08-NOV-14	R3060749
Calcium (Ca)-Total	64.4	+/-7.6	DLM	0.50	mg/L	0		08-NOV-14	R3060749
Chromium (Cr)-Total	<0.0050	-	DLM	0.0050	mg/L	-		08-NOV-14	R3060749
Copper (Cu)-Total	<0.0010	-	DLM	0.0010	mg/L	-		08-NOV-14	R3060749
Iron (Fe)-Total	19.5	+/-3.1	DLM	0.050	mg/L	0		08-NOV-14	R3060749
Lead (Pb)-Total	0.00067	+/-0.00011	DLM	0.00025	mg/L	0		08-NOV-14	R3060749
Magnesium (Mg)-Total	193	+/-23	DLM	0.10	mg/L	0		08-NOV-14	R3060749
Manganese (Mn)-Total	0.135	+/-0.014	DLM	0.0020	mg/L	0		08-NOV-14	R3060749
Nickel (Ni)-Total	<0.0020	-	DLM	0.0020	mg/L	-		08-NOV-14	R3060749
Potassium (K)-Total	43.1	+/-5.3	DLM	0.25	mg/L	0		08-NOV-14	R3060749
Selenium (Se)-Total	<0.00050	-	DLM	0.00050	mg/L	-		08-NOV-14	R3060749
Silicon (Si)-Total	3.84	+/-0.76	DLM	0.25	mg/L	0		08-NOV-14	R3060749
Silver (Ag)-Total	<0.00040	-	DLM	0.00040	mg/L	-		08-NOV-14	R3060749
Sodium (Na)-Total	9400	+/-1200		1.0	mg/L	0		09-NOV-14	R3062470
Uranium (U)-Total	<0.00010	-	DLM	0.00010	mg/L	-		08-NOV-14	R3060749
Zinc (Zn)-Total	<0.015	-	DLM	0.015	mg/L	-		08-NOV-14	R3060749
Miscellaneous Parameters									
Ammonia, Total (as N)	10.7	-		0.050	mg/L	-		06-NOV-14	R3054991
Dissolved Organic Carbon	13.7	+/-1.6		1.0	mg/L	0		07-NOV-14	R3063170
Naphthenic Acids	7.3	+/-1.3	D	1.0	mg/L	0	07-NOV-14	07-NOV-14	R3061749
Phenols (4AAP)	0.0101	+/-0.0015	DLM	0.0030	mg/L	-7.4%		13-NOV-14	R3073514
Total Dissolved Solids	23600	+/-1600		10	mg/L	0		02-NOV-14	R3043730
Silicon (as SiO2)-Total	8.21	-		0.53	mg/L	-		09-NOV-14	
Turbidity	204	+/-11		0.10	NTU	0		31-OCT-14	R3041972
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	03-NOV-14	04-NOV-14	R3049633

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1540624-3 16053141029007									
Sampled By: bp/jl on 29-OCT-14 @ 14:55									
Matrix: h2o									
PAH & Carcinogenic PAH List									
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Anthracene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Fluoranthene	<0.000020	-		0.000020	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Fluorene	<0.000020	-		0.000020	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Naphthalene	<0.000050	-		0.000050	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Phenanthrene	<0.000050	-		0.000050	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Pyrene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Benzo(a)pyrene	<0.000050	-		0.000005	mg/L	-	03-NOV-14	04-NOV-14	R3049633
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Dibenzo(a,h)anthracene	<0.000050	-		0.000005	mg/L	-	03-NOV-14	04-NOV-14	R3049633
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Surr: d10-Acenaphthene	83.1	-		N/A	%	-	03-NOV-14	04-NOV-14	R3049633
Surr: d10-Phenanthrene	92.1	-		N/A	%	-	03-NOV-14	04-NOV-14	R3049633
Surr: d12-Chrysene	88.8	-		N/A	%	-	03-NOV-14	04-NOV-14	R3049633
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	14500	+/-810	DLM	20	mg/L	0		01-NOV-14	R3042255
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.10	-	DLM	0.10	mg/L	-		09-NOV-14	R3062471
Antimony (Sb)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		09-NOV-14	R3062471
Arsenic (As)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		09-NOV-14	R3062471
Barium (Ba)-Dissolved	1.84	+/-0.16	DLM	0.0050	mg/L	0		09-NOV-14	R3062471
Boron (B)-Dissolved	5.9	+/-0.7	DLM	1.0	mg/L	0		09-NOV-14	R3062471
Cadmium (Cd)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		09-NOV-14	R3062471
Calcium (Ca)-Dissolved	64.5	+/-8.8	DLM	2.0	mg/L	0		09-NOV-14	R3062471
Chromium (Cr)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		09-NOV-14	R3062471
Copper (Cu)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		09-NOV-14	R3062471
Iron (Fe)-Dissolved	12.4	+/-1.1	DLM	1.0	mg/L	0		09-NOV-14	R3062471
Lead (Pb)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		09-NOV-14	R3062471
Magnesium (Mg)-Dissolved	154	+/-12	DLM	0.50	mg/L	0		09-NOV-14	R3062471
Manganese (Mn)-Dissolved	0.125	+/-0.0085	DLM	0.0050	mg/L	0		09-NOV-14	R3062471
Nickel (Ni)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		09-NOV-14	R3062471
Potassium (K)-Dissolved	35.4	+/-2.8	DLM	5.0	mg/L	0		09-NOV-14	R3062471
Selenium (Se)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		09-NOV-14	R3062471
Silicon (Si)-Dissolved	<5.0	-	DLM	5.0	mg/L	-		09-NOV-14	R3062471
Silver (Ag)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		09-NOV-14	R3062471
Sodium (Na)-Dissolved	9170	+/-650	DLM	5.0	mg/L	0		09-NOV-14	R3062471
Uranium (U)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		09-NOV-14	R3062471
Zinc (Zn)-Dissolved	<0.10	-	DLM	0.10	mg/L	-		09-NOV-14	R3062471
Ion Balance Calculation									
Ion Balance	91.7	-			%	-		09-NOV-14	
TDS (Calculated)	25300	-			mg/L	-		09-NOV-14	
Hardness (as CaCO3)	795	-			mg/L	-		09-NOV-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	0.0000678	-	RRV	0.000005	mg/L	-		07-NOV-14	R3059288

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1540624-3 16053141029007 Sampled By: bp/jl on 29-OCT-14 @ 14:55 Matrix: h2o									
Mercury (Hg) - Dissolved									
				0					
Nitrate as N by IC									
Nitrate (as N)	<2.0	-	DLM	2.0	mg/L	-		01-NOV-14	R3042255
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<2.2	-		2.2	mg/L	-		05-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.80	-	DLM	0.80	mg/L	-		01-NOV-14	R3042255
Sulfate by IC									
Sulfate (SO4)	<20	-	DLM	20	mg/L	-		01-NOV-14	R3042255
pH, Conductivity and Total Alkalinity									
pH	8.92	+/-0.01		0.10	pH	0		08-NOV-14	R3060009
Conductivity (EC)	38500	+/-1900		0.20	uS/cm	0		08-NOV-14	R3060009
Bicarbonate (HCO3)	2080	+/-77		5.0	mg/L	0		08-NOV-14	R3060009
Carbonate (CO3)	325	+/-41		5.0	mg/L	0		08-NOV-14	R3060009
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		08-NOV-14	R3060009
Alkalinity, Total (as CaCO3)	2250	+/-140		2.0	mg/L	0		08-NOV-14	R3060009
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	<11	-		11	mg/L	-		09-NOV-14	
L1540624-4 16053141029008 Sampled By: bp/jl on 29-OCT-14 @ 15:20 Matrix: h2o									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Toluene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
EthylBenzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
o-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Styrene	<0.0010	-		0.0010	mg/L	-		06-NOV-14	R3048650
F1(C6-C10)	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
F1-BTEX	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
Xylenes	<0.00071	-		0.00071	mg/L	-		06-NOV-14	R3048650
Surr:	1,4-Difluorobenzene (SS)	98.2	-	N/A	%	-		06-NOV-14	R3048650
Surr:	4-Bromofluorobenzene (SS)	90.2	-	N/A	%	-		06-NOV-14	R3048650
Surr:	3,4-Dichlorotoluene (SS)	105.4	-	N/A	%	-		06-NOV-14	R3048650
F2, F3, F4									
F2 (>C10-C16)	0.58	+/-0.15		0.25	mg/L	0	04-NOV-14	04-NOV-14	R3052508
F3 (C16-C34)	1.30	+/-0.32		0.25	mg/L	0	04-NOV-14	04-NOV-14	R3052508
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	04-NOV-14	04-NOV-14	R3052508
Surr:	2-Bromobenzotrifluoride	99.1	-	N/A	%	-	04-NOV-14	04-NOV-14	R3052508
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		07-NOV-14	R3059288
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.0811	+/-0.014		0.0030	mg/L	0		10-NOV-14	R3064932
Antimony (Sb)-Total	<0.00040	-		0.00040	mg/L	-		10-NOV-14	R3064932
Arsenic (As)-Total	0.00333	+/-0.00039		0.00040	mg/L	0		10-NOV-14	R3064932
Barium (Ba)-Total	0.161	+/-0.018		0.0050	mg/L	0		10-NOV-14	R3064932
Boron (B)-Total	0.538	+/-0.086		0.050	mg/L	0		10-NOV-14	R3064932
Cadmium (Cd)-Total	<0.00020	-		0.00020	mg/L	-		10-NOV-14	R3064932

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1540624-4 16053141029008									
Sampled By: bp/jl on 29-OCT-14 @ 15:20									
Matrix: h2o									
Total Metals in Water by CRC ICPMS									
Calcium (Ca)-Total	49.2	+/-5.8		0.50	mg/L	0		10-NOV-14	R3064932
Chromium (Cr)-Total	0.0086	+/-0.0013		0.0050	mg/L	0		10-NOV-14	R3064932
Copper (Cu)-Total	0.0119	+/-0.0014		0.0010	mg/L	0		10-NOV-14	R3064932
Iron (Fe)-Total	42.8	+/-6.8		0.010	mg/L	0		10-NOV-14	R3064932
Lead (Pb)-Total	0.0820	+/-0.013		0.00010	mg/L	0		10-NOV-14	R3064932
Magnesium (Mg)-Total	8.23	+/-1.0		0.10	mg/L	0		10-NOV-14	R3064932
Manganese (Mn)-Total	0.759	+/-0.076		0.0020	mg/L	0		10-NOV-14	R3064932
Nickel (Ni)-Total	0.0030	+/-0.0003		0.0020	mg/L	0		10-NOV-14	R3064932
Potassium (K)-Total	2.57	+/-0.32		0.10	mg/L	0		10-NOV-14	R3064932
Selenium (Se)-Total	<0.00040	-		0.00040	mg/L	0		10-NOV-14	R3064932
Silicon (Si)-Total	5.04	+/-1.0		0.050	mg/L	0		10-NOV-14	R3064932
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		10-NOV-14	R3064932
Sodium (Na)-Total	80.9	+/-9.9		1.0	mg/L	0		10-NOV-14	R3064932
Uranium (U)-Total	<0.00010	-		0.00010	mg/L	-		10-NOV-14	R3064932
Zinc (Zn)-Total	0.114	+/-0.018		0.0040	mg/L	0		10-NOV-14	R3064932
Miscellaneous Parameters									
Ammonia, Total (as N)	0.629	-		0.050	mg/L	-		06-NOV-14	R3054991
Dissolved Organic Carbon	19.3	+/-2.1		1.0	mg/L	0		07-NOV-14	R3063170
Naphthenic Acids	3.4	+/-0.7		1.0	mg/L	0	07-NOV-14	07-NOV-14	R3061749
Phenols (4AAP)	0.0030	+/-0.0008		0.0010	mg/L	-7.4%		12-NOV-14	R3070110
Total Dissolved Solids	446	+/-30		10	mg/L	0		02-NOV-14	R3043730
Silicon (as SiO2)-Total	10.8	-		0.11	mg/L	-		12-NOV-14	
Turbidity	145	+/-8.0		0.10	NTU	0		31-OCT-14	R3041972
PAH & Carcinogenic PAH List									
Acenaphthene	0.000028	-		0.000020	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Anthracene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Fluoranthene	<0.000020	-		0.000020	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Fluorene	0.000024	-		0.000020	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Naphthalene	0.000359	-		0.000050	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Phenanthrene	<0.000050	-		0.000050	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Pyrene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Benzo(a)pyrene	<0.0000050	-		0.000005	mg/L	-	03-NOV-14	04-NOV-14	R3049633
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	03-NOV-14	04-NOV-14	R3049633
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	03-NOV-14	04-NOV-14	R3049633
Surr: d10-Acenaphthene	92.6	-		N/A	%	-	03-NOV-14	04-NOV-14	R3049633
Surr: d10-Phenanthrene	97.4	-		N/A	%	-	03-NOV-14	04-NOV-14	R3049633
Surr: d12-Chrysene	86.6	-		N/A	%	-	03-NOV-14	04-NOV-14	R3049633
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	58.6	+/-3.3	RRV	0.50	mg/L	0		01-NOV-14	R3042255
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-		10-NOV-14	R3064909
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-		10-NOV-14	R3064909

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1540624-4 16053141029008									
Sampled By: bp/jl on 29-OCT-14 @ 15:20									
Matrix: h2o									
Dissolved Metals in Water by CRC ICPMS									
Arsenic (As)-Dissolved	0.00077	+/-0.00008		0.00040	mg/L	0		10-NOV-14	R3064909
Barium (Ba)-Dissolved	0.154	+/-0.013		0.0050	mg/L	0		10-NOV-14	R3064909
Boron (B)-Dissolved	0.522	+/-0.063		0.050	mg/L	0		10-NOV-14	R3064909
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		10-NOV-14	R3064909
Calcium (Ca)-Dissolved	47.1	+/-6.4	RRV	0.50	mg/L	0		10-NOV-14	R3064909
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		10-NOV-14	R3064909
Copper (Cu)-Dissolved	<0.0010	-		0.0010	mg/L	-		10-NOV-14	R3064909
Iron (Fe)-Dissolved	20.7	+/-1.9		0.010	mg/L	0		10-NOV-14	R3064909
Lead (Pb)-Dissolved	0.00016	+/-0.00002		0.00010	mg/L	0		10-NOV-14	R3064909
Magnesium (Mg)-Dissolved	7.89	+/-0.61	RRV	0.10	mg/L	0		10-NOV-14	R3064909
Manganese (Mn)-Dissolved	0.576	+/-0.039		0.0020	mg/L	0		10-NOV-14	R3064909
Nickel (Ni)-Dissolved	<0.0020	-		0.0020	mg/L	-		10-NOV-14	R3064909
Potassium (K)-Dissolved	2.61	+/-0.20	RRV	0.10	mg/L	0		10-NOV-14	R3064909
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-		10-NOV-14	R3064909
Silicon (Si)-Dissolved	4.44	+/-0.38		0.050	mg/L	0		10-NOV-14	R3064909
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		10-NOV-14	R3064909
Sodium (Na)-Dissolved	79.6	+/-5.6	RRV	1.0	mg/L	0		10-NOV-14	R3064909
Uranium (U)-Dissolved	<0.00010	-		0.00010	mg/L	-		10-NOV-14	R3064909
Zinc (Zn)-Dissolved	0.0036	+/-0.0005		0.0030	mg/L	0		10-NOV-14	R3064909
Ion Balance Calculation									
Ion Balance	84.6	-	BL:INT		%	-		10-NOV-14	
TDS (Calculated)	379	-			mg/L	-		10-NOV-14	
Hardness (as CaCO3)	150	-			mg/L	-		10-NOV-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		07-NOV-14	R3059288
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		01-NOV-14	R3042255
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		05-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		01-NOV-14	R3042255
Sulfate by IC									
Sulfate (SO4)	<0.50	-	RRV	0.50	mg/L	-		01-NOV-14	R3042255
pH, Conductivity and Total Alkalinity									
pH	8.67	+/-0.01		0.10	pH	0		08-NOV-14	R3060009
Conductivity (EC)	714	+/-36		0.20	uS/cm	0		08-NOV-14	R3060009
Bicarbonate (HCO3)	337	+/-13		5.0	mg/L	0		08-NOV-14	R3060009
Carbonate (CO3)	17.9	+/-3.5		5.0	mg/L	0		08-NOV-14	R3060009
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		08-NOV-14	R3060009
Alkalinity, Total (as CaCO3)	306	+/-20		2.0	mg/L	0		08-NOV-14	R3060009
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	9.51	-		0.11	mg/L	-		10-NOV-14	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Aluminum (Al)-Total	DLM	
Duplicate	Antimony (Sb)-Total	DLM	
Duplicate	Arsenic (As)-Total	DLM	
Duplicate	Barium (Ba)-Total	DLM	
Duplicate	Boron (B)-Total	DLM	
Duplicate	Cadmium (Cd)-Total	DLM	
Duplicate	Calcium (Ca)-Total	DLM	
Duplicate	Chromium (Cr)-Total	DLM	
Duplicate	Copper (Cu)-Total	DLM	
Duplicate	Iron (Fe)-Total	DLM	
Duplicate	Lead (Pb)-Total	DLM	
Duplicate	Magnesium (Mg)-Total	DLM	
Duplicate	Manganese (Mn)-Total	DLM	
Duplicate	Potassium (K)-Total	DLM	
Duplicate	Selenium (Se)-Total	DLM	
Duplicate	Silicon (Si)-Total	DLM	
Duplicate	Silver (Ag)-Total	DLM	
Duplicate	Sodium (Na)-Total	DLM	
Duplicate	Uranium (U)-Total	DLM	
Duplicate	Zinc (Zn)-Total	DLM	
Matrix Spike	Naphthenic Acids	MS-B	
Matrix Spike	Dissolved Organic Carbon	MS-B	
Matrix Spike	Dissolved Organic Carbon	MS-B	

Sample Parameter Qualifier Key:

Qualifier	Description
BL:INT	Balance Reviewed: Interference Or Non-Measured Component
D	The analyte has been reported from a dilution of the original extract.
DLM	Detection Limit Adjusted due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
BTXS,F1-ED	Water	BTEX, Styrene and F1 (C6-C10)		EPA 5021/8015&8260 GC-MS & FID
C-DIS-ORG-ED	Water	Dissolved Organic Carbon		APHA 5310 B-Instrumental
CL-IC-ED	Water	Chloride by IC		APHA 4110 B-ION CHROMATOGRAPHY
F2,F3,F4-ED	Water	F2, F3, F4		EPA 3510/CCME PHC CWS-GC-FID
HG-D-L-CVAA-ED	Water	Mercury (Hg) - Dissolved		EPA 245.7 / EPA 245.1
HG-T-L-CVAA-ED	Water	Mercury (Hg)		EPA 245.7 / EPA 245.1
IONBALANCE-ED	Water	Ion Balance Calculation		APHA 1030E
MET-D-CCMS-ED	Water	Dissolved Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
NAPHTHENIC-ACID-FM	Water	Naphthenic Acids by FTIR		Naphthenic Acids by FTIR, Syncrude, 1994

Dissolved naphthenic acids are solvent extracted from acidified aqueous samples using Dichloromethane prior to quantitation by Fourier Transform Infra-Red spectroscopy. Note that FTIR is not uniquely selective to naphthenic acids. If present, other carboxylic acids (e.g. humic acids, fulvic acids) may also be detected by this method.

NH3-CFA-ED Water Ammonia in Water by Colour APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.

Nitrate+Nitrite

CALCULATION

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
NO2+NO3-CALC-ED	Water			
NO2-IC-ED	Water	Nitrite as N by IC		APHA 4110 B-ION CHROMATOGRAPHY
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
NO3-IC-ED	Water	Nitrate as N by IC		APHA 4110 B-ION CHROMATOGRAPHY
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
PAH-ABT1-CL	Water	PAH & Carcinogenic PAH List		EPA 3510/8270-GC/MS
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity		APHA 4500-H, 2510, 2320
All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)				
PHENOLS-4AAP-ED	Water	Phenols (4AAP)		AB ENV.06537-COLORIMETRIC
This analysis is carried out using procedures adapted from ENVIRODAT VMV 06537 689, Method Code 154, in "Methods Manual for Chemical Analysis of Water and Wastes" published by the Alberta Environmental Centre. This automated method is based on the distillation of phenol and subsequent reaction of the distillate with alkaline ferricyanide and 4-aminoantipyrine to form a red complex which is measured at 505 nm.				
SIO2-D-CALC-ED	Water	Dissolved Silicon (reported as Silica)		CALCULATION
SIO2-T-CALC-ED	Water	Total Silicon (reported as Silica)		CALCULATION
SO4-IC-ED	Water	Sulfate by IC		APHA 4110 B-ION CHROMATOGRAPHY
SOLIDS-TDS-ED	Water	Total Dissolved Solids		APHA 2540 C
TURBIDITY-ED	Water	Turbidity		APHA 2130 B-Nephelometer

** The indicated Method Reference is the closest nationally or internationally recognized reference for the applicable ALS test method. ALS methods may incorporate modifications from the specified reference to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
FM	ALS ENVIRONMENTAL - FORT MCMURRAY, ALBERTA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

M050684

GLOSSARY OF REPORT TERMS

Surr - Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

MU: Measurement Uncertainty. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 which gives a level of confidence of approximately 95%.

Bias: The reported method bias is the average long term deviation from the target value for a long term reference or control sample, measured in percent.

Zero values indicate no detectable method bias.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 1 of 27

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R3048650							
WG1988539-4	DUP	L1541297-1						
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	06-NOV-14
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	06-NOV-14
EthylBenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	06-NOV-14
o-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	06-NOV-14
m+p-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	06-NOV-14
Styrene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	50	06-NOV-14
F1(C6-C10)		<0.10	<0.10	RPD-NA	mg/L	N/A	30	06-NOV-14
WG1988539-8	DUP	L1541122-6						
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	06-NOV-14
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	06-NOV-14
EthylBenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	06-NOV-14
o-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	06-NOV-14
m+p-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	06-NOV-14
Styrene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	50	06-NOV-14
F1(C6-C10)		<0.10	<0.10	RPD-NA	mg/L	N/A	30	06-NOV-14
WG1988539-2	LCS							
Benzene			98.1		%		70-130	06-NOV-14
Toluene			94.5		%		70-130	06-NOV-14
EthylBenzene			90.2		%		70-130	06-NOV-14
o-Xylene			90.2		%		70-130	06-NOV-14
m+p-Xylene			92.6		%		70-130	06-NOV-14
Styrene			94.8		%		70-130	06-NOV-14
WG1988539-3	LCS							
F1(C6-C10)			102.6		%		70-130	06-NOV-14
WG1988539-6	LCS							
Benzene			92.8		%		70-130	06-NOV-14
Toluene			82.8		%		70-130	06-NOV-14
EthylBenzene			81.4		%		70-130	06-NOV-14
o-Xylene			81.3		%		70-130	06-NOV-14
m+p-Xylene			83.6		%		70-130	06-NOV-14
Styrene			84.6		%		70-130	06-NOV-14
WG1988539-7	LCS							
F1(C6-C10)			103.8		%		70-130	06-NOV-14
WG1988539-1	MB							



Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 2 of 27

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R3048650							
WG1988539-1	MB							
Benzene			<0.00050		mg/L		0.0005	06-NOV-14
Toluene			<0.00050		mg/L		0.0005	06-NOV-14
EthylBenzene			<0.00050		mg/L		0.0005	06-NOV-14
o-Xylene			<0.00050		mg/L		0.0005	06-NOV-14
m+p-Xylene			<0.00050		mg/L		0.0005	06-NOV-14
Styrene			<0.0010		mg/L		0.001	06-NOV-14
F1(C6-C10)			<0.10		mg/L		0.1	06-NOV-14
Surrogate: 1,4-Difluorobenzene (SS)			99.1		%		70-130	06-NOV-14
Surrogate: 4-Bromofluorobenzene (SS)			94.2		%		70-130	06-NOV-14
Surrogate: 3,4-Dichlorotoluene (SS)			104.1		%		70-130	06-NOV-14
WG1988539-5	MB							
Benzene			<0.00050		mg/L		0.0005	06-NOV-14
Toluene			<0.00050		mg/L		0.0005	06-NOV-14
EthylBenzene			<0.00050		mg/L		0.0005	06-NOV-14
o-Xylene			<0.00050		mg/L		0.0005	06-NOV-14
m+p-Xylene			<0.00050		mg/L		0.0005	06-NOV-14
Styrene			<0.0010		mg/L		0.001	06-NOV-14
F1(C6-C10)			<0.10		mg/L		0.1	06-NOV-14
Surrogate: 1,4-Difluorobenzene (SS)			97.2		%		70-130	06-NOV-14
Surrogate: 4-Bromofluorobenzene (SS)			89.5		%		70-130	06-NOV-14
Surrogate: 3,4-Dichlorotoluene (SS)			103.6		%		70-130	06-NOV-14
C-DIS-ORG-ED		Water						
Batch	R3063170							
WG1991256-3	CVS							
Dissolved Organic Carbon			137.3		%		80-160	07-NOV-14
WG1991256-10	DUP	L1540624-4						
Dissolved Organic Carbon		19.3	19.4		mg/L	0.8	20	07-NOV-14
WG1991256-4	DUP	L1540607-1						
Dissolved Organic Carbon		20.5	21.0		mg/L	2.2	20	07-NOV-14
WG1991256-8	DUP	L1540304-11						
Dissolved Organic Carbon		<1.0	<1.0	RPD-NA	mg/L	N/A	20	07-NOV-14
WG1991256-2	LCS							
Dissolved Organic Carbon			96.6		%		80-120	07-NOV-14
WG1991256-1	MB							
Dissolved Organic Carbon			<1.0		mg/L		1	07-NOV-14



Environmental

Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 4 of 27

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-ED		Water						
Batch	R3042255							
WG1986730-2	LCS							
Chloride (Cl)			108.5		%		90-110	01-NOV-14
WG1986730-9	LCS							
Chloride (Cl)			109.3		%		90-110	01-NOV-14
WG1986730-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	02-NOV-14
WG1986730-10	MB							
Chloride (Cl)			<0.50		mg/L		0.5	01-NOV-14
WG1986730-12	MB							
Chloride (Cl)			<0.50		mg/L		0.5	01-NOV-14
WG1986730-14	MB							
Chloride (Cl)			<0.50		mg/L		0.5	01-NOV-14
WG1986730-16	MB							
Chloride (Cl)			<0.50		mg/L		0.5	01-NOV-14
WG1986730-18	MB							
Chloride (Cl)			<0.50		mg/L		0.5	01-NOV-14
WG1986730-4	MS	L1540624-4						
Chloride (Cl)			107.0		%		75-125	01-NOV-14
WG1986730-6	MS	L1540594-3						
Chloride (Cl)			111.9		%		75-125	01-NOV-14
WG1986730-8	MS	L1540304-15						
Chloride (Cl)			99.5		%		75-125	01-NOV-14
F2,F3,F4-ED		Water						
Batch	R3052508							
WG1987500-2	LCS							
F2 (>C10-C16)			80.7		%		70-130	04-NOV-14
F3 (C16-C34)			79.3		%		70-130	04-NOV-14
F4 (C34-C50)			72.0		%		70-130	04-NOV-14
WG1987500-1	MB							
F2 (>C10-C16)			<0.25		mg/L		0.25	04-NOV-14
F3 (C16-C34)			<0.25		mg/L		0.25	04-NOV-14
F4 (C34-C50)			<0.25		mg/L		0.25	04-NOV-14
Surrogate: 2-Bromobenzotrifluoride			97.6		%		60-140	04-NOV-14
HG-D-L-CVAA-ED		Water						



Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 5 of 27

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-L-CVAA-ED		Water						
Batch	R3059288							
WG1991215-11 DUP		L1540304-15						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	07-NOV-14
WG1991215-15 DUP		L1540624-4						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	07-NOV-14
WG1991215-10 LCS			99.0		%		80-120	07-NOV-14
Mercury (Hg)-Dissolved								
WG1991215-14 LCS			96.0		%		80-120	07-NOV-14
Mercury (Hg)-Dissolved								
WG1991215-13 MB			<0.0000050		mg/L		0.000005	07-NOV-14
Mercury (Hg)-Dissolved								
WG1991215-9 MB			<0.0000050		mg/L		0.000005	07-NOV-14
Mercury (Hg)-Dissolved								
WG1991215-12 MS		L1540304-15						
Mercury (Hg)-Dissolved			92.7		%		70-130	07-NOV-14
WG1991215-16 MS		L1540624-4						
Mercury (Hg)-Dissolved			92.4		%		70-130	07-NOV-14
HG-T-L-CVAA-ED		Water						
Batch	R3059288							
WG1991233-3 DUP		L1540304-13						
Mercury (Hg)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	07-NOV-14
WG1991233-2 LCS			98.6		%		80-120	07-NOV-14
Mercury (Hg)-Total								
WG1991233-1 MB			<0.0000050		mg/L		0.000005	07-NOV-14
Mercury (Hg)-Total								
WG1991233-4 MS		L1540304-13						
Mercury (Hg)-Total			91.9		%		70-130	07-NOV-14
MET-D-CCMS-ED		Water						
Batch	R3062471							
WG1991996-4 CRM		ED-HIGH-WATRM						
Aluminum (Al)-Dissolved			103.1		%		80-120	08-NOV-14
Antimony (Sb)-Dissolved			95.8		%		80-120	08-NOV-14
Arsenic (As)-Dissolved			89.9		%		80-120	08-NOV-14
Barium (Ba)-Dissolved			100.5		%		80-120	08-NOV-14
Boron (B)-Dissolved			88.2		%		80-120	08-NOV-14
Cadmium (Cd)-Dissolved			100.5		%		80-120	08-NOV-14
Calcium (Ca)-Dissolved			98.7		%		80-120	08-NOV-14
Chromium (Cr)-Dissolved			93.0		%		80-120	08-NOV-14



Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 6 of 27

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R3062471							
WG1991996-4 CRM	ED-HIGH-WATRM							
Copper (Cu)-Dissolved			96.9		%		80-120	08-NOV-14
Iron (Fe)-Dissolved			96.3		%		80-120	08-NOV-14
Lead (Pb)-Dissolved			104.2		%		80-120	08-NOV-14
Magnesium (Mg)-Dissolved			98.3		%		80-120	08-NOV-14
Manganese (Mn)-Dissolved			95.4		%		80-120	08-NOV-14
Nickel (Ni)-Dissolved			97.5		%		80-120	08-NOV-14
Potassium (K)-Dissolved			98.6		%		80-120	08-NOV-14
Selenium (Se)-Dissolved			91.2		%		80-120	08-NOV-14
Silicon (Si)-Dissolved			105.2		%		80-120	08-NOV-14
Silver (Ag)-Dissolved			105.0		%		80-120	08-NOV-14
Sodium (Na)-Dissolved			99.4		%		80-120	08-NOV-14
Uranium (U)-Dissolved			101.0		%		80-120	08-NOV-14
Zinc (Zn)-Dissolved			98.8		%		80-120	08-NOV-14
WG1991996-6 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			100.8		%		80-120	09-NOV-14
Antimony (Sb)-Dissolved			94.9		%		80-120	09-NOV-14
Arsenic (As)-Dissolved			91.0		%		80-120	09-NOV-14
Barium (Ba)-Dissolved			99.9		%		80-120	09-NOV-14
Boron (B)-Dissolved			93.0		%		80-120	09-NOV-14
Cadmium (Cd)-Dissolved			96.5		%		80-120	09-NOV-14
Calcium (Ca)-Dissolved			102.3		%		80-120	09-NOV-14
Chromium (Cr)-Dissolved			96.4		%		80-120	09-NOV-14
Copper (Cu)-Dissolved			97.2		%		80-120	09-NOV-14
Iron (Fe)-Dissolved			90.6		%		80-120	09-NOV-14
Lead (Pb)-Dissolved			103.8		%		80-120	09-NOV-14
Magnesium (Mg)-Dissolved			96.9		%		80-120	09-NOV-14
Manganese (Mn)-Dissolved			97.4		%		80-120	09-NOV-14
Nickel (Ni)-Dissolved			97.0		%		80-120	09-NOV-14
Potassium (K)-Dissolved			100.4		%		80-120	09-NOV-14
Selenium (Se)-Dissolved			91.3		%		80-120	09-NOV-14
Silicon (Si)-Dissolved			97.5		%		80-120	09-NOV-14
Silver (Ag)-Dissolved			102.9		%		80-120	09-NOV-14
Sodium (Na)-Dissolved			100.5		%		80-120	09-NOV-14
Uranium (U)-Dissolved			99.5		%		80-120	09-NOV-14



Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 7 of 27

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R3062471							
WG1991996-6	CRM	ED-HIGH-WATRM						
Zinc (Zn)-Dissolved			96.7		%		80-120	09-NOV-14
WG1991996-7	DUP	L1540624-2						
Aluminum (Al)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	09-NOV-14
Antimony (Sb)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	09-NOV-14
Arsenic (As)-Dissolved		0.00193	0.00197		mg/L	2.1	20	09-NOV-14
Barium (Ba)-Dissolved		0.0581	0.0568		mg/L	2.2	20	09-NOV-14
Boron (B)-Dissolved		0.194	0.194		mg/L	0.4	20	09-NOV-14
Cadmium (Cd)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-NOV-14
Calcium (Ca)-Dissolved		43.2	42.5		mg/L	1.7	20	09-NOV-14
Chromium (Cr)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	09-NOV-14
Copper (Cu)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	09-NOV-14
Iron (Fe)-Dissolved		0.149	0.148		mg/L	0.7	20	09-NOV-14
Lead (Pb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-NOV-14
Magnesium (Mg)-Dissolved		71.0	70.6		mg/L	0.6	20	09-NOV-14
Manganese (Mn)-Dissolved		0.189	0.190		mg/L	0.3	20	09-NOV-14
Nickel (Ni)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	09-NOV-14
Potassium (K)-Dissolved		3.59	3.56		mg/L	1.0	20	09-NOV-14
Selenium (Se)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	09-NOV-14
Silicon (Si)-Dissolved		5.23	5.16		mg/L	1.4	20	09-NOV-14
Silver (Ag)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-NOV-14
Sodium (Na)-Dissolved		54.3	52.9		mg/L	2.6	20	09-NOV-14
Uranium (U)-Dissolved		0.00038	0.00039		mg/L	1.2	20	09-NOV-14
Zinc (Zn)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	09-NOV-14
WG1991996-8	DUP	L1542522-1						
Aluminum (Al)-Dissolved		0.0047	0.0063	J	mg/L	0.0017	0.002	09-NOV-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-NOV-14
Arsenic (As)-Dissolved		0.00023	0.00028		mg/L	20	20	09-NOV-14
Barium (Ba)-Dissolved		0.136	0.138		mg/L	1.3	20	09-NOV-14
Boron (B)-Dissolved		0.016	0.016		mg/L	1.0	20	09-NOV-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	09-NOV-14
Calcium (Ca)-Dissolved		75.2	76.6		mg/L	1.9	20	09-NOV-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-NOV-14
Copper (Cu)-Dissolved		0.00013	0.00016	J	mg/L	0.00003	0.0002	09-NOV-14



Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 8 of 27

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R3062471							
WG1991996-8	DUP	L1542522-1						
Iron (Fe)-Dissolved		0.135	0.140		mg/L	3.7	20	09-NOV-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	09-NOV-14
Magnesium (Mg)-Dissolved		19.6	20.3		mg/L	3.5	20	09-NOV-14
Manganese (Mn)-Dissolved		0.148	0.153		mg/L	3.4	20	09-NOV-14
Nickel (Ni)-Dissolved		0.00053	0.00052		mg/L	2.1	20	09-NOV-14
Potassium (K)-Dissolved		1.17	1.21		mg/L	3.2	20	09-NOV-14
Selenium (Se)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-NOV-14
Silicon (Si)-Dissolved		4.34	4.33		mg/L	0.3	20	09-NOV-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	09-NOV-14
Sodium (Na)-Dissolved		28.5	29.8		mg/L	4.4	20	09-NOV-14
Uranium (U)-Dissolved		0.00151	0.00148		mg/L	1.8	20	09-NOV-14
Zinc (Zn)-Dissolved		<0.0010	0.0010	RPD-NA	mg/L	N/A	20	09-NOV-14
WG1991996-3	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	08-NOV-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	08-NOV-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	08-NOV-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	08-NOV-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	08-NOV-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	08-NOV-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	08-NOV-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	08-NOV-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	08-NOV-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	08-NOV-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	08-NOV-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	08-NOV-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	08-NOV-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	08-NOV-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	08-NOV-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	08-NOV-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	08-NOV-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	08-NOV-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	08-NOV-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	08-NOV-14



Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 9 of 27

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R3062471							
WG1991996-3	MB							
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	08-NOV-14
WG1991996-5	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	09-NOV-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	09-NOV-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	09-NOV-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	09-NOV-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	09-NOV-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	09-NOV-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	09-NOV-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	09-NOV-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	09-NOV-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	09-NOV-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	09-NOV-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	09-NOV-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	09-NOV-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	09-NOV-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	09-NOV-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	09-NOV-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	09-NOV-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	09-NOV-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	09-NOV-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	09-NOV-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	09-NOV-14
Batch	R3064909							
WG1992685-2	CRM	ED-HIGH-WATRM						
Aluminum (Al)-Dissolved			98.2		%		80-120	10-NOV-14
Antimony (Sb)-Dissolved			92.1		%		80-120	10-NOV-14
Arsenic (As)-Dissolved			90.7		%		80-120	10-NOV-14
Barium (Ba)-Dissolved			103.3		%		80-120	10-NOV-14
Boron (B)-Dissolved			96.9		%		80-120	10-NOV-14
Cadmium (Cd)-Dissolved			99.7		%		80-120	10-NOV-14
Calcium (Ca)-Dissolved			96.5		%		80-120	10-NOV-14
Chromium (Cr)-Dissolved			99.0		%		80-120	10-NOV-14
Copper (Cu)-Dissolved			99.5		%		80-120	10-NOV-14



Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 10 of 27

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R3064909							
WG1992685-2 CRM	ED-HIGH-WATRM							
Iron (Fe)-Dissolved			97.6		%		80-120	10-NOV-14
Lead (Pb)-Dissolved			100.7		%		80-120	10-NOV-14
Magnesium (Mg)-Dissolved			102.2		%		80-120	10-NOV-14
Manganese (Mn)-Dissolved			99.3		%		80-120	10-NOV-14
Nickel (Ni)-Dissolved			99.1		%		80-120	10-NOV-14
Potassium (K)-Dissolved			100.3		%		80-120	10-NOV-14
Selenium (Se)-Dissolved			91.7		%		80-120	10-NOV-14
Silicon (Si)-Dissolved			95.6		%		80-120	10-NOV-14
Silver (Ag)-Dissolved			100.0		%		80-120	10-NOV-14
Sodium (Na)-Dissolved			96.8		%		80-120	10-NOV-14
Uranium (U)-Dissolved			98.7		%		80-120	10-NOV-14
Zinc (Zn)-Dissolved			97.8		%		80-120	10-NOV-14
WG1992685-5 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			98.3		%		80-120	10-NOV-14
Antimony (Sb)-Dissolved			93.2		%		80-120	10-NOV-14
Arsenic (As)-Dissolved			90.5		%		80-120	10-NOV-14
Barium (Ba)-Dissolved			100.4		%		80-120	10-NOV-14
Boron (B)-Dissolved			96.8		%		80-120	10-NOV-14
Cadmium (Cd)-Dissolved			103.5		%		80-120	10-NOV-14
Calcium (Ca)-Dissolved			97.5		%		80-120	10-NOV-14
Chromium (Cr)-Dissolved			100.3		%		80-120	10-NOV-14
Copper (Cu)-Dissolved			100.8		%		80-120	10-NOV-14
Iron (Fe)-Dissolved			98.8		%		80-120	10-NOV-14
Lead (Pb)-Dissolved			100.5		%		80-120	10-NOV-14
Magnesium (Mg)-Dissolved			106.4		%		80-120	10-NOV-14
Manganese (Mn)-Dissolved			100.9		%		80-120	10-NOV-14
Nickel (Ni)-Dissolved			99.6		%		80-120	10-NOV-14
Potassium (K)-Dissolved			101.1		%		80-120	10-NOV-14
Selenium (Se)-Dissolved			89.9		%		80-120	10-NOV-14
Silicon (Si)-Dissolved			90.7		%		80-120	10-NOV-14
Silver (Ag)-Dissolved			102.9		%		80-120	10-NOV-14
Sodium (Na)-Dissolved			102.7		%		80-120	10-NOV-14
Uranium (U)-Dissolved			97.0		%		80-120	10-NOV-14
Zinc (Zn)-Dissolved			113.5		%		80-120	10-NOV-14



Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 11 of 27

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R3064909							
WG1992685-8 CRM		ED-HIGH-WATRM						
Aluminum (Al)-Dissolved			100.1		%		80-120	10-NOV-14
Antimony (Sb)-Dissolved			93.5		%		80-120	10-NOV-14
Arsenic (As)-Dissolved			91.0		%		80-120	10-NOV-14
Barium (Ba)-Dissolved			106.4		%		80-120	10-NOV-14
Boron (B)-Dissolved			98.0		%		80-120	10-NOV-14
Cadmium (Cd)-Dissolved			101.5		%		80-120	10-NOV-14
Calcium (Ca)-Dissolved			98.2		%		80-120	10-NOV-14
Chromium (Cr)-Dissolved			99.8		%		80-120	10-NOV-14
Copper (Cu)-Dissolved			101.0		%		80-120	10-NOV-14
Iron (Fe)-Dissolved			102.1		%		80-120	10-NOV-14
Lead (Pb)-Dissolved			101.0		%		80-120	10-NOV-14
Magnesium (Mg)-Dissolved			101.8		%		80-120	10-NOV-14
Manganese (Mn)-Dissolved			100.4		%		80-120	10-NOV-14
Nickel (Ni)-Dissolved			98.7		%		80-120	10-NOV-14
Potassium (K)-Dissolved			101.0		%		80-120	10-NOV-14
Selenium (Se)-Dissolved			90.2		%		80-120	10-NOV-14
Silicon (Si)-Dissolved			92.4		%		80-120	10-NOV-14
Silver (Ag)-Dissolved			102.4		%		80-120	10-NOV-14
Sodium (Na)-Dissolved			100.1		%		80-120	10-NOV-14
Uranium (U)-Dissolved			99.9		%		80-120	10-NOV-14
Zinc (Zn)-Dissolved			113.5		%		80-120	10-NOV-14
WG1992685-3 DUP		L1537970-9						
Aluminum (Al)-Dissolved		0.0041	0.0042		mg/L	3.0	20	10-NOV-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-NOV-14
Arsenic (As)-Dissolved		0.00082	0.00080		mg/L	2.2	20	10-NOV-14
Barium (Ba)-Dissolved		0.0192	0.0197		mg/L	2.5	20	10-NOV-14
Boron (B)-Dissolved		0.017	0.012	J	mg/L	0.005	0.02	10-NOV-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	10-NOV-14
Calcium (Ca)-Dissolved		25.5	24.7		mg/L	3.1	20	10-NOV-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-NOV-14
Copper (Cu)-Dissolved		0.00051	0.00054		mg/L	5.4	20	10-NOV-14
Iron (Fe)-Dissolved		0.527	0.537		mg/L	1.8	20	10-NOV-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	10-NOV-14



Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 12 of 27

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R3064909							
WG1992685-3	DUP	L1537970-9						
Magnesium (Mg)-Dissolved		8.05	7.73		mg/L	4.0	20	10-NOV-14
Manganese (Mn)-Dissolved		0.0590	0.0586		mg/L	0.6	20	10-NOV-14
Nickel (Ni)-Dissolved		0.00030	0.00027		mg/L	13	20	10-NOV-14
Potassium (K)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	10-NOV-14
Selenium (Se)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-NOV-14
Silicon (Si)-Dissolved		2.84	2.82		mg/L	0.7	20	10-NOV-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	10-NOV-14
Sodium (Na)-Dissolved		2.5	2.6		mg/L	1.7	20	10-NOV-14
Uranium (U)-Dissolved		0.000020	0.000020		mg/L	3.3	20	10-NOV-14
WG1992685-6	DUP	L1541573-2						
Aluminum (Al)-Dissolved		0.0402	0.0410		mg/L	1.8	20	10-NOV-14
Antimony (Sb)-Dissolved		0.00034	0.00032		mg/L	6.8	20	10-NOV-14
Arsenic (As)-Dissolved		0.00048	0.00047		mg/L	2.5	20	10-NOV-14
Barium (Ba)-Dissolved		0.0420	0.0422		mg/L	0.4	20	10-NOV-14
Boron (B)-Dissolved		0.047	0.048		mg/L	2.5	20	10-NOV-14
Cadmium (Cd)-Dissolved		0.000110	0.000118		mg/L	7.7	20	10-NOV-14
Calcium (Ca)-Dissolved		39.4	40.5		mg/L	2.6	20	10-NOV-14
Copper (Cu)-Dissolved		0.00245	0.00240		mg/L	2.0	20	10-NOV-14
Iron (Fe)-Dissolved		0.123	0.121		mg/L	2.1	20	10-NOV-14
Magnesium (Mg)-Dissolved		11.2	11.5		mg/L	2.7	20	10-NOV-14
Manganese (Mn)-Dissolved		0.0387	0.0389		mg/L	0.4	20	10-NOV-14
Potassium (K)-Dissolved		22.5	22.9		mg/L	1.6	20	10-NOV-14
Selenium (Se)-Dissolved		0.00018	0.00018		mg/L	1.4	20	10-NOV-14
Silicon (Si)-Dissolved		2.39	2.42		mg/L	1.2	20	10-NOV-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	10-NOV-14
Sodium (Na)-Dissolved		115	118		mg/L	2.4	20	10-NOV-14
Uranium (U)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	10-NOV-14
Zinc (Zn)-Dissolved		0.191	0.191		mg/L	0.2	20	10-NOV-14
WG1992685-9	DUP	L1542314-7						
Aluminum (Al)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	10-NOV-14
Antimony (Sb)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	10-NOV-14
Arsenic (As)-Dissolved		0.00096	0.00105		mg/L	8.5	20	10-NOV-14
Barium (Ba)-Dissolved		0.458	0.483		mg/L	5.4	20	10-NOV-14



Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 13 of 27

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R3064909							
WG1992685-9	DUP	L1542314-7						
Boron (B)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	10-NOV-14
Calcium (Ca)-Dissolved		174	171		mg/L	1.5	20	10-NOV-14
Chromium (Cr)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	10-NOV-14
Copper (Cu)-Dissolved		<0.00060	<0.00060	RPD-NA	mg/L	N/A	20	10-NOV-14
Iron (Fe)-Dissolved		1.23	1.25		mg/L	1.7	20	10-NOV-14
Lead (Pb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-NOV-14
Magnesium (Mg)-Dissolved		42.4	43.4		mg/L	2.3	20	10-NOV-14
Manganese (Mn)-Dissolved		0.620	0.622		mg/L	0.5	20	10-NOV-14
Nickel (Ni)-Dissolved		0.00771	0.00774		mg/L	0.4	20	10-NOV-14
Potassium (K)-Dissolved		0.87	0.89		mg/L	2.5	20	10-NOV-14
Selenium (Se)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	10-NOV-14
Silicon (Si)-Dissolved		8.58	8.77		mg/L	2.1	20	10-NOV-14
Silver (Ag)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-NOV-14
Sodium (Na)-Dissolved		5.1	5.2		mg/L	1.1	20	10-NOV-14
Uranium (U)-Dissolved		0.00115	0.00119		mg/L	3.3	20	10-NOV-14
Zinc (Zn)-Dissolved		<0.0010	0.0012	RPD-NA	mg/L	N/A	20	10-NOV-14
WG1992685-1	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	10-NOV-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	10-NOV-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	10-NOV-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	10-NOV-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	10-NOV-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	10-NOV-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	10-NOV-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	10-NOV-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	10-NOV-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	10-NOV-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	10-NOV-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	10-NOV-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	10-NOV-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	10-NOV-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	10-NOV-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	10-NOV-14



Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 14 of 27

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R3064909							
WG1992685-1 MB								
	Silicon (Si)-Dissolved		<0.050		mg/L		0.05	10-NOV-14
	Silver (Ag)-Dissolved		<0.000010		mg/L		0.00001	10-NOV-14
	Sodium (Na)-Dissolved		<0.050		mg/L		0.05	10-NOV-14
	Uranium (U)-Dissolved		<0.000010		mg/L		0.00001	10-NOV-14
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	10-NOV-14
WG1992685-4 MB								
	Aluminum (Al)-Dissolved		<0.0010		mg/L		0.001	10-NOV-14
	Antimony (Sb)-Dissolved		<0.00010		mg/L		0.0001	10-NOV-14
	Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	10-NOV-14
	Barium (Ba)-Dissolved		<0.000050		mg/L		0.00005	10-NOV-14
	Boron (B)-Dissolved		<0.010		mg/L		0.01	10-NOV-14
	Cadmium (Cd)-Dissolved		<0.000010		mg/L		0.00001	10-NOV-14
	Calcium (Ca)-Dissolved		<0.020		mg/L		0.02	10-NOV-14
	Chromium (Cr)-Dissolved		<0.00010		mg/L		0.0001	10-NOV-14
	Copper (Cu)-Dissolved		<0.00010		mg/L		0.0001	10-NOV-14
	Iron (Fe)-Dissolved		<0.010		mg/L		0.01	10-NOV-14
	Lead (Pb)-Dissolved		<0.000050		mg/L		0.00005	10-NOV-14
	Magnesium (Mg)-Dissolved		<0.0050		mg/L		0.005	10-NOV-14
	Manganese (Mn)-Dissolved		<0.000050		mg/L		0.00005	10-NOV-14
	Nickel (Ni)-Dissolved		<0.00010		mg/L		0.0001	10-NOV-14
	Potassium (K)-Dissolved		<0.050		mg/L		0.05	10-NOV-14
	Selenium (Se)-Dissolved		<0.00010		mg/L		0.0001	10-NOV-14
	Silicon (Si)-Dissolved		<0.050		mg/L		0.05	10-NOV-14
	Silver (Ag)-Dissolved		<0.000010		mg/L		0.00001	10-NOV-14
	Sodium (Na)-Dissolved		<0.050		mg/L		0.05	10-NOV-14
	Uranium (U)-Dissolved		<0.000010		mg/L		0.00001	10-NOV-14
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	10-NOV-14
WG1992685-7 MB								
	Aluminum (Al)-Dissolved		<0.0010		mg/L		0.001	10-NOV-14
	Antimony (Sb)-Dissolved		<0.00010		mg/L		0.0001	10-NOV-14
	Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	10-NOV-14
	Barium (Ba)-Dissolved		<0.000050		mg/L		0.00005	10-NOV-14
	Boron (B)-Dissolved		<0.010		mg/L		0.01	10-NOV-14
	Cadmium (Cd)-Dissolved		<0.000010		mg/L		0.00001	10-NOV-14



Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 15 of 27

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R3064909							
WG1992685-7	MB							
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	10-NOV-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	10-NOV-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	10-NOV-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	10-NOV-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	10-NOV-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	10-NOV-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	10-NOV-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	10-NOV-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	10-NOV-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	10-NOV-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	10-NOV-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	10-NOV-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	10-NOV-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	10-NOV-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	10-NOV-14
MET-T-CCMS-ED		Water						
Batch	R3060749							
WG1987792-3	DUP	L1539964-13						
Aluminum (Al)-Total		<0.0060	0.0075	RPD-NA	mg/L	N/A	20	07-NOV-14
Antimony (Sb)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	07-NOV-14
Arsenic (As)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	07-NOV-14
Barium (Ba)-Total		0.113	0.108		mg/L	4.4	20	07-NOV-14
Boron (B)-Total		2.01	1.96		mg/L	2.5	20	07-NOV-14
Cadmium (Cd)-Total		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	07-NOV-14
Calcium (Ca)-Total		29.9	28.5		mg/L	4.8	20	07-NOV-14
Chromium (Cr)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	07-NOV-14
Copper (Cu)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	07-NOV-14
Iron (Fe)-Total		1.60	1.59		mg/L	0.2	20	07-NOV-14
Lead (Pb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-NOV-14
Magnesium (Mg)-Total		19.5	20.0		mg/L	2.5	20	07-NOV-14
Manganese (Mn)-Total		0.0632	0.0648		mg/L	2.5	20	07-NOV-14
Potassium (K)-Total		13.3	13.4		mg/L	0.7	20	07-NOV-14
Selenium (Se)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	07-NOV-14



Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 16 of 27

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R3060749							
WG1987792-3	DUP	L1539964-13						
Silicon (Si)-Total		3.01	3.05		mg/L	1.3	20	07-NOV-14
Silver (Ag)-Total		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	07-NOV-14
Sodium (Na)-Total		438	435		mg/L	0.6	20	07-NOV-14
Uranium (U)-Total		0.000029	0.000026		mg/L	14	20	07-NOV-14
Zinc (Zn)-Total		<0.0060	<0.0060	RPD-NA	mg/L	N/A	20	07-NOV-14
WG1987792-6	DUP	L1540004-6						
Aluminum (Al)-Total		0.0320	0.0314		mg/L	1.8	20	07-NOV-14
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-NOV-14
Arsenic (As)-Total		0.00033	0.00036		mg/L	9.0	20	07-NOV-14
Barium (Ba)-Total		0.0356	0.0359		mg/L	1.1	20	07-NOV-14
Boron (B)-Total		0.036	0.035		mg/L	1.2	20	07-NOV-14
Cadmium (Cd)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	07-NOV-14
Calcium (Ca)-Total		42.5	41.0		mg/L	3.7	20	07-NOV-14
Chromium (Cr)-Total		0.00013	0.00013		mg/L	3.4	20	07-NOV-14
Copper (Cu)-Total		0.00012	0.00011		mg/L	7.8	20	07-NOV-14
Iron (Fe)-Total		1.09	1.11		mg/L	1.5	20	07-NOV-14
Lead (Pb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	07-NOV-14
Magnesium (Mg)-Total		12.7	12.6		mg/L	0.7	20	07-NOV-14
Manganese (Mn)-Total		0.0395	0.0395		mg/L	0.0	20	07-NOV-14
Nickel (Ni)-Total		0.00053	0.00055		mg/L	2.8	20	07-NOV-14
Potassium (K)-Total		1.81	1.83		mg/L	0.9	20	07-NOV-14
Selenium (Se)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-NOV-14
Silicon (Si)-Total		4.17	4.25		mg/L	1.8	20	07-NOV-14
Silver (Ag)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	07-NOV-14
Sodium (Na)-Total		11.4	11.7		mg/L	3.1	20	07-NOV-14
Uranium (U)-Total		0.000055	0.000054		mg/L	1.4	20	07-NOV-14
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	07-NOV-14
WG1987792-5	LCS							
Aluminum (Al)-Total			108.9		%		70-130	07-NOV-14
Antimony (Sb)-Total			100.2		%		70-130	07-NOV-14
Arsenic (As)-Total			94.4		%		70-130	07-NOV-14
Barium (Ba)-Total			105.9		%		70-130	07-NOV-14
Boron (B)-Total			108.1		%		70-130	07-NOV-14



Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 17 of 27

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R3060749							
WG1987792-5 LCS								
Cadmium (Cd)-Total			104.0		%		70-130	07-NOV-14
Calcium (Ca)-Total			102.0		%		70-130	07-NOV-14
Chromium (Cr)-Total			105.6		%		70-130	07-NOV-14
Copper (Cu)-Total			102.8		%		70-130	07-NOV-14
Iron (Fe)-Total			99.8		%		70-130	07-NOV-14
Lead (Pb)-Total			106.0		%		70-130	07-NOV-14
Magnesium (Mg)-Total			109.3		%		70-130	07-NOV-14
Manganese (Mn)-Total			108.9		%		70-130	07-NOV-14
Nickel (Ni)-Total			104.8		%		70-130	07-NOV-14
Potassium (K)-Total			110.4		%		70-130	07-NOV-14
Selenium (Se)-Total			94.3		%		70-130	07-NOV-14
Silicon (Si)-Total			109.4		%		70-130	07-NOV-14
Silver (Ag)-Total			107.3		%		70-130	07-NOV-14
Sodium (Na)-Total			117.0		%		70-130	07-NOV-14
Uranium (U)-Total			103.2		%		70-130	07-NOV-14
Zinc (Zn)-Total			104.4		%		70-130	07-NOV-14
WG1987792-4 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	07-NOV-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	07-NOV-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	07-NOV-14
Barium (Ba)-Total			<0.000050		mg/L		0.00005	07-NOV-14
Boron (B)-Total			<0.010		mg/L		0.01	07-NOV-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	07-NOV-14
Calcium (Ca)-Total			<0.020		mg/L		0.02	07-NOV-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	07-NOV-14
Iron (Fe)-Total			<0.010		mg/L		0.01	07-NOV-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	07-NOV-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	07-NOV-14
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	07-NOV-14
Nickel (Ni)-Total			<0.00010		mg/L		0.0001	07-NOV-14
Potassium (K)-Total			<0.050		mg/L		0.05	07-NOV-14
Selenium (Se)-Total			<0.00010		mg/L		0.0001	07-NOV-14
Silicon (Si)-Total			<0.050		mg/L		0.05	07-NOV-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	07-NOV-14



Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 18 of 27

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R3060749							
WG1987792-4 MB								
Sodium (Na)-Total			<0.050		mg/L		0.05	07-NOV-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	07-NOV-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	07-NOV-14
NAPHTHENIC-ACID-FM		Water						
Batch	R3061749							
WG1991195-3 DUP		L1538915-2						
Naphthenic Acids		<1.0	<1.0	RPD-NA	mg/L	N/A	30	07-NOV-14
WG1991195-7 DUP		L1540602-2						
Naphthenic Acids		13.4	13.8		mg/L	2.9	30	07-NOV-14
WG1991195-4 LCS								
Naphthenic Acids			79.8		%		70-130	07-NOV-14
WG1991195-8 LCS								
Naphthenic Acids			94.1		%		70-130	07-NOV-14
WG1991195-1 MB								
Naphthenic Acids			<1.0		mg/L		1	07-NOV-14
WG1991195-5 MB								
Naphthenic Acids			<1.0		mg/L		1	07-NOV-14
WG1991195-2 MS		L1538915-1						
Naphthenic Acids			104.1		%		50-150	07-NOV-14
WG1991195-6 MS		L1540602-1						
Naphthenic Acids			31.0	MS-B	%		50-150	07-NOV-14
NH3-CFA-ED		Water						
Batch	R3054991							
WG1990079-11 DUP		L1543319-1						
Ammonia, Total (as N)		0.469	0.473		mg/L	0.8	20	06-NOV-14
WG1990079-5 DUP		L1537041-1						
Ammonia, Total (as N)		0.117	0.104		mg/L	12	20	06-NOV-14
WG1990079-7 DUP		L1540569-2						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	06-NOV-14
WG1990079-9 DUP		L1537949-1						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	06-NOV-14
WG1990079-2 LCS								
Ammonia, Total (as N)			99.4		%		85-115	06-NOV-14
WG1990079-1 MB								
Ammonia, Total (as N)			<0.050		mg/L		0.05	06-NOV-14
WG1990079-10 MS		L1539168-8						



Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 19 of 27

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-CFA-ED		Water						
Batch	R3054991							
WG1990079-10 MS		L1539168-8						
Ammonia, Total (as N)			109.2		%		75-125	06-NOV-14
WG1990079-6 MS		L1540173-2						
Ammonia, Total (as N)			103.8		%		75-125	06-NOV-14
WG1990079-8 MS		L1541154-2						
Ammonia, Total (as N)			103.1		%		75-125	06-NOV-14
NO2-IC-ED		Water						
Batch	R3042255							
WG1986730-3 DUP		L1540624-4						
Nitrite (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	01-NOV-14
WG1986730-7 DUP		L1540304-15						
Nitrite (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	01-NOV-14
WG1986730-11 LCS								
Nitrite (as N)			102.9		%		90-110	01-NOV-14
WG1986730-13 LCS								
Nitrite (as N)			104.6		%		90-110	01-NOV-14
WG1986730-15 LCS								
Nitrite (as N)			104.1		%		90-110	01-NOV-14
WG1986730-17 LCS								
Nitrite (as N)			90.2		%		90-110	01-NOV-14
WG1986730-2 LCS								
Nitrite (as N)			106.7		%		90-110	01-NOV-14
WG1986730-9 LCS								
Nitrite (as N)			104.8		%		90-110	01-NOV-14
WG1986730-1 MB								
Nitrite (as N)			<0.020		mg/L		0.02	02-NOV-14
WG1986730-10 MB								
Nitrite (as N)			<0.020		mg/L		0.02	01-NOV-14
WG1986730-12 MB								
Nitrite (as N)			<0.020		mg/L		0.02	01-NOV-14
WG1986730-14 MB								
Nitrite (as N)			<0.020		mg/L		0.02	01-NOV-14
WG1986730-16 MB								
Nitrite (as N)			<0.020		mg/L		0.02	01-NOV-14
WG1986730-18 MB								
Nitrite (as N)			<0.020		mg/L		0.02	01-NOV-14
WG1986730-4 MS		L1540624-4						
Nitrite (as N)			87.4		%		75-125	01-NOV-14



Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 20 of 27

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-ED		Water						
Batch	R3042255							
WG1986730-8	MS	L1540304-15						
Nitrite (as N)			86.7		%		75-125	01-NOV-14
NO3-IC-ED		Water						
Batch	R3042255							
WG1986730-3	DUP	L1540624-4						
Nitrate (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	01-NOV-14
WG1986730-7	DUP	L1540304-15						
Nitrate (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	01-NOV-14
WG1986730-11	LCS		94.8		%		90-110	01-NOV-14
Nitrate (as N)								
WG1986730-13	LCS		94.8		%		90-110	01-NOV-14
Nitrate (as N)								
WG1986730-15	LCS		95.2		%		90-110	01-NOV-14
Nitrate (as N)								
WG1986730-17	LCS		95.7		%		90-110	01-NOV-14
Nitrate (as N)								
WG1986730-2	LCS		95.2		%		90-110	01-NOV-14
Nitrate (as N)								
WG1986730-9	LCS		95.5		%		90-110	01-NOV-14
Nitrate (as N)								
WG1986730-1	MB		<0.050		mg/L		0.05	02-NOV-14
Nitrate (as N)								
WG1986730-10	MB		<0.050		mg/L		0.05	01-NOV-14
Nitrate (as N)								
WG1986730-12	MB		<0.050		mg/L		0.05	01-NOV-14
Nitrate (as N)								
WG1986730-14	MB		<0.050		mg/L		0.05	01-NOV-14
Nitrate (as N)								
WG1986730-16	MB		<0.050		mg/L		0.05	01-NOV-14
Nitrate (as N)								
WG1986730-18	MB		<0.050		mg/L		0.05	01-NOV-14
Nitrate (as N)								
WG1986730-4	MS	L1540624-4						
Nitrate (as N)			86.8		%		75-125	01-NOV-14
WG1986730-8	MS	L1540304-15						
Nitrate (as N)			84.5		%		75-125	01-NOV-14
PAH-ABT1-CL	Water							



Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 21 of 27

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch	R3049633							
WG1988369-2	LCS							
Acenaphthene			89.4		%		60-130	04-NOV-14
Acenaphthylene			96.0		%		60-130	04-NOV-14
Anthracene			94.7		%		60-130	04-NOV-14
Fluoranthene			102.0		%		60-130	04-NOV-14
Fluorene			92.8		%		60-130	04-NOV-14
Naphthalene			86.1		%		50-130	04-NOV-14
Phenanthrene			94.6		%		60-130	04-NOV-14
Pyrene			103.0		%		60-130	04-NOV-14
Benzo(a)anthracene			104.5		%		60-130	04-NOV-14
Benzo(k)fluoranthene			107.5		%		60-130	04-NOV-14
Benzo(b&j)fluoranthene			104.7		%		60-130	04-NOV-14
Benzo(g,h,i)perylene			95.2		%		60-130	04-NOV-14
Benzo(a)pyrene			110.9		%		60-130	04-NOV-14
Chrysene			101.2		%		60-130	04-NOV-14
Dibenzo(a,h)anthracene			101.9		%		60-130	04-NOV-14
Indeno(1,2,3-cd)pyrene			92.3		%		60-130	04-NOV-14
WG1988369-1	MB							
Acenaphthene			<0.000020		mg/L		0.00002	04-NOV-14
Acenaphthylene			<0.000020		mg/L		0.00002	04-NOV-14
Anthracene			<0.000010		mg/L		0.00001	04-NOV-14
Fluoranthene			<0.000020		mg/L		0.00002	04-NOV-14
Fluorene			<0.000020		mg/L		0.00002	04-NOV-14
Naphthalene			<0.000050		mg/L		0.00005	04-NOV-14
Phenanthrene			<0.000050		mg/L		0.00005	04-NOV-14
Pyrene			<0.000010		mg/L		0.00001	04-NOV-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	04-NOV-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	04-NOV-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	04-NOV-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	04-NOV-14
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	04-NOV-14
Chrysene			<0.000020		mg/L		0.00002	04-NOV-14
Dibenzo(a,h)anthracene			<0.0000050		mg/L		0.000005	04-NOV-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	04-NOV-14
Surrogate: d10-Acenaphthene			96.2		%		60-130	04-NOV-14



Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 22 of 27

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch	R3049633							
WG1988369-1	MB							
Surrogate: d10-Phenanthrene			95.6		%		60-130	04-NOV-14
Surrogate: d12-Chrysene			96.2		%		60-130	04-NOV-14
PH/EC/ALK-ED		Water						
Batch	R3060009							
WG1991307-9	DUP	L1540624-4						
pH		8.67	8.64	J	pH	0.03	0.3	08-NOV-14
Conductivity (EC)		714	707		uS/cm	1.1	10	08-NOV-14
Bicarbonate (HCO3)		337	339		mg/L	0.6	25	08-NOV-14
Carbonate (CO3)		17.9	16.5		mg/L	8.0	25	08-NOV-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	08-NOV-14
Alkalinity, Total (as CaCO3)		306	306		mg/L	0.2	20	08-NOV-14
WG1991307-12	LCS							
pH			6.04		pH		5.9-6.1	07-NOV-14
WG1991307-13	LCS							
Alkalinity, Total (as CaCO3)			104.6		%		85-115	07-NOV-14
WG1991307-14	LCS							
Conductivity (EC)			96.7		%		90-110	07-NOV-14
WG1991307-16	LCS							
Conductivity (EC)			100.3		%		90-110	07-NOV-14
WG1991307-17	LCS							
pH			6.06		pH		5.9-6.1	07-NOV-14
WG1991307-18	LCS							
Alkalinity, Total (as CaCO3)			101.5		%		85-115	07-NOV-14
WG1991307-19	LCS							
Conductivity (EC)			96.5		%		90-110	07-NOV-14
WG1991307-2	LCS							
Conductivity (EC)			100.8		%		90-110	07-NOV-14
WG1991307-21	LCS							
Conductivity (EC)			99.8		%		90-110	07-NOV-14
WG1991307-22	LCS							
pH			6.09		pH		5.9-6.1	07-NOV-14
WG1991307-23	LCS							
Alkalinity, Total (as CaCO3)			103.0		%		85-115	07-NOV-14
WG1991307-24	LCS							
Conductivity (EC)			95.4		%		90-110	07-NOV-14
WG1991307-26	LCS							



Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 23 of 27

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R3060009							
WG1991307-26	LCS							
Conductivity (EC)			99.0		%		90-110	08-NOV-14
WG1991307-27	LCS							
pH			6.07		pH		5.9-6.1	08-NOV-14
WG1991307-28	LCS							
Alkalinity, Total (as CaCO3)			101.1		%		85-115	08-NOV-14
WG1991307-29	LCS							
Conductivity (EC)			95.3		%		90-110	08-NOV-14
WG1991307-3	LCS							
pH			6.03		pH		5.9-6.1	07-NOV-14
WG1991307-5	LCS							
Conductivity (EC)			97.7		%		90-110	07-NOV-14
WG1991307-10	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	07-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	07-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	07-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	07-NOV-14
WG1991307-15	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	07-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	07-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	07-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	07-NOV-14
WG1991307-20	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	07-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	07-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	07-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	07-NOV-14
WG1991307-25	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	08-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	08-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	08-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	08-NOV-14
PHENOLS-4AAP-ED		Water						
Batch	R3070110							
WG1994182-3	DUP	L1538086-9						
Phenols (4AAP)		<0.0030	<0.0010	RPD-NA	mg/L	N/A	15	12-NOV-14
WG1994182-4	DUP	L1539572-4						



Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 24 of 27

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PHENOLS-4AAP-ED								
	Water							
Batch	R3070110							
WG1994182-4	DUP	L1539572-4						
Phenols (4AAP)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	15	12-NOV-14
WG1994182-5	DUP	L1539796-2						
Phenols (4AAP)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	15	12-NOV-14
WG1994182-2	LCS		95.0		%		85-115	12-NOV-14
Phenols (4AAP)								
WG1994182-1	MB		<0.0010		mg/L		0.001	12-NOV-14
Phenols (4AAP)								
Batch	R3073514							
WG1995055-2	LCS		96.4		%		85-115	13-NOV-14
Phenols (4AAP)								
WG1995055-1	MB		<0.0010		mg/L		0.001	13-NOV-14
Phenols (4AAP)								
SO4-IC-ED								
	Water							
Batch	R3042255							
WG1986730-3	DUP	L1540624-4						
Sulfate (SO4)		<0.50	<0.50	RPD-NA	mg/L	N/A	20	01-NOV-14
WG1986730-5	DUP	L1540594-3						
Sulfate (SO4)		13.1	13.2		mg/L	1.3	20	01-NOV-14
WG1986730-7	DUP	L1540304-15						
Sulfate (SO4)		28.2	28.2		mg/L	0.3	20	01-NOV-14
WG1986730-11	LCS		98.8		%		90-110	01-NOV-14
Sulfate (SO4)								
WG1986730-13	LCS		99.4		%		90-110	01-NOV-14
Sulfate (SO4)								
WG1986730-15	LCS		99.6		%		90-110	01-NOV-14
Sulfate (SO4)								
WG1986730-17	LCS		101.2		%		90-110	01-NOV-14
Sulfate (SO4)								
WG1986730-2	LCS		98.4		%		90-110	01-NOV-14
Sulfate (SO4)								
WG1986730-9	LCS		98.9		%		90-110	01-NOV-14
Sulfate (SO4)								
WG1986730-1	MB		<0.50		mg/L		0.5	02-NOV-14
Sulfate (SO4)								
WG1986730-10	MB		<0.50		mg/L		0.5	01-NOV-14
Sulfate (SO4)								
WG1986730-12	MB							



Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Page 25 of 27

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: AKIN OWOJORI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-ED		Water						
Batch	R3042255							
WG1986730-12	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	01-NOV-14
WG1986730-14	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	01-NOV-14
WG1986730-16	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	01-NOV-14
WG1986730-18	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	01-NOV-14
WG1986730-4	MS	L1540624-4						
Sulfate (SO4)			98.0		%		75-125	01-NOV-14
WG1986730-6	MS	L1540594-3						
Sulfate (SO4)			100.5		%		75-125	01-NOV-14
WG1986730-8	MS	L1540304-15						
Sulfate (SO4)			95.6		%		75-125	01-NOV-14
SOLIDS-TDS-ED		Water						
Batch	R3043730							
WG1987094-3	DUP	L1540173-2						
Total Dissolved Solids		303	310		mg/L	2.3	20	02-NOV-14
WG1987094-4	DUP	L1540173-1						
Total Dissolved Solids		240	236		mg/L	1.7	20	02-NOV-14
WG1987094-2	LCS							
Total Dissolved Solids			99.5		%		85-115	02-NOV-14
WG1987094-1	MB							
Total Dissolved Solids			<10		mg/L		10	02-NOV-14
TURBIDITY-ED		Water						
Batch	R3041972							
WG1986267-3	DUP	L1540624-1						
Turbidity		3.71	3.76		NTU	1.3	15	31-OCT-14
WG1986267-2	LCS							
Turbidity			99.3		%		70-130	31-OCT-14
WG1986267-1	MB							
Turbidity			<0.10		NTU		0.1	31-OCT-14

Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Page 26 of 27

Contact: AKIN OWOJORI

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects.
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L1540624

Report Date: 13-NOV-14

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Page 27 of 27

Contact: AKIN OWOJORI

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Anions and Nutrients							
Nitrate as N by IC	1	29-OCT-14 11:06	01-NOV-14 08:00	48	69	hours	EHTL
	2	29-OCT-14 12:08	01-NOV-14 08:00	48	68	hours	EHTL
	3	29-OCT-14 14:55	01-NOV-14 08:00	48	65	hours	EHTL
	4	29-OCT-14 15:20	01-NOV-14 08:00	48	65	hours	EHTL
Nitrite as N by IC	1	29-OCT-14 11:06	01-NOV-14 08:00	48	69	hours	EHTL
	2	29-OCT-14 12:08	01-NOV-14 08:00	48	68	hours	EHTL
	3	29-OCT-14 14:55	01-NOV-14 08:00	48	65	hours	EHTL
	4	29-OCT-14 15:20	01-NOV-14 08:00	48	65	hours	EHTL

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1540624 were received on 30-OCT-14 17:41.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



Matrix Solutions Inc.
ATTN: Sue Raynard
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Date Received: 31-OCT-14
Report Date: 17-NOV-14 13:39 (MT)
Version: FINAL

Client Phone: 403-513-2275

Certificate of Analysis

Lab Work Order #: L1541122
Project P.O. #: NOT SUBMITTED
Job Reference: 16053-502 NAOS GWM
C of C Numbers: M050662
Legal Site Desc: sites 5, 6 & 3

Nicole Thibault
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 9936-67 Avenue, Edmonton, AB T6E 0P5 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1541122-1 16053141030010									
Sampled By: jl/bp on 30-OCT-14 @ 13:00									
Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Toluene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
EthylBenzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
o-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Styrene	<0.0010	-		0.0010	mg/L	-		06-NOV-14	R3048650
F1(C6-C10)	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
F1-BTEX	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
Xylenes	<0.00071	-		0.00071	mg/L	-		06-NOV-14	R3048650
Surr: 1,4-Difluorobenzene (SS)	98.0	-		N/A	%	-		06-NOV-14	R3048650
Surr: 4-Bromofluorobenzene (SS)	89.6	-		N/A	%	-		06-NOV-14	R3048650
Surr: 3,4-Dichlorotoluene (SS)	102.7	-		N/A	%	-		06-NOV-14	R3048650
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
Surr: 2-Bromobenzotrifluoride	89.5	-		N/A	%	-	05-NOV-14	05-NOV-14	R3056689
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	0.0000204	+/-0.0000052		0.000005 0	mg/L	0		09-NOV-14	R3062999
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	2.30	+/-0.37		0.0030	mg/L	0		09-NOV-14	R3062470
Antimony (Sb)-Total	<0.00040	-		0.00040	mg/L	-		09-NOV-14	R3062470
Arsenic (As)-Total	0.00128	+/-0.00016		0.00040	mg/L	0		09-NOV-14	R3062470
Barium (Ba)-Total	0.0731	+/-0.0082		0.0050	mg/L	0		09-NOV-14	R3062470
Boron (B)-Total	0.305	+/-0.049		0.050	mg/L	0		09-NOV-14	R3062470
Cadmium (Cd)-Total	0.00033	+/-0.00006		0.00020	mg/L	0		09-NOV-14	R3062470
Calcium (Ca)-Total	102	+/-12		0.50	mg/L	0		09-NOV-14	R3062470
Chromium (Cr)-Total	<0.0050	-		0.0050	mg/L	-		09-NOV-14	R3062470
Copper (Cu)-Total	0.0049	+/-0.0006		0.0010	mg/L	0		09-NOV-14	R3062470
Iron (Fe)-Total	5.26	+/-0.83		0.010	mg/L	0		09-NOV-14	R3062470
Lead (Pb)-Total	0.00285	+/-0.00045		0.00010	mg/L	0		09-NOV-14	R3062470
Magnesium (Mg)-Total	36.0	+/-4.4		0.10	mg/L	0		09-NOV-14	R3062470
Manganese (Mn)-Total	0.478	+/-0.048		0.0020	mg/L	0		09-NOV-14	R3062470
Nickel (Ni)-Total	0.0045	+/-0.0005		0.0020	mg/L	0		09-NOV-14	R3062470
Potassium (K)-Total	4.18	+/-0.51		0.10	mg/L	0		09-NOV-14	R3062470
Selenium (Se)-Total	<0.00040	-		0.00040	mg/L	-		09-NOV-14	R3062470
Silicon (Si)-Total	11.9	+/-2.4		0.050	mg/L	0		09-NOV-14	R3062470
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		09-NOV-14	R3062470
Sodium (Na)-Total	44.7	+/-5.5		1.0	mg/L	0		09-NOV-14	R3062470
Uranium (U)-Total	0.00191	+/-0.00027		0.00010	mg/L	0		09-NOV-14	R3062470
Zinc (Zn)-Total	0.0153	+/-0.0033		0.0040	mg/L	0		09-NOV-14	R3062470
Miscellaneous Parameters									
Ammonia, Total (as N)	<0.050	-		0.050	mg/L	-		07-NOV-14	R3058793
Dissolved Organic Carbon	10.9	+/-1.3		1.0	mg/L	0		09-NOV-14	R3063468
Naphthenic Acids	<1.0	-		1.0	mg/L	-	10-NOV-14	10-NOV-14	R3065928
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		17-NOV-14	R3081196
Total Dissolved Solids	546	+/-36		10	mg/L	0		03-NOV-14	R3047694
Silicon (as SiO2)-Total	25.4	-		0.11	mg/L	-		09-NOV-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1541122-1 16053141030010									
Sampled By: jl/bp on 30-OCT-14 @ 13:00									
Matrix: H2O									
Turbidity	150	+/-8.3		0.10	NTU	0		01-NOV-14	R3041974
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Anthracene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Fluoranthene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Fluorene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Naphthalene	<0.000050	-		0.000050	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Phenanthrene	<0.000050	-		0.000050	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Pyrene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Benzo(a)pyrene	<0.0000050	-		0.000005	mg/L	-	05-NOV-14	05-NOV-14	R3056308
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	05-NOV-14	05-NOV-14	R3056308
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Surr: d10-Acenaphthene	90.0	-		N/A	%	-	05-NOV-14	05-NOV-14	R3056308
Surr: d10-Phenanthrene	85.8	-		N/A	%	-	05-NOV-14	05-NOV-14	R3056308
Surr: d12-Chrysene	64.4	-		N/A	%	-	05-NOV-14	05-NOV-14	R3056308
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	1.73	+/-0.13		0.50	mg/L	0		02-NOV-14	R3044256
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-		09-NOV-14	R3062997
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-		09-NOV-14	R3062997
Arsenic (As)-Dissolved	0.00046	+/-0.00005		0.00040	mg/L	0		09-NOV-14	R3062997
Barium (Ba)-Dissolved	0.0474	+/-0.0041		0.0050	mg/L	0		09-NOV-14	R3062997
Boron (B)-Dissolved	0.322	+/-0.039		0.050	mg/L	0		09-NOV-14	R3062997
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		09-NOV-14	R3062997
Calcium (Ca)-Dissolved	89.1	+/-12		0.50	mg/L	0		09-NOV-14	R3062997
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		09-NOV-14	R3062997
Copper (Cu)-Dissolved	<0.0010	-		0.0010	mg/L	-		09-NOV-14	R3062997
Iron (Fe)-Dissolved	1.31	+/-0.12		0.010	mg/L	0		09-NOV-14	R3062997
Lead (Pb)-Dissolved	<0.00010	-		0.00010	mg/L	-		09-NOV-14	R3062997
Magnesium (Mg)-Dissolved	32.2	+/-2.5		0.10	mg/L	0		09-NOV-14	R3062997
Manganese (Mn)-Dissolved	0.399	+/-0.027		0.0020	mg/L	0		09-NOV-14	R3062997
Nickel (Ni)-Dissolved	<0.0020	-		0.0020	mg/L	-		09-NOV-14	R3062997
Potassium (K)-Dissolved	3.76	+/-0.29		0.10	mg/L	0		09-NOV-14	R3062997
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-		09-NOV-14	R3062997
Silicon (Si)-Dissolved	7.32	+/-0.62		0.050	mg/L	0		09-NOV-14	R3062997
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		09-NOV-14	R3062997
Sodium (Na)-Dissolved	42.4	+/-3.0		1.0	mg/L	0		09-NOV-14	R3062997
Uranium (U)-Dissolved	0.00136	+/-0.00014		0.00010	mg/L	0		09-NOV-14	R3062997
Zinc (Zn)-Dissolved	<0.0030	-		0.0030	mg/L	-		09-NOV-14	R3062997
Ion Balance Calculation									
Ion Balance	106	-			%	-		10-NOV-14	
TDS (Calculated)	454	-			mg/L	-		10-NOV-14	
Hardness (as CaCO3)	355	-			mg/L	-		10-NOV-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1541122-1 16053141030010 Sampled By: jl/bp on 30-OCT-14 @ 13:00 Matrix: H2O									
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		09-NOV-14	R3062999
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		02-NOV-14	R3044256
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		05-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		02-NOV-14	R3044256
Sulfate by IC									
Sulfate (SO4)	74.3	+/-4.2		0.50	mg/L	0		02-NOV-14	R3044256
pH, Conductivity and Total Alkalinity									
pH	8.33	+/-0.01		0.10	pH	0		07-NOV-14	R3060009
Conductivity (EC)	743	+/-37		0.20	uS/cm	0		07-NOV-14	R3060009
Bicarbonate (HCO3)	423	+/-17		5.0	mg/L	0		07-NOV-14	R3060009
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		07-NOV-14	R3060009
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		07-NOV-14	R3060009
Alkalinity, Total (as CaCO3)	351	+/-22		2.0	mg/L	0		07-NOV-14	R3060009
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	15.7	-		0.11	mg/L	-		10-NOV-14	
L1541122-2 16053141030011 Sampled By: jl/bp on 30-OCT-14 @ 13:05 Matrix: H2O									
BTEX, Styrene & F1-F2									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Toluene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
EthylBenzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
o-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Styrene	<0.0010	-		0.0010	mg/L	-		06-NOV-14	R3048650
F1(C6-C10)	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
F1-BTEX	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
Xylenes	<0.00071	-		0.00071	mg/L	-		06-NOV-14	R3048650
Surr: 1,4-Difluorobenzene (SS)	98.0	-		N/A	%	-		06-NOV-14	R3048650
Surr: 4-Bromofluorobenzene (SS)	89.4	-		N/A	%	-		06-NOV-14	R3048650
Surr: 3,4-Dichlorotoluene (SS)	101.9	-		N/A	%	-		06-NOV-14	R3048650
F2 (>C10-C16)									
F2 (C10-C16)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
Surr: 2-Bromobenzotrifluoride	98.1	-		N/A	%	-	05-NOV-14	05-NOV-14	R3056689
Routine Water Analysis									
Chloride by IC									
Chloride (Cl)	<0.50	-		0.50	mg/L	-		02-NOV-14	R3044256
Dissolved Metals in Water by CRC ICPMS									
Calcium (Ca)-Dissolved	<0.50	-		0.50	mg/L	-		09-NOV-14	R3062997
Magnesium (Mg)-Dissolved	<0.10	-		0.10	mg/L	-		09-NOV-14	R3062997
Potassium (K)-Dissolved	<0.50	-		0.50	mg/L	-		09-NOV-14	R3062997
Sodium (Na)-Dissolved	<1.0	-		1.0	mg/L	-		09-NOV-14	R3062997
Ion Balance Calculation									
Ion Balance	Low TDS	-			%	-		10-NOV-14	
TDS (Calculated)	<1.0	-			mg/L	-		10-NOV-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1541122-2 16053141030011 Sampled By: jl/bp on 30-OCT-14 @ 13:05 Matrix: H2O									
Ion Balance Calculation									
Hardness (as CaCO3)	<1.0	-			mg/L	-		10-NOV-14	
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		02-NOV-14	R3044256
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		05-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		02-NOV-14	R3044256
Sulfate by IC									
Sulfate (SO4)	<0.50	-		0.50	mg/L	-		02-NOV-14	R3044256
pH, Conductivity and Total Alkalinity									
pH	5.38	+/-0.01		0.10	pH	0		07-NOV-14	R3060009
Conductivity (EC)	0.44	+/-0.25		0.20	uS/cm	0		07-NOV-14	R3060009
Bicarbonate (HCO3)	<5.0	-		5.0	mg/L	-		07-NOV-14	R3060009
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		07-NOV-14	R3060009
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		07-NOV-14	R3060009
Alkalinity, Total (as CaCO3)	<2.0	-		2.0	mg/L	-		07-NOV-14	R3060009
L1541122-3 16053141030012 Sampled By: jl/bp on 30-OCT-14 @ 13:10 Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Toluene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
EthylBenzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
o-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Styrene	<0.0010	-		0.0010	mg/L	-		06-NOV-14	R3048650
F1(C6-C10)	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
F1-BTEX	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
Xylenes	<0.00071	-		0.00071	mg/L	-		06-NOV-14	R3048650
Surr: 1,4-Difluorobenzene (SS)	98.5	-		N/A	%	-		06-NOV-14	R3048650
Surr: 4-Bromofluorobenzene (SS)	89.4	-		N/A	%	-		06-NOV-14	R3048650
Surr: 3,4-Dichlorotoluene (SS)	104.1	-		N/A	%	-		06-NOV-14	R3048650
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
Surr: 2-Bromobenzotrifluoride	97.9	-		N/A	%	-	05-NOV-14	05-NOV-14	R3056689
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	0.0000094	+/-0.0000044		0.0000050	mg/L	0		09-NOV-14	R3062999
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	4.40	+/-0.70		0.0030	mg/L	0		09-NOV-14	R3062470
Antimony (Sb)-Total	<0.00040	-		0.00040	mg/L	-		09-NOV-14	R3062470
Arsenic (As)-Total	0.00579	+/-0.00067		0.00040	mg/L	0		09-NOV-14	R3062470
Barium (Ba)-Total	0.224	+/-0.025		0.0050	mg/L	0		09-NOV-14	R3062470
Boron (B)-Total	0.345	+/-0.055		0.050	mg/L	0		09-NOV-14	R3062470
Cadmium (Cd)-Total	0.00043	+/-0.00008		0.00020	mg/L	0		09-NOV-14	R3062470
Calcium (Ca)-Total	105	+/-12		0.50	mg/L	0		09-NOV-14	R3062470
Chromium (Cr)-Total	0.0097	+/-0.0014		0.0050	mg/L	0		09-NOV-14	R3062470
Copper (Cu)-Total	0.0105	+/-0.0013		0.0010	mg/L	0		09-NOV-14	R3062470

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1541122-3 16053141030012									
Sampled By: jl/bp on 30-OCT-14 @ 13:10									
Matrix: H2O									
Total Metals in Water by CRC ICPMS									
Iron (Fe)-Total	23.4	+/-3.7		0.010	mg/L	0		09-NOV-14	R3062470
Lead (Pb)-Total	0.0100	+/-0.0016		0.00010	mg/L	0		09-NOV-14	R3062470
Magnesium (Mg)-Total	33.7	+/-4.1		0.10	mg/L	0		09-NOV-14	R3062470
Manganese (Mn)-Total	0.802	+/-0.081		0.0020	mg/L	0		09-NOV-14	R3062470
Nickel (Ni)-Total	0.0147	+/-0.0016		0.0020	mg/L	0		09-NOV-14	R3062470
Potassium (K)-Total	6.14	+/-0.75		0.10	mg/L	0		09-NOV-14	R3062470
Selenium (Se)-Total	<0.00040	-		0.00040	mg/L	-		09-NOV-14	R3062470
Silicon (Si)-Total	16.2	+/-3.2		0.050	mg/L	0		09-NOV-14	R3062470
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		09-NOV-14	R3062470
Sodium (Na)-Total	46.5	+/-5.7		1.0	mg/L	0		09-NOV-14	R3062470
Uranium (U)-Total	0.00176	+/-0.00025		0.00010	mg/L	0		09-NOV-14	R3062470
Zinc (Zn)-Total	0.0799	+/-0.013		0.0040	mg/L	0		09-NOV-14	R3062470
Miscellaneous Parameters									
Ammonia, Total (as N)	0.566	-		0.050	mg/L	-		07-NOV-14	R3058793
Dissolved Organic Carbon	6.6	+/-0.9		1.0	mg/L	0		09-NOV-14	R3063468
Naphthenic Acids	<1.0	-		1.0	mg/L	-	10-NOV-14	10-NOV-14	R3065928
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		17-NOV-14	R3081196
Total Dissolved Solids	523	+/-35		10	mg/L	0		03-NOV-14	R3047694
Silicon (as SiO2)-Total	34.6	-		0.11	mg/L	-		09-NOV-14	
Turbidity	165	+/-9.1		0.10	NTU	0		01-NOV-14	R3041974
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Anthracene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Fluoranthene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Fluorene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Naphthalene	<0.000050	-		0.000050	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Phenanthrene	<0.000050	-		0.000050	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Pyrene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Benzo(a)pyrene	<0.000050	-		0.000050	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Chrysene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Dibenzo(a,h)anthracene	<0.000050	-		0.000050	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Surr: d10-Acenaphthene	95.3	-		N/A	%	-	05-NOV-14	05-NOV-14	R3056308
Surr: d10-Phenanthrene	91.8	-		N/A	%	-	05-NOV-14	05-NOV-14	R3056308
Surr: d12-Chrysene	75.0	-		N/A	%	-	05-NOV-14	05-NOV-14	R3056308
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	2.10	+/-0.15		0.50	mg/L	0		02-NOV-14	R3044256
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-		09-NOV-14	R3062997
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-		09-NOV-14	R3062997
Arsenic (As)-Dissolved	<0.00040	-		0.00040	mg/L	-		09-NOV-14	R3062997
Barium (Ba)-Dissolved	0.0422	+/-0.0037		0.0050	mg/L	0		09-NOV-14	R3062997
Boron (B)-Dissolved	0.371	+/-0.045		0.050	mg/L	0		09-NOV-14	R3062997

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1541122-3 16053141030012 Sampled By: jl/bp on 30-OCT-14 @ 13:10 Matrix: H2O									
Dissolved Metals in Water by CRC ICPMS									
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		09-NOV-14	R3062997
Calcium (Ca)-Dissolved	81.9	+/-11		0.50	mg/L	0		09-NOV-14	R3062997
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		09-NOV-14	R3062997
Copper (Cu)-Dissolved	<0.0010	-		0.0010	mg/L	-		09-NOV-14	R3062997
Iron (Fe)-Dissolved	3.21	+/-0.29		0.010	mg/L	0		09-NOV-14	R3062997
Lead (Pb)-Dissolved	<0.00010	-		0.00010	mg/L	-		09-NOV-14	R3062997
Magnesium (Mg)-Dissolved	28.3	+/-2.2		0.10	mg/L	0		09-NOV-14	R3062997
Manganese (Mn)-Dissolved	0.474	+/-0.032		0.0020	mg/L	0		09-NOV-14	R3062997
Nickel (Ni)-Dissolved	<0.0020	-		0.0020	mg/L	-		09-NOV-14	R3062997
Potassium (K)-Dissolved	5.14	+/-0.40		0.10	mg/L	0		09-NOV-14	R3062997
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-		09-NOV-14	R3062997
Silicon (Si)-Dissolved	9.60	+/-0.82		0.050	mg/L	0		09-NOV-14	R3062997
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		09-NOV-14	R3062997
Sodium (Na)-Dissolved	47.0	+/-3.3		1.0	mg/L	0		09-NOV-14	R3062997
Uranium (U)-Dissolved	<0.00010	-		0.00010	mg/L	-		09-NOV-14	R3062997
Zinc (Zn)-Dissolved	<0.0030	-		0.0030	mg/L	-		09-NOV-14	R3062997
Ion Balance Calculation									
Ion Balance	99.3	-			%	-		10-NOV-14	
TDS (Calculated)	463	-			mg/L	-		10-NOV-14	
Hardness (as CaCO3)	321	-			mg/L	-		10-NOV-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.000005 0	mg/L	-		09-NOV-14	R3062999
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		02-NOV-14	R3044256
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		05-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		02-NOV-14	R3044256
Sulfate by IC									
Sulfate (SO4)	99.7	+/-5.6		0.50	mg/L	0		02-NOV-14	R3044256
pH, Conductivity and Total Alkalinity									
pH	8.32	+/-0.01		0.10	pH	0		07-NOV-14	R3060009
Conductivity (EC)	751	+/-38		0.20	uS/cm	0		07-NOV-14	R3060009
Bicarbonate (HCO3)	400	+/-16		5.0	mg/L	0		07-NOV-14	R3060009
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		07-NOV-14	R3060009
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		07-NOV-14	R3060009
Alkalinity, Total (as CaCO3)	331	+/-21		2.0	mg/L	0		07-NOV-14	R3060009
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	20.5	-		0.11	mg/L	-		10-NOV-14	
L1541122-4 16053141030009 Sampled By: jl/bp on 30-OCT-14 @ 12:44 Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Toluene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
EthylBenzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
o-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Styrene	<0.0010	-		0.0010	mg/L	-		06-NOV-14	R3048650

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1541122-4 16053141030009									
Sampled By: jl/bp on 30-OCT-14 @ 12:44									
Matrix: H2O									
BTEX, Styrene and F1 (C6-C10)									
F1(C6-C10)	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
F1-BTEX	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
Xylenes	<0.00071	-		0.00071	mg/L	-		06-NOV-14	R3048650
Surr: 1,4-Difluorobenzene (SS)	97.3	-		N/A	%	-		06-NOV-14	R3048650
Surr: 4-Bromofluorobenzene (SS)	90.1	-		N/A	%	-		06-NOV-14	R3048650
Surr: 3,4-Dichlorotoluene (SS)	103.4	-		N/A	%	-		06-NOV-14	R3048650
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
Surr: 2-Bromobenzotrifluoride	104.5	-		N/A	%	-	05-NOV-14	05-NOV-14	R3056689
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	0.0000456	+/-0.000082		0.000005 0	mg/L	0		09-NOV-14	R3062999
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	14.9	+/-2.4	DLM	0.0060	mg/L	0		09-NOV-14	R3062470
Antimony (Sb)-Total	0.00080	+/-0.00012	DLM	0.00040	mg/L	0		09-NOV-14	R3062470
Arsenic (As)-Total	0.0187	+/-0.0022	DLM	0.00040	mg/L	0		09-NOV-14	R3062470
Barium (Ba)-Total	0.178	+/-0.020	DLM	0.0050	mg/L	0		09-NOV-14	R3062470
Boron (B)-Total	2.29	+/-0.36	DLM	0.050	mg/L	0		09-NOV-14	R3062470
Cadmium (Cd)-Total	0.00076	+/-0.00015	DLM	0.00020	mg/L	0		09-NOV-14	R3062470
Calcium (Ca)-Total	53.8	+/-6.4	DLM	0.50	mg/L	0		09-NOV-14	R3062470
Chromium (Cr)-Total	0.0338	+/-0.0049	DLM	0.0050	mg/L	0		09-NOV-14	R3062470
Copper (Cu)-Total	0.0554	+/-0.0065	DLM	0.0010	mg/L	0		09-NOV-14	R3062470
Iron (Fe)-Total	26.4	+/-4.2	DLM	0.020	mg/L	0		09-NOV-14	R3062470
Lead (Pb)-Total	0.0187	+/-0.0030	DLM	0.00010	mg/L	0		09-NOV-14	R3062470
Magnesium (Mg)-Total	34.0	+/-4.1	DLM	0.10	mg/L	0		09-NOV-14	R3062470
Manganese (Mn)-Total	0.440	+/-0.044	DLM	0.0020	mg/L	0		09-NOV-14	R3062470
Nickel (Ni)-Total	0.0544	+/-0.0059	DLM	0.0020	mg/L	0		09-NOV-14	R3062470
Potassium (K)-Total	9.74	+/-1.2	DLM	0.10	mg/L	0		09-NOV-14	R3062470
Selenium (Se)-Total	0.00133	+/-0.00019	DLM	0.00040	mg/L	0		09-NOV-14	R3062470
Silicon (Si)-Total	27.3	+/-5.4	DLM	0.10	mg/L	0		09-NOV-14	R3062470
Silver (Ag)-Total	<0.00040	-	DLM	0.00040	mg/L	-		09-NOV-14	R3062470
Sodium (Na)-Total	325	+/-40	DLM	1.0	mg/L	0		09-NOV-14	R3062470
Uranium (U)-Total	0.00248	+/-0.00035	DLM	0.00010	mg/L	0		09-NOV-14	R3062470
Zinc (Zn)-Total	0.157	+/-0.024	DLM	0.0060	mg/L	0		09-NOV-14	R3062470
Miscellaneous Parameters									
Ammonia, Total (as N)	2.21	-		0.050	mg/L	-		07-NOV-14	R3058793
Dissolved Organic Carbon	6.1	+/-0.9		1.0	mg/L	0		09-NOV-14	R3063468
Naphthenic Acids	<1.0	-		1.0	mg/L	-	10-NOV-14	10-NOV-14	R3065928
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		17-NOV-14	R3081196
Total Dissolved Solids	1090	+/-73		10	mg/L	0		03-NOV-14	R3047694
Silicon (as SiO2)-Total	58.4	-		0.21	mg/L	-		09-NOV-14	
Turbidity	1410	+/-78		0.10	NTU	0		01-NOV-14	R3041974
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Anthracene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Fluoranthene	0.000036	-		0.000020	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Fluorene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	06-NOV-14	R3056308

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1541122-4 16053141030009									
Sampled By: jl/bp on 30-OCT-14 @ 12:44									
Matrix: H2O									
PAH & Carcinogenic PAH List									
Naphthalene	<0.000050	-		0.000050	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Phenanthrene	<0.000050	-		0.000050	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Pyrene	0.000036	-		0.000010	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Benzo(a)anthracene	0.000029	-		0.000010	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Benzo(k)fluoranthene	0.000011	-		0.000010	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Benzo(b&j)fluoranthene	0.000046	-		0.000010	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Benzo(g,h,i)perylene	0.000020	-		0.000020	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Benzo(a)pyrene	0.0000280	-		0.000005	mg/L	-	05-NOV-14	06-NOV-14	R3056308
				0					
Chrysene	0.000029	-		0.000020	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Dibenzo(a,h)anthracene	0.0000050	-		0.000005	mg/L	-	05-NOV-14	06-NOV-14	R3056308
				0					
Indeno(1,2,3-cd)pyrene	0.000017	-		0.000010	mg/L	-	05-NOV-14	06-NOV-14	R3056308
B(A)P Total Potency Equivalent	0.000044	-		0.000010	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Surr: d10-Acenaphthene	96.5	-		N/A	%	-	05-NOV-14	06-NOV-14	R3056308
Surr: d10-Phenanthrene	91.0	-		N/A	%	-	05-NOV-14	06-NOV-14	R3056308
Surr: d12-Chrysene	82.5	-		N/A	%	-	05-NOV-14	06-NOV-14	R3056308
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	11.9	+/-0.69		0.50	mg/L	0		02-NOV-14	R3044256
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		09-NOV-14	R3062997
Antimony (Sb)-Dissolved	0.00100	+/-0.00010	DLM	0.00040	mg/L	0		09-NOV-14	R3062997
Arsenic (As)-Dissolved	0.00205	+/-0.00021	DLM	0.00040	mg/L	0		09-NOV-14	R3062997
Barium (Ba)-Dissolved	0.0360	+/-0.0031	DLM	0.0050	mg/L	0		09-NOV-14	R3062997
Boron (B)-Dissolved	2.11	+/-0.26	DLM	0.050	mg/L	0		09-NOV-14	R3062997
Cadmium (Cd)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		09-NOV-14	R3062997
Calcium (Ca)-Dissolved	29.6	+/-4.0	DLM	0.50	mg/L	0		09-NOV-14	R3062997
Chromium (Cr)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		09-NOV-14	R3062997
Copper (Cu)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		09-NOV-14	R3062997
Iron (Fe)-Dissolved	0.102	+/-0.009	DLM	0.020	mg/L	0		09-NOV-14	R3062997
Lead (Pb)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		09-NOV-14	R3062997
Magnesium (Mg)-Dissolved	14.0	+/-1.1	DLM	0.10	mg/L	0		09-NOV-14	R3062997
Manganese (Mn)-Dissolved	0.154	+/-0.011	DLM	0.0020	mg/L	0		09-NOV-14	R3062997
Nickel (Ni)-Dissolved	0.0072	+/-0.0006	DLM	0.0020	mg/L	0		09-NOV-14	R3062997
Potassium (K)-Dissolved	6.81	+/-0.53	DLM	0.10	mg/L	0		09-NOV-14	R3062997
Selenium (Se)-Dissolved	<0.00040	-	DLM	0.00040	mg/L	-		09-NOV-14	R3062997
Silicon (Si)-Dissolved	3.96	+/-0.34	DLM	0.10	mg/L	0		09-NOV-14	R3062997
Silver (Ag)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		09-NOV-14	R3062997
Sodium (Na)-Dissolved	318	+/-22	DLM	1.0	mg/L	0		09-NOV-14	R3062997
Uranium (U)-Dissolved	0.00027	+/-0.00003	DLM	0.00010	mg/L	0		09-NOV-14	R3062997
Zinc (Zn)-Dissolved	<0.0030	-	DLM	0.0030	mg/L	-		09-NOV-14	R3062997
Ion Balance Calculation									
Ion Balance	95.3	-			%	-		10-NOV-14	
TDS (Calculated)	997	-			mg/L	-		10-NOV-14	
Hardness (as CaCO3)	132	-			mg/L	-		10-NOV-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	0.0000106	-		0.000005	mg/L	-		09-NOV-14	R3062999
				0					
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		02-NOV-14	R3044256
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		05-NOV-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1541122-4 16053141030009 Sampled By: jl/bp on 30-OCT-14 @ 12:44 Matrix: H2O									
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		02-NOV-14	R3044256
Sulfate by IC									
Sulfate (SO4)	261	+/-15		0.50	mg/L	0		02-NOV-14	R3044256
pH, Conductivity and Total Alkalinity									
pH	8.68	+/-0.01		0.10	pH	0		07-NOV-14	R3060009
Conductivity (EC)	1610	+/-81		0.20	uS/cm	0		07-NOV-14	R3060009
Bicarbonate (HCO3)	650	+/-25		5.0	mg/L	0		07-NOV-14	R3060009
Carbonate (CO3)	35.9	+/-5.6		5.0	mg/L	0		07-NOV-14	R3060009
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		07-NOV-14	R3060009
Alkalinity, Total (as CaCO3)	593	+/-37		2.0	mg/L	0		07-NOV-14	R3060009
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	8.48	-		0.21	mg/L	-		10-NOV-14	
L1541122-5 16053141030013 Sampled By: jl/bp on 30-OCT-14 @ 15:47 Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Toluene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
EthylBenzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
o-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Styrene	<0.0010	-		0.0010	mg/L	-		06-NOV-14	R3048650
F1(C6-C10)	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
F1-BTEX	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
Xylenes	<0.00071	-		0.00071	mg/L	-		06-NOV-14	R3048650
Surr: 1,4-Difluorobenzene (SS)	97.8	-		N/A	%	-		06-NOV-14	R3048650
Surr: 4-Bromofluorobenzene (SS)	89.4	-		N/A	%	-		06-NOV-14	R3048650
Surr: 3,4-Dichlorotoluene (SS)	102.8	-		N/A	%	-		06-NOV-14	R3048650
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
Surr: 2-Bromobenzotrifluoride	90.3	-		N/A	%	-	05-NOV-14	05-NOV-14	R3056689
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		09-NOV-14	R3062999
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.0216	+/-0.0043	DLM	0.0060	mg/L	0		09-NOV-14	R3062470
Antimony (Sb)-Total	<0.00040	-	DLM	0.00040	mg/L	-		09-NOV-14	R3062470
Arsenic (As)-Total	<0.00040	-	DLM	0.00040	mg/L	-		09-NOV-14	R3062470
Barium (Ba)-Total	0.0145	+/-0.0016	DLM	0.0050	mg/L	0		09-NOV-14	R3062470
Boron (B)-Total	1.32	+/-0.21	DLM	0.050	mg/L	0		09-NOV-14	R3062470
Cadmium (Cd)-Total	<0.00020	-	DLM	0.00020	mg/L	-		09-NOV-14	R3062470
Calcium (Ca)-Total	48.4	+/-5.7	DLM	0.50	mg/L	0		09-NOV-14	R3062470
Chromium (Cr)-Total	<0.0050	-	DLM	0.0050	mg/L	-		09-NOV-14	R3062470
Copper (Cu)-Total	<0.0010	-	DLM	0.0010	mg/L	-		09-NOV-14	R3062470
Iron (Fe)-Total	0.403	+/-0.064	DLM	0.020	mg/L	0		09-NOV-14	R3062470
Lead (Pb)-Total	0.00022	+/-0.00004	DLM	0.00010	mg/L	0		09-NOV-14	R3062470
Magnesium (Mg)-Total	26.3	+/-3.2	DLM	0.10	mg/L	0		09-NOV-14	R3062470

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1541122-5 16053141030013									
Sampled By: jl/bp on 30-OCT-14 @ 15:47									
Matrix: H2O									
Total Metals in Water by CRC ICPMS									
Manganese (Mn)-Total	0.0247	+/-0.0025	DLM	0.0020	mg/L	0		09-NOV-14	R3062470
Nickel (Ni)-Total	<0.0020	-	DLM	0.0020	mg/L	-		09-NOV-14	R3062470
Potassium (K)-Total	5.00	+/-0.61	DLM	0.10	mg/L	0		09-NOV-14	R3062470
Selenium (Se)-Total	<0.00040	-	DLM	0.00040	mg/L	-		09-NOV-14	R3062470
Silicon (Si)-Total	5.49	+/-1.1	DLM	0.10	mg/L	0		09-NOV-14	R3062470
Silver (Ag)-Total	<0.00040	-	DLM	0.00040	mg/L	-		09-NOV-14	R3062470
Sodium (Na)-Total	354	+/-44	DLM	1.0	mg/L	0		09-NOV-14	R3062470
Uranium (U)-Total	0.00015	+/-0.00002	DLM	0.00010	mg/L	0		09-NOV-14	R3062470
Zinc (Zn)-Total	<0.0060	-	DLM	0.0060	mg/L	-		09-NOV-14	R3062470
Miscellaneous Parameters									
Ammonia, Total (as N)	1.99	-		0.050	mg/L	-		07-NOV-14	R3058793
Dissolved Organic Carbon	8.2	+/-1.1		1.0	mg/L	0		09-NOV-14	R3063468
Naphthenic Acids	1.1	+/-0.4		1.0	mg/L	0	10-NOV-14	10-NOV-14	R3065928
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		17-NOV-14	R3081196
Total Dissolved Solids	1170	+/-78		10	mg/L	0		03-NOV-14	R3047694
Silicon (as SiO2)-Total	11.7	-		0.21	mg/L	-		09-NOV-14	
Turbidity	2.44	+/-0.18		0.10	NTU	0		01-NOV-14	R3041974
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Anthracene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Fluoranthene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Fluorene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Naphthalene	<0.000050	-		0.000050	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Phenanthrene	<0.000050	-		0.000050	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Pyrene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Benzo(a)pyrene	<0.0000050	-		0.000005	mg/L	-	05-NOV-14	05-NOV-14	R3056308
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	05-NOV-14	05-NOV-14	R3056308
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Surr: d10-Acenaphthene	93.8	-		N/A	%	-	05-NOV-14	05-NOV-14	R3056308
Surr: d10-Phenanthrene	90.8	-		N/A	%	-	05-NOV-14	05-NOV-14	R3056308
Surr: d12-Chrysene	70.6	-		N/A	%	-	05-NOV-14	05-NOV-14	R3056308
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	50.6	+/-2.9		0.50	mg/L	0		02-NOV-14	R3044256
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		09-NOV-14	R3062997
Antimony (Sb)-Dissolved	<0.00040	-	DLM	0.00040	mg/L	-		09-NOV-14	R3062997
Arsenic (As)-Dissolved	<0.00040	-	DLM	0.00040	mg/L	-		09-NOV-14	R3062997
Barium (Ba)-Dissolved	0.0143	+/-0.0012	DLM	0.0050	mg/L	0		09-NOV-14	R3062997
Boron (B)-Dissolved	1.36	+/-0.16	DLM	0.050	mg/L	0		09-NOV-14	R3062997
Cadmium (Cd)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		09-NOV-14	R3062997
Calcium (Ca)-Dissolved	48.0	+/-6.5	DLM	0.50	mg/L	0		09-NOV-14	R3062997
Chromium (Cr)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		09-NOV-14	R3062997

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1541122-5 16053141030013									
Sampled By: jl/bp on 30-OCT-14 @ 15:47									
Matrix: H2O									
Dissolved Metals in Water by CRC ICPMS									
Copper (Cu)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		09-NOV-14	R3062997
Iron (Fe)-Dissolved	0.337	+/-0.030	DLM	0.020	mg/L	0		09-NOV-14	R3062997
Lead (Pb)-Dissolved	0.00011	+/-0.00001	DLM	0.00010	mg/L	0		09-NOV-14	R3062997
Magnesium (Mg)-Dissolved	24.4	+/-1.9	DLM	0.10	mg/L	0		09-NOV-14	R3062997
Manganese (Mn)-Dissolved	0.0232	+/-0.0016	DLM	0.0020	mg/L	0		09-NOV-14	R3062997
Nickel (Ni)-Dissolved	<0.0020	-	DLM	0.0020	mg/L	-		09-NOV-14	R3062997
Potassium (K)-Dissolved	5.22	+/-0.40	DLM	0.10	mg/L	0		09-NOV-14	R3062997
Selenium (Se)-Dissolved	<0.00040	-	DLM	0.00040	mg/L	-		09-NOV-14	R3062997
Silicon (Si)-Dissolved	6.29	+/-0.53	DLM	0.10	mg/L	0		09-NOV-14	R3062997
Silver (Ag)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		09-NOV-14	R3062997
Sodium (Na)-Dissolved	350	+/-25	DLM	1.0	mg/L	0		09-NOV-14	R3062997
Uranium (U)-Dissolved	0.00013	+/-0.00001	DLM	0.00010	mg/L	0		09-NOV-14	R3062997
Zinc (Zn)-Dissolved	<0.0030	-	DLM	0.0030	mg/L	-		09-NOV-14	R3062997
Ion Balance Calculation									
Ion Balance	97.1	-			%	-		10-NOV-14	
TDS (Calculated)	1150	-			mg/L	-		10-NOV-14	
Hardness (as CaCO3)	220	-			mg/L	-		10-NOV-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.000005 0	mg/L	-		09-NOV-14	R3062999
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		02-NOV-14	R3044256
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		05-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		02-NOV-14	R3044256
Sulfate by IC									
Sulfate (SO4)	277	+/-16		0.50	mg/L	0		02-NOV-14	R3044256
pH, Conductivity and Total Alkalinity									
pH	8.77	+/-0.01		0.10	pH	0		07-NOV-14	R3060009
Conductivity (EC)	1800	+/-90		0.20	uS/cm	0		07-NOV-14	R3060009
Bicarbonate (HCO3)	694	+/-26		5.0	mg/L	0		07-NOV-14	R3060009
Carbonate (CO3)	58.1	+/-8.2		5.0	mg/L	0		07-NOV-14	R3060009
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		07-NOV-14	R3060009
Alkalinity, Total (as CaCO3)	665	+/-42		2.0	mg/L	0		07-NOV-14	R3060009
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	13.5	-		0.21	mg/L	-		10-NOV-14	
L1541122-6 16053141030014									
Sampled By: jl/bp on 30-OCT-14 @ 16:30									
Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Toluene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
EthylBenzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
o-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Styrene	<0.0010	-		0.0010	mg/L	-		06-NOV-14	R3048650
F1(C6-C10)	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
F1-BTEX	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
Xylenes	<0.00071	-		0.00071	mg/L	-		06-NOV-14	R3048650

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1541122-6 16053141030014									
Sampled By: jl/bp on 30-OCT-14 @ 16:30									
Matrix: H2O									
BTEX, Styrene and F1 (C6-C10)									
Surr: 1,4-Difluorobenzene (SS)	97.9	-		N/A	%	-		06-NOV-14	R3048650
Surr: 4-Bromofluorobenzene (SS)	90.2	-		N/A	%	-		06-NOV-14	R3048650
Surr: 3,4-Dichlorotoluene (SS)	101.7	-		N/A	%	-		06-NOV-14	R3048650
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
Surr: 2-Bromobenzotrifluoride	78.9	-		N/A	%	-	05-NOV-14	05-NOV-14	R3056689
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	0.0000482	+/-0.0000085		0.000005 0	mg/L	0		09-NOV-14	R3062999
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	4.49	+/-0.71		0.0030	mg/L	0		09-NOV-14	R3062470
Antimony (Sb)-Total	<0.00040	-		0.00040	mg/L	-		09-NOV-14	R3062470
Arsenic (As)-Total	0.00711	+/-0.00083		0.00040	mg/L	0		09-NOV-14	R3062470
Barium (Ba)-Total	0.114	+/-0.013		0.0050	mg/L	0		09-NOV-14	R3062470
Boron (B)-Total	1.25	+/-0.20		0.050	mg/L	0		09-NOV-14	R3062470
Cadmium (Cd)-Total	0.00035	+/-0.00007		0.00020	mg/L	0		09-NOV-14	R3062470
Calcium (Ca)-Total	138	+/-16		0.50	mg/L	0		09-NOV-14	R3062470
Chromium (Cr)-Total	0.0080	+/-0.0012		0.0050	mg/L	0		09-NOV-14	R3062470
Copper (Cu)-Total	0.0158	+/-0.0019		0.0010	mg/L	0		09-NOV-14	R3062470
Iron (Fe)-Total	16.2	+/-2.6		0.010	mg/L	0		09-NOV-14	R3062470
Lead (Pb)-Total	0.00829	+/-0.0013		0.00010	mg/L	0		09-NOV-14	R3062470
Magnesium (Mg)-Total	50.5	+/-6.1		0.10	mg/L	0		09-NOV-14	R3062470
Manganese (Mn)-Total	0.417	+/-0.042		0.0020	mg/L	0		09-NOV-14	R3062470
Nickel (Ni)-Total	0.0173	+/-0.0019		0.0020	mg/L	0		09-NOV-14	R3062470
Potassium (K)-Total	12.3	+/-1.5		0.10	mg/L	0		09-NOV-14	R3062470
Selenium (Se)-Total	0.00060	+/-0.00008		0.00040	mg/L	0		09-NOV-14	R3062470
Silicon (Si)-Total	14.9	+/-3.0		0.050	mg/L	0		09-NOV-14	R3062470
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		09-NOV-14	R3062470
Sodium (Na)-Total	71.6	+/-8.8		1.0	mg/L	0		09-NOV-14	R3062470
Uranium (U)-Total	0.00145	+/-0.00020		0.00010	mg/L	0		09-NOV-14	R3062470
Zinc (Zn)-Total	0.0496	+/-0.0083		0.0040	mg/L	0		09-NOV-14	R3062470
Miscellaneous Parameters									
Ammonia, Total (as N)	3.30	-		0.050	mg/L	-		07-NOV-14	R3058793
Dissolved Organic Carbon	8.3	+/-1.1		1.0	mg/L	0		09-NOV-14	R3063468
Naphthenic Acids	<1.0	-		1.0	mg/L	-	10-NOV-14	10-NOV-14	R3065928
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		17-NOV-14	R3081196
Total Dissolved Solids	769	+/-51		10	mg/L	0		03-NOV-14	R3047694
Silicon (as SiO2)-Total	31.9	-		0.11	mg/L	-		09-NOV-14	
Turbidity	473	+/-26		0.10	NTU	0		01-NOV-14	R3041974
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Anthracene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Fluoranthene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Fluorene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Naphthalene	<0.000050	-		0.000050	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Phenanthrene	<0.000050	-		0.000050	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Pyrene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1541122-6 16053141030014 Sampled By: jl/bp on 30-OCT-14 @ 16:30 Matrix: H2O									
Sulfate by IC									
Sulfate (SO4)	120	+/-6.8		0.50	mg/L	0		02-NOV-14	R3044256
pH, Conductivity and Total Alkalinity									
pH	8.10	+/-0.01		0.10	pH	0		07-NOV-14	R3060009
Conductivity (EC)	1120	+/-56		0.20	uS/cm	0		07-NOV-14	R3060009
Bicarbonate (HCO3)	688	+/-26		5.0	mg/L	0		07-NOV-14	R3060009
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		07-NOV-14	R3060009
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		07-NOV-14	R3060009
Alkalinity, Total (as CaCO3)	564	+/-35		2.0	mg/L	0		07-NOV-14	R3060009
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	16.7	-		0.11	mg/L	-		10-NOV-14	
L1541122-7 16053141030015 Sampled By: jl/bp on 30-OCT-14 @ 16:43 Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Toluene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
EthylBenzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
o-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Styrene	<0.0010	-		0.0010	mg/L	-		06-NOV-14	R3048650
F1(C6-C10)	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
F1-BTEX	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
Xylenes	<0.00071	-		0.00071	mg/L	-		06-NOV-14	R3048650
Surr: 1,4-Difluorobenzene (SS)	97.3	-		N/A	%	-		06-NOV-14	R3048650
Surr: 4-Bromofluorobenzene (SS)	87.1	-		N/A	%	-		06-NOV-14	R3048650
Surr: 3,4-Dichlorotoluene (SS)	104.0	-		N/A	%	-		06-NOV-14	R3048650
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
F3 (C16-C34)	0.29	+/-0.12		0.25	mg/L	0	05-NOV-14	05-NOV-14	R3056689
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
Surr: 2-Bromobenzotrifluoride	78.3	-		N/A	%	-	05-NOV-14	05-NOV-14	R3056689
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	0.0000153	+/-0.0000047		0.000005 0	mg/L	0		09-NOV-14	R3062999
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	2.06	+/-0.33		0.0030	mg/L	0		09-NOV-14	R3062470
Antimony (Sb)-Total	0.00068	+/-0.00011		0.00040	mg/L	0		09-NOV-14	R3062470
Arsenic (As)-Total	0.00539	+/-0.00063		0.00040	mg/L	0		09-NOV-14	R3062470
Barium (Ba)-Total	0.254	+/-0.028		0.0050	mg/L	0		09-NOV-14	R3062470
Boron (B)-Total	0.172	+/-0.028		0.050	mg/L	0		09-NOV-14	R3062470
Cadmium (Cd)-Total	0.00059	+/-0.00011		0.00020	mg/L	0		09-NOV-14	R3062470
Calcium (Ca)-Total	143	+/-17		0.50	mg/L	0		09-NOV-14	R3062470
Chromium (Cr)-Total	<0.0050	-		0.0050	mg/L	-		09-NOV-14	R3062470
Copper (Cu)-Total	0.0072	+/-0.0009		0.0010	mg/L	0		09-NOV-14	R3062470
Iron (Fe)-Total	9.72	+/-1.5		0.010	mg/L	0		09-NOV-14	R3062470
Lead (Pb)-Total	0.00759	+/-0.0012		0.00010	mg/L	0		09-NOV-14	R3062470
Magnesium (Mg)-Total	63.6	+/-7.7		0.10	mg/L	0		09-NOV-14	R3062470
Manganese (Mn)-Total	0.519	+/-0.052		0.0020	mg/L	0		09-NOV-14	R3062470
Nickel (Ni)-Total	0.0152	+/-0.0017		0.0020	mg/L	0		09-NOV-14	R3062470

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1541122-7 16053141030015									
Sampled By: jl/bp on 30-OCT-14 @ 16:43									
Matrix: H2O									
Total Metals in Water by CRC ICPMS									
Potassium (K)-Total	2.64	+/-0.32		0.10	mg/L	0		09-NOV-14	R3062470
Selenium (Se)-Total	0.00050	+/-0.00007		0.00040	mg/L	0		09-NOV-14	R3062470
Silicon (Si)-Total	11.8	+/-2.3		0.050	mg/L	0		09-NOV-14	R3062470
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		09-NOV-14	R3062470
Sodium (Na)-Total	22.3	+/-2.7		1.0	mg/L	0		09-NOV-14	R3062470
Uranium (U)-Total	0.00770	+/-0.0011		0.00010	mg/L	0		09-NOV-14	R3062470
Zinc (Zn)-Total	0.567	+/-0.087		0.0040	mg/L	0		09-NOV-14	R3062470
Miscellaneous Parameters									
Ammonia, Total (as N)	0.064	-		0.050	mg/L	-		07-NOV-14	R3058793
Dissolved Organic Carbon	9.4	+/-1.2		1.0	mg/L	0		09-NOV-14	R3063468
Naphthenic Acids	<1.0	-		1.0	mg/L	-	10-NOV-14	10-NOV-14	R3065928
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		17-NOV-14	R3081196
Total Dissolved Solids	690	+/-46		10	mg/L	0		03-NOV-14	R3047694
Silicon (as SiO2)-Total	25.2	-		0.11	mg/L	-		09-NOV-14	
Turbidity	133	+/-7.4		0.10	NTU	0		01-NOV-14	R3041974
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Anthracene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Fluoranthene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Fluorene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Naphthalene	0.000102	-		0.000050	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Phenanthrene	<0.000050	-		0.000050	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Pyrene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Benzo(a)pyrene	<0.0000080	-	DLM	0.0000080	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Chrysene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Dibenzo(a,h)anthracene	<0.0000050	-		0.0000050	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	05-NOV-14	05-NOV-14	R3056308
Surr: d10-Acenaphthene	93.3	-		N/A	%	-	05-NOV-14	05-NOV-14	R3056308
Surr: d10-Phenanthrene	91.3	-		N/A	%	-	05-NOV-14	05-NOV-14	R3056308
Surr: d12-Chrysene	77.4	-		N/A	%	-	05-NOV-14	05-NOV-14	R3056308
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	3.35	+/-0.21		0.50	mg/L	0		02-NOV-14	R3044256
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-		09-NOV-14	R3062997
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-		09-NOV-14	R3062997
Arsenic (As)-Dissolved	0.00164	+/-0.00017		0.00040	mg/L	0		09-NOV-14	R3062997
Barium (Ba)-Dissolved	0.190	+/-0.016		0.0050	mg/L	0		09-NOV-14	R3062997
Boron (B)-Dissolved	0.197	+/-0.024		0.050	mg/L	0		09-NOV-14	R3062997
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		09-NOV-14	R3062997
Calcium (Ca)-Dissolved	130	+/-18		0.50	mg/L	0		09-NOV-14	R3062997
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		09-NOV-14	R3062997
Copper (Cu)-Dissolved	<0.0010	-		0.0010	mg/L	-		09-NOV-14	R3062997
Iron (Fe)-Dissolved	4.54	+/-0.41		0.010	mg/L	0		09-NOV-14	R3062997

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1541122-7 16053141030015 Sampled By: jl/bp on 30-OCT-14 @ 16:43 Matrix: H2O									
Dissolved Metals in Water by CRC ICPMS									
Lead (Pb)-Dissolved	<0.00010	-		0.00010	mg/L	-		09-NOV-14	R3062997
Magnesium (Mg)-Dissolved	58.0	+/-4.5		0.10	mg/L	0		09-NOV-14	R3062997
Manganese (Mn)-Dissolved	0.351	+/-0.024		0.0020	mg/L	0		09-NOV-14	R3062997
Nickel (Ni)-Dissolved	0.0040	+/-0.0003		0.0020	mg/L	0		09-NOV-14	R3062997
Potassium (K)-Dissolved	2.22	+/-0.17		0.10	mg/L	0		09-NOV-14	R3062997
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-		09-NOV-14	R3062997
Silicon (Si)-Dissolved	9.06	+/-0.77		0.050	mg/L	0		09-NOV-14	R3062997
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		09-NOV-14	R3062997
Sodium (Na)-Dissolved	23.1	+/-1.6		1.0	mg/L	0		09-NOV-14	R3062997
Uranium (U)-Dissolved	0.00585	+/-0.00061		0.00010	mg/L	0		09-NOV-14	R3062997
Zinc (Zn)-Dissolved	1.41	+/-0.16	RRV	0.0030	mg/L	0		10-NOV-14	R3064909
Ion Balance Calculation									
Ion Balance	101	-			%	-		10-NOV-14	
TDS (Calculated)	618	-			mg/L	-		10-NOV-14	
Hardness (as CaCO3)	563	-			mg/L	-		10-NOV-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.000005 0	mg/L	-		09-NOV-14	R3062999
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		02-NOV-14	R3044256
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		05-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		02-NOV-14	R3044256
Sulfate by IC									
Sulfate (SO4)	103	+/-5.8		0.50	mg/L	0		02-NOV-14	R3044256
pH, Conductivity and Total Alkalinity									
pH	8.13	+/-0.01		0.10	pH	0		07-NOV-14	R3060009
Conductivity (EC)	993	+/-50		0.20	uS/cm	0		07-NOV-14	R3060009
Bicarbonate (HCO3)	606	+/-23		5.0	mg/L	0		07-NOV-14	R3060009
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		07-NOV-14	R3060009
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		07-NOV-14	R3060009
Alkalinity, Total (as CaCO3)	497	+/-31		2.0	mg/L	0		07-NOV-14	R3060009
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	19.4	-		0.11	mg/L	-		10-NOV-14	
L1541122-8 16053141031016 Sampled By: jl/bp on 31-OCT-14 @ 11:05 Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Toluene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
EthylBenzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
o-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Styrene	<0.0010	-		0.0010	mg/L	-		06-NOV-14	R3048650
F1(C6-C10)	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
F1-BTEX	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
Xylenes	<0.00071	-		0.00071	mg/L	-		06-NOV-14	R3048650
Surr:	1,4-Difluorobenzene (SS)	97.6	-	N/A	%	-		06-NOV-14	R3048650
Surr:	4-Bromofluorobenzene (SS)	87.8	-	N/A	%	-		06-NOV-14	R3048650

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1541122-8 16053141031016									
Sampled By: jl/bp on 31-OCT-14 @ 11:05									
Matrix: H2O									
BTEX, Styrene and F1 (C6-C10)									
Surr: 3,4-Dichlorotoluene (SS)	102.7	-		N/A	%	-		06-NOV-14	R3048650
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
Surr: 2-Bromobenzotrifluoride	98.4	-		N/A	%	-	05-NOV-14	05-NOV-14	R3056689
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.000005 0	mg/L	-		09-NOV-14	R3062999
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.113	+/-0.019	DLM	0.030	mg/L	0		09-NOV-14	R3062470
Antimony (Sb)-Total	<0.0010	-	DLM	0.0010	mg/L	-		09-NOV-14	R3062470
Arsenic (As)-Total	<0.0010	-	DLM	0.0010	mg/L	-		09-NOV-14	R3062470
Barium (Ba)-Total	0.827	+/-0.093	DLM	0.0050	mg/L	0		09-NOV-14	R3062470
Boron (B)-Total	3.81	+/-0.61	DLM	0.10	mg/L	0		09-NOV-14	R3062470
Cadmium (Cd)-Total	<0.00020	-	DLM	0.00020	mg/L	-		09-NOV-14	R3062470
Calcium (Ca)-Total	9.03	+/-1.1	DLM	0.50	mg/L	0		09-NOV-14	R3062470
Chromium (Cr)-Total	<0.0050	-	DLM	0.0050	mg/L	-		09-NOV-14	R3062470
Copper (Cu)-Total	0.0119	+/-0.0014	DLM	0.0010	mg/L	0		09-NOV-14	R3062470
Iron (Fe)-Total	3.66	+/-0.58	DLM	0.10	mg/L	0		09-NOV-14	R3062470
Lead (Pb)-Total	0.0135	+/-0.0021	DLM	0.00050	mg/L	0		09-NOV-14	R3062470
Magnesium (Mg)-Total	9.34	+/-1.1	DLM	0.10	mg/L	0		09-NOV-14	R3062470
Manganese (Mn)-Total	0.0667	+/-0.0067	DLM	0.0020	mg/L	0		09-NOV-14	R3062470
Nickel (Ni)-Total	0.0031	+/-0.0004	DLM	0.0020	mg/L	0		09-NOV-14	R3062470
Potassium (K)-Total	7.14	+/-0.88	DLM	0.50	mg/L	0		09-NOV-14	R3062470
Selenium (Se)-Total	<0.0010	-	DLM	0.0010	mg/L	-		09-NOV-14	R3062470
Silicon (Si)-Total	3.54	+/-0.70	DLM	0.50	mg/L	0		09-NOV-14	R3062470
Silver (Ag)-Total	<0.00040	-	DLM	0.00040	mg/L	-		09-NOV-14	R3062470
Sodium (Na)-Total	1590	+/-200	DLM	1.0	mg/L	0		09-NOV-14	R3062470
Uranium (U)-Total	<0.00010	-	DLM	0.00010	mg/L	-		09-NOV-14	R3062470
Zinc (Zn)-Total	0.070	+/-0.011	DLM	0.030	mg/L	0		09-NOV-14	R3062470
Miscellaneous Parameters									
Ammonia, Total (as N)	3.33	-		0.050	mg/L	-		07-NOV-14	R3058793
Dissolved Organic Carbon	2.8	+/-0.6		1.0	mg/L	0		09-NOV-14	R3063468
Naphthenic Acids	<1.0	-		1.0	mg/L	-	10-NOV-14	10-NOV-14	R3065928
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		17-NOV-14	R3081196
Total Dissolved Solids	3740	+/-250		10	mg/L	0		03-NOV-14	R3047694
Silicon (as SiO2)-Total	7.6	-		1.1	mg/L	-		09-NOV-14	
Turbidity	16.4	+/-0.95		0.10	NTU	0		01-NOV-14	R3041974
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Anthracene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Fluoranthene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Fluorene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Naphthalene	<0.000050	-		0.000050	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Phenanthrene	<0.000050	-		0.000050	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Pyrene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	06-NOV-14	R3056308

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1541122-8 16053141031016 Sampled By: jl/bp on 31-OCT-14 @ 11:05 Matrix: H2O									
pH, Conductivity and Total Alkalinity									
pH	9.06	+/-0.01		0.10	pH	0		07-NOV-14	R3060009
Conductivity (EC)	6510	+/-330		0.20	uS/cm	0		07-NOV-14	R3060009
Bicarbonate (HCO3)	1690	+/-63		5.0	mg/L	0		07-NOV-14	R3060009
Carbonate (CO3)	237	+/-30		5.0	mg/L	0		07-NOV-14	R3060009
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		07-NOV-14	R3060009
Alkalinity, Total (as CaCO3)	1780	+/-110		2.0	mg/L	0		07-NOV-14	R3060009
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	6.8	-		1.1	mg/L	-		10-NOV-14	
L1541122-9 16053141031017 Sampled By: jl/bp on 31-OCT-14 @ 12:05 Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Toluene	0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
EthylBenzene	0.00071	-		0.00050	mg/L	-		06-NOV-14	R3048650
o-Xylene	0.00114	-		0.00050	mg/L	-		06-NOV-14	R3048650
m+p-Xylene	0.00298	-		0.00050	mg/L	-		06-NOV-14	R3048650
Styrene	<0.0010	-		0.0010	mg/L	-		06-NOV-14	R3048650
F1(C6-C10)	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
F1-BTEX	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
Xylenes	0.00412	-		0.00071	mg/L	-		06-NOV-14	R3048650
Surr:	1,4-Difluorobenzene (SS)	97.8	-	N/A	%	-		06-NOV-14	R3048650
Surr:	4-Bromofluorobenzene (SS)	90.5	-	N/A	%	-		06-NOV-14	R3048650
Surr:	3,4-Dichlorotoluene (SS)	107.8	-	N/A	%	-		06-NOV-14	R3048650
F2, F3, F4									
F2 (>C10-C16)	13.2	+/-3.2		0.25	mg/L	0	05-NOV-14	05-NOV-14	R3056689
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
Surr:	2-Bromobenzotrifluoride	105.5	-	N/A	%	-	05-NOV-14	05-NOV-14	R3056689
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		09-NOV-14	R3062999
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.341	+/-0.055	DLM	0.015	mg/L	0		09-NOV-14	R3062470
Antimony (Sb)-Total	0.00100	+/-0.00014	DLM	0.00050	mg/L	0		09-NOV-14	R3062470
Arsenic (As)-Total	0.00553	+/-0.00065	DLM	0.00050	mg/L	0		09-NOV-14	R3062470
Barium (Ba)-Total	0.0624	+/-0.0070	DLM	0.0050	mg/L	0		09-NOV-14	R3062470
Boron (B)-Total	0.478	+/-0.076	DLM	0.050	mg/L	0		09-NOV-14	R3062470
Cadmium (Cd)-Total	<0.00020	-	DLM	0.00020	mg/L	-		09-NOV-14	R3062470
Calcium (Ca)-Total	129	+/-15	DLM	0.50	mg/L	0		09-NOV-14	R3062470
Chromium (Cr)-Total	0.0183	+/-0.0026	DLM	0.0050	mg/L	0		09-NOV-14	R3062470
Copper (Cu)-Total	0.0460	+/-0.0054	DLM	0.0010	mg/L	0		09-NOV-14	R3062470
Iron (Fe)-Total	73.7	+/-12	DLM	0.050	mg/L	0		09-NOV-14	R3062470
Lead (Pb)-Total	0.0228	+/-0.0036	DLM	0.00025	mg/L	0		09-NOV-14	R3062470
Magnesium (Mg)-Total	104	+/-13	DLM	0.10	mg/L	0		09-NOV-14	R3062470
Manganese (Mn)-Total	1.66	+/-0.17	DLM	0.0020	mg/L	0		09-NOV-14	R3062470
Nickel (Ni)-Total	0.0273	+/-0.0030	DLM	0.0020	mg/L	0		09-NOV-14	R3062470
Potassium (K)-Total	5.33	+/-0.65	DLM	0.25	mg/L	0		09-NOV-14	R3062470
Selenium (Se)-Total	<0.00050	-	DLM	0.00050	mg/L	-		09-NOV-14	R3062470

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1541122-9 16053141031017									
Sampled By: jl/bp on 31-OCT-14 @ 12:05									
Matrix: H2O									
Total Metals in Water by CRC ICPMS									
Silicon (Si)-Total	2.94	+/-0.58	DLM	0.25	mg/L	0		09-NOV-14	R3062470
Silver (Ag)-Total	<0.00040	-	DLM	0.00040	mg/L	-		09-NOV-14	R3062470
Sodium (Na)-Total	190	+/-23	DLM	1.0	mg/L	0		09-NOV-14	R3062470
Uranium (U)-Total	<0.00010	-	DLM	0.00010	mg/L	-		09-NOV-14	R3062470
Zinc (Zn)-Total	0.032	+/-0.006	DLM	0.015	mg/L	0		09-NOV-14	R3062470
Miscellaneous Parameters									
Ammonia, Total (as N)	0.495	-		0.050	mg/L	-		07-NOV-14	R3058793
Dissolved Organic Carbon	7.5	+/-1.0		1.0	mg/L	0		09-NOV-14	R3063468
Naphthenic Acids	<1.0	-		1.0	mg/L	-	10-NOV-14	10-NOV-14	R3065928
Phenols (4AAP)	0.0080	+/-0.0012	RRV	0.0010	mg/L	-7.4%		17-NOV-14	R3081196
Total Dissolved Solids	1300	+/-86		10	mg/L	0		03-NOV-14	R3047694
Silicon (as SiO2)-Total	6.28	-		0.53	mg/L	-		09-NOV-14	
Turbidity	295	+/-16		0.10	NTU	0		01-NOV-14	R3041974
PAH & Carcinogenic PAH List									
Acenaphthene	<0.00088	-	DLM	0.00088	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Acenaphthylene	<0.00036	-	DLM	0.00036	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Anthracene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Fluoranthene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Fluorene	0.000558	-		0.000020	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Naphthalene	0.0178	-	DLA	0.00050	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Phenanthrene	0.000114	-		0.000050	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Pyrene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Benzo(a)pyrene	<0.0000050	-		0.000005	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Chrysene	<0.000020	-		0.000020	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	05-NOV-14	06-NOV-14	R3056308
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	05-NOV-14	06-NOV-14	R3056308
Surr: d10-Acenaphthene	89.0	-		N/A	%	-	05-NOV-14	06-NOV-14	R3056308
Surr: d10-Phenanthrene	102.0	-		N/A	%	-	05-NOV-14	06-NOV-14	R3056308
Surr: d12-Chrysene	81.1	-		N/A	%	-	05-NOV-14	06-NOV-14	R3056308
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	547	+/-31	DLM	2.5	mg/L	0		02-NOV-14	R3044256
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-		09-NOV-14	R3062997
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-		09-NOV-14	R3062997
Arsenic (As)-Dissolved	0.00077	+/-0.00008		0.00040	mg/L	0		09-NOV-14	R3062997
Barium (Ba)-Dissolved	0.0571	+/-0.0050		0.0050	mg/L	0		09-NOV-14	R3062997
Boron (B)-Dissolved	0.449	+/-0.054		0.050	mg/L	0		09-NOV-14	R3062997
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		09-NOV-14	R3062997
Calcium (Ca)-Dissolved	114	+/-16		0.50	mg/L	0		09-NOV-14	R3062997
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		09-NOV-14	R3062997
Copper (Cu)-Dissolved	<0.0010	-		0.0010	mg/L	-		09-NOV-14	R3062997
Iron (Fe)-Dissolved	29.7	+/-2.7		0.020	mg/L	0		09-NOV-14	R3062997
Lead (Pb)-Dissolved	<0.00010	-		0.00010	mg/L	-		09-NOV-14	R3062997
Magnesium (Mg)-Dissolved	90.4	+/-7.0		0.10	mg/L	0		09-NOV-14	R3062997

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1541122-9 16053141031017 Sampled By: jl/bp on 31-OCT-14 @ 12:05 Matrix: H2O									
Dissolved Metals in Water by CRC ICPMS									
Manganese (Mn)-Dissolved	1.12	+/-0.077		0.0020	mg/L	0		09-NOV-14	R3062997
Nickel (Ni)-Dissolved	0.0109	+/-0.0009		0.0020	mg/L	0		09-NOV-14	R3062997
Potassium (K)-Dissolved	5.44	+/-0.42		0.10	mg/L	0		09-NOV-14	R3062997
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-		09-NOV-14	R3062997
Silicon (Si)-Dissolved	1.66	+/-0.14		0.10	mg/L	0		09-NOV-14	R3062997
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		09-NOV-14	R3062997
Sodium (Na)-Dissolved	178	+/-13		1.0	mg/L	0		09-NOV-14	R3062997
Uranium (U)-Dissolved	<0.00010	-		0.00010	mg/L	-		09-NOV-14	R3062997
Zinc (Zn)-Dissolved	0.0118	+/-0.0014		0.0030	mg/L	0		09-NOV-14	R3062997
Ion Balance Calculation									
Ion Balance	91.4	-			%	-		10-NOV-14	
TDS (Calculated)	1230	-			mg/L	-		10-NOV-14	
Hardness (as CaCO3)	657	-			mg/L	-		10-NOV-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		09-NOV-14	R3062999
Nitrate as N by IC									
Nitrate (as N)	<0.25	-	DLM	0.25	mg/L	-		02-NOV-14	R3044256
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.27	-		0.27	mg/L	-		05-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.10	-	DLM	0.10	mg/L	-		02-NOV-14	R3044256
Sulfate by IC									
Sulfate (SO4)	167	+/-9.4	DLM	2.5	mg/L	0		02-NOV-14	R3044256
pH, Conductivity and Total Alkalinity									
pH	8.37	+/-0.01		0.10	pH	0		07-NOV-14	R3060009
Conductivity (EC)	2410	+/-120		0.20	uS/cm	0		07-NOV-14	R3060009
Bicarbonate (HCO3)	251	+/-10		5.0	mg/L	0		07-NOV-14	R3060009
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		07-NOV-14	R3060009
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		07-NOV-14	R3060009
Alkalinity, Total (as CaCO3)	212	+/-14		2.0	mg/L	0		07-NOV-14	R3060009
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	3.55	-		0.21	mg/L	-		10-NOV-14	
L1541122-10 16053141031018 Sampled By: jl/bp on 31-OCT-14 @ 11:05 Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Toluene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
EthylBenzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
o-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Styrene	<0.0010	-		0.0010	mg/L	-		06-NOV-14	R3048650
F1(C6-C10)	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
F1-BTEX	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
Xylenes	<0.00071	-		0.00071	mg/L	-		06-NOV-14	R3048650
Surr:	1,4-Difluorobenzene (SS)	97.8	-	N/A	%	-		06-NOV-14	R3048650
Surr:	4-Bromofluorobenzene (SS)	89.1	-	N/A	%	-		06-NOV-14	R3048650
Surr:	3,4-Dichlorotoluene (SS)	104.2	-	N/A	%	-		06-NOV-14	R3048650
F2, F3, F4									

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1541122-10 16053141031018									
Sampled By: jl/bp on 31-OCT-14 @ 11:05									
Matrix: H2O									
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
Surr: 2-Bromobenzotrifluoride	94.1	-		N/A	%	-	05-NOV-14	05-NOV-14	R3056689
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	0.0000066	+/-0.0000043		0.000005 0	mg/L	0		09-NOV-14	R3062999
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.123	+/-0.020	DLM	0.030	mg/L	0		09-NOV-14	R3062470
Antimony (Sb)-Total	<0.0010	-	DLM	0.0010	mg/L	-		09-NOV-14	R3062470
Arsenic (As)-Total	<0.0010	-	DLM	0.0010	mg/L	-		09-NOV-14	R3062470
Barium (Ba)-Total	0.825	+/-0.092	DLM	0.0050	mg/L	0		09-NOV-14	R3062470
Boron (B)-Total	3.64	+/-0.58	DLM	0.10	mg/L	0		09-NOV-14	R3062470
Cadmium (Cd)-Total	<0.00020	-	DLM	0.00020	mg/L	-		09-NOV-14	R3062470
Calcium (Ca)-Total	7.84	+/-0.93	DLM	0.50	mg/L	0		09-NOV-14	R3062470
Chromium (Cr)-Total	<0.0050	-	DLM	0.0050	mg/L	-		09-NOV-14	R3062470
Copper (Cu)-Total	0.0105	+/-0.0013	DLM	0.0010	mg/L	0		09-NOV-14	R3062470
Iron (Fe)-Total	3.39	+/-0.54	DLM	0.10	mg/L	0		09-NOV-14	R3062470
Lead (Pb)-Total	0.0122	+/-0.0019	DLM	0.00050	mg/L	0		09-NOV-14	R3062470
Magnesium (Mg)-Total	9.05	+/-1.1	DLM	0.10	mg/L	0		09-NOV-14	R3062470
Manganese (Mn)-Total	0.0553	+/-0.0056	DLM	0.0020	mg/L	0		09-NOV-14	R3062470
Nickel (Ni)-Total	0.0024	+/-0.0003	DLM	0.0020	mg/L	0		09-NOV-14	R3062470
Potassium (K)-Total	7.07	+/-0.87	DLM	0.50	mg/L	0		09-NOV-14	R3062470
Selenium (Se)-Total	<0.0010	-	DLM	0.0010	mg/L	-		09-NOV-14	R3062470
Silicon (Si)-Total	3.46	+/-0.69	DLM	0.50	mg/L	0		09-NOV-14	R3062470
Silver (Ag)-Total	<0.00040	-	DLM	0.00040	mg/L	-		09-NOV-14	R3062470
Sodium (Na)-Total	1580	+/-190	DLM	1.0	mg/L	0		09-NOV-14	R3062470
Uranium (U)-Total	<0.00010	-	DLM	0.00010	mg/L	-		09-NOV-14	R3062470
Zinc (Zn)-Total	0.051	+/-0.009	DLM	0.030	mg/L	0		09-NOV-14	R3062470
Miscellaneous Parameters									
Ammonia, Total (as N)	3.34	-		0.050	mg/L	-		07-NOV-14	R3058793
Dissolved Organic Carbon	2.6	+/-0.6		1.0	mg/L	0		09-NOV-14	R3063468
Naphthenic Acids	<1.0	-		1.0	mg/L	-	10-NOV-14	10-NOV-14	R3065928
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		17-NOV-14	R3081196
Total Dissolved Solids	3760	+/-250		10	mg/L	0		03-NOV-14	R3047694
Silicon (as SiO2)-Total	7.4	-		1.1	mg/L	-		09-NOV-14	
Turbidity	18.5	+/-1.1		0.10	NTU	0		01-NOV-14	R3041974
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Anthracene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Fluoranthene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Fluorene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Naphthalene	<0.000050	-		0.000050	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Phenanthrene	<0.000050	-		0.000050	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Pyrene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1541122-10 16053141031018									
Sampled By: jl/bp on 31-OCT-14 @ 11:05									
Matrix: H2O									
PAH & Carcinogenic PAH List									
Benzo(a)pyrene	<0.000050	-		0.000005 0	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Chrysene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Dibenzo(a,h)anthracene	<0.000050	-		0.000005 0	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Surr: d10-Acenaphthene	96.0	-		N/A	%	-	06-NOV-14	07-NOV-14	R3059631
Surr: d10-Phenanthrene	96.8	-		N/A	%	-	06-NOV-14	07-NOV-14	R3059631
Surr: d12-Chrysene	92.3	-		N/A	%	-	06-NOV-14	07-NOV-14	R3059631
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	1250	+/-71	DLM	5.0	mg/L	0		05-NOV-14	R3056229
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		09-NOV-14	R3062997
Antimony (Sb)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		09-NOV-14	R3062997
Arsenic (As)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		09-NOV-14	R3062997
Barium (Ba)-Dissolved	0.766	+/-0.066	DLM	0.0050	mg/L	0		09-NOV-14	R3062997
Boron (B)-Dissolved	3.78	+/-0.46	DLM	0.10	mg/L	0		09-NOV-14	R3062997
Cadmium (Cd)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		09-NOV-14	R3062997
Calcium (Ca)-Dissolved	6.91	+/-0.94	DLM	0.50	mg/L	0		09-NOV-14	R3062997
Chromium (Cr)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		09-NOV-14	R3062997
Copper (Cu)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		09-NOV-14	R3062997
Iron (Fe)-Dissolved	0.18	+/-0.02	DLM	0.10	mg/L	0		09-NOV-14	R3062997
Lead (Pb)-Dissolved	<0.00050	-	DLM	0.00050	mg/L	-		09-NOV-14	R3062997
Magnesium (Mg)-Dissolved	7.76	+/-0.60	DLM	0.10	mg/L	0		09-NOV-14	R3062997
Manganese (Mn)-Dissolved	0.0085	+/-0.0006	DLM	0.0020	mg/L	0		09-NOV-14	R3062997
Nickel (Ni)-Dissolved	<0.0020	-	DLM	0.0020	mg/L	-		09-NOV-14	R3062997
Potassium (K)-Dissolved	7.04	+/-0.55	DLM	0.50	mg/L	0		09-NOV-14	R3062997
Selenium (Se)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		09-NOV-14	R3062997
Silicon (Si)-Dissolved	2.99	+/-0.25	DLM	0.50	mg/L	0		09-NOV-14	R3062997
Silver (Ag)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		09-NOV-14	R3062997
Sodium (Na)-Dissolved	1450	+/-100	DLM	1.0	mg/L	0		09-NOV-14	R3062997
Uranium (U)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		09-NOV-14	R3062997
Zinc (Zn)-Dissolved	<0.010	-	DLM	0.010	mg/L	-		09-NOV-14	R3062997
Ion Balance Calculation									
Ion Balance	91.3	-			%	-		10-NOV-14	
TDS (Calculated)	3780	-			mg/L	-		10-NOV-14	
Hardness (as CaCO3)	49.2	-			mg/L	-		10-NOV-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.000005 0	mg/L	-		09-NOV-14	R3062999
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		02-NOV-14	R3044256
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		05-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		02-NOV-14	R3044256
Sulfate by IC									
Sulfate (SO4)	<0.50	-		0.50	mg/L	-		02-NOV-14	R3044256
pH, Conductivity and Total Alkalinity									
pH	9.09	+/-0.01		0.10	pH	0		07-NOV-14	R3060009
Conductivity (EC)	6580	+/-330		0.20	uS/cm	0		07-NOV-14	R3060009

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1541122-10 16053141031018 Sampled By: jl/bp on 31-OCT-14 @ 11:05 Matrix: H2O									
pH, Conductivity and Total Alkalinity									
Bicarbonate (HCO3)	1720	+/-64		5.0	mg/L	0		07-NOV-14	R3060009
Carbonate (CO3)	215	+/-27		5.0	mg/L	0		07-NOV-14	R3060009
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		07-NOV-14	R3060009
Alkalinity, Total (as CaCO3)	1770	+/-110		2.0	mg/L	0		07-NOV-14	R3060009
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	6.4	-		1.1	mg/L	-		10-NOV-14	
L1541122-11 16053141031019 Sampled By: jl/bp on 31-OCT-14 @ 12:20 Matrix: H2O									
BTEX, Styrene & F1-F2									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Toluene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
EthylBenzene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
o-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		06-NOV-14	R3048650
Styrene	<0.0010	-		0.0010	mg/L	-		06-NOV-14	R3048650
F1(C6-C10)	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
F1-BTEX	<0.10	-		0.10	mg/L	-		06-NOV-14	R3048650
Xylenes	<0.00071	-		0.00071	mg/L	-		06-NOV-14	R3048650
Surr: 1,4-Difluorobenzene (SS)	97.1	-		N/A	%	-		06-NOV-14	R3048650
Surr: 4-Bromofluorobenzene (SS)	87.4	-		N/A	%	-		06-NOV-14	R3048650
Surr: 3,4-Dichlorotoluene (SS)	102.7	-		N/A	%	-		06-NOV-14	R3048650
F2 (>C10-C16)									
F2 (C10-C16)	<0.25	-		0.25	mg/L	-	05-NOV-14	05-NOV-14	R3056689
Surr: 2-Bromobenzotrifluoride	96.8	-		N/A	%	-	05-NOV-14	05-NOV-14	R3056689
Routine Water Analysis									
Chloride by IC									
Chloride (Cl)	<0.50	-		0.50	mg/L	-		02-NOV-14	R3044256
Dissolved Metals in Water by CRC ICPMS									
Calcium (Ca)-Dissolved	<0.50	-		0.50	mg/L	-		09-NOV-14	R3062997
Magnesium (Mg)-Dissolved	<0.10	-		0.10	mg/L	-		09-NOV-14	R3062997
Potassium (K)-Dissolved	<0.50	-		0.50	mg/L	-		09-NOV-14	R3062997
Sodium (Na)-Dissolved	<1.0	-		1.0	mg/L	-		09-NOV-14	R3062997
Ion Balance Calculation									
Ion Balance	Low TDS	-			%	-		10-NOV-14	
TDS (Calculated)	<1.0	-			mg/L	-		10-NOV-14	
Hardness (as CaCO3)	<1.0	-			mg/L	-		10-NOV-14	
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		02-NOV-14	R3044256
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		05-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		02-NOV-14	R3044256
Sulfate by IC									
Sulfate (SO4)	<0.50	-		0.50	mg/L	-		02-NOV-14	R3044256
pH, Conductivity and Total Alkalinity									
pH	5.45	+/-0.01		0.10	pH	0		07-NOV-14	R3060009
Conductivity (EC)	0.38	+/-0.25		0.20	uS/cm	0		07-NOV-14	R3060009
Bicarbonate (HCO3)	<5.0	-		5.0	mg/L	-		07-NOV-14	R3060009

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1541122-11 16053141031019 Sampled By: jl/bp on 31-OCT-14 @ 12:20 Matrix: H2O									
pH, Conductivity and Total Alkalinity									
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		07-NOV-14	R3060009
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		07-NOV-14	R3060009
Alkalinity, Total (as CaCO3)	<2.0	-		2.0	mg/L	-		07-NOV-14	R3060009
* Refer to Referenced Information for Qualifiers (if any) and Methodology.									

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	

Sample Parameter Qualifier Key:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLM	Detection Limit Adjusted due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
BTXS,F1-ED	Water	BTEX, Styrene and F1 (C6-C10)		EPA 5021/8015&8260 GC-MS & FID
C-DIS-ORG-ED	Water	Dissolved Organic Carbon		APHA 5310 B-Instrumental
CL-IC-ED	Water	Chloride by IC		APHA 4110 B-ION CHROMATOGRAPHY
F2,F3,F4-ED	Water	F2, F3, F4		EPA 3510/CCME PHC CWS-GC-FID
F2-ED	Water	F2 (>C10-C16)		EPA 3510/CCME PHC CWS-GC-FID
HG-D-L-CVAA-ED	Water	Mercury (Hg) - Dissolved		EPA 245.7 / EPA 245.1
HG-T-L-CVAA-ED	Water	Mercury (Hg)		EPA 245.7 / EPA 245.1
IONBALANCE-ED	Water	Ion Balance Calculation		APHA 1030E
MET-D-CCMS-ED	Water	Dissolved Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
NAPHTHENIC-ACID-FM	Water	Naphthenic Acids by FTIR		Naphthenic Acids by FTIR, Syncrude, 1994

Dissolved naphthenic acids are solvent extracted from acidified aqueous samples using Dichloromethane prior to quantitation by Fourier Transform Infra-Red spectroscopy. Note that FTIR is not uniquely selective to naphthenic acids. If present, other carboxylic acids (e.g. humic acids, fulvic acids) may also be detected by this method.

NH3-CFA-ED Water Ammonia in Water by Colour APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.

NO2+NO3-CALC-ED Water Nitrate+Nitrite CALCULATION

NO2-IC-ED Water Nitrite as N by IC APHA 4110 B-ION CHROMATOGRAPHY

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

NO3-IC-ED Water Nitrate as N by IC APHA 4110 B-ION CHROMATOGRAPHY

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

PAH-ABT1-CL Water PAH & Carcinogenic PAH List EPA 3510/8270-GC/MS

PH/EC/ALK-ED Water pH, Conductivity and Total Alkalinity APHA 4500-H, 2510, 2320

All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PHENOLS-4AAP-ED Water Phenols (4AAP) AB ENV.06537-COLORIMETRIC

This analysis is carried out using procedures adapted from ENVIRODAT VMV 06537 689, Method Code 154, in "Methods Manual for Chemical Analysis of Water and Wastes" published by the Alberta Environmental Centre. This automated method is based on the distillation of phenol and subsequent reaction of the distillate with alkaline ferricyanide and 4-aminoantipyrine to form a red complex which is measured at 505 nm.

SIO2-D-CALC-ED Water Dissolved Silicon (reported as Silica) CALCULATION

SIO2-T-CALC-ED Water Total Silicon (reported as Silica) CALCULATION

SO4-IC-ED Water Sulfate by IC APHA 4110 B-ION CHROMATOGRAPHY

SOLIDS-TDS-ED Water Total Dissolved Solids APHA 2540 C

Turbidity APHA 2130 B-Nephelometer

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
TURBIDITY-ED	Water			

** The indicated Method Reference is the closest nationally or internationally recognized reference for the applicable ALS test method. ALS methods may incorporate modifications from the specified reference to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
FM	ALS ENVIRONMENTAL - FORT MCMURRAY, ALBERTA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

M050662

GLOSSARY OF REPORT TERMS

Surr - Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

MU: Measurement Uncertainty. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 which gives a level of confidence of approximately 95%.

Bias: The reported method bias is the average long term deviation from the target value for a long term reference or control sample, measured in percent.

Zero values indicate no detectable method bias.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L1541122

Report Date: 17-NOV-14

Page 1 of 23

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R3048650							
WG1988539-4	DUP	L1541297-1						
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	06-NOV-14
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	06-NOV-14
EthylBenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	06-NOV-14
o-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	06-NOV-14
m+p-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	06-NOV-14
Styrene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	50	06-NOV-14
F1(C6-C10)		<0.10	<0.10	RPD-NA	mg/L	N/A	30	06-NOV-14
WG1988539-8	DUP	L1541122-6						
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	06-NOV-14
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	06-NOV-14
EthylBenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	06-NOV-14
o-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	06-NOV-14
m+p-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	06-NOV-14
Styrene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	50	06-NOV-14
F1(C6-C10)		<0.10	<0.10	RPD-NA	mg/L	N/A	30	06-NOV-14
WG1988539-2	LCS							
Benzene			98.1		%		70-130	06-NOV-14
Toluene			94.5		%		70-130	06-NOV-14
EthylBenzene			90.2		%		70-130	06-NOV-14
o-Xylene			90.2		%		70-130	06-NOV-14
m+p-Xylene			92.6		%		70-130	06-NOV-14
Styrene			94.8		%		70-130	06-NOV-14
WG1988539-3	LCS							
F1(C6-C10)			102.6		%		70-130	06-NOV-14
WG1988539-6	LCS							
Benzene			92.8		%		70-130	06-NOV-14
Toluene			82.8		%		70-130	06-NOV-14
EthylBenzene			81.4		%		70-130	06-NOV-14
o-Xylene			81.3		%		70-130	06-NOV-14
m+p-Xylene			83.6		%		70-130	06-NOV-14
Styrene			84.6		%		70-130	06-NOV-14
WG1988539-7	LCS							
F1(C6-C10)			103.8		%		70-130	06-NOV-14
WG1988539-1	MB							



Quality Control Report

Workorder: L1541122

Report Date: 17-NOV-14

Page 2 of 23

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R3048650							
WG1988539-1	MB							
Benzene			<0.00050		mg/L		0.0005	06-NOV-14
Toluene			<0.00050		mg/L		0.0005	06-NOV-14
EthylBenzene			<0.00050		mg/L		0.0005	06-NOV-14
o-Xylene			<0.00050		mg/L		0.0005	06-NOV-14
m+p-Xylene			<0.00050		mg/L		0.0005	06-NOV-14
Styrene			<0.0010		mg/L		0.001	06-NOV-14
F1(C6-C10)			<0.10		mg/L		0.1	06-NOV-14
Surrogate: 1,4-Difluorobenzene (SS)			99.1		%		70-130	06-NOV-14
Surrogate: 4-Bromofluorobenzene (SS)			94.2		%		70-130	06-NOV-14
Surrogate: 3,4-Dichlorotoluene (SS)			104.1		%		70-130	06-NOV-14
WG1988539-5	MB							
Benzene			<0.00050		mg/L		0.0005	06-NOV-14
Toluene			<0.00050		mg/L		0.0005	06-NOV-14
EthylBenzene			<0.00050		mg/L		0.0005	06-NOV-14
o-Xylene			<0.00050		mg/L		0.0005	06-NOV-14
m+p-Xylene			<0.00050		mg/L		0.0005	06-NOV-14
Styrene			<0.0010		mg/L		0.001	06-NOV-14
F1(C6-C10)			<0.10		mg/L		0.1	06-NOV-14
Surrogate: 1,4-Difluorobenzene (SS)			97.2		%		70-130	06-NOV-14
Surrogate: 4-Bromofluorobenzene (SS)			89.5		%		70-130	06-NOV-14
Surrogate: 3,4-Dichlorotoluene (SS)			103.6		%		70-130	06-NOV-14
C-DIS-ORG-ED		Water						
Batch	R3063468							
WG1992603-3	CVS							
Dissolved Organic Carbon			111.3		%		80-160	09-NOV-14
WG1992603-4	DUP	L1540006-1						
Dissolved Organic Carbon		19.1	19.4		mg/L	1.8	20	09-NOV-14
WG1992603-2	LCS							
Dissolved Organic Carbon			93.8		%		80-120	09-NOV-14
WG1992603-1	MB							
Dissolved Organic Carbon			<1.0		mg/L		1	09-NOV-14
WG1992603-5	MS	L1540006-1						
Dissolved Organic Carbon			N/A	MS-B	%		-	09-NOV-14

CL-IC-ED Water



Environmental

Quality Control Report

Workorder: L1541122

Report Date: 17-NOV-14

Page 3 of 23

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-ED								
	Water							
Batch	R3044256							
WG1987044-5	DUP	L1541137-3						
Chloride (Cl)		0.56	0.69	J	mg/L	0.13	1	02-NOV-14
WG1987044-11	LCS							
Chloride (Cl)			99.1		%		90-110	02-NOV-14
WG1987044-13	LCS							
Chloride (Cl)			99.3		%		90-110	02-NOV-14
WG1987044-2	LCS							
Chloride (Cl)			99.2		%		90-110	02-NOV-14
WG1987044-3	LCS							
Chloride (Cl)			99.2		%		90-110	02-NOV-14
WG1987044-7	LCS							
Chloride (Cl)			99.2		%		90-110	02-NOV-14
WG1987044-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	02-NOV-14
WG1987044-12	MB							
Chloride (Cl)			<0.50		mg/L		0.5	02-NOV-14
WG1987044-14	MB							
Chloride (Cl)			<0.50		mg/L		0.5	02-NOV-14
WG1987044-4	MB							
Chloride (Cl)			<0.50		mg/L		0.5	02-NOV-14
WG1987044-8	MB							
Chloride (Cl)			<0.50		mg/L		0.5	02-NOV-14
WG1987044-10	MS	L1541285-4						
Chloride (Cl)			101.3		%		75-125	02-NOV-14
WG1987044-6	MS	L1541137-3						
Chloride (Cl)			99.3		%		75-125	02-NOV-14
Batch	R3056229							
WG1989908-3	DUP	L1542432-3						
Chloride (Cl)		40.5	40.8		mg/L	0.8	20	05-NOV-14
WG1989908-7	DUP	L1542522-4						
Chloride (Cl)		2.38	2.38		mg/L	0.2	20	05-NOV-14
WG1989908-11	LCS							
Chloride (Cl)			102.1		%		90-110	05-NOV-14
WG1989908-13	LCS							
Chloride (Cl)			101.6		%		90-110	05-NOV-14
WG1989908-2	LCS							
Chloride (Cl)			100.8		%		90-110	05-NOV-14
WG1989908-5	LCS							



Quality Control Report

Workorder: L1541122

Report Date: 17-NOV-14

Page 4 of 23

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-ED		Water						
Batch	R3056229							
WG1989908-5	LCS							
Chloride (Cl)			101.2		%		90-110	05-NOV-14
WG1989908-9	LCS							
Chloride (Cl)			101.1		%		90-110	05-NOV-14
WG1989908-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	05-NOV-14
WG1989908-10	MB							
Chloride (Cl)			<0.50		mg/L		0.5	05-NOV-14
WG1989908-12	MB							
Chloride (Cl)			<0.50		mg/L		0.5	05-NOV-14
WG1989908-14	MB							
Chloride (Cl)			<0.50		mg/L		0.5	05-NOV-14
WG1989908-6	MB							
Chloride (Cl)			<0.50		mg/L		0.5	05-NOV-14
WG1989908-4	MS	L1542432-3						
Chloride (Cl)			91.6		%		75-125	05-NOV-14
WG1989908-8	MS	L1542522-4						
Chloride (Cl)			97.7		%		75-125	05-NOV-14
F2,F3,F4-ED		Water						
Batch	R3056689							
WG1988232-2	LCS							
F2 (>C10-C16)			93.9		%		70-130	05-NOV-14
F3 (C16-C34)			93.3		%		70-130	05-NOV-14
F4 (C34-C50)			95.0		%		70-130	05-NOV-14
WG1988232-5	LCS							
F2 (>C10-C16)			87.9		%		70-130	05-NOV-14
F3 (C16-C34)			92.6		%		70-130	05-NOV-14
F4 (C34-C50)			102.1		%		70-130	05-NOV-14
WG1988232-1	MB							
F2 (>C10-C16)			<0.25		mg/L		0.25	05-NOV-14
F3 (C16-C34)			<0.25		mg/L		0.25	05-NOV-14
F4 (C34-C50)			<0.25		mg/L		0.25	05-NOV-14
Surrogate: 2-Bromobenzotrifluoride			96.6		%		60-140	05-NOV-14
WG1988232-4	MB							
F2 (>C10-C16)			<0.25		mg/L		0.25	05-NOV-14
F3 (C16-C34)			<0.25		mg/L		0.25	05-NOV-14
F4 (C34-C50)			<0.25		mg/L		0.25	05-NOV-14



Quality Control Report

Workorder: L1541122

Report Date: 17-NOV-14

Page 5 of 23

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F2,F3,F4-ED Water								
Batch	R3056689							
WG1988232-4 MB								
Surrogate: 2-Bromobenzotrifluoride			88.1		%		60-140	05-NOV-14
F2-ED Water								
Batch	R3056689							
WG1988232-2 LCS								
F2 (C10-C16)			93.9		%		70-130	05-NOV-14
WG1988232-5 LCS								
F2 (C10-C16)			87.9		%		70-130	05-NOV-14
WG1988232-1 MB								
F2 (C10-C16)			<0.25		mg/L		0.25	05-NOV-14
Surrogate: 2-Bromobenzotrifluoride			96.6		%		65-135	05-NOV-14
WG1988232-4 MB								
F2 (C10-C16)			<0.25		mg/L		0.25	05-NOV-14
Surrogate: 2-Bromobenzotrifluoride			88.1		%		65-135	05-NOV-14
WG1988232-3 MS		L1540651-1						
F2 (C10-C16)			95.5		%		50-150	05-NOV-14
WG1988232-6 MS		L1541120-2						
F2 (C10-C16)			87.9		%		50-150	05-NOV-14
HG-D-L-CVAA-ED Water								
Batch	R3062999							
WG1992271-11 DUP		L1542981-4						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	09-NOV-14
WG1992271-3 DUP		L1537600-1						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	09-NOV-14
WG1992271-7 DUP		L1541122-1						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	09-NOV-14
WG1992271-10 LCS								
Mercury (Hg)-Dissolved			100.5		%		80-120	09-NOV-14
WG1992271-2 LCS								
Mercury (Hg)-Dissolved			99.8		%		80-120	09-NOV-14
WG1992271-6 LCS								
Mercury (Hg)-Dissolved			93.2		%		80-120	09-NOV-14
Mercury (Hg)-Dissolved			93.2		%		80-120	09-NOV-14
WG1992271-1 MB								
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	09-NOV-14
WG1992271-5 MB							0.000005	



Quality Control Report

Workorder: L1541122

Report Date: 17-NOV-14

Page 6 of 23

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-L-CVAA-ED		Water						
Batch	R3062999							
WG1992271-5 MB								
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	09-NOV-14
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	09-NOV-14
WG1992271-9 MB								
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	09-NOV-14
WG1992271-12 MS		L1542981-4						
Mercury (Hg)-Dissolved			96.8		%		70-130	09-NOV-14
WG1992271-4 MS		L1537600-1						
Mercury (Hg)-Dissolved			101.5		%		70-130	09-NOV-14
WG1992271-8 MS		L1541122-1						
Mercury (Hg)-Dissolved			93.2		%		70-130	09-NOV-14
HG-T-L-CVAA-ED		Water						
Batch	R3062999							
WG1992274-3 DUP		L1543075-1						
Mercury (Hg)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	09-NOV-14
WG1992274-2 LCS								
Mercury (Hg)-Total			101.1		%		80-120	09-NOV-14
WG1992274-1 MB								
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	09-NOV-14
WG1992274-4 MS		L1543075-1						
Mercury (Hg)-Total			100.5		%		70-130	09-NOV-14
MET-D-CCMS-ED		Water						
Batch	R3062997							
WG1992322-2 CRM		ED-HIGH-WATRM						
Aluminum (Al)-Dissolved			103.5		%		80-120	09-NOV-14
Antimony (Sb)-Dissolved			88.2		%		80-120	09-NOV-14
Arsenic (As)-Dissolved			88.4		%		80-120	09-NOV-14
Barium (Ba)-Dissolved			104.0		%		80-120	09-NOV-14
Boron (B)-Dissolved			97.4		%		80-120	09-NOV-14
Cadmium (Cd)-Dissolved			96.9		%		80-120	09-NOV-14
Calcium (Ca)-Dissolved			100.3		%		80-120	09-NOV-14
Chromium (Cr)-Dissolved			99.2		%		80-120	09-NOV-14
Copper (Cu)-Dissolved			96.2		%		80-120	09-NOV-14
Iron (Fe)-Dissolved			90.0		%		80-120	09-NOV-14
Lead (Pb)-Dissolved			98.4		%		80-120	09-NOV-14
Magnesium (Mg)-Dissolved			96.8		%		80-120	09-NOV-14



Quality Control Report

Workorder: L1541122

Report Date: 17-NOV-14

Page 7 of 23

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R3062997							
WG1992322-2 CRM	ED-HIGH-WATRM							
Manganese (Mn)-Dissolved			99.9		%		80-120	09-NOV-14
Nickel (Ni)-Dissolved			99.3		%		80-120	09-NOV-14
Potassium (K)-Dissolved			106.4		%		80-120	09-NOV-14
Selenium (Se)-Dissolved			86.0		%		80-120	09-NOV-14
Silicon (Si)-Dissolved			100.3		%		80-120	09-NOV-14
Silver (Ag)-Dissolved			99.0		%		80-120	09-NOV-14
Sodium (Na)-Dissolved			106.1		%		80-120	09-NOV-14
Uranium (U)-Dissolved			99.3		%		80-120	09-NOV-14
Zinc (Zn)-Dissolved			96.0		%		80-120	09-NOV-14
WG1992322-5 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			104.3		%		80-120	09-NOV-14
Antimony (Sb)-Dissolved			86.5		%		80-120	09-NOV-14
Arsenic (As)-Dissolved			89.1		%		80-120	09-NOV-14
Barium (Ba)-Dissolved			105.0		%		80-120	09-NOV-14
Boron (B)-Dissolved			97.2		%		80-120	09-NOV-14
Cadmium (Cd)-Dissolved			96.9		%		80-120	09-NOV-14
Calcium (Ca)-Dissolved			98.8		%		80-120	09-NOV-14
Chromium (Cr)-Dissolved			100.0		%		80-120	09-NOV-14
Copper (Cu)-Dissolved			97.2		%		80-120	09-NOV-14
Iron (Fe)-Dissolved			90.5		%		80-120	09-NOV-14
Lead (Pb)-Dissolved			96.4		%		80-120	09-NOV-14
Magnesium (Mg)-Dissolved			96.1		%		80-120	09-NOV-14
Manganese (Mn)-Dissolved			99.7		%		80-120	09-NOV-14
Nickel (Ni)-Dissolved			99.4		%		80-120	09-NOV-14
Potassium (K)-Dissolved			108.5		%		80-120	09-NOV-14
Selenium (Se)-Dissolved			85.9		%		80-120	09-NOV-14
Silicon (Si)-Dissolved			115.0		%		80-120	09-NOV-14
Silver (Ag)-Dissolved			95.1		%		80-120	09-NOV-14
Sodium (Na)-Dissolved			105.0		%		80-120	09-NOV-14
Uranium (U)-Dissolved			98.3		%		80-120	09-NOV-14
Zinc (Zn)-Dissolved			99.7		%		80-120	09-NOV-14
WG1992322-3 DUP	L1541122-11							
Aluminum (Al)-Dissolved		0.0013	0.0014		mg/L	5.7	20	09-NOV-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-NOV-14



Quality Control Report

Workorder: L1541122

Report Date: 17-NOV-14

Page 8 of 23

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R3062997							
WG1992322-3	DUP	L1541122-11						
Arsenic (As)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-NOV-14
Barium (Ba)-Dissolved		0.000133	0.000122		mg/L	9.0	20	09-NOV-14
Boron (B)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	09-NOV-14
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	09-NOV-14
Calcium (Ca)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	09-NOV-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-NOV-14
Copper (Cu)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-NOV-14
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	09-NOV-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	09-NOV-14
Magnesium (Mg)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	20	09-NOV-14
Manganese (Mn)-Dissolved		0.000063	0.000069		mg/L	10	20	09-NOV-14
Nickel (Ni)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-NOV-14
Potassium (K)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	09-NOV-14
Selenium (Se)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-NOV-14
Silicon (Si)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	09-NOV-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	09-NOV-14
Sodium (Na)-Dissolved		<1.0	<1.0	RPD-NA	mg/L	N/A	20	09-NOV-14
Uranium (U)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	09-NOV-14
Zinc (Zn)-Dissolved		N/A	0.0013		mg/L	13	20	09-NOV-14
WG1992322-6	DUP	L1541285-10						
Aluminum (Al)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	09-NOV-14
Antimony (Sb)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	09-NOV-14
Arsenic (As)-Dissolved		0.00132	0.00137		mg/L	4.3	20	09-NOV-14
Barium (Ba)-Dissolved		0.469	0.481		mg/L	2.5	20	09-NOV-14
Boron (B)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	09-NOV-14
Cadmium (Cd)-Dissolved		0.000074	0.000072		mg/L	2.9	20	09-NOV-14
Calcium (Ca)-Dissolved		123	124		mg/L	0.7	20	09-NOV-14
Chromium (Cr)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	09-NOV-14
Copper (Cu)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	09-NOV-14
Iron (Fe)-Dissolved		0.130	0.127		mg/L	2.0	20	09-NOV-14
Lead (Pb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-NOV-14
Magnesium (Mg)-Dissolved		24.3	24.3		mg/L	0.1	20	09-NOV-14
Manganese (Mn)-Dissolved		0.620	0.618		mg/L	0.3	20	09-NOV-14



Quality Control Report

Workorder: L1541122

Report Date: 17-NOV-14

Page 9 of 23

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R3062997							
WG1992322-6	DUP	L1541285-10						
Nickel (Ni)-Dissolved		0.0044	0.0044		mg/L	0.4	20	09-NOV-14
Potassium (K)-Dissolved		1.49	1.49		mg/L	0.3	20	09-NOV-14
Selenium (Se)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	09-NOV-14
Silicon (Si)-Dissolved		4.98	4.98		mg/L	0.1	20	09-NOV-14
Silver (Ag)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-NOV-14
Sodium (Na)-Dissolved		1.5	1.5		mg/L	2.4	20	09-NOV-14
Uranium (U)-Dissolved		0.00145	0.00141		mg/L	2.7	20	09-NOV-14
Zinc (Zn)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	09-NOV-14
WG1992322-1	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	09-NOV-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	09-NOV-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	09-NOV-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	09-NOV-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	09-NOV-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	09-NOV-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	09-NOV-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	09-NOV-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	09-NOV-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	09-NOV-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	09-NOV-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	09-NOV-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	09-NOV-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	09-NOV-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	09-NOV-14
Selenium (Se)-Dissolved			<0.00010		mg/L		0.0001	09-NOV-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	09-NOV-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	09-NOV-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	09-NOV-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	09-NOV-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	09-NOV-14
WG1992322-4	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	09-NOV-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	09-NOV-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	09-NOV-14



Quality Control Report

Workorder: L1541122

Report Date: 17-NOV-14

Page 10 of 23

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch R3062997								
WG1992322-4 MB								
	Barium (Ba)-Dissolved		<0.000050		mg/L		0.00005	09-NOV-14
	Boron (B)-Dissolved		<0.010		mg/L		0.01	09-NOV-14
	Cadmium (Cd)-Dissolved		<0.000010		mg/L		0.00001	09-NOV-14
	Calcium (Ca)-Dissolved		<0.020		mg/L		0.02	09-NOV-14
	Chromium (Cr)-Dissolved		<0.00010		mg/L		0.0001	09-NOV-14
	Copper (Cu)-Dissolved		<0.00010		mg/L		0.0001	09-NOV-14
	Iron (Fe)-Dissolved		<0.010		mg/L		0.01	09-NOV-14
	Lead (Pb)-Dissolved		<0.000050		mg/L		0.00005	09-NOV-14
	Magnesium (Mg)-Dissolved		<0.0050		mg/L		0.005	09-NOV-14
	Manganese (Mn)-Dissolved		<0.000050		mg/L		0.00005	09-NOV-14
	Nickel (Ni)-Dissolved		<0.00010		mg/L		0.0001	09-NOV-14
	Potassium (K)-Dissolved		<0.050		mg/L		0.05	09-NOV-14
	Selenium (Se)-Dissolved		<0.00010		mg/L		0.0001	09-NOV-14
	Silicon (Si)-Dissolved		<0.050		mg/L		0.05	09-NOV-14
	Silver (Ag)-Dissolved		<0.000010		mg/L		0.00001	09-NOV-14
	Sodium (Na)-Dissolved		<0.050		mg/L		0.05	09-NOV-14
	Uranium (U)-Dissolved		<0.000010		mg/L		0.00001	09-NOV-14
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	09-NOV-14
Batch R3064909								
WG1992685-2 CRM		ED-HIGH-WATRM						
	Zinc (Zn)-Dissolved		97.8		%		80-120	10-NOV-14
WG1992685-5 CRM		ED-HIGH-WATRM						
	Zinc (Zn)-Dissolved		113.5		%		80-120	10-NOV-14
WG1992685-8 CRM		ED-HIGH-WATRM						
	Zinc (Zn)-Dissolved		113.5		%		80-120	10-NOV-14
WG1992685-6 DUP		L1541573-2						
	Zinc (Zn)-Dissolved	0.191	0.191		mg/L	0.2	20	10-NOV-14
WG1992685-9 DUP		L1542314-7						
	Zinc (Zn)-Dissolved	<0.0010	0.0012	RPD-NA	mg/L	N/A	20	10-NOV-14
WG1992685-1 MB								
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	10-NOV-14
WG1992685-4 MB								
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	10-NOV-14
WG1992685-7 MB								
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	10-NOV-14



Quality Control Report

Workorder: L1541122

Report Date: 17-NOV-14

Page 11 of 23

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R3062470							
WG1989494-3	DUP	L1541122-5						
Aluminum (Al)-Total		0.0216	0.0169	J	mg/L	0.0047	0.012	09-NOV-14
Antimony (Sb)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	09-NOV-14
Arsenic (As)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	09-NOV-14
Barium (Ba)-Total		0.0145	0.0141		mg/L	2.5	20	09-NOV-14
Boron (B)-Total		1.32	1.31		mg/L	0.8	20	09-NOV-14
Cadmium (Cd)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	09-NOV-14
Calcium (Ca)-Total		48.4	48.0		mg/L	1.0	20	09-NOV-14
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	09-NOV-14
Copper (Cu)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	09-NOV-14
Iron (Fe)-Total		0.403	0.389		mg/L	3.5	20	09-NOV-14
Lead (Pb)-Total		0.00022	0.00021		mg/L	7.0	20	09-NOV-14
Magnesium (Mg)-Total		26.3	26.0		mg/L	1.4	20	09-NOV-14
Manganese (Mn)-Total		0.0247	0.0240		mg/L	3.0	20	09-NOV-14
Nickel (Ni)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	09-NOV-14
Potassium (K)-Total		5.00	4.88		mg/L	2.4	20	09-NOV-14
Selenium (Se)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	09-NOV-14
Silicon (Si)-Total		5.49	5.39		mg/L	1.7	20	09-NOV-14
Silver (Ag)-Total		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	09-NOV-14
Sodium (Na)-Total		354	354		mg/L	0.0	20	09-NOV-14
Uranium (U)-Total		0.00015	0.00015		mg/L	3.6	20	09-NOV-14
Zinc (Zn)-Total		<0.0060	<0.0060	RPD-NA	mg/L	N/A	20	09-NOV-14
NAPHTHENIC-ACID-FM		Water						
Batch	R3065928							
WG1992631-3	DUP	L1541122-10						
Naphthenic Acids		<1.0	<1.0	RPD-NA	mg/L	N/A	30	10-NOV-14
WG1992631-7	DUP	L1542399-9						
Naphthenic Acids		<1.0	<1.0	RPD-NA	mg/L	N/A	30	10-NOV-14
WG1992631-4	LCS							
Naphthenic Acids			87.4		%		70-130	10-NOV-14
WG1992631-8	LCS							
Naphthenic Acids			94.7		%		70-130	10-NOV-14
WG1992631-1	MB							
Naphthenic Acids			<1.0		mg/L		1	10-NOV-14
WG1992631-5	MB							



Quality Control Report

Workorder: L1541122

Report Date: 17-NOV-14

Page 13 of 23

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-ED		Water						
Batch	R3044256							
WG1987044-7	LCS							
Nitrite (as N)			90.1		%		90-110	02-NOV-14
WG1987044-1	MB							
Nitrite (as N)			<0.020		mg/L		0.02	02-NOV-14
WG1987044-12	MB							
Nitrite (as N)			<0.020		mg/L		0.02	02-NOV-14
WG1987044-14	MB							
Nitrite (as N)			<0.020		mg/L		0.02	02-NOV-14
WG1987044-4	MB							
Nitrite (as N)			<0.020		mg/L		0.02	02-NOV-14
WG1987044-8	MB							
Nitrite (as N)			<0.020		mg/L		0.02	02-NOV-14
NO3-IC-ED		Water						
Batch	R3044256							
WG1987044-5	DUP	L1541137-3						
Nitrate (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	02-NOV-14
WG1987044-9	DUP	L1541285-4						
Nitrate (as N)		0.648	0.780		mg/L	18	20	02-NOV-14
WG1987044-11	LCS							
Nitrate (as N)			94.8		%		90-110	02-NOV-14
WG1987044-13	LCS							
Nitrate (as N)			95.2		%		90-110	02-NOV-14
WG1987044-2	LCS							
Nitrate (as N)			96.6		%		90-110	02-NOV-14
WG1987044-3	LCS							
Nitrate (as N)			95.1		%		90-110	02-NOV-14
WG1987044-7	LCS							
Nitrate (as N)			95.1		%		90-110	02-NOV-14
WG1987044-1	MB							
Nitrate (as N)			<0.050		mg/L		0.05	02-NOV-14
WG1987044-12	MB							
Nitrate (as N)			<0.050		mg/L		0.05	02-NOV-14
WG1987044-14	MB							
Nitrate (as N)			<0.050		mg/L		0.05	02-NOV-14
WG1987044-4	MB							
Nitrate (as N)			<0.050		mg/L		0.05	02-NOV-14
WG1987044-8	MB							
Nitrate (as N)			<0.050		mg/L		0.05	02-NOV-14



Quality Control Report

Workorder: L1541122

Report Date: 17-NOV-14

Page 14 of 23

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-ED								
	Water							
Batch	R3044256							
WG1987044-10 MS		L1541285-4						
Nitrate (as N)			99.2		%		75-125	02-NOV-14
WG1987044-6 MS		L1541137-3						
Nitrate (as N)			94.4		%		75-125	02-NOV-14
PAH-ABT1-CL								
	Water							
Batch	R3056308							
WG1990397-3 LCS								
Acenaphthene			109.7		%		60-130	05-NOV-14
Acenaphthylene			114.1		%		60-130	05-NOV-14
Anthracene			112.7		%		60-130	05-NOV-14
Fluoranthene			109.6		%		60-130	05-NOV-14
Fluorene			112.8		%		60-130	05-NOV-14
Naphthalene			104.6		%		50-130	05-NOV-14
Phenanthrene			108.7		%		60-130	05-NOV-14
Pyrene			110.8		%		60-130	05-NOV-14
Benzo(a)anthracene			116.3		%		60-130	05-NOV-14
Benzo(k)fluoranthene			114.3		%		60-130	05-NOV-14
Benzo(b&j)fluoranthene			117.8		%		60-130	05-NOV-14
Benzo(g,h,i)perylene			109.1		%		60-130	05-NOV-14
Benzo(a)pyrene			123.2		%		60-130	05-NOV-14
Chrysene			109.9		%		60-130	05-NOV-14
Dibenzo(a,h)anthracene			111.6		%		60-130	05-NOV-14
Indeno(1,2,3-cd)pyrene			114.1		%		60-130	05-NOV-14
WG1990397-5 LCS								
Acenaphthene			96.2		%		60-130	06-NOV-14
Acenaphthylene			100.0		%		60-130	06-NOV-14
Anthracene			97.5		%		60-130	06-NOV-14
Fluoranthene			97.4		%		60-130	06-NOV-14
Fluorene			97.8		%		60-130	06-NOV-14
Naphthalene			96.7		%		50-130	06-NOV-14
Phenanthrene			94.3		%		60-130	06-NOV-14
Pyrene			98.5		%		60-130	06-NOV-14
Benzo(a)anthracene			101.3		%		60-130	06-NOV-14
Benzo(k)fluoranthene			101.6		%		60-130	06-NOV-14
Benzo(b&j)fluoranthene			101.4		%		60-130	06-NOV-14



Quality Control Report

Workorder: L1541122

Report Date: 17-NOV-14

Page 15 of 23

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch	R3056308							
WG1990397-5	LCS							
Benzo(g,h,i)perylene			94.2		%		60-130	06-NOV-14
Benzo(a)pyrene			102.6		%		60-130	06-NOV-14
Chrysene			95.7		%		60-130	06-NOV-14
Dibenzo(a,h)anthracene			96.4		%		60-130	06-NOV-14
Indeno(1,2,3-cd)pyrene			94.5		%		60-130	06-NOV-14
WG1990397-1	MB							
Acenaphthene			<0.000020		mg/L		0.00002	05-NOV-14
Acenaphthylene			<0.000020		mg/L		0.00002	05-NOV-14
Anthracene			<0.000010		mg/L		0.00001	05-NOV-14
Fluoranthene			<0.000020		mg/L		0.00002	05-NOV-14
Fluorene			<0.000020		mg/L		0.00002	05-NOV-14
Naphthalene			<0.000050		mg/L		0.00005	05-NOV-14
Phenanthrene			<0.000050		mg/L		0.00005	05-NOV-14
Pyrene			<0.000010		mg/L		0.00001	05-NOV-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	05-NOV-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	05-NOV-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	05-NOV-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	05-NOV-14
Benzo(a)pyrene			<0.000050		mg/L		0.000005	05-NOV-14
Chrysene			<0.000020		mg/L		0.00002	05-NOV-14
Dibenzo(a,h)anthracene			<0.000050		mg/L		0.000005	05-NOV-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	05-NOV-14
Surrogate: d10-Acenaphthene			94.4		%		60-130	05-NOV-14
Surrogate: d10-Phenanthrene			90.2		%		60-130	05-NOV-14
Surrogate: d12-Chrysene			88.7		%		60-130	05-NOV-14
WG1990397-2	MB							
Acenaphthene			<0.000020		mg/L		0.00002	05-NOV-14
Acenaphthylene			<0.000020		mg/L		0.00002	05-NOV-14
Anthracene			<0.000010		mg/L		0.00001	05-NOV-14
Fluoranthene			<0.000020		mg/L		0.00002	05-NOV-14
Fluorene			<0.000020		mg/L		0.00002	05-NOV-14
Naphthalene			<0.000050		mg/L		0.00005	05-NOV-14
Phenanthrene			<0.000050		mg/L		0.00005	05-NOV-14
Pyrene			<0.000010		mg/L		0.00001	05-NOV-14



Quality Control Report

Workorder: L1541122

Report Date: 17-NOV-14

Page 16 of 23

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch	R3056308							
WG1990397-2 MB								
Benzo(a)anthracene			<0.000010		mg/L		0.00001	05-NOV-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	05-NOV-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	05-NOV-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	05-NOV-14
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	05-NOV-14
Chrysene			<0.000020		mg/L		0.00002	05-NOV-14
Dibenzo(a,h)anthracene			<0.0000050		mg/L		0.000005	05-NOV-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	05-NOV-14
Surrogate: d10-Acenaphthene			102.9		%		60-130	05-NOV-14
Surrogate: d10-Phenanthrene			97.1		%		60-130	05-NOV-14
Surrogate: d12-Chrysene			87.7		%		60-130	05-NOV-14
WG1990397-4 MB								
Acenaphthene			<0.000020		mg/L		0.00002	06-NOV-14
Acenaphthylene			<0.000020		mg/L		0.00002	06-NOV-14
Anthracene			<0.000010		mg/L		0.00001	06-NOV-14
Fluoranthene			<0.000020		mg/L		0.00002	06-NOV-14
Fluorene			<0.000020		mg/L		0.00002	06-NOV-14
Naphthalene			<0.000050		mg/L		0.00005	06-NOV-14
Phenanthrene			<0.000050		mg/L		0.00005	06-NOV-14
Pyrene			<0.000010		mg/L		0.00001	06-NOV-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	06-NOV-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	06-NOV-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	06-NOV-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	06-NOV-14
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	06-NOV-14
Chrysene			<0.000020		mg/L		0.00002	06-NOV-14
Dibenzo(a,h)anthracene			<0.0000050		mg/L		0.000005	06-NOV-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	06-NOV-14
Surrogate: d10-Acenaphthene			99.8		%		60-130	06-NOV-14
Surrogate: d10-Phenanthrene			94.9		%		60-130	06-NOV-14
Surrogate: d12-Chrysene			86.6		%		60-130	06-NOV-14



Quality Control Report

Workorder: L1541122

Report Date: 17-NOV-14

Page 17 of 23

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch	R3059631							
WG1991474-2	LCS							
Acenaphthene			96.9		%		60-130	07-NOV-14
Acenaphthylene			101.4		%		60-130	07-NOV-14
Anthracene			99.2		%		60-130	07-NOV-14
Fluoranthene			100.7		%		60-130	07-NOV-14
Fluorene			99.6		%		60-130	07-NOV-14
Naphthalene			94.4		%		50-130	07-NOV-14
Phenanthrene			96.6		%		60-130	07-NOV-14
Pyrene			101.3		%		60-130	07-NOV-14
Benzo(a)anthracene			103.8		%		60-130	07-NOV-14
Benzo(k)fluoranthene			99.0		%		60-130	07-NOV-14
Benzo(b&j)fluoranthene			103.6		%		60-130	07-NOV-14
Benzo(g,h,i)perylene			96.0		%		60-130	07-NOV-14
Benzo(a)pyrene			105.5		%		60-130	07-NOV-14
Chrysene			95.8		%		60-130	07-NOV-14
Dibenzo(a,h)anthracene			99.6		%		60-130	07-NOV-14
Indeno(1,2,3-cd)pyrene			90.6		%		60-130	07-NOV-14
WG1991474-1	MB							
Acenaphthene			<0.000020		mg/L		0.00002	07-NOV-14
Acenaphthylene			<0.000020		mg/L		0.00002	07-NOV-14
Anthracene			<0.000010		mg/L		0.00001	07-NOV-14
Fluoranthene			<0.000020		mg/L		0.00002	07-NOV-14
Fluorene			<0.000020		mg/L		0.00002	07-NOV-14
Naphthalene			<0.000050		mg/L		0.00005	07-NOV-14
Phenanthrene			<0.000050		mg/L		0.00005	07-NOV-14
Pyrene			<0.000010		mg/L		0.00001	07-NOV-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	07-NOV-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	07-NOV-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	07-NOV-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	07-NOV-14
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	07-NOV-14
Chrysene			<0.000020		mg/L		0.00002	07-NOV-14
Dibenzo(a,h)anthracene			<0.0000050		mg/L		0.000005	07-NOV-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	07-NOV-14
Surrogate: d10-Acenaphthene			93.4		%		60-130	07-NOV-14



Quality Control Report

Workorder: L1541122

Report Date: 17-NOV-14

Page 18 of 23

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch R3059631								
WG1991474-1 MB								
Surrogate: d10-Phenanthrene			94.9		%		60-130	07-NOV-14
Surrogate: d12-Chrysene			92.9		%		60-130	07-NOV-14
PH/EC/ALK-ED		Water						
Batch R3060009								
WG1991307-9 DUP		L1540624-4						
pH		8.67	8.64	J	pH	0.03	0.3	08-NOV-14
Conductivity (EC)		714	707		uS/cm	1.1	10	08-NOV-14
Bicarbonate (HCO3)		337	339		mg/L	0.6	25	08-NOV-14
Carbonate (CO3)		17.9	16.5		mg/L	8.0	25	08-NOV-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	08-NOV-14
Alkalinity, Total (as CaCO3)		306	306		mg/L	0.2	20	08-NOV-14
WG1991307-12 LCS								
pH			6.04		pH		5.9-6.1	07-NOV-14
WG1991307-13 LCS								
Alkalinity, Total (as CaCO3)			104.6		%		85-115	07-NOV-14
WG1991307-14 LCS								
Conductivity (EC)			96.7		%		90-110	07-NOV-14
WG1991307-16 LCS								
Conductivity (EC)			100.3		%		90-110	07-NOV-14
WG1991307-17 LCS								
pH			6.06		pH		5.9-6.1	07-NOV-14
WG1991307-18 LCS								
Alkalinity, Total (as CaCO3)			101.5		%		85-115	07-NOV-14
WG1991307-19 LCS								
Conductivity (EC)			96.5		%		90-110	07-NOV-14
WG1991307-2 LCS								
Conductivity (EC)			100.8		%		90-110	07-NOV-14
WG1991307-21 LCS								
Conductivity (EC)			99.8		%		90-110	07-NOV-14
WG1991307-22 LCS								
pH			6.09		pH		5.9-6.1	07-NOV-14
WG1991307-23 LCS								
Alkalinity, Total (as CaCO3)			103.0		%		85-115	07-NOV-14
WG1991307-24 LCS								
Conductivity (EC)			95.4		%		90-110	07-NOV-14
WG1991307-26 LCS								



Quality Control Report

Workorder: L1541122

Report Date: 17-NOV-14

Page 19 of 23

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R3060009							
WG1991307-26	LCS							
Conductivity (EC)			99.0		%		90-110	08-NOV-14
WG1991307-27	LCS							
pH			6.07		pH		5.9-6.1	08-NOV-14
WG1991307-28	LCS							
Alkalinity, Total (as CaCO3)			101.1		%		85-115	08-NOV-14
WG1991307-29	LCS							
Conductivity (EC)			95.3		%		90-110	08-NOV-14
WG1991307-3	LCS							
pH			6.03		pH		5.9-6.1	07-NOV-14
WG1991307-5	LCS							
Conductivity (EC)			97.7		%		90-110	07-NOV-14
WG1991307-10	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	07-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	07-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	07-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	07-NOV-14
WG1991307-15	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	07-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	07-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	07-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	07-NOV-14
WG1991307-20	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	07-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	07-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	07-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	07-NOV-14
WG1991307-25	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	08-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	08-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	08-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	08-NOV-14
PHENOLS-4AAP-ED		Water						
Batch	R3081196							
WG1997134-2	LCS							
Phenols (4AAP)			98.0		%		85-115	17-NOV-14
WG1997134-1	MB							



Quality Control Report

Workorder: L1541122

Report Date: 17-NOV-14

Page 20 of 23

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PHENOLS-4AAP-ED								
Batch	R3081196							
WG1997134-1	MB							
Phenols (4AAP)			<0.0010		mg/L		0.001	17-NOV-14
SO4-IC-ED								
Batch	R3044256							
WG1987044-5	DUP	L1541137-3						
Sulfate (SO4)		24.6	24.4		mg/L	0.8	20	02-NOV-14
WG1987044-9	DUP	L1541285-4						
Sulfate (SO4)		19.4	19.6		mg/L	1.0	20	02-NOV-14
WG1987044-11	LCS		98.4		%		90-110	02-NOV-14
Sulfate (SO4)								
WG1987044-13	LCS		98.7		%		90-110	02-NOV-14
Sulfate (SO4)								
WG1987044-2	LCS		98.8		%		90-110	02-NOV-14
Sulfate (SO4)								
WG1987044-3	LCS		98.7		%		90-110	02-NOV-14
Sulfate (SO4)								
WG1987044-7	LCS		98.5		%		90-110	02-NOV-14
Sulfate (SO4)								
WG1987044-1	MB		<0.50		mg/L		0.5	02-NOV-14
Sulfate (SO4)								
WG1987044-12	MB		<0.50		mg/L		0.5	02-NOV-14
Sulfate (SO4)								
WG1987044-14	MB		<0.50		mg/L		0.5	02-NOV-14
Sulfate (SO4)								
WG1987044-4	MB		<0.50		mg/L		0.5	02-NOV-14
Sulfate (SO4)								
WG1987044-8	MB		<0.50		mg/L		0.5	02-NOV-14
Sulfate (SO4)								
WG1987044-10	MS	L1541285-4	97.1		%		75-125	02-NOV-14
Sulfate (SO4)								
WG1987044-6	MS	L1541137-3	94.9		%		75-125	02-NOV-14
Sulfate (SO4)								
SOLIDS-TDS-ED								
Batch	R3047694							
WG1987584-3	DUP	L1541284-1						
Total Dissolved Solids		552	569		mg/L	3.0	20	03-NOV-14
WG1987584-2	LCS							



Quality Control Report

Workorder: L1541122

Report Date: 17-NOV-14

Page 21 of 23

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-ED		Water						
Batch	R3047694							
WG1987584-2	LCS							
Total Dissolved Solids			100.0		%		85-115	03-NOV-14
WG1987584-1	MB							
Total Dissolved Solids			<10		mg/L		10	03-NOV-14
TURBIDITY-ED		Water						
Batch	R3041974							
WG1986956-3	DUP	L1541122-1						
Turbidity		150	167		NTU	11	15	01-NOV-14
WG1986956-2	LCS							
Turbidity			99.3		%		70-130	01-NOV-14
WG1986956-1	MB							
Turbidity			<0.10		NTU		0.1	01-NOV-14

Quality Control Report

Workorder: L1541122

Report Date: 17-NOV-14

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Page 22 of 23

Contact: Sue Raynard

Legend:

Limit ALS Control Limit (Data Quality Objectives)
DUP Duplicate
RPD Relative Percent Difference
N/A Not Available
LCS Laboratory Control Sample
SRM Standard Reference Material
MS Matrix Spike
MSD Matrix Spike Duplicate
ADE Average Desorption Efficiency
MB Method Blank
IRM Internal Reference Material
CRM Certified Reference Material
CCV Continuing Calibration Verification
CVS Calibration Verification Standard
LCSD Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L1541122

Report Date: 17-NOV-14

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Page 23 of 23

Contact: Sue Raynard

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Anions and Nutrients							
Nitrate as N by IC							
	1	30-OCT-14 13:00	02-NOV-14 08:00	48	67	hours	EHTL
	2	30-OCT-14 13:05	02-NOV-14 08:00	48	67	hours	EHTL
	3	30-OCT-14 13:10	02-NOV-14 08:00	48	67	hours	EHTL
	4	30-OCT-14 12:44	02-NOV-14 08:00	48	67	hours	EHTL
	5	30-OCT-14 15:47	02-NOV-14 08:00	48	64	hours	EHT
	6	30-OCT-14 16:30	02-NOV-14 08:00	48	64	hours	EHT
	7	30-OCT-14 16:43	02-NOV-14 08:00	48	63	hours	EHT
Nitrite as N by IC							
	1	30-OCT-14 13:00	02-NOV-14 08:00	48	67	hours	EHTL
	2	30-OCT-14 13:05	02-NOV-14 08:00	48	67	hours	EHTL
	3	30-OCT-14 13:10	02-NOV-14 08:00	48	67	hours	EHTL
	4	30-OCT-14 12:44	02-NOV-14 08:00	48	67	hours	EHTL
	5	30-OCT-14 15:47	02-NOV-14 08:00	48	64	hours	EHT
	6	30-OCT-14 16:30	02-NOV-14 08:00	48	64	hours	EHT
	7	30-OCT-14 16:43	02-NOV-14 08:00	48	63	hours	EHT

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1541122 were received on 31-OCT-14 15:50.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



Matrix Solutions Inc.
ATTN: Sue Raynard
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Date Received: 05-NOV-14
Report Date: 19-NOV-14 16:06 (MT)
Version: FINAL

Client Phone: 403-513-2275

Certificate of Analysis

Lab Work Order #: L1542752
Project P.O. #: NOT SUBMITTED
Job Reference: 16053-502 NAOS GWM
C of C Numbers: M050669, M050681
Legal Site Desc: SITES 10, 12, 9, 11, 8

Nicole Thibault
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 9936-67 Avenue, Edmonton, AB T6E 0P5 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-1 16053141101020									
Sampled By: JL/DP on 01-NOV-14 @ 11:52									
Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Toluene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
EthylBenzene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
o-Xylene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
m+p-Xylene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Styrene	<0.0010	-		0.0010	mg/L	-	07-NOV-14	07-NOV-14	R3060948
F1(C6-C10)	<0.10	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948
F1-BTEX	<0.10	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Xylenes	<0.00071	-		0.00071	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Surr: 1,4-Difluorobenzene (SS)	99.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr: 4-Bromofluorobenzene (SS)	85.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr: 3,4-Dichlorotoluene (SS)	101.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
F2, F3, F4									
F2 (>C10-C16)	0.50	+/-0.13		0.25	mg/L	0	12-NOV-14	12-NOV-14	R3069629
F3 (C16-C34)	3.34	+/-0.79		0.25	mg/L	0	12-NOV-14	12-NOV-14	R3069629
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	12-NOV-14	12-NOV-14	R3069629
Surr: 2-Bromobenzotrifluoride	94.7	-		N/A	%	-	12-NOV-14	12-NOV-14	R3069629
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		15-NOV-14	R3079330
				0					
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.130	+/-0.021	DLM	0.030	mg/L	0		16-NOV-14	R3079217
Antimony (Sb)-Total	<0.0010	-	DLM	0.0010	mg/L	-		16-NOV-14	R3079217
Arsenic (As)-Total	0.0028	+/-0.0003	DLM	0.0010	mg/L	0		16-NOV-14	R3079217
Barium (Ba)-Total	0.342	+/-0.038	DLM	0.0050	mg/L	0		16-NOV-14	R3079217
Boron (B)-Total	3.29	+/-0.52	DLM	0.10	mg/L	0		16-NOV-14	R3079217
Cadmium (Cd)-Total	<0.00020	-	DLM	0.00020	mg/L	-		16-NOV-14	R3079217
Calcium (Ca)-Total	52.5	+/-6.2	DLM	0.50	mg/L	0		16-NOV-14	R3079217
Chromium (Cr)-Total	0.0085	+/-0.0012	DLM	0.0050	mg/L	0		16-NOV-14	R3079217
Copper (Cu)-Total	0.0129	+/-0.0015	DLM	0.0010	mg/L	0		16-NOV-14	R3079217
Iron (Fe)-Total	55.6	+/-8.8	DLM	0.10	mg/L	0		16-NOV-14	R3079217
Lead (Pb)-Total	0.0358	+/-0.0057	DLM	0.00050	mg/L	0		16-NOV-14	R3079217
Magnesium (Mg)-Total	72.3	+/-8.8	DLM	0.10	mg/L	0		16-NOV-14	R3079217
Manganese (Mn)-Total	0.151	+/-0.015	DLM	0.0020	mg/L	0		16-NOV-14	R3079217
Nickel (Ni)-Total	0.0968	+/-0.011	DLM	0.0020	mg/L	0		16-NOV-14	R3079217
Potassium (K)-Total	54.4	+/-6.7	DLM	0.50	mg/L	0		16-NOV-14	R3079217
Selenium (Se)-Total	<0.0010	-	DLM	0.0010	mg/L	-		16-NOV-14	R3079217
Silicon (Si)-Total	6.83	+/-1.4	DLM	0.50	mg/L	0		16-NOV-14	R3079217
Silver (Ag)-Total	<0.00040	-	DLM	0.00040	mg/L	-		16-NOV-14	R3079217
Sodium (Na)-Total	1190	+/-150	DLM	1.0	mg/L	0		16-NOV-14	R3079217
Uranium (U)-Total	<0.00010	-	DLM	0.00010	mg/L	-		16-NOV-14	R3079217
Zinc (Zn)-Total	0.122	+/-0.019	DLM	0.030	mg/L	0		16-NOV-14	R3079217
Miscellaneous Parameters									
Ammonia, Total (as N)	3.94	-		0.050	mg/L	-		12-NOV-14	R3068709
Dissolved Organic Carbon	21.0	+/-2.3		1.0	mg/L	0		10-NOV-14	R3068336
Naphthenic Acids	17.4	+/-3.0		1.0	mg/L	0	12-NOV-14	12-NOV-14	R3070828
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		19-NOV-14	R3090671
Total Dissolved Solids	1730	+/-120		10	mg/L	0		17-NOV-14	R3085549
Silicon (as SiO2)-Total	14.6	-		1.1	mg/L	-		17-NOV-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-1 16053141101020									
Sampled By: JL/DP on 01-NOV-14 @ 11:52									
Matrix: H2O									
Turbidity	203	+/-11		0.10	NTU	0		06-NOV-14	R3062648
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Anthracene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Fluoranthene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Fluorene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Naphthalene	<0.000050	-		0.000050	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Phenanthrene	<0.000050	-		0.000050	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Pyrene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(b&j)fluoranthene	0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(a)pyrene	<0.0000050	-		0.000005	mg/L	-	06-NOV-14	07-NOV-14	R3059631
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	06-NOV-14	07-NOV-14	R3059631
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Surr: d10-Acenaphthene	99.7	-		N/A	%	-	06-NOV-14	07-NOV-14	R3059631
Surr: d10-Phenanthrene	91.8	-		N/A	%	-	06-NOV-14	07-NOV-14	R3059631
Surr: d12-Chrysene	82.4	-		N/A	%	-	06-NOV-14	07-NOV-14	R3059631
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	302	+/-17		0.50	mg/L	0		06-NOV-14	R3059450
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		16-NOV-14	R3080811
Antimony (Sb)-Dissolved	<0.00050	-	DLM	0.00050	mg/L	-		16-NOV-14	R3080811
Arsenic (As)-Dissolved	<0.00050	-	DLM	0.00050	mg/L	-		16-NOV-14	R3080811
Barium (Ba)-Dissolved	0.112	+/-0.0097	DLM	0.0050	mg/L	0		16-NOV-14	R3080811
Boron (B)-Dissolved	1.56	+/-0.19	DLM	0.050	mg/L	0		16-NOV-14	R3080811
Cadmium (Cd)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		16-NOV-14	R3080811
Calcium (Ca)-Dissolved	23.8	+/-3.2	DLM	0.50	mg/L	0		16-NOV-14	R3080811
Chromium (Cr)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		16-NOV-14	R3080811
Copper (Cu)-Dissolved	<0.0010	-	DLM	0.0010	mg/L	-		16-NOV-14	R3080811
Iron (Fe)-Dissolved	3.60	+/-0.32	DLM	0.050	mg/L	0		16-NOV-14	R3080811
Lead (Pb)-Dissolved	0.00038	+/-0.00004	DLM	0.00025	mg/L	0		16-NOV-14	R3080811
Magnesium (Mg)-Dissolved	32.3	+/-2.5	DLM	0.10	mg/L	0		16-NOV-14	R3080811
Manganese (Mn)-Dissolved	0.0511	+/-0.0035	DLM	0.0020	mg/L	0		16-NOV-14	R3080811
Nickel (Ni)-Dissolved	0.0071	+/-0.0006	DLM	0.0020	mg/L	0		16-NOV-14	R3080811
Potassium (K)-Dissolved	23.4	+/-1.8	DLM	0.25	mg/L	0		16-NOV-14	R3080811
Selenium (Se)-Dissolved	<0.00050	-	DLM	0.00050	mg/L	-		16-NOV-14	R3080811
Silicon (Si)-Dissolved	2.89	+/-0.25	DLM	0.25	mg/L	0		16-NOV-14	R3080811
Silver (Ag)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		16-NOV-14	R3080811
Sodium (Na)-Dissolved	564	+/-40	DLM	1.0	mg/L	0		16-NOV-14	R3080811
Uranium (U)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		16-NOV-14	R3080811
Zinc (Zn)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		16-NOV-14	R3080811
Ion Balance Calculation									
Ion Balance	91.3	-			%	-		17-NOV-14	
TDS (Calculated)	1650	-			mg/L	-		17-NOV-14	
Hardness (as CaCO3)	192	-			mg/L	-		17-NOV-14	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-1 16053141101020 Sampled By: JL/DP on 01-NOV-14 @ 11:52 Matrix: H2O									
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		15-NOV-14	R3079330
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		06-NOV-14	R3059450
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		13-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		06-NOV-14	R3059450
Sulfate by IC									
Sulfate (SO4)	<0.50	-		0.50	mg/L	-		06-NOV-14	R3059450
pH, Conductivity and Total Alkalinity									
pH	8.84	+/-0.01		0.10	pH	0		15-NOV-14	R3078994
Conductivity (EC)	2850	+/-140		0.20	uS/cm	0		15-NOV-14	R3078994
Bicarbonate (HCO3)	1230	+/-46		5.0	mg/L	0		15-NOV-14	R3078994
Carbonate (CO3)	101	+/-13		5.0	mg/L	0		15-NOV-14	R3078994
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		15-NOV-14	R3078994
Alkalinity, Total (as CaCO3)	1180	+/-73		2.0	mg/L	0		15-NOV-14	R3078994
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	6.18	-		0.53	mg/L	-		17-NOV-14	
L1542752-2 16053141101021 Sampled By: JL/DP on 01-NOV-14 @ 12:29 Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Toluene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
EthylBenzene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
o-Xylene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
m+p-Xylene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Styrene	<0.0010	-		0.0010	mg/L	-	07-NOV-14	07-NOV-14	R3060948
F1(C6-C10)	<0.10	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948
F1-BTEX	<0.10	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Xylenes	<0.00071	-		0.00071	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Surr: 1,4-Difluorobenzene (SS)	101.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr: 4-Bromofluorobenzene (SS)	87.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr: 3,4-Dichlorotoluene (SS)	123.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
F2, F3, F4									
F2 (>C10-C16)	1.60	+/-0.40		0.25	mg/L	0	12-NOV-14	12-NOV-14	R3069629
F3 (C16-C34)	8.42	+/-2.0		0.25	mg/L	0	12-NOV-14	12-NOV-14	R3069629
F4 (C34-C50)	0.43	+/-0.14		0.25	mg/L	0	12-NOV-14	12-NOV-14	R3069629
Surr: 2-Bromobenzotrifluoride	82.8	-		N/A	%	-	12-NOV-14	12-NOV-14	R3069629
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		15-NOV-14	R3079330
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.325	+/-0.052		0.0030	mg/L	0		16-NOV-14	R3079879
Antimony (Sb)-Total	0.00079	+/-0.00012		0.00040	mg/L	0		16-NOV-14	R3079879
Arsenic (As)-Total	0.00138	+/-0.00017		0.00040	mg/L	0		16-NOV-14	R3079879
Barium (Ba)-Total	0.294	+/-0.033		0.0050	mg/L	0		16-NOV-14	R3079879
Boron (B)-Total	1.58	+/-0.25		0.050	mg/L	0		16-NOV-14	R3079879

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-2 16053141101021									
Sampled By: JL/DP on 01-NOV-14 @ 12:29									
Matrix: H2O									
Total Metals in Water by CRC ICPMS									
Cadmium (Cd)-Total	<0.00020	-		0.00020	mg/L	-		16-NOV-14	R3079879
Calcium (Ca)-Total	90.1	+/-11		0.50	mg/L	0		16-NOV-14	R3079879
Chromium (Cr)-Total	<0.0050	-		0.0050	mg/L	-		16-NOV-14	R3079879
Copper (Cu)-Total	0.0692	+/-0.0081		0.0010	mg/L	0		16-NOV-14	R3079879
Iron (Fe)-Total	17.9	+/-2.8		0.010	mg/L	0		16-NOV-14	R3079879
Lead (Pb)-Total	0.00292	+/-0.00046		0.00010	mg/L	0		16-NOV-14	R3079879
Magnesium (Mg)-Total	14.4	+/-1.8		0.10	mg/L	0		16-NOV-14	R3079879
Manganese (Mn)-Total	0.159	+/-0.016		0.0020	mg/L	0		16-NOV-14	R3079879
Nickel (Ni)-Total	0.0201	+/-0.0022		0.0020	mg/L	0		16-NOV-14	R3079879
Potassium (K)-Total	20.5	+/-2.5		0.10	mg/L	0		16-NOV-14	R3079879
Selenium (Se)-Total	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3079879
Silicon (Si)-Total	2.25	+/-0.45		0.050	mg/L	0		16-NOV-14	R3079879
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3079879
Uranium (U)-Total	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3079879
Zinc (Zn)-Total	0.214	+/-0.033		0.0040	mg/L	0		16-NOV-14	R3079879
Miscellaneous Parameters									
Ammonia, Total (as N)	3.93	-		0.050	mg/L	-		12-NOV-14	R3068709
Dissolved Organic Carbon	26.0	+/-2.8		1.0	mg/L	0		10-NOV-14	R3068336
Naphthenic Acids	26.0	+/-4.5		1.0	mg/L	0	12-NOV-14	12-NOV-14	R3070828
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		19-NOV-14	R3090671
Total Dissolved Solids	879	+/-59		10	mg/L	0		07-NOV-14	R3062291
Silicon (as SiO2)-Total	4.82	-		0.11	mg/L	-		17-NOV-14	
Turbidity	35.6	+/-2.0		0.10	NTU	0		06-NOV-14	R3062648
PAH & Carcinogenic PAH List									
Acenaphthene	0.000229	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Acenaphthylene	<0.000030	-	DLM	0.000030	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Anthracene	<0.000020	-	DLM	0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Fluoranthene	<0.000050	-	DLM	0.000050	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Fluorene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Naphthalene	0.000307	-		0.000050	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Phenanthrene	0.000850	-		0.000050	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Pyrene	0.000109	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(a)anthracene	0.000032	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(b&j)fluoranthene	<0.000060	-	DLM	0.000060	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(g,h,i)perylene	0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(a)pyrene	<0.000018	-	DLM	0.000018	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Chrysene	0.000102	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Dibenzo(a,h)anthracene	<0.000011	-	DLM	0.000011	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
B(A)P Total Potency Equivalent	0.000023	-		0.000019	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Surr: d10-Acenaphthene	105.5	-		N/A	%	-	06-NOV-14	07-NOV-14	R3059631
Surr: d10-Phenanthrene	92.7	-		N/A	%	-	06-NOV-14	07-NOV-14	R3059631
Surr: d12-Chrysene	76.3	-		N/A	%	-	06-NOV-14	07-NOV-14	R3059631
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	44.9	+/-2.5		0.50	mg/L	0		06-NOV-14	R3059450
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-		16-NOV-14	R3080811
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3080811
Arsenic (As)-Dissolved	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3080811

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-2 16053141101021									
Sampled By: JL/DP on 01-NOV-14 @ 12:29									
Matrix: H2O									
Dissolved Metals in Water by CRC ICPMS									
Barium (Ba)-Dissolved	<0.0050	-		0.0050	mg/L	-		16-NOV-14	R3080811
Boron (B)-Dissolved	1.71	+/-0.21		0.050	mg/L	0		16-NOV-14	R3080811
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811
Calcium (Ca)-Dissolved	2.19	+/-0.30		0.50	mg/L	0		16-NOV-14	R3080811
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		16-NOV-14	R3080811
Copper (Cu)-Dissolved	0.0015	+/-0.0001		0.0010	mg/L	0		16-NOV-14	R3080811
Iron (Fe)-Dissolved	0.033	+/-0.003		0.010	mg/L	0		16-NOV-14	R3080811
Lead (Pb)-Dissolved	0.00051	+/-0.00005		0.00010	mg/L	0		16-NOV-14	R3080811
Magnesium (Mg)-Dissolved	12.6	+/-0.98		0.10	mg/L	0		16-NOV-14	R3080811
Manganese (Mn)-Dissolved	0.0022	+/-0.0002		0.0020	mg/L	0		16-NOV-14	R3080811
Nickel (Ni)-Dissolved	0.0021	+/-0.0002		0.0020	mg/L	0		16-NOV-14	R3080811
Potassium (K)-Dissolved	22.4	+/-1.7		0.10	mg/L	0		16-NOV-14	R3080811
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3080811
Silicon (Si)-Dissolved	1.49	+/-0.13		0.050	mg/L	0		16-NOV-14	R3080811
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811
Sodium (Na)-Dissolved	311	+/-22		1.0	mg/L	0		16-NOV-14	R3080811
Uranium (U)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811
Zinc (Zn)-Dissolved	<0.0030	-		0.0030	mg/L	-		16-NOV-14	R3080811
Ion Balance Calculation									
Ion Balance	94.3	-			%	-		17-NOV-14	
TDS (Calculated)	849	-			mg/L	-		17-NOV-14	
Hardness (as CaCO3)	57.4	-			mg/L	-		17-NOV-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		15-NOV-14	R3079330
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		06-NOV-14	R3059450
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		13-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		06-NOV-14	R3059450
Sulfate by IC									
Sulfate (SO4)	<0.50	-		0.50	mg/L	-		06-NOV-14	R3059450
pH, Conductivity and Total Alkalinity									
pH	8.80	+/-0.01		0.10	pH	0		15-NOV-14	R3078994
Conductivity (EC)	1420	+/-71		0.20	uS/cm	0		15-NOV-14	R3078994
Bicarbonate (HCO3)	829	+/-31		5.0	mg/L	0		15-NOV-14	R3078994
Carbonate (CO3)	48.4	+/-7.1		5.0	mg/L	0		15-NOV-14	R3078994
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		15-NOV-14	R3078994
Alkalinity, Total (as CaCO3)	760	+/-48		2.0	mg/L	0		15-NOV-14	R3078994
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	3.19	-		0.11	mg/L	-		17-NOV-14	
L1542752-3 16053141101022									
Sampled By: JL/DP on 01-NOV-14 @ 12:40									
Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Toluene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
EthylBenzene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
o-Xylene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-3 16053141101022									
Sampled By: JL/DP on 01-NOV-14 @ 12:40									
Matrix: H2O									
BTEX, Styrene and F1 (C6-C10)									
m+p-Xylene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Styrene	<0.0010	-		0.0010	mg/L	-	07-NOV-14	07-NOV-14	R3060948
F1(C6-C10)	<0.10	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948
F1-BTEX	<0.10	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Xylenes	<0.00071	-		0.00071	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Surr: 1,4-Difluorobenzene (SS)	100.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr: 4-Bromofluorobenzene (SS)	88.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr: 3,4-Dichlorotoluene (SS)	104.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
F2, F3, F4									
F2 (>C10-C16)	0.34	+/-0.10		0.25	mg/L	0	12-NOV-14	12-NOV-14	R3069629
F3 (C16-C34)	4.05	+/-0.95		0.25	mg/L	0	12-NOV-14	12-NOV-14	R3069629
F4 (C34-C50)	2.82	+/-0.65		0.25	mg/L	0	12-NOV-14	12-NOV-14	R3069629
Surr: 2-Bromobenzotrifluoride	101.2	-		N/A	%	-	12-NOV-14	12-NOV-14	R3069629
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	0.0000155	+/-0.0000048		0.0000050	mg/L	0		15-NOV-14	R3079330
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	14.4	+/-2.3		0.0030	mg/L	0		16-NOV-14	R3079879
Antimony (Sb)-Total	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3079879
Arsenic (As)-Total	0.00627	+/-0.00073		0.00040	mg/L	0		16-NOV-14	R3079879
Barium (Ba)-Total	0.347	+/-0.039		0.0050	mg/L	0		16-NOV-14	R3079879
Boron (B)-Total	0.104	+/-0.017		0.050	mg/L	0		16-NOV-14	R3079879
Cadmium (Cd)-Total	<0.00020	-		0.00020	mg/L	-		16-NOV-14	R3079879
Calcium (Ca)-Total	107	+/-13		0.50	mg/L	0		16-NOV-14	R3079879
Chromium (Cr)-Total	0.0285	+/-0.0041		0.0050	mg/L	0		16-NOV-14	R3079879
Copper (Cu)-Total	0.0496	+/-0.0058		0.0010	mg/L	0		16-NOV-14	R3079879
Iron (Fe)-Total	63.1	+/-10		0.010	mg/L	0		16-NOV-14	R3079879
Lead (Pb)-Total	0.0184	+/-0.0029		0.00010	mg/L	0		16-NOV-14	R3079879
Magnesium (Mg)-Total	29.4	+/-3.6		0.10	mg/L	0		16-NOV-14	R3079879
Manganese (Mn)-Total	0.936	+/-0.094		0.0020	mg/L	0		16-NOV-14	R3079879
Nickel (Ni)-Total	0.0708	+/-0.0077		0.0020	mg/L	0		16-NOV-14	R3079879
Potassium (K)-Total	4.86	+/-0.60		0.10	mg/L	0		16-NOV-14	R3079879
Selenium (Se)-Total	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3079879
Silicon (Si)-Total	35.4	+/-7.0		0.050	mg/L	0		16-NOV-14	R3079879
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3079879
Sodium (Na)-Total	8.4	+/-1.0		1.0	mg/L	0		16-NOV-14	R3079879
Uranium (U)-Total	0.00134	+/-0.00019		0.00010	mg/L	0		16-NOV-14	R3079879
Zinc (Zn)-Total	0.0713	+/-0.012		0.0040	mg/L	0		16-NOV-14	R3079879
Miscellaneous Parameters									
Ammonia, Total (as N)	0.243	-		0.050	mg/L	-		12-NOV-14	R3068709
Dissolved Organic Carbon	5.4	+/-0.8		1.0	mg/L	0		10-NOV-14	R3068336
Naphthenic Acids	1.3	+/-0.4		1.0	mg/L	0	12-NOV-14	12-NOV-14	R3070828
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		19-NOV-14	R3090671
Total Dissolved Solids	306	+/-21	DLA	10	mg/L	0		07-NOV-14	R3062291
Silicon (as SiO2)-Total	75.7	-		0.11	mg/L	-		17-NOV-14	
Turbidity	>4000	-		0.10	NTU	-		06-NOV-14	R3062648
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Anthracene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-3 16053141101022									
Sampled By: JL/DP on 01-NOV-14 @ 12:40									
Matrix: H2O									
PAH & Carcinogenic PAH List									
Fluoranthene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Fluorene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Naphthalene	<0.000050	-		0.000050	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Phenanthrene	<0.000050	-		0.000050	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Pyrene	0.000075	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(a)anthracene	0.000016	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(b&j)fluoranthene	<0.000040	-	DLM	0.000040	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(g,h,i)perylene	0.000021	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(a)pyrene	<0.000015	-	DLM	0.000015	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Chrysene	<0.000030	-	DLM	0.000030	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Dibenzo(a,h)anthracene	<0.000070	-	DLM	0.000007	mg/L	-	06-NOV-14	07-NOV-14	R3059631
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
B(A)P Total Potency Equivalent	0.000016	-		0.000015	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Surr: d10-Acenaphthene	88.1	-		N/A	%	-	06-NOV-14	07-NOV-14	R3059631
Surr: d10-Phenanthrene	78.2	-		N/A	%	-	06-NOV-14	07-NOV-14	R3059631
Surr: d12-Chrysene	67.4	-		N/A	%	-	06-NOV-14	07-NOV-14	R3059631
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	4.30	+/-0.27		0.50	mg/L	0		06-NOV-14	R3059450
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-		16-NOV-14	R3080811
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3080811
Arsenic (As)-Dissolved	0.00051	+/-0.00005		0.00040	mg/L	0		16-NOV-14	R3080811
Barium (Ba)-Dissolved	0.135	+/-0.012		0.0050	mg/L	0		16-NOV-14	R3080811
Boron (B)-Dissolved	0.113	+/-0.014		0.050	mg/L	0		16-NOV-14	R3080811
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811
Calcium (Ca)-Dissolved	67.9	+/-9.2		0.50	mg/L	0		16-NOV-14	R3080811
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		16-NOV-14	R3080811
Copper (Cu)-Dissolved	<0.0010	-		0.0010	mg/L	-		16-NOV-14	R3080811
Iron (Fe)-Dissolved	3.13	+/-0.28		0.010	mg/L	0		16-NOV-14	R3080811
Lead (Pb)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811
Magnesium (Mg)-Dissolved	22.9	+/-1.8		0.10	mg/L	0		16-NOV-14	R3080811
Manganese (Mn)-Dissolved	0.297	+/-0.020		0.0020	mg/L	0		16-NOV-14	R3080811
Nickel (Ni)-Dissolved	0.0063	+/-0.0005		0.0020	mg/L	0		16-NOV-14	R3080811
Potassium (K)-Dissolved	2.66	+/-0.20		0.10	mg/L	0		16-NOV-14	R3080811
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3080811
Silicon (Si)-Dissolved	3.85	+/-0.33		0.050	mg/L	0		16-NOV-14	R3080811
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811
Sodium (Na)-Dissolved	9.4	+/-0.7		1.0	mg/L	0		16-NOV-14	R3080811
Uranium (U)-Dissolved	0.00043	+/-0.00004		0.00010	mg/L	0		16-NOV-14	R3080811
Zinc (Zn)-Dissolved	<0.0030	-		0.0030	mg/L	-		16-NOV-14	R3080811
Ion Balance Calculation									
Ion Balance	106	-			%	-		17-NOV-14	
TDS (Calculated)	270	-			mg/L	-		17-NOV-14	
Hardness (as CaCO3)	264	-			mg/L	-		17-NOV-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	0.0000059	-		0.000005	mg/L	-		15-NOV-14	R3079330
				0					
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		06-NOV-14	R3059450

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-3 16053141101022 Sampled By: JL/DP on 01-NOV-14 @ 12:40 Matrix: H2O									
Nitrate+Nitrite Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		13-NOV-14	
Nitrite as N by IC Nitrite (as N)	<0.020	-		0.020	mg/L	-		06-NOV-14	R3059450
Sulfate by IC Sulfate (SO4)	5.16	+/-0.32		0.50	mg/L	0		06-NOV-14	R3059450
pH, Conductivity and Total Alkalinity pH	8.17	+/-0.01		0.10	pH	0		15-NOV-14	R3078994
Conductivity (EC)	463	+/-23		0.20	uS/cm	0		15-NOV-14	R3078994
Bicarbonate (HCO3)	319	+/-13		5.0	mg/L	0		15-NOV-14	R3078994
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		15-NOV-14	R3078994
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		15-NOV-14	R3078994
Alkalinity, Total (as CaCO3)	262	+/-17		2.0	mg/L	0		15-NOV-14	R3078994
Silicon (reported as Silica) Dissolved Silicon (reported as Silica) Silicon (as SiO2)-Dissolved	8.23	-		0.11	mg/L	-		17-NOV-14	
L1542752-4 16053141102023 Sampled By: JL/DP on 02-NOV-14 @ 11:44 Matrix: H2O									
BTXS, Styrene & F1-F4 BTEX, Styrene and F1 (C6-C10) Benzene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Toluene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
EthylBenzene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
o-Xylene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
m+p-Xylene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Styrene	<0.0010	-		0.0010	mg/L	-	07-NOV-14	07-NOV-14	R3060948
F1(C6-C10)	<0.10	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948
F1-BTEX	<0.10	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Xylenes	<0.00071	-		0.00071	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Surr: 1,4-Difluorobenzene (SS)	100.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr: 4-Bromofluorobenzene (SS)	88.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr: 3,4-Dichlorotoluene (SS)	103.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
F2, F3, F4 F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	12-NOV-14	12-NOV-14	R3069629
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	12-NOV-14	12-NOV-14	R3069629
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	12-NOV-14	12-NOV-14	R3069629
Surr: 2-Bromobenzotrifluoride	104.3	-		N/A	%	-	12-NOV-14	12-NOV-14	R3069629
Alberta Tier 1 Metals (Total) Mercury (Hg) Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		15-NOV-14	R3079330
Total Metals in Water by CRC ICPMS Aluminum (Al)-Total	0.0107	+/-0.0027		0.0030	mg/L	0		16-NOV-14	R3079879
Antimony (Sb)-Total	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3079879
Arsenic (As)-Total	0.00064	+/-0.00009		0.00040	mg/L	0		16-NOV-14	R3079879
Barium (Ba)-Total	0.0075	+/-0.0009		0.0050	mg/L	0		16-NOV-14	R3079879
Boron (B)-Total	0.051	+/-0.008		0.050	mg/L	0		16-NOV-14	R3079879
Cadmium (Cd)-Total	<0.00020	-		0.00020	mg/L	-		16-NOV-14	R3079879
Calcium (Ca)-Total	10.7	+/-1.3		0.50	mg/L	0		16-NOV-14	R3079879
Chromium (Cr)-Total	<0.0050	-		0.0050	mg/L	-		16-NOV-14	R3079879
Copper (Cu)-Total	0.0015	+/-0.0002		0.0010	mg/L	0		16-NOV-14	R3079879
Iron (Fe)-Total	4.84	+/-0.77		0.010	mg/L	0		16-NOV-14	R3079879

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-4 16053141102023									
Sampled By: JL/DP on 02-NOV-14 @ 11:44									
Matrix: H2O									
Total Metals in Water by CRC ICPMS									
Lead (Pb)-Total	0.00066	+/-0.00011		0.00010	mg/L	0		16-NOV-14	R3079879
Magnesium (Mg)-Total	0.42	+/-0.05		0.10	mg/L	0		16-NOV-14	R3079879
Manganese (Mn)-Total	0.127	+/-0.013		0.0020	mg/L	0		16-NOV-14	R3079879
Nickel (Ni)-Total	0.0095	+/-0.0010		0.0020	mg/L	0		16-NOV-14	R3079879
Potassium (K)-Total	79.5	+/-9.8		0.10	mg/L	0		16-NOV-14	R3079879
Selenium (Se)-Total	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3079879
Silicon (Si)-Total	0.073	+/-0.015		0.050	mg/L	0		16-NOV-14	R3079879
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3079879
Sodium (Na)-Total	148	+/-18		1.0	mg/L	0		16-NOV-14	R3079879
Uranium (U)-Total	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3079879
Zinc (Zn)-Total	0.335	+/-0.051		0.0040	mg/L	0		16-NOV-14	R3079879
Miscellaneous Parameters									
Ammonia, Total (as N)	3.09	-		0.050	mg/L	-		12-NOV-14	R3068709
Dissolved Organic Carbon	6.1	+/-0.9		1.0	mg/L	0		10-NOV-14	R3068336
Naphthenic Acids	1.1	+/-0.4		1.0	mg/L	0	12-NOV-14	12-NOV-14	R3070828
Phenols (4AAP)	0.0012	+/-0.0008		0.0010	mg/L	-7.4%		19-NOV-14	R3090671
Total Dissolved Solids	582	+/-39		10	mg/L	0		07-NOV-14	R3062291
Silicon (as SiO2)-Total	0.16	-		0.11	mg/L	-		17-NOV-14	
Turbidity	60.6	+/-3.4		0.10	NTU	0		06-NOV-14	R3062648
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Anthracene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Fluoranthene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Fluorene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Naphthalene	<0.000050	-		0.000050	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Phenanthrene	<0.000050	-		0.000050	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Pyrene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(a)pyrene	<0.000050	-		0.000050	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Chrysene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Dibenzo(a,h)anthracene	<0.000050	-		0.000050	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Surr: d10-Acenaphthene	85.5	-		N/A	%	-	06-NOV-14	07-NOV-14	R3059631
Surr: d10-Phenanthrene	83.3	-		N/A	%	-	06-NOV-14	07-NOV-14	R3059631
Surr: d12-Chrysene	80.1	-		N/A	%	-	06-NOV-14	07-NOV-14	R3059631
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	8.27	+/-0.48		0.50	mg/L	0		06-NOV-14	R3059450
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-		16-NOV-14	R3080811
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3080811
Arsenic (As)-Dissolved	0.00046	+/-0.00005		0.00040	mg/L	0		16-NOV-14	R3080811
Barium (Ba)-Dissolved	0.0065	+/-0.0006		0.0050	mg/L	0		16-NOV-14	R3080811
Boron (B)-Dissolved	0.062	+/-0.007		0.050	mg/L	0		16-NOV-14	R3080811
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-4 16053141102023 Sampled By: JL/DP on 02-NOV-14 @ 11:44 Matrix: H2O									
Dissolved Metals in Water by CRC ICPMS									
Calcium (Ca)-Dissolved	10.7	+/-1.5		0.50	mg/L	0		16-NOV-14	R3080811
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		16-NOV-14	R3080811
Copper (Cu)-Dissolved	<0.0010	-		0.0010	mg/L	-		16-NOV-14	R3080811
Iron (Fe)-Dissolved	0.043	+/-0.004		0.010	mg/L	0		16-NOV-14	R3080811
Lead (Pb)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811
Magnesium (Mg)-Dissolved	0.43	+/-0.03		0.10	mg/L	0		16-NOV-14	R3080811
Manganese (Mn)-Dissolved	0.0687	+/-0.0047		0.0020	mg/L	0		16-NOV-14	R3080811
Nickel (Ni)-Dissolved	0.0022	+/-0.0002		0.0020	mg/L	0		16-NOV-14	R3080811
Potassium (K)-Dissolved	84.6	+/-6.6		0.10	mg/L	0		16-NOV-14	R3080811
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3080811
Silicon (Si)-Dissolved	<0.050	-		0.050	mg/L	-		16-NOV-14	R3080811
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811
Sodium (Na)-Dissolved	152	+/-11		1.0	mg/L	0		16-NOV-14	R3080811
Uranium (U)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811
Zinc (Zn)-Dissolved	0.0060	+/-0.0008		0.0030	mg/L	0		16-NOV-14	R3080811
Ion Balance Calculation									
Ion Balance	90.6	-			%	-		17-NOV-14	
TDS (Calculated)	567	-			mg/L	-		17-NOV-14	
Hardness (as CaCO3)	28.5	-			mg/L	-		17-NOV-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.000005 0	mg/L	-		15-NOV-14	R3079330
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		06-NOV-14	R3059450
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		13-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		06-NOV-14	R3059450
Sulfate by IC									
Sulfate (SO4)	2.35	+/-0.17		0.50	mg/L	0		06-NOV-14	R3059450
pH, Conductivity and Total Alkalinity									
pH	8.55	+/-0.01		0.10	pH	0		15-NOV-14	R3078994
Conductivity (EC)	940	+/-47		0.20	uS/cm	0		15-NOV-14	R3078994
Bicarbonate (HCO3)	597	+/-23		5.0	mg/L	0		15-NOV-14	R3078994
Carbonate (CO3)	14.6	+/-3.2		5.0	mg/L	0		15-NOV-14	R3078994
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		15-NOV-14	R3078994
Alkalinity, Total (as CaCO3)	514	+/-32		2.0	mg/L	0		15-NOV-14	R3078994
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	<0.11	-		0.11	mg/L	-		17-NOV-14	
L1542752-5 16053141102024 Sampled By: JL/DP on 02-NOV-14 @ 12:01 Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Toluene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
EthylBenzene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
o-Xylene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
m+p-Xylene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Styrene	<0.0010	-		0.0010	mg/L	-	07-NOV-14	07-NOV-14	R3060948
F1(C6-C10)	<0.10	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-5 16053141102024									
Sampled By: JL/DP on 02-NOV-14 @ 12:01									
Matrix: H2O									
BTEX, Styrene and F1 (C6-C10)									
F1-BTEX	<0.10	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Xylenes	<0.00071	-		0.00071	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Surr: 1,4-Difluorobenzene (SS)	98.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr: 4-Bromofluorobenzene (SS)	86.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr: 3,4-Dichlorotoluene (SS)	99.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	12-NOV-14	12-NOV-14	R3069629
F3 (C16-C34)	0.28	+/-0.12		0.25	mg/L	0	12-NOV-14	12-NOV-14	R3069629
F4 (C34-C50)	0.38	+/-0.13		0.25	mg/L	0	12-NOV-14	12-NOV-14	R3069629
Surr: 2-Bromobenzotrifluoride	101.2	-		N/A	%	-	12-NOV-14	12-NOV-14	R3069629
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		15-NOV-14	R3079330
				0					
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.884	+/-0.14	DLM	0.015	mg/L	0		16-NOV-14	R3079879
Antimony (Sb)-Total	<0.00050	-	DLM	0.00050	mg/L	-		16-NOV-14	R3079879
Arsenic (As)-Total	0.00153	+/-0.00019	DLM	0.00050	mg/L	0		16-NOV-14	R3079879
Barium (Ba)-Total	0.101	+/-0.011	DLM	0.0050	mg/L	0		16-NOV-14	R3079879
Boron (B)-Total	3.47	+/-0.55	DLM	0.050	mg/L	0		16-NOV-14	R3079879
Cadmium (Cd)-Total	<0.00020	-	DLM	0.00020	mg/L	-		16-NOV-14	R3079879
Calcium (Ca)-Total	7.26	+/-0.86	DLM	0.50	mg/L	0		16-NOV-14	R3079879
Chromium (Cr)-Total	0.0097	+/-0.0014	DLM	0.0050	mg/L	0		16-NOV-14	R3079879
Copper (Cu)-Total	0.0229	+/-0.0027	DLM	0.0010	mg/L	0		16-NOV-14	R3079879
Iron (Fe)-Total	6.81	+/-1.1	DLM	0.050	mg/L	0		16-NOV-14	R3079879
Lead (Pb)-Total	0.00230	+/-0.00037	DLM	0.00025	mg/L	0		16-NOV-14	R3079879
Magnesium (Mg)-Total	2.74	+/-0.33	DLM	0.10	mg/L	0		16-NOV-14	R3079879
Manganese (Mn)-Total	0.0484	+/-0.0049	DLM	0.0020	mg/L	0		16-NOV-14	R3079879
Nickel (Ni)-Total	0.0130	+/-0.0014	DLM	0.0020	mg/L	0		16-NOV-14	R3079879
Potassium (K)-Total	2.92	+/-0.36	DLM	0.25	mg/L	0		16-NOV-14	R3079879
Selenium (Se)-Total	<0.00050	-	DLM	0.00050	mg/L	-		16-NOV-14	R3079879
Silicon (Si)-Total	4.84	+/-0.96	DLM	0.25	mg/L	0		16-NOV-14	R3079879
Silver (Ag)-Total	<0.00040	-	DLM	0.00040	mg/L	-		16-NOV-14	R3079879
Sodium (Na)-Total	621	+/-76	DLM	1.0	mg/L	0		16-NOV-14	R3079879
Uranium (U)-Total	0.00011	+/-0.00002	DLM	0.00010	mg/L	0		16-NOV-14	R3079879
Zinc (Zn)-Total	0.029	+/-0.005	DLM	0.015	mg/L	0		16-NOV-14	R3079879
Miscellaneous Parameters									
Ammonia, Total (as N)	1.64	-		0.050	mg/L	-		12-NOV-14	R3068709
Dissolved Organic Carbon	7.2	+/-1.0		1.0	mg/L	0		10-NOV-14	R3068336
Naphthenic Acids	<1.0	-		1.0	mg/L	-	12-NOV-14	12-NOV-14	R3070828
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		19-NOV-14	R3090671
Total Dissolved Solids	1560	+/-100		10	mg/L	0		08-NOV-14	R3062844
Silicon (as SiO2)-Total	10.3	-		0.53	mg/L	-		17-NOV-14	
Turbidity	12.8	+/-0.75		0.10	NTU	0		06-NOV-14	R3062648
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Anthracene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Fluoranthene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Fluorene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Naphthalene	<0.000050	-		0.000050	mg/L	-	06-NOV-14	07-NOV-14	R3059631

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-5 16053141102024 Sampled By: JL/DP on 02-NOV-14 @ 12:01 Matrix: H2O									
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		06-NOV-14	R3059450
Sulfate by IC									
Sulfate (SO4)	<0.50	-	RRV	0.50	mg/L	-		06-NOV-14	R3059450
pH, Conductivity and Total Alkalinity									
pH	8.91	+/-0.01		0.10	pH	0		15-NOV-14	R3078994
Conductivity (EC)	2700	+/-130		0.20	uS/cm	0		15-NOV-14	R3078994
Bicarbonate (HCO3)	1340	+/-50		5.0	mg/L	0		15-NOV-14	R3078994
Carbonate (CO3)	110	+/-15		5.0	mg/L	0		15-NOV-14	R3078994
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		15-NOV-14	R3078994
Alkalinity, Total (as CaCO3)	1280	+/-80		2.0	mg/L	0		15-NOV-14	R3078994
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	5.82	-		0.53	mg/L	-		17-NOV-14	
L1542752-6 16053141102025 Sampled By: JL/DP on 02-NOV-14 @ 12:46 Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Toluene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
EthylBenzene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
o-Xylene	0.00105	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
m+p-Xylene	0.00135	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Styrene	<0.0010	-		0.0010	mg/L	-	07-NOV-14	07-NOV-14	R3060948
F1(C6-C10)	0.12	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948
F1-BTEX	0.11	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Xylenes	0.00240	-		0.00071	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Surr: 1,4-Difluorobenzene (SS)	99.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr: 4-Bromofluorobenzene (SS)	90.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr: 3,4-Dichlorotoluene (SS)	114.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
F2, F3, F4									
F2 (>C10-C16)	3.10	+/-0.76		0.25	mg/L	0	12-NOV-14	12-NOV-14	R3069629
F3 (C16-C34)	0.88	+/-0.23		0.25	mg/L	0	12-NOV-14	12-NOV-14	R3069629
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	12-NOV-14	12-NOV-14	R3069629
Surr: 2-Bromobenzotrifluoride	103.2	-		N/A	%	-	12-NOV-14	12-NOV-14	R3069629
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	0.000104	+/-0.000017		0.000005 0	mg/L	0		16-NOV-14	R3079330
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	3.79	+/-0.60		0.0030	mg/L	0		16-NOV-14	R3079879
Antimony (Sb)-Total	0.00122	+/-0.00016		0.00040	mg/L	0		16-NOV-14	R3079879
Arsenic (As)-Total	0.00448	+/-0.00052		0.00040	mg/L	0		16-NOV-14	R3079879
Barium (Ba)-Total	0.148	+/-0.017		0.0050	mg/L	0		16-NOV-14	R3079879
Boron (B)-Total	0.915	+/-0.15		0.050	mg/L	0		16-NOV-14	R3079879
Cadmium (Cd)-Total	0.00032	+/-0.00006		0.00020	mg/L	0		16-NOV-14	R3079879
Calcium (Ca)-Total	37.6	+/-4.4		0.50	mg/L	0		16-NOV-14	R3079879
Chromium (Cr)-Total	0.0091	+/-0.0013		0.0050	mg/L	0		16-NOV-14	R3079879
Copper (Cu)-Total	0.0356	+/-0.0042		0.0010	mg/L	0		16-NOV-14	R3079879
Iron (Fe)-Total	40.9	+/-6.5		0.010	mg/L	0		16-NOV-14	R3079879
Lead (Pb)-Total	0.0370	+/-0.0059		0.00010	mg/L	0		16-NOV-14	R3079879
Magnesium (Mg)-Total	18.4	+/-2.2		0.10	mg/L	0		16-NOV-14	R3079879

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-6 16053141102025									
Sampled By: JL/DP on 02-NOV-14 @ 12:46									
Matrix: H2O									
Total Metals in Water by CRC ICPMS									
Manganese (Mn)-Total	0.604	+/-0.061		0.0020	mg/L	0		16-NOV-14	R3079879
Nickel (Ni)-Total	0.0633	+/-0.0069		0.0020	mg/L	0		16-NOV-14	R3079879
Potassium (K)-Total	4.42	+/-0.54		0.10	mg/L	0		16-NOV-14	R3079879
Selenium (Se)-Total	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3079879
Silicon (Si)-Total	11.1	+/-2.2		0.050	mg/L	0		16-NOV-14	R3079879
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3079879
Sodium (Na)-Total	150	+/-18		1.0	mg/L	0		16-NOV-14	R3079879
Uranium (U)-Total	0.00039	+/-0.00005		0.00010	mg/L	0		16-NOV-14	R3079879
Zinc (Zn)-Total	0.0728	+/-0.012		0.0040	mg/L	0		16-NOV-14	R3079879
Miscellaneous Parameters									
Ammonia, Total (as N)	0.646	-		0.050	mg/L	-		12-NOV-14	R3068709
Dissolved Organic Carbon	10.9	+/-1.3		1.0	mg/L	0		10-NOV-14	R3068336
Naphthenic Acids	<1.0	-		1.0	mg/L	-	12-NOV-14	12-NOV-14	R3070828
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		19-NOV-14	R3090671
Total Dissolved Solids	484	+/-32		10	mg/L	0		08-NOV-14	R3062844
Silicon (as SiO2)-Total	23.6	-		0.11	mg/L	-		17-NOV-14	
Turbidity	370	+/-20		0.10	NTU	0		06-NOV-14	R3062648
PAH & Carcinogenic PAH List									
Acenaphthene	0.000098	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Acenaphthylene	<0.000040	-	DLM	0.000040	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Anthracene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Fluoranthene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Fluorene	0.000110	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Naphthalene	0.000863	-		0.000050	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Phenanthrene	<0.000070	-	DLM	0.000070	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Pyrene	0.000063	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Benzo(a)pyrene	<0.0000050	-		0.000005	mg/L	-	06-NOV-14	07-NOV-14	R3059631
				0					
Chrysene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	06-NOV-14	07-NOV-14	R3059631
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Surr: d10-Acenaphthene	100.3	-		N/A	%	-	06-NOV-14	07-NOV-14	R3059631
Surr: d10-Phenanthrene	82.0	-		N/A	%	-	06-NOV-14	07-NOV-14	R3059631
Surr: d12-Chrysene	88.2	-		N/A	%	-	06-NOV-14	07-NOV-14	R3059631
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	1.07	+/-0.10		0.50	mg/L	0		06-NOV-14	R3059450
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-		16-NOV-14	R3080811
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3080811
Arsenic (As)-Dissolved	0.00079	+/-0.00008		0.00040	mg/L	0		16-NOV-14	R3080811
Barium (Ba)-Dissolved	0.0545	+/-0.0047		0.0050	mg/L	0		16-NOV-14	R3080811
Boron (B)-Dissolved	0.879	+/-0.11		0.050	mg/L	0		16-NOV-14	R3080811
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811
Calcium (Ca)-Dissolved	24.9	+/-3.4		0.50	mg/L	0		16-NOV-14	R3080811
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		16-NOV-14	R3080811

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-6 16053141102025									
Sampled By: JL/DP on 02-NOV-14 @ 12:46									
Matrix: H2O									
Dissolved Metals in Water by CRC ICPMS									
Copper (Cu)-Dissolved	<0.0010	-		0.0010	mg/L	-		16-NOV-14	R3080811
Iron (Fe)-Dissolved	0.506	+/-0.045		0.010	mg/L	0		16-NOV-14	R3080811
Lead (Pb)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811
Magnesium (Mg)-Dissolved	15.3	+/-1.2		0.10	mg/L	0		16-NOV-14	R3080811
Manganese (Mn)-Dissolved	0.0591	+/-0.0040		0.0020	mg/L	0		16-NOV-14	R3080811
Nickel (Ni)-Dissolved	0.0028	+/-0.0002		0.0020	mg/L	0		16-NOV-14	R3080811
Potassium (K)-Dissolved	3.43	+/-0.26		0.10	mg/L	0		16-NOV-14	R3080811
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3080811
Silicon (Si)-Dissolved	2.14	+/-0.18		0.050	mg/L	0		16-NOV-14	R3080811
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811
Sodium (Na)-Dissolved	145	+/-10		1.0	mg/L	0		16-NOV-14	R3080811
Uranium (U)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811
Zinc (Zn)-Dissolved	<0.0030	-		0.0030	mg/L	-		16-NOV-14	R3080811
Ion Balance Calculation									
Ion Balance	90.4	-			%	-		17-NOV-14	
TDS (Calculated)	486	-			mg/L	-		17-NOV-14	
Hardness (as CaCO3)	125	-			mg/L	-		17-NOV-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.000005 0	mg/L	-		15-NOV-14	R3079330
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		06-NOV-14	R3059450
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		13-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		06-NOV-14	R3059450
Sulfate by IC									
Sulfate (SO4)	<0.50	-		0.50	mg/L	-		06-NOV-14	R3059450
pH, Conductivity and Total Alkalinity									
pH	8.53	+/-0.01		0.10	pH	0		15-NOV-14	R3078994
Conductivity (EC)	819	+/-41		0.20	uS/cm	0		15-NOV-14	R3078994
Bicarbonate (HCO3)	572	+/-22		5.0	mg/L	0		15-NOV-14	R3078994
Carbonate (CO3)	14.7	+/-3.2		5.0	mg/L	0		15-NOV-14	R3078994
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		15-NOV-14	R3078994
Alkalinity, Total (as CaCO3)	494	+/-31		2.0	mg/L	0		15-NOV-14	R3078994
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	4.58	-		0.11	mg/L	-		17-NOV-14	
L1542752-7 16053141102026									
Sampled By: JL/DP on 02-NOV-14 @ 14:13									
Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Toluene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
EthylBenzene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
o-Xylene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
m+p-Xylene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Styrene	<0.0010	-		0.0010	mg/L	-	07-NOV-14	07-NOV-14	R3060948
F1(C6-C10)	<0.10	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948
F1-BTEX	<0.10	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Xylenes	<0.00071	-		0.00071	mg/L	-	07-NOV-14	07-NOV-14	R3060948

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-7 16053141102026									
Sampled By: JL/DP on 02-NOV-14 @ 14:13									
Matrix: H2O									
BTEX, Styrene and F1 (C6-C10)									
Surr: 1,4-Difluorobenzene (SS)	103.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr: 4-Bromofluorobenzene (SS)	88.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr: 3,4-Dichlorotoluene (SS)	107.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	12-NOV-14	12-NOV-14	R3069629
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	12-NOV-14	12-NOV-14	R3069629
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	12-NOV-14	12-NOV-14	R3069629
Surr: 2-Bromobenzotrifluoride	100.0	-		N/A	%	-	12-NOV-14	12-NOV-14	R3069629
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		15-NOV-14	R3079330
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.0381	+/-0.0068		0.0030	mg/L	0		16-NOV-14	R3079879
Antimony (Sb)-Total	0.0169	+/-0.0019		0.00040	mg/L	0		16-NOV-14	R3079879
Arsenic (As)-Total	0.00407	+/-0.00048		0.00040	mg/L	0		16-NOV-14	R3079879
Barium (Ba)-Total	0.0976	+/-0.011		0.0050	mg/L	0		16-NOV-14	R3079879
Boron (B)-Total	0.804	+/-0.13		0.050	mg/L	0		16-NOV-14	R3079879
Cadmium (Cd)-Total	<0.00020	-		0.00020	mg/L	-		16-NOV-14	R3079879
Calcium (Ca)-Total	22.5	+/-2.7		0.50	mg/L	0		16-NOV-14	R3079879
Chromium (Cr)-Total	<0.0050	-		0.0050	mg/L	-		16-NOV-14	R3079879
Copper (Cu)-Total	0.0186	+/-0.0022		0.0010	mg/L	0		16-NOV-14	R3079879
Iron (Fe)-Total	6.29	+/-1.0		0.010	mg/L	0		16-NOV-14	R3079879
Lead (Pb)-Total	0.0386	+/-0.0061		0.00010	mg/L	0		16-NOV-14	R3079879
Magnesium (Mg)-Total	4.76	+/-0.58		0.10	mg/L	0		16-NOV-14	R3079879
Manganese (Mn)-Total	0.0514	+/-0.0052		0.0020	mg/L	0		16-NOV-14	R3079879
Nickel (Ni)-Total	0.0212	+/-0.0023		0.0020	mg/L	0		16-NOV-14	R3079879
Potassium (K)-Total	8.79	+/-1.1		0.10	mg/L	0		16-NOV-14	R3079879
Selenium (Se)-Total	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3079879
Silicon (Si)-Total	2.93	+/-0.58		0.050	mg/L	0		16-NOV-14	R3079879
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3079879
Sodium (Na)-Total	174	+/-21		1.0	mg/L	0		16-NOV-14	R3079879
Uranium (U)-Total	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3079879
Zinc (Zn)-Total	0.0107	+/-0.0027		0.0040	mg/L	0		16-NOV-14	R3079879
Miscellaneous Parameters									
Ammonia, Total (as N)	0.758	-		0.050	mg/L	-		12-NOV-14	R3068709
Dissolved Organic Carbon	8.5	+/-1.1		1.0	mg/L	0		10-NOV-14	R3068336
Naphthenic Acids	1.3	+/-0.4		1.0	mg/L	0	12-NOV-14	12-NOV-14	R3070828
Phenols (4AAP)	0.0040	+/-0.0009		0.0010	mg/L	-7.4%		19-NOV-14	R3090671
Total Dissolved Solids	520	+/-35		10	mg/L	0		08-NOV-14	R3062844
Silicon (as SiO2)-Total	6.27	-		0.11	mg/L	-		17-NOV-14	
Turbidity	18.4	+/-1.1		0.10	NTU	0		06-NOV-14	R3062648
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000040	-	DLM	0.000040	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Anthracene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Fluoranthene	<0.000020	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Fluorene	0.000069	-		0.000020	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Naphthalene	0.00115	-		0.000050	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Phenanthrene	0.000063	-		0.000050	mg/L	-	06-NOV-14	07-NOV-14	R3059631
Pyrene	<0.000010	-		0.000010	mg/L	-	06-NOV-14	07-NOV-14	R3059631

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-9 16053141103028									
Sampled By: JL/DP on 03-NOV-14 @ 10:55									
Matrix: H2O									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		15-NOV-14	R3079330
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.0169	+/-0.0036		0.0030	mg/L	0		16-NOV-14	R3079879
Antimony (Sb)-Total	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3079879
Arsenic (As)-Total	0.00096	+/-0.00012		0.00040	mg/L	0		16-NOV-14	R3079879
Barium (Ba)-Total	0.475	+/-0.053		0.0050	mg/L	0		16-NOV-14	R3079879
Boron (B)-Total	<0.050	-		0.050	mg/L	-		16-NOV-14	R3079879
Cadmium (Cd)-Total	<0.00020	-		0.00020	mg/L	-		16-NOV-14	R3079879
Calcium (Ca)-Total	99.6	+/-12		0.50	mg/L	0		16-NOV-14	R3079879
Chromium (Cr)-Total	<0.0050	-		0.0050	mg/L	-		16-NOV-14	R3079879
Copper (Cu)-Total	0.0014	+/-0.0002		0.0010	mg/L	0		16-NOV-14	R3079879
Iron (Fe)-Total	31.2	+/-4.9		0.010	mg/L	0		16-NOV-14	R3079879
Lead (Pb)-Total	0.00043	+/-0.00007		0.00010	mg/L	0		16-NOV-14	R3079879
Magnesium (Mg)-Total	14.8	+/-1.8		0.10	mg/L	0		16-NOV-14	R3079879
Manganese (Mn)-Total	0.554	+/-0.056		0.0020	mg/L	0		16-NOV-14	R3079879
Nickel (Ni)-Total	0.0038	+/-0.0004		0.0020	mg/L	0		16-NOV-14	R3079879
Potassium (K)-Total	1.58	+/-0.19		0.10	mg/L	0		16-NOV-14	R3079879
Selenium (Se)-Total	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3079879
Silicon (Si)-Total	10.2	+/-2.0		0.050	mg/L	0		16-NOV-14	R3079879
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3079879
Sodium (Na)-Total	5.1	+/-0.6		1.0	mg/L	0		16-NOV-14	R3079879
Uranium (U)-Total	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3079879
Zinc (Zn)-Total	0.0622	+/-0.010		0.0040	mg/L	0		16-NOV-14	R3079879
Miscellaneous Parameters									
Ammonia, Total (as N)	0.555	-		0.050	mg/L	-		12-NOV-14	R3068709
Dissolved Organic Carbon	30.0	+/-3.2		1.0	mg/L	0		10-NOV-14	R3068336
Naphthenic Acids	1.7	+/-0.5		1.0	mg/L	0	12-NOV-14	12-NOV-14	R3070828
Phenols (4AAP)	0.0023	+/-0.0008		0.0010	mg/L	-7.4%		19-NOV-14	R3090671
Total Dissolved Solids	388	+/-26		10	mg/L	0		07-NOV-14	R3062291
Silicon (as SiO2)-Total	21.9	-		0.11	mg/L	-		17-NOV-14	
Turbidity	229	+/-13		0.10	NTU	0		06-NOV-14	R3062648
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Anthracene	<0.000010	-		0.000010	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Fluoranthene	<0.000020	-		0.000020	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Fluorene	<0.000020	-		0.000020	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Naphthalene	<0.000050	-		0.000050	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Phenanthrene	<0.000050	-		0.000050	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Pyrene	<0.000010	-		0.000010	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Benzo(a)anthracene	<0.000010	-		0.000010	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Benzo(b&j)fluoranthene	<0.000010	-		0.000010	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Benzo(a)pyrene	<0.0000050	-		0.0000050	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Chrysene	<0.000020	-		0.000020	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Dibenzo(a,h)anthracene	<0.0000050	-		0.0000050	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	07-NOV-14	08-NOV-14	R3064696
B(A)P Total Potency Equivalent	<0.000010	-		0.000010	mg/L	-	07-NOV-14	08-NOV-14	R3064696

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-9 16053141103028									
Sampled By: JL/DP on 03-NOV-14 @ 10:55									
Matrix: H2O									
PAH & Carcinogenic PAH List									
Surr: d10-Acenaphthene	100.5	-		N/A	%	-	07-NOV-14	08-NOV-14	R3064696
Surr: d10-Phenanthrene	95.1	-		N/A	%	-	07-NOV-14	08-NOV-14	R3064696
Surr: d12-Chrysene	87.0	-		N/A	%	-	07-NOV-14	08-NOV-14	R3064696
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	<0.50	-		0.50	mg/L	-		06-NOV-14	R3059450
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-		16-NOV-14	R3080811
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3080811
Arsenic (As)-Dissolved	0.00082	+/-0.00009		0.00040	mg/L	0		16-NOV-14	R3080811
Barium (Ba)-Dissolved	0.472	+/-0.041		0.0050	mg/L	0		16-NOV-14	R3080811
Boron (B)-Dissolved	0.092	+/-0.011		0.050	mg/L	0		16-NOV-14	R3080811
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811
Calcium (Ca)-Dissolved	102	+/-14		0.50	mg/L	0		16-NOV-14	R3080811
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		16-NOV-14	R3080811
Copper (Cu)-Dissolved	<0.0010	-		0.0010	mg/L	-		16-NOV-14	R3080811
Iron (Fe)-Dissolved	29.5	+/-2.7		0.010	mg/L	0		16-NOV-14	R3080811
Lead (Pb)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811
Magnesium (Mg)-Dissolved	15.1	+/-1.2		0.10	mg/L	0		16-NOV-14	R3080811
Manganese (Mn)-Dissolved	0.543	+/-0.037		0.0020	mg/L	0		16-NOV-14	R3080811
Nickel (Ni)-Dissolved	0.0023	+/-0.0002		0.0020	mg/L	0		16-NOV-14	R3080811
Potassium (K)-Dissolved	1.60	+/-0.12		0.10	mg/L	0		16-NOV-14	R3080811
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3080811
Silicon (Si)-Dissolved	10.6	+/-0.90		0.050	mg/L	0		16-NOV-14	R3080811
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811
Sodium (Na)-Dissolved	5.0	+/-0.3		1.0	mg/L	0		16-NOV-14	R3080811
Uranium (U)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811
Zinc (Zn)-Dissolved	0.0038	+/-0.0005		0.0030	mg/L	0		16-NOV-14	R3080811
Ion Balance Calculation									
Ion Balance	98.0	-			%	-		17-NOV-14	
TDS (Calculated)	330	-			mg/L	-		17-NOV-14	
Hardness (as CaCO3)	317	-			mg/L	-		17-NOV-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.000005 0	mg/L	-		15-NOV-14	R3079330
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		06-NOV-14	R3059450
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		13-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		06-NOV-14	R3059450
Sulfate by IC									
Sulfate (SO4)	<0.50	-		0.50	mg/L	-		06-NOV-14	R3059450
pH, Conductivity and Total Alkalinity									
pH	8.33	+/-0.01		0.10	pH	0		15-NOV-14	R3078994
Conductivity (EC)	556	+/-28		0.20	uS/cm	0		15-NOV-14	R3078994
Bicarbonate (HCO3)	413	+/-16		5.0	mg/L	0		15-NOV-14	R3078994
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		15-NOV-14	R3078994
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		15-NOV-14	R3078994
Alkalinity, Total (as CaCO3)	344	+/-22		2.0	mg/L	0		15-NOV-14	R3078994
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-10 16053141103029									
Sampled By: JL/DP on 03-NOV-14 @ 15:01									
Matrix: H2O									
Dissolved Organic Carbon	12.4	+/-1.5		1.0	mg/L	0		10-NOV-14	R3068336
Naphthenic Acids	1.8	+/-0.5		1.0	mg/L	0	12-NOV-14	12-NOV-14	R3070828
Phenols (4AAP)	0.0047	+/-0.0009		0.0010	mg/L	-7.4%		19-NOV-14	R3090671
Total Dissolved Solids	374	+/-25		10	mg/L	0		07-NOV-14	R3062291
Silicon (as SiO2)-Total	20.8	-		0.11	mg/L	-		17-NOV-14	
Turbidity	473	+/-26		0.10	NTU	0		06-NOV-14	R3062648
PAH & Carcinogenic PAH List									
Acenaphthene	0.000202	-		0.000020	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Acenaphthylene	<0.000060	-	DLM	0.000060	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Anthracene	<0.000035	-	DLM	0.000035	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Fluoranthene	<0.00010	-	DLM	0.00010	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Fluorene	0.000212	-		0.000020	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Naphthalene	0.000567	-		0.000050	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Phenanthrene	0.00138	-		0.000050	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Pyrene	<0.000010	-		0.000010	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Benzo(a)anthracene	<0.000020	-	DLM	0.000020	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Benzo(b&j)fluoranthene	<0.000050	-	DLM	0.000050	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Benzo(g,h,i)perylene	<0.000040	-	DLM	0.000040	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Benzo(a)pyrene	<0.000020	-	DLM	0.000020	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Chrysene	0.000086	-		0.000020	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Dibenzo(a,h)anthracene	<0.000010	-	DLM	0.000010	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	07-NOV-14	08-NOV-14	R3064696
B(A)P Total Potency Equivalent	0.000021	-		0.000020	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Surr: d10-Acenaphthene	82.5	-		N/A	%	-	07-NOV-14	08-NOV-14	R3064696
Surr: d10-Phenanthrene	95.3	-		N/A	%	-	07-NOV-14	08-NOV-14	R3064696
Surr: d12-Chrysene	75.7	-		N/A	%	-	07-NOV-14	08-NOV-14	R3064696
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	<0.50	-		0.50	mg/L	-		06-NOV-14	R3059450
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-		16-NOV-14	R3080811
Antimony (Sb)-Dissolved	0.00041	+/-0.00004		0.00040	mg/L	0		16-NOV-14	R3080811
Arsenic (As)-Dissolved	0.00134	+/-0.00014		0.00040	mg/L	0		16-NOV-14	R3080811
Barium (Ba)-Dissolved	0.147	+/-0.013		0.0050	mg/L	0		16-NOV-14	R3080811
Boron (B)-Dissolved	0.054	+/-0.006		0.050	mg/L	0		16-NOV-14	R3080811
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811
Calcium (Ca)-Dissolved	97.9	+/-13		0.50	mg/L	0		16-NOV-14	R3080811
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		16-NOV-14	R3080811
Copper (Cu)-Dissolved	<0.0010	-		0.0010	mg/L	-		16-NOV-14	R3080811
Iron (Fe)-Dissolved	10.7	+/-0.97		0.010	mg/L	0		16-NOV-14	R3080811
Lead (Pb)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811
Magnesium (Mg)-Dissolved	22.2	+/-1.7		0.10	mg/L	0		16-NOV-14	R3080811
Manganese (Mn)-Dissolved	0.430	+/-0.029		0.0020	mg/L	0		16-NOV-14	R3080811
Nickel (Ni)-Dissolved	0.0252	+/-0.0021		0.0020	mg/L	0		16-NOV-14	R3080811
Potassium (K)-Dissolved	0.37	+/-0.03		0.10	mg/L	0		16-NOV-14	R3080811
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3080811
Silicon (Si)-Dissolved	4.31	+/-0.37		0.050	mg/L	0		16-NOV-14	R3080811
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811
Sodium (Na)-Dissolved	3.0	+/-0.2		1.0	mg/L	0		16-NOV-14	R3080811
Uranium (U)-Dissolved	0.00023	+/-0.00002		0.00010	mg/L	0		16-NOV-14	R3080811
Zinc (Zn)-Dissolved	0.0046	+/-0.0006		0.0030	mg/L	0		16-NOV-14	R3080811

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-10 16053141103029 Sampled By: JL/DP on 03-NOV-14 @ 15:01 Matrix: H2O									
Ion Balance Calculation									
Ion Balance	115	-	BL:INT		%	-		17-NOV-14	
TDS (Calculated)	304	-			mg/L	-		17-NOV-14	
Hardness (as CaCO3)	336	-			mg/L	-		17-NOV-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		15-NOV-14	R3079330
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		06-NOV-14	R3059450
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		13-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		06-NOV-14	R3059450
Sulfate by IC									
Sulfate (SO4)	4.70	+/-0.29		0.50	mg/L	0		06-NOV-14	R3059450
pH, Conductivity and Total Alkalinity									
pH	8.21	+/-0.01		0.10	pH	0		15-NOV-14	R3078994
Conductivity (EC)	514	+/-26		0.20	uS/cm	0		15-NOV-14	R3078994
Bicarbonate (HCO3)	357	+/-14		5.0	mg/L	0		15-NOV-14	R3078994
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		15-NOV-14	R3078994
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		15-NOV-14	R3078994
Alkalinity, Total (as CaCO3)	293	+/-19		2.0	mg/L	0		15-NOV-14	R3078994
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	9.21	-		0.11	mg/L	-		17-NOV-14	
L1542752-11 16053141103030 Sampled By: JL/DP on 03-NOV-14 @ 10:55 Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Toluene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
EthylBenzene	0.00096	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
o-Xylene	0.00162	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
m+p-Xylene	0.00244	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Styrene	<0.0010	-		0.0010	mg/L	-	07-NOV-14	07-NOV-14	R3060948
F1(C6-C10)	<0.10	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948
F1-BTEX	<0.10	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Xylenes	0.00406	-		0.00071	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Surr: 1,4-Difluorobenzene (SS)	99.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr: 4-Bromofluorobenzene (SS)	88.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr: 3,4-Dichlorotoluene (SS)	102.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	12-NOV-14	12-NOV-14	R3069629
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	12-NOV-14	12-NOV-14	R3069629
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	12-NOV-14	12-NOV-14	R3069629
Surr: 2-Bromobenzotrifluoride	95.8	-		N/A	%	-	12-NOV-14	12-NOV-14	R3069629
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		15-NOV-14	R3079330
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.0124	+/-0.0029		0.0030	mg/L	0		16-NOV-14	R3079879

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-12 16053141103031									
Sampled By: JL/DP on 03-NOV-14 @ 14:24									
Matrix: H2O									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Toluene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
EthylBenzene	0.00094	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
o-Xylene	0.00146	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
m+p-Xylene	0.00223	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Styrene	<0.0010	-		0.0010	mg/L	-	07-NOV-14	07-NOV-14	R3060948
F1(C6-C10)	<0.10	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948
F1-BTEX	<0.10	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Xylenes	0.00369	-		0.00071	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Surr: 1,4-Difluorobenzene (SS)	98.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr: 4-Bromofluorobenzene (SS)	85.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr: 3,4-Dichlorotoluene (SS)	104.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
F2, F3, F4									
F2 (>C10-C16)	0.60	+/-0.16		0.25	mg/L	0	12-NOV-14	12-NOV-14	R3069629
F3 (C16-C34)	4.32	+/-1.0		0.25	mg/L	0	12-NOV-14	12-NOV-14	R3069629
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	12-NOV-14	12-NOV-14	R3069629
Surr: 2-Bromobenzotrifluoride	91.0	-		N/A	%	-	12-NOV-14	12-NOV-14	R3069629
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		15-NOV-14	R3079330
				0					
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.030	+/-0.006	DLM	0.030	mg/L	0		16-NOV-14	R3079217
Antimony (Sb)-Total	<0.0010	-	DLM	0.0010	mg/L	-		16-NOV-14	R3079217
Arsenic (As)-Total	<0.0010	-	DLM	0.0010	mg/L	-		16-NOV-14	R3079217
Barium (Ba)-Total	0.360	+/-0.040	DLM	0.0050	mg/L	0		16-NOV-14	R3079217
Boron (B)-Total	2.50	+/-0.40	DLM	0.10	mg/L	0		16-NOV-14	R3079217
Cadmium (Cd)-Total	<0.00020	-	DLM	0.00020	mg/L	-		16-NOV-14	R3079217
Calcium (Ca)-Total	34.8	+/-4.1	DLM	0.50	mg/L	0		16-NOV-14	R3079217
Chromium (Cr)-Total	0.0050	+/-0.0007	DLM	0.0050	mg/L	0		16-NOV-14	R3079217
Copper (Cu)-Total	0.0084	+/-0.0010	DLM	0.0010	mg/L	0		16-NOV-14	R3079217
Iron (Fe)-Total	15.2	+/-2.4	DLM	0.10	mg/L	0		16-NOV-14	R3079217
Lead (Pb)-Total	0.00453	+/-0.00072	DLM	0.00050	mg/L	0		16-NOV-14	R3079217
Magnesium (Mg)-Total	24.4	+/-3.0	DLM	0.10	mg/L	0		16-NOV-14	R3079217
Manganese (Mn)-Total	0.0719	+/-0.0073	DLM	0.0020	mg/L	0		16-NOV-14	R3079217
Nickel (Ni)-Total	0.0148	+/-0.0016	DLM	0.0020	mg/L	0		16-NOV-14	R3079217
Potassium (K)-Total	17.5	+/-2.1	DLM	0.50	mg/L	0		16-NOV-14	R3079217
Selenium (Se)-Total	<0.0010	-	DLM	0.0010	mg/L	-		16-NOV-14	R3079217
Silicon (Si)-Total	2.43	+/-0.48	DLM	0.50	mg/L	0		16-NOV-14	R3079217
Silver (Ag)-Total	<0.00040	-	DLM	0.00040	mg/L	-		16-NOV-14	R3079217
Sodium (Na)-Total	1390	+/-170	DLM	1.0	mg/L	0		16-NOV-14	R3079217
Uranium (U)-Total	<0.00010	-	DLM	0.00010	mg/L	-		16-NOV-14	R3079217
Zinc (Zn)-Total	<0.030	-	DLM	0.030	mg/L	-		16-NOV-14	R3079217
Miscellaneous Parameters									
Ammonia, Total (as N)	2.29	-		0.050	mg/L	-		12-NOV-14	R3068709
Dissolved Organic Carbon	34.3	+/-3.7		1.0	mg/L	0		11-NOV-14	R3068336
Naphthenic Acids	56.2	+/-9.7	D	1.0	mg/L	0	12-NOV-14	12-NOV-14	R3070828
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		19-NOV-14	R3090671
Total Dissolved Solids	3820	+/-260		10	mg/L	0		08-NOV-14	R3062844
Silicon (as SiO2)-Total	5.2	-		1.1	mg/L	-		17-NOV-14	
Turbidity	126	+/-7.0		0.10	NTU	0		06-NOV-14	R3062648

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-12 16053141103031									
Sampled By: JL/DP on 03-NOV-14 @ 14:24									
Matrix: H2O									
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		15-NOV-14	R3079330
Nitrate as N by IC									
Nitrate (as N)	<0.25	-	DLM	0.25	mg/L	-		06-NOV-14	R3059450
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.27	-		0.27	mg/L	-		13-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.10	-	DLM	0.10	mg/L	-		06-NOV-14	R3059450
Sulfate by IC									
Sulfate (SO4)	<2.5	-	DLM	2.5	mg/L	-		06-NOV-14	R3059450
pH, Conductivity and Total Alkalinity									
pH	8.96	+/-0.01		0.10	pH	0		13-NOV-14	R3068828
Conductivity (EC)	6240	+/-310		0.20	uS/cm	0		13-NOV-14	R3068828
Bicarbonate (HCO3)	1910	+/-71		5.0	mg/L	0		13-NOV-14	R3068828
Carbonate (CO3)	167	+/-22		5.0	mg/L	0		13-NOV-14	R3068828
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		13-NOV-14	R3068828
Alkalinity, Total (as CaCO3)	1840	+/-110		2.0	mg/L	0		13-NOV-14	R3068828
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	5.3	-		1.1	mg/L	-		17-NOV-14	
L1542752-13 16053141103032									
Sampled By: JL/DP on 03-NOV-14 @ 15:22									
Matrix: H2O									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Toluene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
EthylBenzene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
o-Xylene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
m+p-Xylene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Styrene	<0.0010	-		0.0010	mg/L	-	07-NOV-14	07-NOV-14	R3060948
F1(C6-C10)	<0.10	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948
F1-BTEX	<0.10	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Xylenes	<0.00071	-		0.00071	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Surr:	1,4-Difluorobenzene (SS)	99.0	-	N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr:	4-Bromofluorobenzene (SS)	89.0	-	N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr:	3,4-Dichlorotoluene (SS)	97.0	-	N/A	%	-	07-NOV-14	07-NOV-14	R3060948
L1542752-14 16053141104033									
Sampled By: JL/DP on 04-NOV-14 @ 11:45									
Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Toluene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
EthylBenzene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
o-Xylene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
m+p-Xylene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Styrene	<0.0010	-		0.0010	mg/L	-	07-NOV-14	07-NOV-14	R3060948
F1(C6-C10)	<0.10	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948
F1-BTEX	<0.10	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Xylenes	<0.00071	-		0.00071	mg/L	-	07-NOV-14	07-NOV-14	R3060948

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-14 16053141104033									
Sampled By: JL/DP on 04-NOV-14 @ 11:45									
Matrix: H2O									
BTEX, Styrene and F1 (C6-C10)									
Surr: 1,4-Difluorobenzene (SS)	98.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr: 4-Bromofluorobenzene (SS)	83.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr: 3,4-Dichlorotoluene (SS)	94.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
F2, F3, F4									
F2 (>C10-C16)	<0.25	-		0.25	mg/L	-	13-NOV-14	13-NOV-14	R3069629
F3 (C16-C34)	<0.25	-		0.25	mg/L	-	13-NOV-14	13-NOV-14	R3069629
F4 (C34-C50)	<0.25	-		0.25	mg/L	-	13-NOV-14	13-NOV-14	R3069629
Surr: 2-Bromobenzotrifluoride	108.0	-		N/A	%	-	13-NOV-14	13-NOV-14	R3069629
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-		0.0000050	mg/L	-		15-NOV-14	R3079330
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	<0.30	-	DLM	0.30	mg/L	-		16-NOV-14	R3079879
Antimony (Sb)-Total	<0.010	-	DLM	0.010	mg/L	-		16-NOV-14	R3079879
Arsenic (As)-Total	<0.010	-	DLM	0.010	mg/L	-		16-NOV-14	R3079879
Barium (Ba)-Total	0.0631	+/-0.0071	DLM	0.0050	mg/L	0		16-NOV-14	R3079879
Boron (B)-Total	4.2	+/-0.7	DLM	1.0	mg/L	0		16-NOV-14	R3079879
Cadmium (Cd)-Total	<0.0010	-	DLM	0.0010	mg/L	-		16-NOV-14	R3079879
Calcium (Ca)-Total	1290	+/-150	DLM	2.0	mg/L	0		16-NOV-14	R3079879
Chromium (Cr)-Total	<0.010	-	DLM	0.010	mg/L	-		16-NOV-14	R3079879
Copper (Cu)-Total	0.014	+/-0.002	DLM	0.010	mg/L	0		16-NOV-14	R3079879
Iron (Fe)-Total	243	+/-38	DLM	1.0	mg/L	0		16-NOV-14	R3079879
Lead (Pb)-Total	0.0075	+/-0.0012	DLM	0.0050	mg/L	0		16-NOV-14	R3079879
Magnesium (Mg)-Total	306	+/-37	DLM	0.50	mg/L	0		16-NOV-14	R3079879
Manganese (Mn)-Total	19.0	+/-1.9	DLM	0.0050	mg/L	0		16-NOV-14	R3079879
Nickel (Ni)-Total	<0.010	-	DLM	0.010	mg/L	-		16-NOV-14	R3079879
Potassium (K)-Total	118	+/-15	DLM	5.0	mg/L	0		16-NOV-14	R3079879
Selenium (Se)-Total	<0.010	-	DLM	0.010	mg/L	-		16-NOV-14	R3079879
Silicon (Si)-Total	<5.0	-	DLM	5.0	mg/L	-		16-NOV-14	R3079879
Silver (Ag)-Total	<0.0010	-	DLM	0.0010	mg/L	-		16-NOV-14	R3079879
Sodium (Na)-Total	110000	+/-14000	DLM	5.0	mg/L	0		16-NOV-14	R3079879
Uranium (U)-Total	<0.0010	-	DLM	0.0010	mg/L	-		16-NOV-14	R3079879
Zinc (Zn)-Total	<0.30	-	DLM	0.30	mg/L	-		16-NOV-14	R3079879
Miscellaneous Parameters									
Ammonia, Total (as N)	10.7	-		0.050	mg/L	-		12-NOV-14	R3068709
Dissolved Organic Carbon	9.5	+/-1.2		1.0	mg/L	0		11-NOV-14	R3068336
Naphthenic Acids	<1.0	-		1.0	mg/L	-	12-NOV-14	12-NOV-14	R3070828
Phenols (4AAP)	0.196	+/-0.025		0.0010	mg/L	-7.4%		19-NOV-14	R3090671
Total Dissolved Solids	275000	+/-18000	DLA	200	mg/L	0		13-NOV-14	R3076828
Silicon (as SiO2)-Total	<11	-		11	mg/L	-		17-NOV-14	
Turbidity	80.3	+/-4.5		0.10	NTU	0		06-NOV-14	R3062648
PAH & Carcinogenic PAH List									
Acenaphthene	<0.000020	-		0.000020	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Acenaphthylene	<0.000020	-		0.000020	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Anthracene	<0.000010	-		0.000010	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Fluoranthene	<0.000020	-		0.000020	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Fluorene	<0.000020	-		0.000020	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Naphthalene	0.000203	-		0.000050	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Phenanthrene	<0.000050	-		0.000050	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Pyrene	<0.000010	-		0.000010	mg/L	-	07-NOV-14	08-NOV-14	R3064696

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-14 16053141104033 Sampled By: JL/DP on 04-NOV-14 @ 11:45 Matrix: H2O									
Sulfate by IC									
Sulfate (SO4)	3660	+/-210	DLM	20	mg/L	0		06-NOV-14	R3059450
pH, Conductivity and Total Alkalinity									
pH	4.09	+/-0.01		0.10	pH	0		13-NOV-14	R3072810
Conductivity (EC)	229000	+/-11000		0.20	uS/cm	0		13-NOV-14	R3074508
Bicarbonate (HCO3)	<5.0	-		5.0	mg/L	-		13-NOV-14	R3072810
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		13-NOV-14	R3072810
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		13-NOV-14	R3072810
Alkalinity, Total (as CaCO3)	<2.0	-		2.0	mg/L	-		13-NOV-14	R3072810
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	<11	-		11	mg/L	-		17-NOV-14	
L1542752-15 16053141104034 Sampled By: JL/DP on 04-NOV-14 @ 17:01 Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Toluene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
EthylBenzene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
o-Xylene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
m+p-Xylene	<0.00050	-		0.00050	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Styrene	<0.0010	-		0.0010	mg/L	-	07-NOV-14	07-NOV-14	R3060948
F1(C6-C10)	<0.10	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948
F1-BTEX	<0.10	-		0.10	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Xylenes	<0.00071	-		0.00071	mg/L	-	07-NOV-14	07-NOV-14	R3060948
Surr: 1,4-Difluorobenzene (SS)	99.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr: 4-Bromofluorobenzene (SS)	92.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
Surr: 3,4-Dichlorotoluene (SS)	107.0	-		N/A	%	-	07-NOV-14	07-NOV-14	R3060948
F2, F3, F4									
F2 (>C10-C16)	2.07	+/-0.51		0.25	mg/L	0	12-NOV-14	12-NOV-14	R3069629
F3 (C16-C34)	6.08	+/-1.4		0.25	mg/L	0	12-NOV-14	12-NOV-14	R3069629
F4 (C34-C50)	1.11	+/-0.27		0.25	mg/L	0	12-NOV-14	12-NOV-14	R3069629
Surr: 2-Bromobenzotrifluoride	111.0	-		N/A	%	-	12-NOV-14	12-NOV-14	R3069629
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	0.0000111	+/-0.0000045		0.000005 0	mg/L	0		15-NOV-14	R3079330
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	0.256	+/-0.041		0.0030	mg/L	0		16-NOV-14	R3079879
Antimony (Sb)-Total	0.00275	+/-0.00033		0.00040	mg/L	0		16-NOV-14	R3079879
Arsenic (As)-Total	0.00356	+/-0.00042		0.00040	mg/L	0		16-NOV-14	R3079879
Barium (Ba)-Total	0.436	+/-0.049		0.0050	mg/L	0		16-NOV-14	R3079879
Boron (B)-Total	0.434	+/-0.069		0.050	mg/L	0		16-NOV-14	R3079879
Cadmium (Cd)-Total	<0.00020	-		0.00020	mg/L	-		16-NOV-14	R3079879
Calcium (Ca)-Total	70.7	+/-8.3		0.50	mg/L	0		16-NOV-14	R3079879
Chromium (Cr)-Total	0.0074	+/-0.0011		0.0050	mg/L	0		16-NOV-14	R3079879
Copper (Cu)-Total	0.0376	+/-0.0044		0.0010	mg/L	0		16-NOV-14	R3079879
Iron (Fe)-Total	42.9	+/-6.8		0.010	mg/L	0		16-NOV-14	R3079879
Lead (Pb)-Total	0.0990	+/-0.016		0.00010	mg/L	0		16-NOV-14	R3079879
Magnesium (Mg)-Total	39.6	+/-4.8		0.10	mg/L	0		16-NOV-14	R3079879
Manganese (Mn)-Total	0.653	+/-0.066		0.0020	mg/L	0		16-NOV-14	R3079879
Nickel (Ni)-Total	0.0064	+/-0.0007		0.0020	mg/L	0		16-NOV-14	R3079879

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-15 16053141104034									
Sampled By: JL/DP on 04-NOV-14 @ 17:01									
Matrix: H2O									
Total Metals in Water by CRC ICPMS									
Potassium (K)-Total	6.04	+/-0.74		0.10	mg/L	0		16-NOV-14	R3079879
Selenium (Se)-Total	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3079879
Silicon (Si)-Total	5.26	+/-1.0		0.050	mg/L	0		16-NOV-14	R3079879
Silver (Ag)-Total	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3079879
Sodium (Na)-Total	70.9	+/-8.7		1.0	mg/L	0		16-NOV-14	R3079879
Uranium (U)-Total	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3079879
Zinc (Zn)-Total	0.211	+/-0.033		0.0040	mg/L	0		16-NOV-14	R3079879
Miscellaneous Parameters									
Ammonia, Total (as N)	1.17	-		0.050	mg/L	-		12-NOV-14	R3068709
Dissolved Organic Carbon	16.8	+/-1.9		1.0	mg/L	0		11-NOV-14	R3068336
Naphthenic Acids	10.9	+/-1.9		1.0	mg/L	0	12-NOV-14	12-NOV-14	R3070828
Phenols (4AAP)	0.0020	+/-0.0008		0.0010	mg/L	-7.4%		19-NOV-14	R3090671
Total Dissolved Solids	609	+/-41		10	mg/L	0		08-NOV-14	R3062844
Silicon (as SiO2)-Total	11.2	-		0.11	mg/L	-		17-NOV-14	
Turbidity	273	+/-15		0.10	NTU	0		06-NOV-14	R3062648
PAH & Carcinogenic PAH List									
Acenaphthene	0.000313	-		0.000020	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Acenaphthylene	<0.000055	-	DLM	0.000055	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Anthracene	<0.000015	-	DLM	0.000015	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Fluoranthene	0.000090	-		0.000020	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Fluorene	<0.00010	-	DLM	0.00010	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Naphthalene	0.000697	-		0.000050	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Phenanthrene	0.00102	-		0.000050	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Pyrene	0.000194	-		0.000010	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Benzo(a)anthracene	<0.000035	-	DLM	0.000035	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Benzo(k)fluoranthene	<0.000050	-	DLM	0.000050	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Benzo(b&j)fluoranthene	<0.00015	-	DLM	0.00015	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Benzo(g,h,i)perylene	0.000089	-		0.000020	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Benzo(a)pyrene	<0.00010	-	DLM	0.00010	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Chrysene	0.000097	-		0.000020	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Dibenzo(a,h)anthracene	<0.000030	-	DLM	0.000030	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Indeno(1,2,3-cd)pyrene	<0.000055	-	DLM	0.000055	mg/L	-	07-NOV-14	08-NOV-14	R3064696
B(A)P Total Potency Equivalent	0.000081	-		0.000080	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Surr: d10-Acenaphthene	N/A	-	SMI	N/A	%	-	07-NOV-14	08-NOV-14	R3064696
Surr: d10-Phenanthrene	82.9	-		N/A	%	-	07-NOV-14	08-NOV-14	R3064696
Surr: d12-Chrysene	68.3	-		N/A	%	-	07-NOV-14	08-NOV-14	R3064696
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	6.72	+/-0.40	RRV	0.50	mg/L	0		13-NOV-14	R3076830
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	<0.0050	-		0.0050	mg/L	-		16-NOV-14	R3080811
Antimony (Sb)-Dissolved	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3080811
Arsenic (As)-Dissolved	0.00045	+/-0.00005		0.00040	mg/L	0		16-NOV-14	R3080811
Barium (Ba)-Dissolved	0.365	+/-0.032		0.0050	mg/L	0		16-NOV-14	R3080811
Boron (B)-Dissolved	0.494	+/-0.060		0.050	mg/L	0		16-NOV-14	R3080811
Cadmium (Cd)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811
Calcium (Ca)-Dissolved	71.8	+/-9.8		0.50	mg/L	0		16-NOV-14	R3080811
Chromium (Cr)-Dissolved	<0.0050	-		0.0050	mg/L	-		16-NOV-14	R3080811
Copper (Cu)-Dissolved	<0.0010	-		0.0010	mg/L	-		16-NOV-14	R3080811
Iron (Fe)-Dissolved	10.9	+/-0.98		0.010	mg/L	0		16-NOV-14	R3080811
Lead (Pb)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-15 16053141104034 Sampled By: JL/DP on 04-NOV-14 @ 17:01 Matrix: H2O									
Dissolved Metals in Water by CRC ICPMS									
Magnesium (Mg)-Dissolved	38.9	+/-3.0		0.10	mg/L	0		16-NOV-14	R3080811
Manganese (Mn)-Dissolved	0.409	+/-0.028		0.0020	mg/L	0		16-NOV-14	R3080811
Nickel (Ni)-Dissolved	0.0023	+/-0.0002		0.0020	mg/L	0		16-NOV-14	R3080811
Potassium (K)-Dissolved	6.31	+/-0.49		0.10	mg/L	0		16-NOV-14	R3080811
Selenium (Se)-Dissolved	<0.00040	-		0.00040	mg/L	-		16-NOV-14	R3080811
Silicon (Si)-Dissolved	4.34	+/-0.37		0.050	mg/L	0		16-NOV-14	R3080811
Silver (Ag)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811
Sodium (Na)-Dissolved	70.2	+/-4.9		1.0	mg/L	0		16-NOV-14	R3080811
Uranium (U)-Dissolved	<0.00010	-		0.00010	mg/L	-		16-NOV-14	R3080811
Zinc (Zn)-Dissolved	0.0180	+/-0.0021		0.0030	mg/L	0		16-NOV-14	R3080811
Ion Balance Calculation									
Ion Balance	114	-	BL:INT		%	-		17-NOV-14	
TDS (Calculated)	459	-			mg/L	-		17-NOV-14	
Hardness (as CaCO3)	339	-			mg/L	-		17-NOV-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	0.0000255	-	RRV	0.0000050	mg/L	-		16-NOV-14	R3079330
Nitrate as N by IC									
Nitrate (as N)	<0.050	-		0.050	mg/L	-		06-NOV-14	R3059450
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.054	-		0.054	mg/L	-		13-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.020	-		0.020	mg/L	-		06-NOV-14	R3059450
Sulfate by IC									
Sulfate (SO4)	<0.50	-		0.50	mg/L	-		06-NOV-14	R3059450
pH, Conductivity and Total Alkalinity									
pH	8.37	+/-0.01		0.10	pH	0		13-NOV-14	R3068828
Conductivity (EC)	833	+/-42		0.20	uS/cm	0		13-NOV-14	R3068828
Bicarbonate (HCO3)	530	+/-20		5.0	mg/L	0		13-NOV-14	R3068828
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		13-NOV-14	R3068828
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		13-NOV-14	R3068828
Alkalinity, Total (as CaCO3)	442	+/-28		2.0	mg/L	0		13-NOV-14	R3068828
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	9.28	-		0.11	mg/L	-		17-NOV-14	
L1542752-16 16053141104035 Sampled By: JL/DP on 04-NOV-14 @ 12:19 Matrix: H2O									
BTXS, Styrene & F1-F4									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-	10-NOV-14	10-NOV-14	R3068488
Toluene	<0.00050	-		0.00050	mg/L	-	10-NOV-14	10-NOV-14	R3068488
EthylBenzene	<0.00050	-		0.00050	mg/L	-	10-NOV-14	10-NOV-14	R3068488
o-Xylene	0.00066	-		0.00050	mg/L	-	10-NOV-14	10-NOV-14	R3068488
m+p-Xylene	0.00157	-		0.00050	mg/L	-	10-NOV-14	10-NOV-14	R3068488
Styrene	<0.0010	-		0.0010	mg/L	-	10-NOV-14	10-NOV-14	R3068488
F1(C6-C10)	<0.10	-		0.10	mg/L	-	10-NOV-14	10-NOV-14	R3068488
F1-BTEX	<0.10	-		0.10	mg/L	-	10-NOV-14	10-NOV-14	R3068488
Xylenes	0.00222	-		0.00071	mg/L	-	10-NOV-14	10-NOV-14	R3068488
Surr:	1,4-Difluorobenzene (SS)	103.0	-	N/A	%	-	10-NOV-14	10-NOV-14	R3068488
Surr:	4-Bromofluorobenzene (SS)	102.0	-	N/A	%	-	10-NOV-14	10-NOV-14	R3068488
Surr:	3,4-Dichlorotoluene (SS)	122.0	-	N/A	%	-	10-NOV-14	10-NOV-14	R3068488

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-16 16053141104035									
Sampled By: JL/DP on 04-NOV-14 @ 12:19									
Matrix: H2O									
F2, F3, F4									
F2 (>C10-C16)	5.24	+/-1.3		0.25	mg/L	0	12-NOV-14	12-NOV-14	R3069629
F3 (C16-C34)	2.22	+/-0.53		0.25	mg/L	0	12-NOV-14	12-NOV-14	R3069629
F4 (C34-C50)	0.52	+/-0.16		0.25	mg/L	0	12-NOV-14	12-NOV-14	R3069629
Surr: 2-Bromobenzotrifluoride	83.1	-		N/A	%	-	12-NOV-14	12-NOV-14	R3069629
Alberta Tier 1 Metals (Total)									
Mercury (Hg)									
Mercury (Hg)-Total	<0.0000050	-	RRV	0.000005 0	mg/L	-		16-NOV-14	R3079330
Total Metals in Water by CRC ICPMS									
Aluminum (Al)-Total	10.6	+/-1.7	DLM	0.015	mg/L	0		16-NOV-14	R3079217
Antimony (Sb)-Total	0.00115	+/-0.00016	DLM	0.00050	mg/L	0		16-NOV-14	R3079217
Arsenic (As)-Total	0.0302	+/-0.0035	DLM	0.00050	mg/L	0		16-NOV-14	R3079217
Barium (Ba)-Total	0.438	+/-0.049	DLM	0.0050	mg/L	0		16-NOV-14	R3079217
Boron (B)-Total	3.27	+/-0.52	DLM	0.050	mg/L	0		16-NOV-14	R3079217
Cadmium (Cd)-Total	0.00153	+/-0.00029	DLM	0.00020	mg/L	0		16-NOV-14	R3079217
Calcium (Ca)-Total	42.9	+/-5.1	DLM	0.50	mg/L	0		16-NOV-14	R3079217
Chromium (Cr)-Total	0.0800	+/-0.012	DLM	0.0050	mg/L	0		16-NOV-14	R3079217
Copper (Cu)-Total	0.104	+/-0.012	DLM	0.0010	mg/L	0		16-NOV-14	R3079217
Iron (Fe)-Total	481	+/-76	DLM	0.050	mg/L	0		16-NOV-14	R3079217
Lead (Pb)-Total	0.163	+/-0.026	DLM	0.00025	mg/L	0		16-NOV-14	R3079217
Magnesium (Mg)-Total	17.8	+/-2.2	DLM	0.10	mg/L	0		16-NOV-14	R3079217
Manganese (Mn)-Total	2.88	+/-0.29	DLM	0.0020	mg/L	0		16-NOV-14	R3079217
Nickel (Ni)-Total	0.0693	+/-0.0076	DLM	0.0020	mg/L	0		16-NOV-14	R3079217
Potassium (K)-Total	9.00	+/-1.1	DLM	0.25	mg/L	0		16-NOV-14	R3079217
Selenium (Se)-Total	0.00066	+/-0.00009	DLM	0.00050	mg/L	0		16-NOV-14	R3079217
Silicon (Si)-Total	23.0	+/-4.6	DLM	0.25	mg/L	0		16-NOV-14	R3079217
Silver (Ag)-Total	<0.00040	-	DLM	0.00040	mg/L	-		16-NOV-14	R3079217
Sodium (Na)-Total	892	+/-110	DLM	1.0	mg/L	0		16-NOV-14	R3079217
Uranium (U)-Total	0.00194	+/-0.00027	DLM	0.00010	mg/L	0		16-NOV-14	R3079217
Zinc (Zn)-Total	0.342	+/-0.053	DLM	0.015	mg/L	0		16-NOV-14	R3079217
Miscellaneous Parameters									
Ammonia, Total (as N)	2.54	-		0.050	mg/L	-		12-NOV-14	R3068709
Dissolved Organic Carbon	7.6	+/-1.0		1.0	mg/L	0		11-NOV-14	R3068336
Naphthenic Acids	<1.0	-		1.0	mg/L	-	12-NOV-14	12-NOV-14	R3070828
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		19-NOV-14	R3090671
Total Dissolved Solids	1760	+/-120		10	mg/L	0		07-NOV-14	R3062291
Silicon (as SiO2)-Total	49.3	-		0.53	mg/L	-		17-NOV-14	
Turbidity	1010	+/-56		0.10	NTU	0		06-NOV-14	R3062648
PAH & Carcinogenic PAH List									
Acenaphthene	<0.00020	-	DLM	0.00020	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Acenaphthylene	<0.00010	-	DLM	0.00010	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Anthracene	<0.000015	-	DLM	0.000015	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Fluoranthene	<0.000040	-	DLM	0.000040	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Fluorene	0.000133	-		0.000020	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Naphthalene	0.0124	-	DLA	0.00010	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Phenanthrene	0.000467	-		0.000050	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Pyrene	0.000098	-		0.000010	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Benzo(a)anthracene	<0.000015	-	DLM	0.000015	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Benzo(k)fluoranthene	<0.000010	-		0.000010	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Benzo(b&j)fluoranthene	0.000014	-		0.000010	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Benzo(g,h,i)perylene	<0.000020	-		0.000020	mg/L	-	07-NOV-14	08-NOV-14	R3064696

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-16 16053141104035									
Sampled By: JL/DP on 04-NOV-14 @ 12:19									
Matrix: H2O									
PAH & Carcinogenic PAH List									
Benzo(a)pyrene	<0.000010	-	DLM	0.000010	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Chrysene	<0.000030	-	DLM	0.000030	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Dibenzo(a,h)anthracene	<0.0000050	-		0.000005	mg/L	-	07-NOV-14	08-NOV-14	R3064696
				0					
Indeno(1,2,3-cd)pyrene	<0.000010	-		0.000010	mg/L	-	07-NOV-14	08-NOV-14	R3064696
B(A)P Total Potency Equivalent	0.000011	-		0.000010	mg/L	-	07-NOV-14	08-NOV-14	R3064696
Surr: d10-Acenaphthene	96.9	-		N/A	%	-	07-NOV-14	08-NOV-14	R3064696
Surr: d10-Phenanthrene	103.6	-		N/A	%	-	07-NOV-14	08-NOV-14	R3064696
Surr: d12-Chrysene	76.1	-		N/A	%	-	07-NOV-14	08-NOV-14	R3064696
Major Ions & Trace Dissolved Metals									
Chloride by IC									
Chloride (Cl)	149	+/-8.4	RRV	2.5	mg/L	0		06-NOV-14	R3059450
Dissolved Metals in Water by CRC ICPMS									
Aluminum (Al)-Dissolved	0.0087	+/-0.0014	DLM	0.0050	mg/L	0		17-NOV-14	R3082308
Antimony (Sb)-Dissolved	0.00090	+/-0.00009	DLM	0.00050	mg/L	0		17-NOV-14	R3082308
Arsenic (As)-Dissolved	0.00590	+/-0.00062	DLM	0.00050	mg/L	0		17-NOV-14	R3082308
Barium (Ba)-Dissolved	0.0747	+/-0.0065	DLM	0.0050	mg/L	0		17-NOV-14	R3082308
Boron (B)-Dissolved	3.29	+/-0.40	DLM	0.050	mg/L	0		17-NOV-14	R3082308
Cadmium (Cd)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		16-NOV-14	R3080811
Calcium (Ca)-Dissolved	7.84	+/-1.1	DLM	0.50	mg/L	0		17-NOV-14	R3082308
Chromium (Cr)-Dissolved	<0.0050	-	DLM	0.0050	mg/L	-		17-NOV-14	R3082308
Copper (Cu)-Dissolved	0.0065	+/-0.0005	DLM	0.0010	mg/L	0		17-NOV-14	R3082308
Iron (Fe)-Dissolved	1.03	+/-0.093	DLM	0.050	mg/L	0		17-NOV-14	R3082308
Lead (Pb)-Dissolved	0.00523	+/-0.00049	DLM	0.00025	mg/L	0		17-NOV-14	R3082308
Magnesium (Mg)-Dissolved	6.80	+/-0.53	DLM	0.10	mg/L	0		17-NOV-14	R3082308
Manganese (Mn)-Dissolved	0.0556	+/-0.0038	DLM	0.0020	mg/L	0		17-NOV-14	R3082308
Nickel (Ni)-Dissolved	0.0069	+/-0.0006	DLM	0.0020	mg/L	0		17-NOV-14	R3082308
Potassium (K)-Dissolved	6.24	+/-0.48	DLM	0.25	mg/L	0		17-NOV-14	R3082308
Selenium (Se)-Dissolved	<0.00050	-	DLM	0.00050	mg/L	-		16-NOV-14	R3080811
Silicon (Si)-Dissolved	3.08	+/-0.26	DLM	0.25	mg/L	0		17-NOV-14	R3082308
Silver (Ag)-Dissolved	<0.00010	-	DLM	0.00010	mg/L	-		17-NOV-14	R3082308
Sodium (Na)-Dissolved	978	+/-69	DLM	1.0	mg/L	0		17-NOV-14	R3082308
Uranium (U)-Dissolved	0.00011	+/-0.00001	DLM	0.00010	mg/L	0		16-NOV-14	R3080811
Zinc (Zn)-Dissolved	0.0119	+/-0.0014	DLM	0.0050	mg/L	0		17-NOV-14	R3082308
Ion Balance Calculation									
Ion Balance	99.6	-			%	-		17-NOV-14	
TDS (Calculated)	2420	-			mg/L	-		17-NOV-14	
Hardness (as CaCO3)	47.6	-			mg/L	-		17-NOV-14	
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved	0.0000109	-	RRV	0.000005	mg/L	-		16-NOV-14	R3079330
				0					
Nitrate as N by IC									
Nitrate (as N)	<0.25	-	DLM	0.25	mg/L	-		06-NOV-14	R3059450
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.27	-		0.27	mg/L	-		13-NOV-14	
Nitrite as N by IC									
Nitrite (as N)	<0.10	-	DLM	0.10	mg/L	-		06-NOV-14	R3059450
Sulfate by IC									
Sulfate (SO4)	206	+/-12	RRV	2.5	mg/L	0		06-NOV-14	R3059450
pH, Conductivity and Total Alkalinity									
pH	9.08	+/-0.01		0.10	pH	0		13-NOV-14	R3068828
Conductivity (EC)	3740	+/-190		0.20	uS/cm	0		13-NOV-14	R3068828

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1542752-16 16053141104035 Sampled By: JL/DP on 04-NOV-14 @ 12:19 Matrix: H2O									
pH, Conductivity and Total Alkalinity									
Bicarbonate (HCO3)	1790	+/-67		5.0	mg/L	0		13-NOV-14	R3068828
Carbonate (CO3)	185	+/-24		5.0	mg/L	0		13-NOV-14	R3068828
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		13-NOV-14	R3068828
Alkalinity, Total (as CaCO3)	1780	+/-110		2.0	mg/L	0		13-NOV-14	R3068828
Silicon (reported as Silica)									
Dissolved Silicon (reported as Silica)									
Silicon (as SiO2)-Dissolved	6.58	-		0.53	mg/L	-		17-NOV-14	
L1542752-17 16053141104036 Sampled By: JL/DP on 04-NOV-14 @ 16:00 Matrix: H2O									
BTEX, Styrene and F1 (C6-C10)									
Benzene	<0.00050	-		0.00050	mg/L	-	10-NOV-14	10-NOV-14	R3068488
Toluene	<0.00050	-		0.00050	mg/L	-	10-NOV-14	10-NOV-14	R3068488
EthylBenzene	<0.00050	-		0.00050	mg/L	-	10-NOV-14	10-NOV-14	R3068488
o-Xylene	<0.00050	-		0.00050	mg/L	-	10-NOV-14	10-NOV-14	R3068488
m+p-Xylene	<0.00050	-		0.00050	mg/L	-	10-NOV-14	10-NOV-14	R3068488
Styrene	<0.0010	-		0.0010	mg/L	-	10-NOV-14	10-NOV-14	R3068488
F1(C6-C10)	<0.10	-		0.10	mg/L	-	10-NOV-14	10-NOV-14	R3068488
F1-BTEX	<0.10	-		0.10	mg/L	-	10-NOV-14	10-NOV-14	R3068488
Xylenes	<0.00071	-		0.00071	mg/L	-	10-NOV-14	10-NOV-14	R3068488
Surr: 1,4-Difluorobenzene (SS)	98.0	-		N/A	%	-	10-NOV-14	10-NOV-14	R3068488
Surr: 4-Bromofluorobenzene (SS)	85.0	-		N/A	%	-	10-NOV-14	10-NOV-14	R3068488
Surr: 3,4-Dichlorotoluene (SS)	90.0	-		N/A	%	-	10-NOV-14	10-NOV-14	R3068488
* Refer to Referenced Information for Qualifiers (if any) and Methodology.									

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Mercury (Hg)-Dissolved	K	
Comments:	resubsampled, respiked, redigested and RRV		
Matrix Spike	Sulfate (SO4)	MS-B	
Matrix Spike	Chloride (Cl)	MS-B	
Matrix Spike	Chloride (Cl)	MS-B	

Sample Parameter Qualifier Key:

Qualifier	Description
BL:INT	Balance Reviewed: Interference Or Non-Measured Component
D	The analyte has been reported from a dilution of the original extract.
DLA	Detection Limit adjusted for required dilution
DLM	Detection Limit Adjusted due to sample matrix effects.
K	Matrix Spike recovery outside ALS DQO due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis
SMI	Surrogate recovery could not be measured due to sample matrix interference.

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
BTXS,F1-ED	Water	BTEX, Styrene and F1 (C6-C10)		EPA 5021/8015&8260 GC-MS & FID
C-DIS-ORG-ED	Water	Dissolved Organic Carbon		APHA 5310 B-Instrumental
CL-IC-ED	Water	Chloride by IC		APHA 4110 B-ION CHROMATOGRAPHY
F2,F3,F4-ED	Water	F2, F3, F4		EPA 3510/CCME PHC CWS-GC-FID
HG-D-L-CVAA-ED	Water	Mercury (Hg) - Dissolved		EPA 245.7 / EPA 245.1
HG-T-L-CVAA-ED	Water	Mercury (Hg)		EPA 245.7 / EPA 245.1
IONBALANCE-ED	Water	Ion Balance Calculation		APHA 1030E
MET-D-CCMS-ED	Water	Dissolved Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS		APHA 3030 B&E / EPA SW-846 6020A
NAPHTHENIC-ACID-FM	Water	Naphthenic Acids by FTIR		Naphthenic Acids by FTIR, Syncrude, 1994
Dissolved naphthenic acids are solvent extracted from acidified aqueous samples using Dichloromethane prior to quantitation by Fourier Transform Infra-Red spectroscopy. Note that FTIR is not uniquely selective to naphthenic acids. If present, other carboxylic acids (e.g. humic acids, fulvic acids) may also be detected by this method.				
NH3-CFA-ED	Water	Ammonia in Water by Colour		APHA 4500 NH3-NITROGEN (AMMONIA)
This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.				
NO2+NO3-CALC-ED	Water	Nitrate+Nitrite		CALCULATION
NO2-IC-ED	Water	Nitrite as N by IC		APHA 4110 B-ION CHROMATOGRAPHY
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
NO3-IC-ED	Water	Nitrate as N by IC		APHA 4110 B-ION CHROMATOGRAPHY
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".				
PAH-ABT1-CL	Water	PAH & Carcinogenic PAH List		EPA 3510/8270-GC/MS
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity		APHA 4500-H, 2510, 2320
All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)				
PHENOLS-4AAP-ED	Water	Phenols (4AAP)		AB ENV.06537-COLORIMETRIC

This analysis is carried out using procedures adapted from ENVIRODAT VMV 06537 689, Method Code 154, in "Methods Manual for Chemical Analysis of Water and Wastes" published by the Alberta Environmental Centre. This automated method is based on the distillation of phenol and subsequent

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
		reaction of the distillate with alkaline ferricyanide and 4-aminoantipyrine to form a red complex which is measured at 505 nm.		
SIO2-D-CALC-ED	Water	Dissolved Silicon (reported as Silica)		CALCULATION
SIO2-T-CALC-ED	Water	Total Silicon (reported as Silica)		CALCULATION
SO4-IC-ED	Water	Sulfate by IC		APHA 4110 B-ION CHROMATOGRAPHY
SOLIDS-TDS-ED	Water	Total Dissolved Solids		APHA 2540 C
TURBIDITY-ED	Water	Turbidity		APHA 2130 B-Nephelometer

** The indicated Method Reference is the closest nationally or internationally recognized reference for the applicable ALS test method. ALS methods may incorporate modifications from the specified reference to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
FM	ALS ENVIRONMENTAL - FORT MCMURRAY, ALBERTA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

M050669	M050681
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GLOSSARY OF REPORT TERMS

Surr - Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

MU: Measurement Uncertainty. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 which gives a level of confidence of approximately 95%.

Bias: The reported method bias is the average long term deviation from the target value for a long term reference or control sample, measured in percent.

Zero values indicate no detectable method bias.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 1 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R3060948							
WG1991550-4	DUP	L1542752-15						
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	07-NOV-14
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	07-NOV-14
EthylBenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	07-NOV-14
o-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	07-NOV-14
m+p-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	07-NOV-14
Styrene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	50	07-NOV-14
F1(C6-C10)		<0.10	<0.10	RPD-NA	mg/L	N/A	30	07-NOV-14
WG1991550-2	LCS							
Benzene			78.2		%		70-130	07-NOV-14
Toluene			75.7		%		70-130	07-NOV-14
EthylBenzene			74.1		%		70-130	07-NOV-14
o-Xylene			74.7		%		70-130	07-NOV-14
m+p-Xylene			75.1		%		70-130	07-NOV-14
Styrene			77.7		%		70-130	07-NOV-14
WG1991550-3	LCS							
F1(C6-C10)			86.5		%		70-130	07-NOV-14
WG1991550-6	LCS							
Benzene			74.6		%		70-130	07-NOV-14
Toluene			71.7		%		70-130	07-NOV-14
EthylBenzene			70.5		%		70-130	07-NOV-14
o-Xylene			92.1		%		70-130	07-NOV-14
m+p-Xylene			74.3		%		70-130	07-NOV-14
Styrene			101.3		%		70-130	07-NOV-14
WG1991550-7	LCS							
F1(C6-C10)			89.9		%		70-130	07-NOV-14
WG1991550-1	MB							
Benzene			<0.00050		mg/L		0.0005	07-NOV-14
Toluene			<0.00050		mg/L		0.0005	07-NOV-14
EthylBenzene			<0.00050		mg/L		0.0005	07-NOV-14
o-Xylene			<0.00050		mg/L		0.0005	07-NOV-14
m+p-Xylene			<0.00050		mg/L		0.0005	07-NOV-14
Styrene			<0.0010		mg/L		0.001	07-NOV-14
F1(C6-C10)			<0.10		mg/L		0.1	07-NOV-14
Surrogate: 1,4-Difluorobenzene (SS)			100.0		%		70-130	07-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 2 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R3060948							
WG1991550-1	MB							
Surrogate: 4-Bromofluorobenzene (SS)			88.0		%		70-130	07-NOV-14
Surrogate: 3,4-Dichlorotoluene (SS)			105.0		%		70-130	07-NOV-14
WG1991550-5	MB							
Benzene			<0.00050		mg/L		0.0005	07-NOV-14
Toluene			<0.00050		mg/L		0.0005	07-NOV-14
EthylBenzene			<0.00050		mg/L		0.0005	07-NOV-14
o-Xylene			<0.00050		mg/L		0.0005	07-NOV-14
m+p-Xylene			<0.00050		mg/L		0.0005	07-NOV-14
Styrene			<0.0010		mg/L		0.001	07-NOV-14
F1(C6-C10)			<0.10		mg/L		0.1	07-NOV-14
Surrogate: 1,4-Difluorobenzene (SS)			101.0		%		70-130	07-NOV-14
Surrogate: 4-Bromofluorobenzene (SS)			111.0		%		70-130	07-NOV-14
Surrogate: 3,4-Dichlorotoluene (SS)			81.0		%		70-130	07-NOV-14
Batch	R3068488							
WG1992738-2	LCS							
Benzene			91.0		%		70-130	13-NOV-14
Toluene			93.6		%		70-130	13-NOV-14
EthylBenzene			91.2		%		70-130	13-NOV-14
o-Xylene			86.4		%		70-130	13-NOV-14
m+p-Xylene			91.2		%		70-130	13-NOV-14
Styrene			86.7		%		70-130	13-NOV-14
WG1992738-3	LCS							
F1(C6-C10)			80.7		%		70-130	13-NOV-14
WG1992738-6	LCS							
Benzene			83.6		%		70-130	13-NOV-14
Toluene			91.9		%		70-130	13-NOV-14
EthylBenzene			89.6		%		70-130	13-NOV-14
o-Xylene			73.2		%		70-130	13-NOV-14
m+p-Xylene			90.1		%		70-130	13-NOV-14
Styrene			76.1		%		70-130	13-NOV-14
WG1992738-7	LCS							
F1(C6-C10)			86.3		%		70-130	13-NOV-14
WG1992738-1	MB							
Benzene			<0.00050		mg/L		0.0005	13-NOV-14
Toluene			<0.00050		mg/L		0.0005	13-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 3 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R3068488							
WG1992738-1	MB							
EthylBenzene			<0.00050		mg/L		0.0005	13-NOV-14
o-Xylene			<0.00050		mg/L		0.0005	13-NOV-14
m+p-Xylene			<0.00050		mg/L		0.0005	13-NOV-14
Styrene			<0.0010		mg/L		0.001	13-NOV-14
F1(C6-C10)			<0.10		mg/L		0.1	13-NOV-14
Surrogate: 1,4-Difluorobenzene (SS)			97.5		%		70-130	13-NOV-14
Surrogate: 4-Bromofluorobenzene (SS)			83.8		%		70-130	13-NOV-14
Surrogate: 3,4-Dichlorotoluene (SS)			94.5		%		70-130	13-NOV-14
WG1992738-5	MB							
Benzene			<0.00050		mg/L		0.0005	10-NOV-14
Toluene			<0.00050		mg/L		0.0005	10-NOV-14
EthylBenzene			<0.00050		mg/L		0.0005	10-NOV-14
o-Xylene			<0.00050		mg/L		0.0005	10-NOV-14
m+p-Xylene			<0.00050		mg/L		0.0005	10-NOV-14
Styrene			<0.0010		mg/L		0.001	10-NOV-14
F1(C6-C10)			<0.10		mg/L		0.1	10-NOV-14
Surrogate: 1,4-Difluorobenzene (SS)			101.0		%		70-130	10-NOV-14
Surrogate: 4-Bromofluorobenzene (SS)			91.0		%		70-130	10-NOV-14
Surrogate: 3,4-Dichlorotoluene (SS)			96.0		%		70-130	10-NOV-14
C-DIS-ORG-ED		Water						
Batch	R3068336							
WG1993697-3	CVS							
Dissolved Organic Carbon			101.2		%		80-160	10-NOV-14
WG1993697-4	DUP	L1543816-17						
Dissolved Organic Carbon		<1.0	<1.0	RPD-NA	mg/L	N/A	20	10-NOV-14
WG1993697-6	DUP	L1544043-3						
Dissolved Organic Carbon		8.3	8.2		mg/L	0.5	20	11-NOV-14
WG1993697-2	LCS							
Dissolved Organic Carbon			96.4		%		80-120	10-NOV-14
WG1993697-1	MB							
Dissolved Organic Carbon			<1.0		mg/L		1	10-NOV-14
WG1993697-5	MS	L1543816-17						
Dissolved Organic Carbon			107.3		%		70-130	10-NOV-14
WG1993697-7	MS	L1544043-3						
Dissolved Organic Carbon			93.6		%		70-130	11-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 4 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-ED		Water						
Batch	R3059450							
WG1990897-11	DUP	L1543229-5						
Chloride (Cl)		36.2	36.2		mg/L	0.1	20	06-NOV-14
WG1990897-3	DUP	L1543214-2						
Chloride (Cl)		10.8	10.8		mg/L	0.1	20	06-NOV-14
WG1990897-7	DUP	L1543228-12						
Chloride (Cl)		156	156		mg/L	0.0	20	06-NOV-14
WG1990897-13	LCS							
Chloride (Cl)			102.8		%		90-110	06-NOV-14
WG1990897-2	LCS							
Chloride (Cl)			102.9		%		90-110	06-NOV-14
WG1990897-5	LCS							
Chloride (Cl)			102.9		%		90-110	06-NOV-14
WG1990897-9	LCS							
Chloride (Cl)			103.4		%		90-110	06-NOV-14
WG1990897-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	06-NOV-14
WG1990897-10	MB							
Chloride (Cl)			<0.50		mg/L		0.5	06-NOV-14
WG1990897-14	MB							
Chloride (Cl)			<0.50		mg/L		0.5	06-NOV-14
WG1990897-6	MB							
Chloride (Cl)			<0.50		mg/L		0.5	06-NOV-14
WG1990897-12	MS	L1543229-5						
Chloride (Cl)			99.6		%		75-125	06-NOV-14
WG1990897-4	MS	L1543214-2						
Chloride (Cl)			96.2		%		75-125	06-NOV-14
WG1990897-8	MS	L1543228-12						
Chloride (Cl)			N/A	MS-B	%		-	06-NOV-14
Batch	R3070496							
WG1993960-5	DUP	L1545161-1						
Chloride (Cl)		12.3	12.3		mg/L	0.0	20	12-NOV-14
WG1993960-11	LCS							
Chloride (Cl)			103.6		%		90-110	12-NOV-14
WG1993960-13	LCS							
Chloride (Cl)			104.2		%		90-110	12-NOV-14
WG1993960-2	LCS							
Chloride (Cl)			102.7		%		90-110	12-NOV-14
WG1993960-3	LCS							



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 5 of 45

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-ED		Water						
Batch	R3070496							
WG1993960-3	LCS							
Chloride (Cl)			102.9		%		90-110	12-NOV-14
WG1993960-9	LCS							
Chloride (Cl)			103.5		%		90-110	12-NOV-14
WG1993960-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	12-NOV-14
WG1993960-10	MB							
Chloride (Cl)			<0.50		mg/L		0.5	12-NOV-14
WG1993960-12	MB							
Chloride (Cl)			<0.50		mg/L		0.5	12-NOV-14
WG1993960-14	MB							
Chloride (Cl)			<0.50		mg/L		0.5	12-NOV-14
WG1993960-4	MB							
Chloride (Cl)			<0.50		mg/L		0.5	12-NOV-14
WG1993960-6	MS	L1545161-1						
Chloride (Cl)			102.1		%		75-125	12-NOV-14
Batch	R3076830							
WG1995290-9	DUP	L1545754-6						
Chloride (Cl)		129	128		mg/L	0.3	20	13-NOV-14
WG1995290-2	LCS							
Chloride (Cl)			101.5		%		90-110	13-NOV-14
WG1995290-3	LCS							
Chloride (Cl)			101.5		%		90-110	13-NOV-14
WG1995290-5	LCS							
Chloride (Cl)			101.8		%		90-110	13-NOV-14
WG1995290-7	LCS							
Chloride (Cl)			102.1		%		90-110	13-NOV-14
WG1995290-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	14-NOV-14
WG1995290-4	MB							
Chloride (Cl)			<0.50		mg/L		0.5	13-NOV-14
WG1995290-6	MB							
Chloride (Cl)			<0.50		mg/L		0.5	13-NOV-14
WG1995290-8	MB							
Chloride (Cl)			<0.50		mg/L		0.5	13-NOV-14
WG1995290-10	MS	L1545754-6						
Chloride (Cl)			N/A	MS-B	%		-	13-NOV-14

F2,F3,F4-ED **Water**



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 6 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F2,F3,F4-ED		Water						
Batch	R3069629							
WG1992628-2	LCS							
F2 (>C10-C16)			90.5		%		70-130	10-NOV-14
F3 (C16-C34)			91.6		%		70-130	10-NOV-14
F4 (C34-C50)			90.4		%		70-130	10-NOV-14
WG1992628-5	LCS							
F2 (>C10-C16)			98.5		%		70-130	12-NOV-14
F3 (C16-C34)			98.4		%		70-130	12-NOV-14
F4 (C34-C50)			92.1		%		70-130	12-NOV-14
WG1992628-1	MB							
F2 (>C10-C16)			<0.25		mg/L		0.25	10-NOV-14
F3 (C16-C34)			<0.25		mg/L		0.25	10-NOV-14
F4 (C34-C50)			<0.25		mg/L		0.25	10-NOV-14
Surrogate: 2-Bromobenzotrifluoride			98.7		%		60-140	10-NOV-14
WG1992628-4	MB							
F2 (>C10-C16)			<0.25		mg/L		0.25	12-NOV-14
F3 (C16-C34)			<0.25		mg/L		0.25	12-NOV-14
F4 (C34-C50)			<0.25		mg/L		0.25	12-NOV-14
Surrogate: 2-Bromobenzotrifluoride			99.2		%		60-140	12-NOV-14
WG1992628-3	MS	L1542437-1						
F2 (>C10-C16)			90.4		%		60-140	10-NOV-14
F3 (C16-C34)			91.2		%		60-140	10-NOV-14
F4 (C34-C50)			89.0		%		60-140	10-NOV-14
WG1992628-6	MS	L1543181-3						
F2 (>C10-C16)			97.2		%		60-140	12-NOV-14
F3 (C16-C34)			97.7		%		60-140	12-NOV-14
F4 (C34-C50)			91.7		%		60-140	12-NOV-14
HG-D-L-CVAA-ED		Water						
Batch	R3079330							
WG1996492-11	DUP	L1544311-11						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	15-NOV-14
WG1996492-15	DUP	L1544314-11						
Mercury (Hg)-Dissolved		0.0000064	<0.0000050	RPD-NA	mg/L	N/A	20	15-NOV-14
WG1996492-3	DUP	L1542437-4						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	15-NOV-14
WG1996492-7	DUP	L1544032-10						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	15-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 7 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-L-CVAA-ED		Water						
Batch	R3079330							
WG1996492-10	LCS							
Mercury (Hg)-Dissolved			98.7		%		80-120	15-NOV-14
WG1996492-14	LCS							
Mercury (Hg)-Dissolved			99.4		%		80-120	15-NOV-14
WG1996492-2	LCS							
Mercury (Hg)-Dissolved			98.8		%		80-120	15-NOV-14
WG1996492-6	LCS							
Mercury (Hg)-Dissolved			98.9		%		80-120	15-NOV-14
WG1996492-1	MB							
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	15-NOV-14
WG1996492-13	MB							
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	15-NOV-14
WG1996492-5	MB							
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	15-NOV-14
WG1996492-9	MB							
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	15-NOV-14
WG1996492-12	MS	L1544311-11						
Mercury (Hg)-Dissolved			94.2		%		70-130	15-NOV-14
WG1996492-16	MS	L1544314-11						
Mercury (Hg)-Dissolved			97.7		%		70-130	15-NOV-14
WG1996492-4	MS	L1542437-4						
Mercury (Hg)-Dissolved			53.6	K	%		70-130	15-NOV-14
COMMENTS: resubsampled, respiked, redigested and RRV								
WG1996492-8	MS	L1544032-10						
Mercury (Hg)-Dissolved			83.4		%		70-130	15-NOV-14
HG-T-L-CVAA-ED		Water						
Batch	R3079330							
WG1996493-3	DUP	L1542752-15						
Mercury (Hg)-Total		0.0000111	0.0000116		mg/L	4.4	20	15-NOV-14
WG1996493-2	LCS							
Mercury (Hg)-Total			102.7		%		80-120	15-NOV-14
WG1996493-1	MB							
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	15-NOV-14
WG1996493-4	MS	L1542752-15						
Mercury (Hg)-Total			84.6		%		70-130	15-NOV-14
MET-D-CCMS-ED	Water							



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 8 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R3080811							
WG1996716-2 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			101.1		%		80-120	16-NOV-14
Antimony (Sb)-Dissolved			92.6		%		80-120	16-NOV-14
Arsenic (As)-Dissolved			92.5		%		80-120	16-NOV-14
Barium (Ba)-Dissolved			103.7		%		80-120	16-NOV-14
Boron (B)-Dissolved			91.7		%		80-120	16-NOV-14
Cadmium (Cd)-Dissolved			100.9		%		80-120	16-NOV-14
Calcium (Ca)-Dissolved			101.8		%		80-120	16-NOV-14
Chromium (Cr)-Dissolved			103.6		%		80-120	16-NOV-14
Copper (Cu)-Dissolved			97.6		%		80-120	16-NOV-14
Iron (Fe)-Dissolved			99.4		%		80-120	16-NOV-14
Lead (Pb)-Dissolved			104.3		%		80-120	16-NOV-14
Magnesium (Mg)-Dissolved			103.2		%		80-120	16-NOV-14
Manganese (Mn)-Dissolved			99.5		%		80-120	16-NOV-14
Nickel (Ni)-Dissolved			100.7		%		80-120	16-NOV-14
Potassium (K)-Dissolved			104.3		%		80-120	16-NOV-14
Selenium (Se)-Dissolved			91.4		%		80-120	16-NOV-14
Silicon (Si)-Dissolved			92.6		%		80-120	16-NOV-14
Silver (Ag)-Dissolved			98.5		%		80-120	16-NOV-14
Sodium (Na)-Dissolved			98.1		%		80-120	16-NOV-14
Uranium (U)-Dissolved			99.2		%		80-120	16-NOV-14
Zinc (Zn)-Dissolved			99.0		%		80-120	16-NOV-14
WG1996716-5 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			101.8		%		80-120	16-NOV-14
Antimony (Sb)-Dissolved			92.1		%		80-120	16-NOV-14
Arsenic (As)-Dissolved			91.9		%		80-120	16-NOV-14
Barium (Ba)-Dissolved			106.3		%		80-120	16-NOV-14
Boron (B)-Dissolved			91.5		%		80-120	16-NOV-14
Cadmium (Cd)-Dissolved			99.7		%		80-120	16-NOV-14
Calcium (Ca)-Dissolved			103.2		%		80-120	16-NOV-14
Chromium (Cr)-Dissolved			101.3		%		80-120	16-NOV-14
Copper (Cu)-Dissolved			97.8		%		80-120	16-NOV-14
Iron (Fe)-Dissolved			100.0		%		80-120	16-NOV-14
Lead (Pb)-Dissolved			99.6		%		80-120	16-NOV-14
Magnesium (Mg)-Dissolved			99.5		%		80-120	16-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 9 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R3080811							
WG1996716-5 CRM	ED-HIGH-WATRM							
Manganese (Mn)-Dissolved			99.9		%		80-120	16-NOV-14
Nickel (Ni)-Dissolved			99.6		%		80-120	16-NOV-14
Potassium (K)-Dissolved			102.9		%		80-120	16-NOV-14
Selenium (Se)-Dissolved			92.2		%		80-120	16-NOV-14
Silicon (Si)-Dissolved			93.0		%		80-120	16-NOV-14
Silver (Ag)-Dissolved			99.0		%		80-120	16-NOV-14
Sodium (Na)-Dissolved			97.2		%		80-120	16-NOV-14
Uranium (U)-Dissolved			99.8		%		80-120	16-NOV-14
Zinc (Zn)-Dissolved			102.3		%		80-120	16-NOV-14
WG1996716-3 DUP	L1542752-2							
Aluminum (Al)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	16-NOV-14
Antimony (Sb)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	16-NOV-14
Arsenic (As)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	16-NOV-14
Barium (Ba)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	16-NOV-14
Boron (B)-Dissolved		1.71	1.72		mg/L	0.4	20	16-NOV-14
Cadmium (Cd)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	16-NOV-14
Calcium (Ca)-Dissolved		2.19	2.21		mg/L	0.8	20	16-NOV-14
Chromium (Cr)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	16-NOV-14
Copper (Cu)-Dissolved		0.0015	0.0015		mg/L	0.7	20	16-NOV-14
Iron (Fe)-Dissolved		0.033	0.032		mg/L	2.0	20	16-NOV-14
Lead (Pb)-Dissolved		0.00051	0.00052		mg/L	1.2	20	16-NOV-14
Magnesium (Mg)-Dissolved		12.6	12.7		mg/L	0.8	20	16-NOV-14
Manganese (Mn)-Dissolved		0.0022	0.0022		mg/L	1.4	20	16-NOV-14
Nickel (Ni)-Dissolved		0.0021	0.0021		mg/L	0.5	20	16-NOV-14
Potassium (K)-Dissolved		22.4	22.2		mg/L	1.2	20	16-NOV-14
Selenium (Se)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	16-NOV-14
Silicon (Si)-Dissolved		1.49	1.43		mg/L	4.4	20	16-NOV-14
Silver (Ag)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	16-NOV-14
Sodium (Na)-Dissolved		311	310		mg/L	0.3	20	16-NOV-14
Uranium (U)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	16-NOV-14
Zinc (Zn)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	16-NOV-14
WG1996716-6 DUP	L1544314-10							
Aluminum (Al)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	16-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 10 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R3080811							
WG1996716-6	DUP	L1544314-10						
Antimony (Sb)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	16-NOV-14
Arsenic (As)-Dissolved		0.00094	0.00094		mg/L	0.7	20	16-NOV-14
Barium (Ba)-Dissolved		0.341	0.328		mg/L	3.7	20	16-NOV-14
Boron (B)-Dissolved		0.039	0.039		mg/L	0.2	20	16-NOV-14
Cadmium (Cd)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	16-NOV-14
Calcium (Ca)-Dissolved		97.0	96.4		mg/L	0.7	20	16-NOV-14
Chromium (Cr)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	16-NOV-14
Copper (Cu)-Dissolved		<0.00060	<0.00060	RPD-NA	mg/L	N/A	20	16-NOV-14
Iron (Fe)-Dissolved		0.048	0.048		mg/L	0.1	20	16-NOV-14
Lead (Pb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	16-NOV-14
Magnesium (Mg)-Dissolved		29.3	29.1		mg/L	0.6	20	16-NOV-14
Manganese (Mn)-Dissolved		0.139	0.141		mg/L	1.4	20	16-NOV-14
Nickel (Ni)-Dissolved		0.00153	0.00158		mg/L	2.8	20	16-NOV-14
Potassium (K)-Dissolved		1.85	1.87		mg/L	0.8	20	16-NOV-14
Selenium (Se)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	16-NOV-14
Silicon (Si)-Dissolved		5.12	5.05		mg/L	1.3	20	16-NOV-14
Silver (Ag)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	16-NOV-14
Sodium (Na)-Dissolved		29.9	29.6		mg/L	1.1	20	16-NOV-14
Uranium (U)-Dissolved		0.00088	0.00086		mg/L	2.8	20	16-NOV-14
Zinc (Zn)-Dissolved		<0.0010	0.0012	RPD-NA	mg/L	N/A	20	16-NOV-14
WG1996716-1	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	16-NOV-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	16-NOV-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	16-NOV-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	16-NOV-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	16-NOV-14
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	16-NOV-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	16-NOV-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	16-NOV-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	16-NOV-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	16-NOV-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	16-NOV-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	16-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 11 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R3080811							
WG1996716-1 MB								
	Manganese (Mn)-Dissolved		<0.000050		mg/L		0.00005	16-NOV-14
	Nickel (Ni)-Dissolved		<0.00010		mg/L		0.0001	16-NOV-14
	Potassium (K)-Dissolved		<0.050		mg/L		0.05	16-NOV-14
	Selenium (Se)-Dissolved		<0.00010		mg/L		0.0001	16-NOV-14
	Silicon (Si)-Dissolved		<0.050		mg/L		0.05	16-NOV-14
	Silver (Ag)-Dissolved		<0.000010		mg/L		0.00001	16-NOV-14
	Sodium (Na)-Dissolved		<0.050		mg/L		0.05	16-NOV-14
	Uranium (U)-Dissolved		<0.000010		mg/L		0.00001	16-NOV-14
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	16-NOV-14
WG1996716-4 MB								
	Aluminum (Al)-Dissolved		<0.0010		mg/L		0.001	16-NOV-14
	Antimony (Sb)-Dissolved		<0.00010		mg/L		0.0001	16-NOV-14
	Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	16-NOV-14
	Barium (Ba)-Dissolved		<0.000050		mg/L		0.00005	16-NOV-14
	Boron (B)-Dissolved		<0.010		mg/L		0.01	16-NOV-14
	Cadmium (Cd)-Dissolved		<0.000010		mg/L		0.00001	16-NOV-14
	Calcium (Ca)-Dissolved		<0.020		mg/L		0.02	16-NOV-14
	Chromium (Cr)-Dissolved		<0.00010		mg/L		0.0001	16-NOV-14
	Copper (Cu)-Dissolved		<0.00010		mg/L		0.0001	16-NOV-14
	Iron (Fe)-Dissolved		<0.010		mg/L		0.01	16-NOV-14
	Lead (Pb)-Dissolved		<0.000050		mg/L		0.00005	16-NOV-14
	Magnesium (Mg)-Dissolved		<0.0050		mg/L		0.005	16-NOV-14
	Manganese (Mn)-Dissolved		<0.000050		mg/L		0.00005	16-NOV-14
	Nickel (Ni)-Dissolved		<0.00010		mg/L		0.0001	16-NOV-14
	Potassium (K)-Dissolved		<0.050		mg/L		0.05	16-NOV-14
	Selenium (Se)-Dissolved		<0.00010		mg/L		0.0001	16-NOV-14
	Silicon (Si)-Dissolved		<0.050		mg/L		0.05	16-NOV-14
	Silver (Ag)-Dissolved		<0.000010		mg/L		0.00001	16-NOV-14
	Sodium (Na)-Dissolved		<0.050		mg/L		0.05	16-NOV-14
	Uranium (U)-Dissolved		<0.000010		mg/L		0.00001	16-NOV-14
	Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	16-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 12 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R3082308							
WG1997102-11 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			102.7		%		80-120	17-NOV-14
Antimony (Sb)-Dissolved			94.4		%		80-120	17-NOV-14
Arsenic (As)-Dissolved			91.4		%		80-120	17-NOV-14
Barium (Ba)-Dissolved			100.4		%		80-120	17-NOV-14
Boron (B)-Dissolved			100.8		%		80-120	17-NOV-14
Calcium (Ca)-Dissolved			98.3		%		80-120	17-NOV-14
Chromium (Cr)-Dissolved			101.3		%		80-120	17-NOV-14
Copper (Cu)-Dissolved			99.1		%		80-120	17-NOV-14
Iron (Fe)-Dissolved			94.9		%		80-120	17-NOV-14
Lead (Pb)-Dissolved			96.3		%		80-120	17-NOV-14
Magnesium (Mg)-Dissolved			107.8		%		80-120	17-NOV-14
Manganese (Mn)-Dissolved			99.5		%		80-120	17-NOV-14
Nickel (Ni)-Dissolved			99.6		%		80-120	17-NOV-14
Potassium (K)-Dissolved			100.2		%		80-120	17-NOV-14
Silicon (Si)-Dissolved			95.3		%		80-120	17-NOV-14
Silver (Ag)-Dissolved			101.9		%		80-120	17-NOV-14
Sodium (Na)-Dissolved			103.9		%		80-120	17-NOV-14
Zinc (Zn)-Dissolved			98.6		%		80-120	17-NOV-14
WG1997102-14 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			101.8		%		80-120	17-NOV-14
Antimony (Sb)-Dissolved			95.0		%		80-120	17-NOV-14
Arsenic (As)-Dissolved			89.9		%		80-120	17-NOV-14
Barium (Ba)-Dissolved			99.3		%		80-120	17-NOV-14
Boron (B)-Dissolved			87.6		%		80-120	17-NOV-14
Calcium (Ca)-Dissolved			99.1		%		80-120	17-NOV-14
Chromium (Cr)-Dissolved			101.3		%		80-120	17-NOV-14
Copper (Cu)-Dissolved			97.8		%		80-120	17-NOV-14
Iron (Fe)-Dissolved			90.5		%		80-120	17-NOV-14
Lead (Pb)-Dissolved			101.3		%		80-120	17-NOV-14
Magnesium (Mg)-Dissolved			102.0		%		80-120	17-NOV-14
Manganese (Mn)-Dissolved			101.9		%		80-120	17-NOV-14
Nickel (Ni)-Dissolved			101.7		%		80-120	17-NOV-14
Potassium (K)-Dissolved			99.4		%		80-120	17-NOV-14
Silicon (Si)-Dissolved			89.2		%		80-120	17-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 13 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R3082308							
WG1997102-14 CRM	ED-HIGH-WATRM							
Silver (Ag)-Dissolved			102.6		%		80-120	17-NOV-14
Sodium (Na)-Dissolved			112.1		%		80-120	17-NOV-14
Zinc (Zn)-Dissolved			99.4		%		80-120	17-NOV-14
WG1997102-17 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			101.1		%		80-120	17-NOV-14
Antimony (Sb)-Dissolved			93.4		%		80-120	17-NOV-14
Arsenic (As)-Dissolved			88.6		%		80-120	17-NOV-14
Barium (Ba)-Dissolved			99.5		%		80-120	17-NOV-14
Boron (B)-Dissolved			88.2		%		80-120	17-NOV-14
Calcium (Ca)-Dissolved			101.3		%		80-120	17-NOV-14
Chromium (Cr)-Dissolved			101.7		%		80-120	17-NOV-14
Copper (Cu)-Dissolved			96.5		%		80-120	17-NOV-14
Iron (Fe)-Dissolved			90.8		%		80-120	17-NOV-14
Lead (Pb)-Dissolved			101.6		%		80-120	17-NOV-14
Magnesium (Mg)-Dissolved			101.0		%		80-120	17-NOV-14
Manganese (Mn)-Dissolved			101.8		%		80-120	17-NOV-14
Nickel (Ni)-Dissolved			101.2		%		80-120	17-NOV-14
Potassium (K)-Dissolved			98.2		%		80-120	17-NOV-14
Silicon (Si)-Dissolved			90.9		%		80-120	17-NOV-14
Silver (Ag)-Dissolved			105.0		%		80-120	17-NOV-14
Sodium (Na)-Dissolved			106.7		%		80-120	17-NOV-14
Zinc (Zn)-Dissolved			97.5		%		80-120	17-NOV-14
WG1997102-2 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			103.2		%		80-120	17-NOV-14
Antimony (Sb)-Dissolved			92.2		%		80-120	17-NOV-14
Arsenic (As)-Dissolved			91.8		%		80-120	17-NOV-14
Barium (Ba)-Dissolved			100.2		%		80-120	17-NOV-14
Boron (B)-Dissolved			106.1		%		80-120	17-NOV-14
Calcium (Ca)-Dissolved			99.6		%		80-120	17-NOV-14
Chromium (Cr)-Dissolved			102.4		%		80-120	17-NOV-14
Copper (Cu)-Dissolved			100.6		%		80-120	17-NOV-14
Iron (Fe)-Dissolved			94.8		%		80-120	17-NOV-14
Lead (Pb)-Dissolved			95.4		%		80-120	17-NOV-14
Magnesium (Mg)-Dissolved			105.8		%		80-120	17-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 14 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R3082308							
WG1997102-2 CRM	ED-HIGH-WATRM							
Manganese (Mn)-Dissolved			100.2		%		80-120	17-NOV-14
Nickel (Ni)-Dissolved			101.6		%		80-120	17-NOV-14
Potassium (K)-Dissolved			101.2		%		80-120	17-NOV-14
Silicon (Si)-Dissolved			95.7		%		80-120	17-NOV-14
Silver (Ag)-Dissolved			104.1		%		80-120	17-NOV-14
Sodium (Na)-Dissolved			109.0		%		80-120	17-NOV-14
Zinc (Zn)-Dissolved			103.1		%		80-120	17-NOV-14
WG1997102-20 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			102.3		%		80-120	17-NOV-14
Antimony (Sb)-Dissolved			94.1		%		80-120	17-NOV-14
Arsenic (As)-Dissolved			89.8		%		80-120	17-NOV-14
Barium (Ba)-Dissolved			104.0		%		80-120	17-NOV-14
Boron (B)-Dissolved			86.1		%		80-120	17-NOV-14
Calcium (Ca)-Dissolved			99.4		%		80-120	17-NOV-14
Chromium (Cr)-Dissolved			101.7		%		80-120	17-NOV-14
Copper (Cu)-Dissolved			98.7		%		80-120	17-NOV-14
Iron (Fe)-Dissolved			93.9		%		80-120	17-NOV-14
Lead (Pb)-Dissolved			101.2		%		80-120	17-NOV-14
Magnesium (Mg)-Dissolved			102.0		%		80-120	17-NOV-14
Manganese (Mn)-Dissolved			100.9		%		80-120	17-NOV-14
Nickel (Ni)-Dissolved			101.4		%		80-120	17-NOV-14
Potassium (K)-Dissolved			98.8		%		80-120	17-NOV-14
Silicon (Si)-Dissolved			91.0		%		80-120	17-NOV-14
Silver (Ag)-Dissolved			103.0		%		80-120	17-NOV-14
Sodium (Na)-Dissolved			111.4		%		80-120	17-NOV-14
Zinc (Zn)-Dissolved			97.1		%		80-120	17-NOV-14
WG1997102-23 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			101.7		%		80-120	17-NOV-14
Antimony (Sb)-Dissolved			99.0		%		80-120	17-NOV-14
Arsenic (As)-Dissolved			90.6		%		80-120	17-NOV-14
Barium (Ba)-Dissolved			103.3		%		80-120	17-NOV-14
Boron (B)-Dissolved			83.1		%		80-120	17-NOV-14
Calcium (Ca)-Dissolved			99.2		%		80-120	17-NOV-14
Chromium (Cr)-Dissolved			101.6		%		80-120	17-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 15 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R3082308							
WG1997102-23 CRM	ED-HIGH-WATRM							
Copper (Cu)-Dissolved			99.5		%		80-120	17-NOV-14
Iron (Fe)-Dissolved			92.3		%		80-120	17-NOV-14
Lead (Pb)-Dissolved			100.3		%		80-120	17-NOV-14
Magnesium (Mg)-Dissolved			103.1		%		80-120	17-NOV-14
Manganese (Mn)-Dissolved			102.4		%		80-120	17-NOV-14
Nickel (Ni)-Dissolved			102.0		%		80-120	17-NOV-14
Potassium (K)-Dissolved			99.4		%		80-120	17-NOV-14
Silicon (Si)-Dissolved			90.9		%		80-120	17-NOV-14
Silver (Ag)-Dissolved			104.7		%		80-120	17-NOV-14
Sodium (Na)-Dissolved			110.6		%		80-120	17-NOV-14
Zinc (Zn)-Dissolved			100.7		%		80-120	17-NOV-14
WG1997102-5 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			106.2		%		80-120	17-NOV-14
Antimony (Sb)-Dissolved			96.7		%		80-120	17-NOV-14
Arsenic (As)-Dissolved			93.3		%		80-120	17-NOV-14
Barium (Ba)-Dissolved			102.5		%		80-120	17-NOV-14
Boron (B)-Dissolved			104.0		%		80-120	17-NOV-14
Calcium (Ca)-Dissolved			98.7		%		80-120	17-NOV-14
Chromium (Cr)-Dissolved			104.8		%		80-120	17-NOV-14
Copper (Cu)-Dissolved			102.3		%		80-120	17-NOV-14
Iron (Fe)-Dissolved			96.5		%		80-120	17-NOV-14
Lead (Pb)-Dissolved			100.5		%		80-120	17-NOV-14
Magnesium (Mg)-Dissolved			109.4		%		80-120	17-NOV-14
Manganese (Mn)-Dissolved			102.6		%		80-120	17-NOV-14
Nickel (Ni)-Dissolved			103.6		%		80-120	17-NOV-14
Potassium (K)-Dissolved			102.8		%		80-120	17-NOV-14
Silicon (Si)-Dissolved			96.8		%		80-120	17-NOV-14
Silver (Ag)-Dissolved			101.8		%		80-120	17-NOV-14
Sodium (Na)-Dissolved			108.9		%		80-120	17-NOV-14
Zinc (Zn)-Dissolved			104.0		%		80-120	17-NOV-14
WG1997102-8 CRM	ED-HIGH-WATRM							
Aluminum (Al)-Dissolved			97.0		%		80-120	17-NOV-14
Antimony (Sb)-Dissolved			90.8		%		80-120	17-NOV-14
Arsenic (As)-Dissolved			87.7		%		80-120	17-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 16 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R3082308							
WG1997102-8 CRM		ED-HIGH-WATRM						
Barium (Ba)-Dissolved			93.6		%		80-120	17-NOV-14
Boron (B)-Dissolved			99.0		%		80-120	17-NOV-14
Calcium (Ca)-Dissolved			95.5		%		80-120	17-NOV-14
Chromium (Cr)-Dissolved			98.1		%		80-120	17-NOV-14
Copper (Cu)-Dissolved			94.5		%		80-120	17-NOV-14
Iron (Fe)-Dissolved			90.7		%		80-120	17-NOV-14
Lead (Pb)-Dissolved			93.2		%		80-120	17-NOV-14
Magnesium (Mg)-Dissolved			102.5		%		80-120	17-NOV-14
Manganese (Mn)-Dissolved			95.9		%		80-120	17-NOV-14
Nickel (Ni)-Dissolved			96.7		%		80-120	17-NOV-14
Potassium (K)-Dissolved			96.1		%		80-120	17-NOV-14
Silicon (Si)-Dissolved			92.8		%		80-120	17-NOV-14
Silver (Ag)-Dissolved			94.8		%		80-120	17-NOV-14
Sodium (Na)-Dissolved			98.2		%		80-120	17-NOV-14
Zinc (Zn)-Dissolved			96.4		%		80-120	17-NOV-14
WG1997102-12 DUP		L1544848-15						
Aluminum (Al)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	17-NOV-14
Antimony (Sb)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	17-NOV-14
Arsenic (As)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	17-NOV-14
Barium (Ba)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	17-NOV-14
Boron (B)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	17-NOV-14
Calcium (Ca)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	17-NOV-14
Chromium (Cr)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	17-NOV-14
Copper (Cu)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-NOV-14
Iron (Fe)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	20	17-NOV-14
Lead (Pb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-NOV-14
Magnesium (Mg)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	20	17-NOV-14
Manganese (Mn)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	17-NOV-14
Nickel (Ni)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	17-NOV-14
Potassium (K)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	17-NOV-14
Silicon (Si)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	17-NOV-14
Silver (Ag)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-NOV-14
Sodium (Na)-Dissolved		<1.0	<1.0	RPD-NA	mg/L	N/A	20	17-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 17 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R3082308							
WG1997102-12 DUP		L1544848-15						
Zinc (Zn)-Dissolved		<0.0020	0.0020	RPD-NA	mg/L	N/A	20	17-NOV-14
WG1997102-15 DUP		L1543855-1						
Aluminum (Al)-Dissolved		0.0068	0.0065		mg/L	3.5	20	17-NOV-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-NOV-14
Arsenic (As)-Dissolved		0.00053	0.00054		mg/L	2.1	20	17-NOV-14
Barium (Ba)-Dissolved		0.0280	0.0285		mg/L	1.7	20	17-NOV-14
Boron (B)-Dissolved		0.059	0.060		mg/L	0.6	20	17-NOV-14
Calcium (Ca)-Dissolved		28.2	27.6		mg/L	2.2	20	17-NOV-14
Chromium (Cr)-Dissolved		<0.00010	0.00012	RPD-NA	mg/L	N/A	20	17-NOV-14
Copper (Cu)-Dissolved		0.00057	0.00060		mg/L	4.6	20	17-NOV-14
Iron (Fe)-Dissolved		0.420	0.416		mg/L	0.8	20	17-NOV-14
Lead (Pb)-Dissolved		0.000057	0.000058		mg/L	0.9	20	17-NOV-14
Magnesium (Mg)-Dissolved		8.77	8.82		mg/L	0.6	20	17-NOV-14
Manganese (Mn)-Dissolved		0.0208	0.0210		mg/L	0.9	20	17-NOV-14
Nickel (Ni)-Dissolved		0.00115	0.00104		mg/L	10	20	17-NOV-14
Potassium (K)-Dissolved		1.22	1.22		mg/L	0.1	20	17-NOV-14
Silicon (Si)-Dissolved		1.74	1.71		mg/L	1.6	20	17-NOV-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-NOV-14
Sodium (Na)-Dissolved		15.1	15.0		mg/L	0.5	20	17-NOV-14
Zinc (Zn)-Dissolved		0.0016	0.0023	J	mg/L	0.0007	0.002	17-NOV-14
WG1997102-18 DUP		L1545201-2						
Aluminum (Al)-Dissolved		0.0010	0.0019	J	mg/L	0.0008	0.002	17-NOV-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-NOV-14
Arsenic (As)-Dissolved		0.0168	0.0165		mg/L	1.7	20	17-NOV-14
Barium (Ba)-Dissolved		0.0464	0.0465		mg/L	0.3	20	17-NOV-14
Boron (B)-Dissolved		0.270	0.248		mg/L	8.6	20	17-NOV-14
Calcium (Ca)-Dissolved		112	117		mg/L	3.7	20	17-NOV-14
Chromium (Cr)-Dissolved		0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-NOV-14
Copper (Cu)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-NOV-14
Iron (Fe)-Dissolved		1.48	1.46		mg/L	1.3	20	17-NOV-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-NOV-14
Magnesium (Mg)-Dissolved		38.8	37.1		mg/L	4.6	20	17-NOV-14
Manganese (Mn)-Dissolved		0.731	0.704		mg/L	3.8	20	17-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 18 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R3082308							
WG1997102-18	DUP	L1545201-2						
Nickel (Ni)-Dissolved		0.00099	0.00089		mg/L	9.6	20	17-NOV-14
Potassium (K)-Dissolved		3.72	3.61		mg/L	3.0	20	17-NOV-14
Silicon (Si)-Dissolved		9.73	9.57		mg/L	1.6	20	17-NOV-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-NOV-14
Sodium (Na)-Dissolved		80.1	76.6		mg/L	4.5	20	17-NOV-14
Zinc (Zn)-Dissolved		0.0045	0.0043		mg/L	5.9	20	17-NOV-14
WG1997102-21	DUP	L1544378-2						
Aluminum (Al)-Dissolved		0.0013	0.0012		mg/L	2.0	20	17-NOV-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-NOV-14
Arsenic (As)-Dissolved		0.0109	0.0110		mg/L	1.2	20	17-NOV-14
Barium (Ba)-Dissolved		0.515	0.529		mg/L	2.7	20	17-NOV-14
Boron (B)-Dissolved		0.230	0.228		mg/L	0.7	20	17-NOV-14
Calcium (Ca)-Dissolved		91.1	93.5		mg/L	2.6	20	17-NOV-14
Chromium (Cr)-Dissolved		0.00016	0.00016		mg/L	0.6	20	17-NOV-14
Copper (Cu)-Dissolved		0.00100	0.00098		mg/L	1.8	20	17-NOV-14
Iron (Fe)-Dissolved		3.94	3.91		mg/L	0.7	20	17-NOV-14
Lead (Pb)-Dissolved		0.000055	0.000051		mg/L	8.9	20	17-NOV-14
Magnesium (Mg)-Dissolved		22.4	22.6		mg/L	1.0	20	17-NOV-14
Manganese (Mn)-Dissolved		0.158	0.158		mg/L	0.0	20	17-NOV-14
Nickel (Ni)-Dissolved		0.00027	0.00030		mg/L	11	20	17-NOV-14
Potassium (K)-Dissolved		5.47	5.31		mg/L	2.9	20	17-NOV-14
Silicon (Si)-Dissolved		9.04	9.01		mg/L	0.3	20	17-NOV-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-NOV-14
Sodium (Na)-Dissolved		31.3	31.4		mg/L	0.4	20	17-NOV-14
Zinc (Zn)-Dissolved		0.0090	0.0097		mg/L	6.6	20	17-NOV-14
WG1997102-24	DUP	L1544573-1						
Aluminum (Al)-Dissolved		0.0030	0.0029		mg/L	5.1	20	17-NOV-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-NOV-14
Arsenic (As)-Dissolved		0.00075	0.00077		mg/L	3.4	20	17-NOV-14
Barium (Ba)-Dissolved		0.261	0.260		mg/L	0.3	20	17-NOV-14
Boron (B)-Dissolved		0.064	0.063		mg/L	2.2	20	17-NOV-14
Calcium (Ca)-Dissolved		96.6	98.1		mg/L	1.5	20	17-NOV-14
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 19 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R3082308							
WG1997102-24	DUP	L1544573-1						
Copper (Cu)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-NOV-14
Iron (Fe)-Dissolved		3.21	3.21		mg/L	0.1	20	17-NOV-14
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-NOV-14
Magnesium (Mg)-Dissolved		28.8	29.3		mg/L	1.4	20	17-NOV-14
Manganese (Mn)-Dissolved		0.491	0.493		mg/L	0.4	20	17-NOV-14
Nickel (Ni)-Dissolved		0.00064	0.00061		mg/L	6.0	20	17-NOV-14
Potassium (K)-Dissolved		2.38	2.34		mg/L	1.7	20	17-NOV-14
Silicon (Si)-Dissolved		9.81	9.56		mg/L	2.7	20	17-NOV-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-NOV-14
Sodium (Na)-Dissolved		12.1	12.1		mg/L	0.1	20	17-NOV-14
Zinc (Zn)-Dissolved		0.0021	0.0016	J	mg/L	0.0005	0.002	17-NOV-14
WG1997102-3	DUP	L1541474-1						
Aluminum (Al)-Dissolved		0.205	0.207		mg/L	1.0	20	17-NOV-14
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-NOV-14
Arsenic (As)-Dissolved		0.00054	0.00055		mg/L	2.5	20	17-NOV-14
Barium (Ba)-Dissolved		0.111	0.111		mg/L	0.5	20	17-NOV-14
Boron (B)-Dissolved		0.066	0.064		mg/L	3.1	20	17-NOV-14
Calcium (Ca)-Dissolved		78.0	76.2		mg/L	2.3	20	17-NOV-14
Chromium (Cr)-Dissolved		0.00032	0.00035		mg/L	7.5	20	17-NOV-14
Copper (Cu)-Dissolved		0.00075	0.00078		mg/L	3.8	20	17-NOV-14
Iron (Fe)-Dissolved		0.418	0.419		mg/L	0.2	20	17-NOV-14
Lead (Pb)-Dissolved		0.000326	0.000332		mg/L	1.6	20	17-NOV-14
Magnesium (Mg)-Dissolved		35.7	36.1		mg/L	1.1	20	17-NOV-14
Manganese (Mn)-Dissolved		0.0628	0.0626		mg/L	0.3	20	17-NOV-14
Nickel (Ni)-Dissolved		0.00158	0.00158		mg/L	0.1	20	17-NOV-14
Potassium (K)-Dissolved		2.66	2.68		mg/L	0.9	20	17-NOV-14
Silicon (Si)-Dissolved		5.71	5.71		mg/L	0.0	20	17-NOV-14
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-NOV-14
Sodium (Na)-Dissolved		123	124		mg/L	0.6	20	17-NOV-14
Zinc (Zn)-Dissolved		0.0020	0.0022		mg/L	12	20	17-NOV-14
WG1997102-6	DUP	L1544329-18						
Aluminum (Al)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	17-NOV-14
Antimony (Sb)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	17-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 20 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R3082308							
WG1997102-6	DUP	L1544329-18						
Arsenic (As)-Dissolved		<0.00040	<0.00040	RPD-NA	mg/L	N/A	20	17-NOV-14
Barium (Ba)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	17-NOV-14
Boron (B)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	17-NOV-14
Calcium (Ca)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	17-NOV-14
Chromium (Cr)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	17-NOV-14
Copper (Cu)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-NOV-14
Iron (Fe)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	20	17-NOV-14
Lead (Pb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-NOV-14
Magnesium (Mg)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	20	17-NOV-14
Manganese (Mn)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	17-NOV-14
Nickel (Ni)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	17-NOV-14
Potassium (K)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	17-NOV-14
Silicon (Si)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	17-NOV-14
Silver (Ag)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-NOV-14
Sodium (Na)-Dissolved		<1.0	<1.0	RPD-NA	mg/L	N/A	20	17-NOV-14
Zinc (Zn)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	17-NOV-14
WG1997102-1	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	17-NOV-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	17-NOV-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	17-NOV-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	17-NOV-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	17-NOV-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	17-NOV-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	17-NOV-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	17-NOV-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	17-NOV-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	17-NOV-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	17-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 21 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R3082308							
WG1997102-1 MB								
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	17-NOV-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	17-NOV-14
WG1997102-10 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	17-NOV-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	17-NOV-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	17-NOV-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	17-NOV-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	17-NOV-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	17-NOV-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	17-NOV-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	17-NOV-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	17-NOV-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	17-NOV-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	17-NOV-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	17-NOV-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	17-NOV-14
WG1997102-13 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	17-NOV-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	17-NOV-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	17-NOV-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	17-NOV-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	17-NOV-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	17-NOV-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	17-NOV-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	17-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 22 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R3082308							
WG1997102-13 MB								
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	17-NOV-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	17-NOV-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	17-NOV-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	17-NOV-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	17-NOV-14
WG1997102-19 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	17-NOV-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	17-NOV-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	17-NOV-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	17-NOV-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	17-NOV-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	17-NOV-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	17-NOV-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	17-NOV-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	17-NOV-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	17-NOV-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	17-NOV-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	17-NOV-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	17-NOV-14
WG1997102-4 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	17-NOV-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	17-NOV-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	17-NOV-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	17-NOV-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 23 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R3082308							
WG1997102-4 MB								
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	17-NOV-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	17-NOV-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	17-NOV-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	17-NOV-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	17-NOV-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	17-NOV-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	17-NOV-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	17-NOV-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	17-NOV-14
WG1997102-7 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	17-NOV-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	17-NOV-14
Boron (B)-Dissolved			<0.010		mg/L		0.01	17-NOV-14
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	17-NOV-14
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	17-NOV-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	17-NOV-14
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	17-NOV-14
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	17-NOV-14
Nickel (Ni)-Dissolved			<0.00010		mg/L		0.0001	17-NOV-14
Potassium (K)-Dissolved			<0.050		mg/L		0.05	17-NOV-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	17-NOV-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	17-NOV-14
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	17-NOV-14
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	17-NOV-14
MET-T-CCMS-ED								
	Water							
Batch	R3079217							
WG1992335-15 DUP		L1544498-1						
Aluminum (Al)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	16-NOV-14
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	16-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 24 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R3079217							
WG1992335-15 DUP		L1544498-1						
Arsenic (As)-Total		0.0165	0.0162		mg/L	1.7	20	16-NOV-14
Barium (Ba)-Total		0.0555	0.0544		mg/L	2.0	20	16-NOV-14
Boron (B)-Total		0.251	0.261		mg/L	4.0	20	16-NOV-14
Cadmium (Cd)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	16-NOV-14
Calcium (Ca)-Total		69.6	72.6		mg/L	4.1	20	16-NOV-14
Chromium (Cr)-Total		0.00029	0.00030		mg/L	4.5	20	16-NOV-14
Copper (Cu)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	16-NOV-14
Iron (Fe)-Total		2.76	2.73		mg/L	0.9	20	16-NOV-14
Lead (Pb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	16-NOV-14
Magnesium (Mg)-Total		22.9	22.3		mg/L	2.8	20	16-NOV-14
Manganese (Mn)-Total		0.0961	0.0944		mg/L	1.7	20	16-NOV-14
Nickel (Ni)-Total		0.00085	0.00091		mg/L	6.8	20	16-NOV-14
Potassium (K)-Total		6.06	5.59		mg/L	8.0	20	16-NOV-14
Selenium (Se)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	16-NOV-14
Silicon (Si)-Total		11.9	11.7		mg/L	2.0	20	16-NOV-14
Silver (Ag)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	16-NOV-14
Sodium (Na)-Total		142	138		mg/L	2.6	20	16-NOV-14
Uranium (U)-Total		0.000102	0.000101		mg/L	0.6	20	16-NOV-14
WG1992335-18 DUP		L1544502-1						
Aluminum (Al)-Total		0.394	0.376		mg/L	4.6	20	16-NOV-14
Antimony (Sb)-Total		0.00025	0.00024		mg/L	7.0	20	16-NOV-14
Arsenic (As)-Total		0.0143	0.0141		mg/L	1.1	20	16-NOV-14
Barium (Ba)-Total		0.0442	0.0434		mg/L	1.8	20	16-NOV-14
Boron (B)-Total		0.174	0.169		mg/L	2.9	20	16-NOV-14
Cadmium (Cd)-Total		0.000020	0.000021		mg/L	1.8	20	16-NOV-14
Calcium (Ca)-Total		95.6	93.5		mg/L	2.2	20	16-NOV-14
Chromium (Cr)-Total		0.00702	0.00698		mg/L	0.6	20	16-NOV-14
Copper (Cu)-Total		0.00180	0.00173		mg/L	4.0	20	16-NOV-14
Iron (Fe)-Total		1.90	1.81		mg/L	4.5	20	16-NOV-14
Lead (Pb)-Total		0.000435	0.000420		mg/L	3.6	20	16-NOV-14
Magnesium (Mg)-Total		28.4	28.6		mg/L	0.5	20	16-NOV-14
Manganese (Mn)-Total		0.575	0.567		mg/L	1.4	20	16-NOV-14
Nickel (Ni)-Total		0.00678	0.00664		mg/L	2.2	20	16-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 25 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch R3079217								
WG1992335-18 DUP		L1544502-1						
Potassium (K)-Total		6.65	6.25		mg/L	6.2	20	16-NOV-14
Selenium (Se)-Total		<0.00010	0.00012	RPD-NA	mg/L	N/A	20	16-NOV-14
Silicon (Si)-Total		8.93	8.66		mg/L	3.1	20	16-NOV-14
Silver (Ag)-Total		0.000272	0.000267		mg/L	1.7	20	16-NOV-14
Sodium (Na)-Total		117	115		mg/L	1.5	20	16-NOV-14
Uranium (U)-Total		0.00312	0.00302		mg/L	3.4	20	16-NOV-14
Zinc (Zn)-Total		0.0313	0.0321		mg/L	2.4	20	16-NOV-14
Batch R3079879								
WG1992155-6 DUP		L1544050-1						
Aluminum (Al)-Total		0.152	0.133		mg/L	14	20	16-NOV-14
Antimony (Sb)-Total		0.00017	0.00019		mg/L	15	20	16-NOV-14
Arsenic (As)-Total		0.0268	0.0257		mg/L	4.3	20	16-NOV-14
Barium (Ba)-Total		0.0445	0.0426		mg/L	4.4	20	16-NOV-14
Boron (B)-Total		0.173	0.169		mg/L	2.4	20	16-NOV-14
Cadmium (Cd)-Total		0.000015	0.000018		mg/L	20	20	16-NOV-14
Calcium (Ca)-Total		102	95.1		mg/L	6.6	20	16-NOV-14
Chromium (Cr)-Total		0.00098	0.00094		mg/L	4.7	20	16-NOV-14
Copper (Cu)-Total		0.00099	0.00099		mg/L	0.2	20	16-NOV-14
Iron (Fe)-Total		2.47	2.34		mg/L	5.1	20	16-NOV-14
Magnesium (Mg)-Total		30.6	29.5		mg/L	3.7	20	16-NOV-14
Manganese (Mn)-Total		0.506	0.469		mg/L	7.6	20	16-NOV-14
Nickel (Ni)-Total		0.00220	0.00196		mg/L	12	20	16-NOV-14
Potassium (K)-Total		6.15	5.93		mg/L	3.6	20	16-NOV-14
Selenium (Se)-Total		<0.00010	0.00012	RPD-NA	mg/L	N/A	20	16-NOV-14
Silicon (Si)-Total		9.21	8.79		mg/L	4.7	20	16-NOV-14
Silver (Ag)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	16-NOV-14
Sodium (Na)-Total		131	127		mg/L	3.1	20	16-NOV-14
Uranium (U)-Total		0.00316	0.00301		mg/L	4.8	20	16-NOV-14
Zinc (Zn)-Total		0.0056	0.0040	J	mg/L	0.0016	0.006	16-NOV-14
WG1992155-5 LCS								
Aluminum (Al)-Total			102.6		%		80-120	16-NOV-14
Antimony (Sb)-Total			96.5		%		80-120	16-NOV-14
Arsenic (As)-Total			96.0		%		80-120	16-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 26 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R3079879							
WG1992155-5 LCS								
Barium (Ba)-Total			108.8		%		80-120	16-NOV-14
Boron (B)-Total			92.5		%		80-120	16-NOV-14
Cadmium (Cd)-Total			102.3		%		80-120	16-NOV-14
Calcium (Ca)-Total			105.5		%		80-120	16-NOV-14
Chromium (Cr)-Total			106.3		%		80-120	16-NOV-14
Copper (Cu)-Total			103.3		%		80-120	16-NOV-14
Iron (Fe)-Total			102.0		%		80-120	16-NOV-14
Lead (Pb)-Total			106.1		%		80-120	16-NOV-14
Magnesium (Mg)-Total			106.4		%		80-120	16-NOV-14
Manganese (Mn)-Total			104.8		%		80-120	16-NOV-14
Nickel (Ni)-Total			104.9		%		80-120	16-NOV-14
Potassium (K)-Total			106.8		%		80-120	16-NOV-14
Selenium (Se)-Total			94.9		%		80-120	16-NOV-14
Silicon (Si)-Total			94.1		%		80-120	16-NOV-14
Silver (Ag)-Total			103.1		%		80-120	16-NOV-14
Sodium (Na)-Total			107.1		%		80-120	16-NOV-14
Uranium (U)-Total			103.0		%		80-120	16-NOV-14
Zinc (Zn)-Total			104.5		%		80-120	16-NOV-14
WG1992155-4 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	16-NOV-14
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	16-NOV-14
Arsenic (As)-Total			<0.00010		mg/L		0.0001	16-NOV-14
Barium (Ba)-Total			<0.000050		mg/L		0.00005	16-NOV-14
Boron (B)-Total			<0.010		mg/L		0.01	16-NOV-14
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	16-NOV-14
Calcium (Ca)-Total			<0.020		mg/L		0.02	16-NOV-14
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	16-NOV-14
Copper (Cu)-Total			<0.00010		mg/L		0.0001	16-NOV-14
Iron (Fe)-Total			<0.010		mg/L		0.01	16-NOV-14
Lead (Pb)-Total			<0.000050		mg/L		0.00005	16-NOV-14
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	16-NOV-14
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	16-NOV-14
Nickel (Ni)-Total			<0.00010		mg/L		0.0001	16-NOV-14
Potassium (K)-Total			<0.050		mg/L		0.05	16-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 27 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED		Water						
Batch	R3079879							
WG1992155-4 MB								
Selenium (Se)-Total			<0.00010		mg/L		0.0001	16-NOV-14
Silicon (Si)-Total			<0.050		mg/L		0.05	16-NOV-14
Silver (Ag)-Total			<0.000010		mg/L		0.00001	16-NOV-14
Sodium (Na)-Total			<0.050		mg/L		0.05	16-NOV-14
Uranium (U)-Total			<0.000010		mg/L		0.00001	16-NOV-14
Zinc (Zn)-Total			<0.0030		mg/L		0.003	16-NOV-14
NAPHTHENIC-ACID-FM		Water						
Batch	R3070828							
WG1993732-3 DUP		L1540819-2						
Naphthenic Acids		<1.0	<1.0	RPD-NA	mg/L	N/A	30	12-NOV-14
WG1993732-7 DUP		L1543214-3						
Naphthenic Acids		<1.0	<1.0	RPD-NA	mg/L	N/A	30	12-NOV-14
WG1993732-4 LCS								
Naphthenic Acids			88.1		%		70-130	12-NOV-14
WG1993732-8 LCS								
Naphthenic Acids			87.3		%		70-130	12-NOV-14
WG1993732-1 MB								
Naphthenic Acids			<1.0		mg/L		1	12-NOV-14
WG1993732-5 MB								
Naphthenic Acids			<1.0		mg/L		1	12-NOV-14
WG1993732-2 MS		L1540819-1						
Naphthenic Acids			103.4		%		50-150	12-NOV-14
WG1993732-6 MS		L1543214-2						
Naphthenic Acids			93.3		%		50-150	12-NOV-14
NH3-CFA-ED		Water						
Batch	R3068709							
WG1993592-3 DUP		L1543135-2						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	12-NOV-14
WG1993592-6 DUP		L1543839-2						
Ammonia, Total (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	12-NOV-14
WG1993592-8 DUP		L1542752-2						
Ammonia, Total (as N)		3.93	3.95		mg/L	0.5	20	12-NOV-14
WG1993592-9 DUP		L1545323-1						
Ammonia, Total (as N)		0.272	0.273		mg/L	0.6	20	12-NOV-14
WG1993592-2 LCS								
Ammonia, Total (as N)			97.1		%		85-115	12-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 28 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-CFA-ED		Water						
Batch	R3068709							
WG1993592-1	MB							
Ammonia, Total (as N)			<0.050		mg/L		0.05	12-NOV-14
WG1993592-4	MS	L1540819-3						
Ammonia, Total (as N)			105.3		%		75-125	12-NOV-14
WG1993592-5	MS	L1542425-3						
Ammonia, Total (as N)			108.9		%		75-125	12-NOV-14
NO2-IC-ED		Water						
Batch	R3059450							
WG1990897-11	DUP	L1543229-5						
Nitrite (as N)			<0.020	RPD-NA	mg/L	N/A	20	06-NOV-14
WG1990897-3	DUP	L1543214-2						
Nitrite (as N)			<0.020	RPD-NA	mg/L	N/A	20	06-NOV-14
WG1990897-7	DUP	L1543228-12						
Nitrite (as N)			<0.020	RPD-NA	mg/L	N/A	20	06-NOV-14
WG1990897-13	LCS							
Nitrite (as N)			90.5		%		90-110	06-NOV-14
WG1990897-2	LCS							
Nitrite (as N)			98.2		%		90-110	06-NOV-14
WG1990897-5	LCS							
Nitrite (as N)			91.2		%		90-110	06-NOV-14
WG1990897-9	LCS							
Nitrite (as N)			90.9		%		90-110	06-NOV-14
WG1990897-1	MB							
Nitrite (as N)			<0.020		mg/L		0.02	06-NOV-14
WG1990897-10	MB							
Nitrite (as N)			<0.020		mg/L		0.02	06-NOV-14
WG1990897-14	MB							
Nitrite (as N)			<0.020		mg/L		0.02	06-NOV-14
WG1990897-6	MB							
Nitrite (as N)			<0.020		mg/L		0.02	06-NOV-14
NO3-IC-ED		Water						
Batch	R3059450							
WG1990897-11	DUP	L1543229-5						
Nitrate (as N)			0.169		mg/L	2.2	20	06-NOV-14
WG1990897-3	DUP	L1543214-2						
Nitrate (as N)			<0.050	RPD-NA	mg/L	N/A	20	06-NOV-14
WG1990897-7	DUP	L1543228-12						
Nitrate (as N)			<0.050	RPD-NA	mg/L	N/A	20	06-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 29 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-ED		Water						
Batch	R3059450							
WG1990897-13	LCS							
Nitrate (as N)			97.6		%		90-110	06-NOV-14
WG1990897-2	LCS							
Nitrate (as N)			101.9		%		90-110	06-NOV-14
WG1990897-5	LCS							
Nitrate (as N)			98.9		%		90-110	06-NOV-14
WG1990897-9	LCS							
Nitrate (as N)			99.3		%		90-110	06-NOV-14
WG1990897-1	MB							
Nitrate (as N)			<0.050		mg/L		0.05	06-NOV-14
WG1990897-10	MB							
Nitrate (as N)			<0.050		mg/L		0.05	06-NOV-14
WG1990897-14	MB							
Nitrate (as N)			<0.050		mg/L		0.05	06-NOV-14
WG1990897-6	MB							
Nitrate (as N)			<0.050		mg/L		0.05	06-NOV-14
WG1990897-12	MS	L1543229-5						
Nitrate (as N)			98.4		%		75-125	06-NOV-14
WG1990897-4	MS	L1543214-2						
Nitrate (as N)			90.6		%		75-125	06-NOV-14
WG1990897-8	MS	L1543228-12						
Nitrate (as N)			96.9		%		75-125	06-NOV-14
PAH-ABT1-CL		Water						
Batch	R3059631							
WG1991474-2	LCS							
Acenaphthene			96.9		%		60-130	07-NOV-14
Acenaphthylene			101.4		%		60-130	07-NOV-14
Anthracene			99.2		%		60-130	07-NOV-14
Fluoranthene			100.7		%		60-130	07-NOV-14
Fluorene			99.6		%		60-130	07-NOV-14
Naphthalene			94.4		%		50-130	07-NOV-14
Phenanthrene			96.6		%		60-130	07-NOV-14
Pyrene			101.3		%		60-130	07-NOV-14
Benzo(a)anthracene			103.8		%		60-130	07-NOV-14
Benzo(k)fluoranthene			99.0		%		60-130	07-NOV-14
Benzo(b&j)fluoranthene			103.6		%		60-130	07-NOV-14
Benzo(g,h,i)perylene			96.0		%		60-130	07-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 30 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch R3059631								
WG1991474-2 LCS								
	Benzo(a)pyrene		105.5		%		60-130	07-NOV-14
	Chrysene		95.8		%		60-130	07-NOV-14
	Dibenzo(a,h)anthracene		99.6		%		60-130	07-NOV-14
	Indeno(1,2,3-cd)pyrene		90.6		%		60-130	07-NOV-14
WG1991474-1 MB								
	Acenaphthene		<0.000020		mg/L		0.00002	07-NOV-14
	Acenaphthylene		<0.000020		mg/L		0.00002	07-NOV-14
	Anthracene		<0.000010		mg/L		0.00001	07-NOV-14
	Fluoranthene		<0.000020		mg/L		0.00002	07-NOV-14
	Fluorene		<0.000020		mg/L		0.00002	07-NOV-14
	Naphthalene		<0.000050		mg/L		0.00005	07-NOV-14
	Phenanthrene		<0.000050		mg/L		0.00005	07-NOV-14
	Pyrene		<0.000010		mg/L		0.00001	07-NOV-14
	Benzo(a)anthracene		<0.000010		mg/L		0.00001	07-NOV-14
	Benzo(k)fluoranthene		<0.000010		mg/L		0.00001	07-NOV-14
	Benzo(b&j)fluoranthene		<0.000010		mg/L		0.00001	07-NOV-14
	Benzo(g,h,i)perylene		<0.000020		mg/L		0.00002	07-NOV-14
	Benzo(a)pyrene		<0.0000050		mg/L		0.000005	07-NOV-14
	Chrysene		<0.000020		mg/L		0.00002	07-NOV-14
	Dibenzo(a,h)anthracene		<0.0000050		mg/L		0.000005	07-NOV-14
	Indeno(1,2,3-cd)pyrene		<0.000010		mg/L		0.00001	07-NOV-14
	Surrogate: d10-Acenaphthene		93.4		%		60-130	07-NOV-14
	Surrogate: d10-Phenanthrene		94.9		%		60-130	07-NOV-14
	Surrogate: d12-Chrysene		92.9		%		60-130	07-NOV-14
Batch R3064696								
WG1992846-1 LCS								
	Acenaphthene		92.8		%		60-130	07-NOV-14
	Acenaphthylene		95.6		%		60-130	07-NOV-14
	Anthracene		92.8		%		60-130	07-NOV-14
	Fluoranthene		99.8		%		60-130	07-NOV-14
	Fluorene		94.1		%		60-130	07-NOV-14
	Naphthalene		94.5		%		50-130	07-NOV-14
	Phenanthrene		90.4		%		60-130	07-NOV-14
	Pyrene		100.4		%		60-130	07-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 31 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch	R3064696							
WG1992846-1 LCS								
	Benzo(a)anthracene		100.9		%		60-130	07-NOV-14
	Benzo(k)fluoranthene		102.6		%		60-130	07-NOV-14
	Benzo(b&j)fluoranthene		102.7		%		60-130	07-NOV-14
	Benzo(g,h,i)perylene		104.1		%		60-130	07-NOV-14
	Benzo(a)pyrene		107.3		%		60-130	07-NOV-14
	Chrysene		100.1		%		60-130	07-NOV-14
	Dibenzo(a,h)anthracene		103.2		%		60-130	07-NOV-14
	Indeno(1,2,3-cd)pyrene		104.3		%		60-130	07-NOV-14
WG1992846-5 LCS								
	Acenaphthene		100.4		%		60-130	08-NOV-14
	Acenaphthylene		105.5		%		60-130	08-NOV-14
	Anthracene		93.6		%		60-130	08-NOV-14
	Fluoranthene		107.1		%		60-130	08-NOV-14
	Fluorene		102.5		%		60-130	08-NOV-14
	Naphthalene		103.0		%		50-130	08-NOV-14
	Phenanthrene		96.1		%		60-130	08-NOV-14
	Pyrene		107.3		%		60-130	08-NOV-14
	Benzo(a)anthracene		103.3		%		60-130	08-NOV-14
	Benzo(k)fluoranthene		117.0		%		60-130	08-NOV-14
	Benzo(b&j)fluoranthene		106.8		%		60-130	08-NOV-14
	Benzo(g,h,i)perylene		97.6		%		60-130	08-NOV-14
	Benzo(a)pyrene		121.7		%		60-130	08-NOV-14
	Chrysene		111.1		%		60-130	08-NOV-14
	Dibenzo(a,h)anthracene		109.0		%		60-130	08-NOV-14
	Indeno(1,2,3-cd)pyrene		95.0		%		60-130	08-NOV-14
WG1992846-2 MB								
	Acenaphthene		<0.000020		mg/L		0.00002	07-NOV-14
	Acenaphthylene		<0.000020		mg/L		0.00002	07-NOV-14
	Anthracene		<0.000010		mg/L		0.00001	07-NOV-14
	Fluoranthene		<0.000020		mg/L		0.00002	07-NOV-14
	Fluorene		<0.000020		mg/L		0.00002	07-NOV-14
	Naphthalene		<0.000050		mg/L		0.00005	07-NOV-14
	Phenanthrene		<0.000050		mg/L		0.00005	07-NOV-14
	Pyrene		<0.000010		mg/L		0.00001	07-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 32 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch	R3064696							
WG1992846-2 MB								
	Benzo(a)anthracene		<0.000010		mg/L		0.00001	07-NOV-14
	Benzo(k)fluoranthene		<0.000010		mg/L		0.00001	07-NOV-14
	Benzo(b&j)fluoranthene		<0.000010		mg/L		0.00001	07-NOV-14
	Benzo(g,h,i)perylene		<0.000020		mg/L		0.00002	07-NOV-14
	Benzo(a)pyrene		<0.0000050		mg/L		0.000005	07-NOV-14
	Chrysene		<0.000020		mg/L		0.00002	07-NOV-14
	Dibenzo(a,h)anthracene		<0.0000050		mg/L		0.000005	07-NOV-14
	Indeno(1,2,3-cd)pyrene		<0.000010		mg/L		0.00001	07-NOV-14
	Surrogate: d10-Acenaphthene		98.4		%		60-130	07-NOV-14
	Surrogate: d10-Phenanthrene		94.7		%		60-130	07-NOV-14
	Surrogate: d12-Chrysene		90.9		%		60-130	07-NOV-14
WG1992846-3 MB								
	Acenaphthene		<0.000020		mg/L		0.00002	08-NOV-14
	Acenaphthylene		<0.000020		mg/L		0.00002	08-NOV-14
	Anthracene		<0.000010		mg/L		0.00001	08-NOV-14
	Fluoranthene		<0.000020		mg/L		0.00002	08-NOV-14
	Fluorene		<0.000020		mg/L		0.00002	08-NOV-14
	Naphthalene		<0.000050		mg/L		0.00005	08-NOV-14
	Phenanthrene		<0.000050		mg/L		0.00005	08-NOV-14
	Pyrene		<0.000010		mg/L		0.00001	08-NOV-14
	Benzo(a)anthracene		<0.000010		mg/L		0.00001	08-NOV-14
	Benzo(k)fluoranthene		<0.000010		mg/L		0.00001	08-NOV-14
	Benzo(b&j)fluoranthene		<0.000010		mg/L		0.00001	08-NOV-14
	Benzo(g,h,i)perylene		<0.000020		mg/L		0.00002	08-NOV-14
	Benzo(a)pyrene		<0.0000050		mg/L		0.000005	08-NOV-14
	Chrysene		<0.000020		mg/L		0.00002	08-NOV-14
	Dibenzo(a,h)anthracene		<0.0000050		mg/L		0.000005	08-NOV-14
	Indeno(1,2,3-cd)pyrene		<0.000010		mg/L		0.00001	08-NOV-14
	Surrogate: d10-Acenaphthene		110.4		%		60-130	08-NOV-14
	Surrogate: d10-Phenanthrene		92.8		%		60-130	08-NOV-14
	Surrogate: d12-Chrysene		89.4		%		60-130	08-NOV-14
WG1992846-4 MB								
	Acenaphthene		<0.000020		mg/L		0.00002	08-NOV-14
	Acenaphthylene		<0.000020		mg/L		0.00002	08-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 33 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ABT1-CL		Water						
Batch	R3064696							
WG1992846-4	MB							
Anthracene			<0.000010		mg/L		0.00001	08-NOV-14
Fluoranthene			<0.000020		mg/L		0.00002	08-NOV-14
Fluorene			<0.000020		mg/L		0.00002	08-NOV-14
Naphthalene			<0.000050		mg/L		0.00005	08-NOV-14
Phenanthrene			<0.000050		mg/L		0.00005	08-NOV-14
Pyrene			<0.000010		mg/L		0.00001	08-NOV-14
Benzo(a)anthracene			<0.000010		mg/L		0.00001	08-NOV-14
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	08-NOV-14
Benzo(b&j)fluoranthene			<0.000010		mg/L		0.00001	08-NOV-14
Benzo(g,h,i)perylene			<0.000020		mg/L		0.00002	08-NOV-14
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	08-NOV-14
Chrysene			<0.000020		mg/L		0.00002	08-NOV-14
Dibenzo(a,h)anthracene			<0.0000050		mg/L		0.000005	08-NOV-14
Indeno(1,2,3-cd)pyrene			<0.000010		mg/L		0.00001	08-NOV-14
Surrogate: d10-Acenaphthene			100.3		%		60-130	08-NOV-14
Surrogate: d10-Phenanthrene			99.5		%		60-130	08-NOV-14
Surrogate: d12-Chrysene			95.1		%		60-130	08-NOV-14
PH/EC/ALK-ED		Water						
Batch	R3068828							
WG1993884-7	DUP	L1543855-11						
pH		4.93	4.84	J	pH	0.09	0.3	12-NOV-14
Conductivity (EC)		2.31	2.34		uS/cm	1.4	10	12-NOV-14
Bicarbonate (HCO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	12-NOV-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	12-NOV-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	12-NOV-14
Alkalinity, Total (as CaCO3)		<2.0	<2.0	RPD-NA	mg/L	N/A	20	12-NOV-14
WG1993884-8	DUP	L1543843-12						
pH		7.97	7.95	J	pH	0.02	0.3	13-NOV-14
Conductivity (EC)		1770	1750		uS/cm	1.2	10	13-NOV-14
Bicarbonate (HCO3)		639	629		mg/L	1.6	25	13-NOV-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	13-NOV-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	13-NOV-14
Alkalinity, Total (as CaCO3)		524	516		mg/L	1.6	20	13-NOV-14
WG1993884-10	LCS							



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 34 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R3068828							
WG1993884-10	LCS							
Conductivity (EC)			99.2		%		90-110	12-NOV-14
WG1993884-11	LCS							
pH			6.04		pH		5.9-6.1	12-NOV-14
WG1993884-12	LCS							
Alkalinity, Total (as CaCO3)			103.2		%		85-115	12-NOV-14
WG1993884-13	LCS							
Conductivity (EC)			96.9		%		90-110	12-NOV-14
WG1993884-15	LCS							
Conductivity (EC)			98.8		%		90-110	12-NOV-14
WG1993884-16	LCS							
pH			6.06		pH		5.9-6.1	12-NOV-14
WG1993884-17	LCS							
Alkalinity, Total (as CaCO3)			107.2		%		85-115	12-NOV-14
WG1993884-18	LCS							
Conductivity (EC)			96.0		%		90-110	12-NOV-14
WG1993884-2	LCS							
Conductivity (EC)			97.5		%		90-110	12-NOV-14
WG1993884-20	LCS							
Conductivity (EC)			98.1		%		90-110	12-NOV-14
WG1993884-21	LCS							
pH			6.05		pH		5.9-6.1	12-NOV-14
WG1993884-22	LCS							
Alkalinity, Total (as CaCO3)			105.0		%		85-115	12-NOV-14
WG1993884-23	LCS							
Conductivity (EC)			95.6		%		90-110	12-NOV-14
WG1993884-25	LCS							
Conductivity (EC)			99.4		%		90-110	13-NOV-14
WG1993884-26	LCS							
pH			6.06		pH		5.9-6.1	13-NOV-14
WG1993884-27	LCS							
Alkalinity, Total (as CaCO3)			104.3		%		85-115	13-NOV-14
WG1993884-28	LCS							
Conductivity (EC)			95.0		%		90-110	13-NOV-14
WG1993884-3	LCS							
pH			6.06		pH		5.9-6.1	12-NOV-14
WG1993884-4	LCS							
Alkalinity, Total (as CaCO3)			104.4		%		85-115	12-NOV-14
WG1993884-5	LCS							



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 35 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch R3068828								
WG1993884-5 LCS								
Conductivity (EC)			96.4		%		90-110	12-NOV-14
WG1993884-1 MB								
Bicarbonate (HCO3)			<5.0		mg/L		5	12-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	12-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	12-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	12-NOV-14
WG1993884-14 MB								
Bicarbonate (HCO3)			<5.0		mg/L		5	12-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	12-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	12-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	12-NOV-14
WG1993884-24 MB								
Bicarbonate (HCO3)			<5.0		mg/L		5	13-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	13-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	13-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	13-NOV-14
WG1993884-9 MB								
Bicarbonate (HCO3)			<5.0		mg/L		5	12-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	12-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	12-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	12-NOV-14
Batch R3072810								
WG1994517-7 DUP		L1544311-5						
pH		8.15	8.16	J	pH	0.01	0.3	13-NOV-14
Bicarbonate (HCO3)		566	545		mg/L	3.8	25	13-NOV-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	13-NOV-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	13-NOV-14
Alkalinity, Total (as CaCO3)		464	447		mg/L	3.8	20	13-NOV-14
WG1994517-8 DUP		L1544050-2						
pH		8.40	8.38	J	pH	0.02	0.3	13-NOV-14
Bicarbonate (HCO3)		516	504		mg/L	2.3	25	13-NOV-14
Carbonate (CO3)		8.0	5.9	J	mg/L	2.1	10	13-NOV-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	13-NOV-14
Alkalinity, Total (as CaCO3)		436	423		mg/L	3.1	20	13-NOV-14
WG1994517-12 LCS								



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 36 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R3072810							
WG1994517-12	LCS							
pH			6.02		pH		5.9-6.1	13-NOV-14
WG1994517-13	LCS							
Alkalinity, Total (as CaCO3)			106.1		%		85-115	13-NOV-14
WG1994517-17	LCS							
pH			6.03		pH		5.9-6.1	13-NOV-14
WG1994517-18	LCS							
Alkalinity, Total (as CaCO3)			105.4		%		85-115	13-NOV-14
WG1994517-22	LCS							
pH			6.04		pH		5.9-6.1	13-NOV-14
WG1994517-23	LCS							
Alkalinity, Total (as CaCO3)			106.7		%		85-115	13-NOV-14
WG1994517-27	LCS							
pH			6.03		pH		5.9-6.1	14-NOV-14
WG1994517-28	LCS							
Alkalinity, Total (as CaCO3)			105.6		%		85-115	14-NOV-14
WG1994517-3	LCS							
pH			6.04		pH		5.9-6.1	13-NOV-14
WG1994517-4	LCS							
Alkalinity, Total (as CaCO3)			105.2		%		85-115	13-NOV-14
WG1994517-1	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	13-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	13-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	13-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	13-NOV-14
WG1994517-10	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	13-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	13-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	13-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	13-NOV-14
WG1994517-15	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	13-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	13-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	13-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	13-NOV-14
WG1994517-20	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	13-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 37 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch R3072810								
WG1994517-20 MB								
Carbonate (CO3)			<5.0		mg/L		5	13-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	13-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	13-NOV-14
WG1994517-25 MB								
Bicarbonate (HCO3)			<5.0		mg/L		5	14-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	14-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	14-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	14-NOV-14
Batch R3074508								
WG1995275-6 DUP		L1542752-14						
Conductivity (EC)		229000	229000		uS/cm	0.0	10	13-NOV-14
WG1995275-2 LCS								
Conductivity (EC)			99.3		%		90-110	13-NOV-14
WG1995275-5 LCS								
Conductivity (EC)			99.2		%		90-110	13-NOV-14
Batch R3078994								
WG1996340-10 DUP		L1546419-1						
pH		7.91	7.84	J	pH	0.07	0.3	16-NOV-14
Conductivity (EC)		55000	55500		uS/cm	0.8	10	16-NOV-14
Bicarbonate (HCO3)		2840	2810		mg/L	1.2	25	16-NOV-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	16-NOV-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	16-NOV-14
Alkalinity, Total (as CaCO3)		2330	2300		mg/L	1.2	20	16-NOV-14
WG1996340-8 DUP		L1544314-8						
pH		8.25	8.24	J	pH	0.01	0.3	15-NOV-14
Conductivity (EC)		715	723		uS/cm	1.1	10	15-NOV-14
Bicarbonate (HCO3)		459	454		mg/L	1.1	25	15-NOV-14
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	15-NOV-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	15-NOV-14
Alkalinity, Total (as CaCO3)		376	372		mg/L	1.1	20	15-NOV-14
WG1996340-9 DUP		L1544386-1						
pH		8.46	8.49	J	pH	0.04	0.3	15-NOV-14
Conductivity (EC)		1770	1780		uS/cm	0.7	10	15-NOV-14
Bicarbonate (HCO3)		851	865		mg/L	1.5	25	15-NOV-14
Carbonate (CO3)		17.0	22.6					



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 38 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R3078994							
WG1996340-9	DUP	L1544386-1						
Carbonate (CO3)		17.0	22.6	J	mg/L	5.6	10	15-NOV-14
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	15-NOV-14
Alkalinity, Total (as CaCO3)		726	746		mg/L	2.8	20	15-NOV-14
WG1996340-12	LCS							
Conductivity (EC)			98.8		%		90-110	15-NOV-14
WG1996340-13	LCS							
pH			6.02		pH		5.9-6.1	15-NOV-14
WG1996340-14	LCS							
Alkalinity, Total (as CaCO3)			104.1		%		85-115	15-NOV-14
WG1996340-15	LCS							
Conductivity (EC)			96.2		%		90-110	15-NOV-14
WG1996340-17	LCS							
Conductivity (EC)			98.1		%		90-110	15-NOV-14
WG1996340-18	LCS							
pH			6.00		pH		5.9-6.1	15-NOV-14
WG1996340-19	LCS							
Alkalinity, Total (as CaCO3)			102.8		%		85-115	15-NOV-14
WG1996340-2	LCS							
Conductivity (EC)			99.5		%		90-110	15-NOV-14
WG1996340-20	LCS							
Conductivity (EC)			95.4		%		90-110	15-NOV-14
WG1996340-22	LCS							
Conductivity (EC)			97.3		%		90-110	15-NOV-14
WG1996340-23	LCS							
pH			6.01		pH		5.9-6.1	15-NOV-14
WG1996340-24	LCS							
Alkalinity, Total (as CaCO3)			107.1		%		85-115	15-NOV-14
WG1996340-25	LCS							
Conductivity (EC)			95.2		%		90-110	15-NOV-14
WG1996340-27	LCS							
Conductivity (EC)			97.7		%		90-110	15-NOV-14
WG1996340-28	LCS							
pH			6.02		pH		5.9-6.1	15-NOV-14
WG1996340-29	LCS							
Alkalinity, Total (as CaCO3)			104.0		%		85-115	15-NOV-14
WG1996340-3	LCS							
pH			6.02		pH		5.9-6.1	15-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 39 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R3078994							
WG1996340-30	LCS							
Conductivity (EC)			94.7		%		90-110	15-NOV-14
WG1996340-32	LCS							
Conductivity (EC)			97.5		%		90-110	16-NOV-14
WG1996340-35	LCS							
Conductivity (EC)			92.9		%		90-110	16-NOV-14
WG1996340-4	LCS							
Alkalinity, Total (as CaCO3)			106.1		%		85-115	15-NOV-14
WG1996340-5	LCS							
Conductivity (EC)			96.8		%		90-110	15-NOV-14
WG1996340-1	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	15-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	15-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	15-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	15-NOV-14
WG1996340-11	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	15-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	15-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	15-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	15-NOV-14
WG1996340-16	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	15-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	15-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	15-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	15-NOV-14
WG1996340-21	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	15-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	15-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	15-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	15-NOV-14
WG1996340-26	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	16-NOV-14
Carbonate (CO3)			<5.0		mg/L		5	16-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	16-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	16-NOV-14
WG1996340-31	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	16-NOV-14



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 40 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R3078994							
WG1996340-31	MB							
Carbonate (CO3)			<5.0		mg/L		5	16-NOV-14
Hydroxide (OH)			<5.0		mg/L		5	16-NOV-14
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	16-NOV-14
PHENOLS-4AAP-ED		Water						
Batch	R3090671							
WG1999067-2	LCS							
Phenols (4AAP)			92.0		%		85-115	19-NOV-14
WG1999067-1	MB							
Phenols (4AAP)			<0.0010		mg/L		0.001	19-NOV-14
SO4-IC-ED		Water						
Batch	R3059450							
WG1990897-11	DUP	L1543229-5						
Sulfate (SO4)		7.74	7.65		mg/L	1.2	20	06-NOV-14
WG1990897-3	DUP	L1543214-2						
Sulfate (SO4)		144	144		mg/L	0.1	20	06-NOV-14
WG1990897-7	DUP	L1543228-12						
Sulfate (SO4)		5.07	5.05		mg/L	0.3	20	06-NOV-14
WG1990897-13	LCS							
Sulfate (SO4)			102.0		%		90-110	06-NOV-14
WG1990897-2	LCS							
Sulfate (SO4)			102.8		%		90-110	06-NOV-14
WG1990897-5	LCS							
Sulfate (SO4)			102.6		%		90-110	06-NOV-14
WG1990897-9	LCS							
Sulfate (SO4)			102.8		%		90-110	06-NOV-14
WG1990897-1	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	06-NOV-14
WG1990897-10	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	06-NOV-14
WG1990897-14	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	06-NOV-14
WG1990897-6	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	06-NOV-14
WG1990897-12	MS	L1543229-5						
Sulfate (SO4)			99.9		%		75-125	06-NOV-14
WG1990897-4	MS	L1543214-2						



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 41 of 45

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2
 Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-ED								
	Water							
Batch	R3059450							
WG1990897-4	MS	L1543214-2						
Sulfate (SO4)			N/A	MS-B	%		-	06-NOV-14
WG1990897-8	MS	L1543228-12						
Sulfate (SO4)			100.2		%		75-125	06-NOV-14
SOLIDS-TDS-ED								
	Water							
Batch	R3062291							
WG1991336-3	DUP	L1543214-2						
Total Dissolved Solids		761	769		mg/L	1.0	20	07-NOV-14
WG1991336-2	LCS							
Total Dissolved Solids			99.5		%		85-115	07-NOV-14
WG1991336-1	MB							
Total Dissolved Solids			<10		mg/L		10	07-NOV-14
Batch	R3062844							
WG1992045-3	DUP	L1542752-5						
Total Dissolved Solids		1560	1560		mg/L	0.1	20	08-NOV-14
WG1992045-2	LCS							
Total Dissolved Solids			94.9		%		85-115	08-NOV-14
WG1992045-1	MB							
Total Dissolved Solids			<10		mg/L		10	08-NOV-14
Batch	R3076828							
WG1994541-3	DUP	L1544340-1						
Total Dissolved Solids		199	203		mg/L	2.0	20	13-NOV-14
WG1994541-4	DUP	L1545127-1						
Total Dissolved Solids		3110	3090		mg/L	0.8	20	13-NOV-14
WG1994541-2	LCS							
Total Dissolved Solids			102.7		%		85-115	13-NOV-14
WG1994541-1	MB							
Total Dissolved Solids			<10		mg/L		10	13-NOV-14
Batch	R3085549							
WG1997291-3	DUP	L1547201-1						
Total Dissolved Solids		356	351		mg/L	1.4	20	17-NOV-14
WG1997291-2	LCS							
Total Dissolved Solids			103.0		%		85-115	17-NOV-14
WG1997291-1	MB							
Total Dissolved Solids			<10		mg/L		10	17-NOV-14
TURBIDITY-ED	Water							



Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Page 42 of 45

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Contact: Sue Raynard

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-ED		Water						
Batch	R3062648							
WG1990379-3	DUP	L1542752-1						
Turbidity		203	208		NTU	2.4	15	06-NOV-14
WG1990379-2	LCS							
Turbidity			98.6		%		70-130	06-NOV-14
WG1990379-1	MB							
Turbidity			<0.10		NTU		0.1	06-NOV-14

Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2
Contact: Sue Raynard

Page 43 of 45

Legend:

Limit ALS Control Limit (Data Quality Objectives)
DUP Duplicate
RPD Relative Percent Difference
N/A Not Available
LCS Laboratory Control Sample
SRM Standard Reference Material
MS Matrix Spike
MSD Matrix Spike Duplicate
ADE Average Desorption Efficiency
MB Method Blank
IRM Internal Reference Material
CRM Certified Reference Material
CCV Continuing Calibration Verification
CVS Calibration Verification Standard
LCSD Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
K	Matrix Spike recovery outside ALS DQO due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Client: Matrix Solutions Inc.
 Suite 200, 150 - 13 Avenue SW
 Calgary AB T2R 0V2

Page 44 of 45

Contact: Sue Raynard

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Total Dissolved Solids							
	1	01-NOV-14 11:52	17-NOV-14 00:00	7	16	days	EHT
	14	04-NOV-14 11:45	13-NOV-14 00:00	7	9	days	EHT
Turbidity							
	1	01-NOV-14 11:52	06-NOV-14 00:00	48	108	hours	EHTR
	2	01-NOV-14 12:29	06-NOV-14 00:00	48	108	hours	EHTR
	3	01-NOV-14 12:40	06-NOV-14 00:00	48	107	hours	EHTR
	4	02-NOV-14 11:44	06-NOV-14 00:00	48	84	hours	EHTR
	5	02-NOV-14 12:01	06-NOV-14 00:00	48	84	hours	EHTR
	6	02-NOV-14 12:46	06-NOV-14 00:00	48	83	hours	EHTR
	7	02-NOV-14 14:13	06-NOV-14 00:00	48	82	hours	EHTR
	9	03-NOV-14 10:55	06-NOV-14 00:00	48	61	hours	EHTL
	10	03-NOV-14 15:01	06-NOV-14 00:00	48	57	hours	EHTL
	11	03-NOV-14 10:55	06-NOV-14 00:00	48	61	hours	EHTL
	12	03-NOV-14 14:24	06-NOV-14 00:00	48	58	hours	EHTL
Anions and Nutrients							
Nitrate as N by IC							
	1	01-NOV-14 11:52	06-NOV-14 08:00	48	116	hours	EHTR
	2	01-NOV-14 12:29	06-NOV-14 08:00	48	115	hours	EHTR
	3	01-NOV-14 12:40	06-NOV-14 08:00	48	115	hours	EHTR
	4	02-NOV-14 11:44	06-NOV-14 08:00	48	92	hours	EHTR
	5	02-NOV-14 12:01	06-NOV-14 08:00	48	92	hours	EHTR
	6	02-NOV-14 12:46	06-NOV-14 08:00	48	91	hours	EHTR
	7	02-NOV-14 14:13	06-NOV-14 08:00	48	90	hours	EHTR
	9	03-NOV-14 10:55	06-NOV-14 08:00	48	69	hours	EHTL
	10	03-NOV-14 15:01	06-NOV-14 08:00	48	65	hours	EHTL
	11	03-NOV-14 10:55	06-NOV-14 08:00	48	69	hours	EHTL
	12	03-NOV-14 14:24	06-NOV-14 08:00	48	66	hours	EHTL
Nitrite as N by IC							
	1	01-NOV-14 11:52	06-NOV-14 08:00	48	116	hours	EHTR
	2	01-NOV-14 12:29	06-NOV-14 08:00	48	115	hours	EHTR
	3	01-NOV-14 12:40	06-NOV-14 08:00	48	115	hours	EHTR
	4	02-NOV-14 11:44	06-NOV-14 08:00	48	92	hours	EHTR
	5	02-NOV-14 12:01	06-NOV-14 08:00	48	92	hours	EHTR
	6	02-NOV-14 12:46	06-NOV-14 08:00	48	91	hours	EHTR
	7	02-NOV-14 14:13	06-NOV-14 08:00	48	90	hours	EHTR
	9	03-NOV-14 10:55	06-NOV-14 08:00	48	69	hours	EHTL
	10	03-NOV-14 15:01	06-NOV-14 08:00	48	65	hours	EHTL
	11	03-NOV-14 10:55	06-NOV-14 08:00	48	69	hours	EHTL
	12	03-NOV-14 14:24	06-NOV-14 08:00	48	66	hours	EHTL

Legend & Qualifier Definitions:

- EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
- EHTR: Exceeded ALS recommended hold time prior to sample receipt.
- EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
- EHT: Exceeded ALS recommended hold time prior to analysis.
- Rec. HT: ALS recommended hold time (see units).

Notes*:
 Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
 Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1542752 were received on 05-NOV-14 10:28.

Quality Control Report

Workorder: L1542752

Report Date: 19-NOV-14

Client: Matrix Solutions Inc.
Suite 200, 150 - 13 Avenue SW
Calgary AB T2R 0V2

Page 45 of 45

Contact: Sue Raynard

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.