March 2016

REPORT ON

2015 Long Term Monitoring Program, Former Waste Disposal Middens, Bar U Ranch National Historic Site, Alberta

Submitted to:
Ms. Natalie Robinson
Public Works and Government Services Canada
Suite 1650, 635 - 8th Ave SW
Calgary, Alberta T2P 3M3

REPORT

Report Number: 1526784-2000

Distribution:

1 Copy: Public Works and Government Services Canada, Calgary, AB
1 Copy: Golder Associates Ltd., Edmonton, AB

Golder Associates

Executive Summary

Golder Associates Ltd. (Golder) was retained by Public Works and Government Services Canada (PWGSC), on behalf of Parks Canada Agency (PCA), in July 2015 to complete the 2015 long term monitoring program at the Bar U Ranch National Historic Site located near Longview, Alberta (hereafter referred to as the Site). The objective of the 2015 long term monitoring program was to determine whether historical Site activities, have affected groundwater and surface water quality at the Site and the nearby Pekisko Creek. In addition, Golder understands that a future objective for the Site is to determine its suitability for closure.

The Site is located approximately 13 km south of Longview, Alberta. The Site consists of agricultural land used for cattle grazing with Pekisko Creek passing through the Site, which is used for watering livestock. The Site became a National Historic Site operated by PCA on December 31, 1991. There are two waste disposal middens (coulees backfilled with waste) located in the northern portion of the Site, approximately 210 m and 140 m northwest of the creek, respectively. Midden # 1 is furthest to the west and measures approximately 35 m x 8 m. Midden # 2 is the easterly of the two middens and measures approximately 60 m x 10 m. The waste middens are roughly 100 m apart and slope towards the southeast. Waste generated by historic ranching activities at the Bar U Ranch during the over 100 years of operation (since 1881) has been placed in these coulees. The waste middens potentially contain waste oil and fuel containers, pesticide and herbicide containers, glycol, batteries, creosote treated lumber, scrap metal, vehicles and paint containers.

Various environmental investigations have been completed at the Site, resulting in seventeen groundwater monitoring wells being installed. A Human Health and Ecological Risk Assessment (HHERA) was completed for the Site by Meridian Environmental Inc. (Meridian) in 2007. The HHERA identified risks associated with direct soil and groundwater contact and recommended the capping of the former waste disposal middens. In 2008, the former waste disposal middens were capped with clay material. The capping of the middens was contracted by PWGSC on behalf of PCA. The ground contour of the final clay cap blended in with the natural grades of the adjacent slopes, with a positive drainage away from the waste middens. PWGSC reviewed historical project files for additional cap design information and concluded that the final clay cap was not an engineered design but based on landscaping for surface water drainage. No historical data was available to confirm cap thickness over the middens. A ground penetrating radar (GPR) survey of the middens was completed by PCA in September 2015 to provide preliminary qualitative information regarding the thickness and uniformity of the clay cap. The GPR survey identified the thickness of the clay cap as approximately 0.15 m; however the thickness of the clay cap was variable.

The scope of work for the 2015 long term monitoring program was developed in collaboration with PWGSC and PCA and was outlined in Golder's proposal dated June 30, 2015. An amendment to the original scope of work was submitted on October 30, 2015. In summary, the scope of work for the 2015 long term monitoring program included the following:

- Completion of a groundwater monitoring and sampling event of the existing groundwater monitoring wells at the Site in July 2015;
- Submission of select groundwater samples, plus three duplicate samples for quality assurance/quality control (QA/QC) purposes (one blind duplicate sample, one field blank sample, and one trip blank sample), to

Maxxam Analytics (Maxxam) located in Calgary, Alberta for analysis of BTEX, PHC Fractions F1 and F2, PAHs, VOCs, dissolved metals, total metals, organochlorinated pesticides, and routine chemistry parameters;

- Advancement of a borehole to a maximum depth of 6.1 m below ground surface (bgs), to be completed as an initial background groundwater monitoring well;
- Submission of one soil sample to Maxxam for analysis of PAHs, metals, salinity parameters, grain size, and waste characterization parameters;
- Completion of a groundwater monitoring and sampling event of the initial background groundwater monitoring well in November 2015;
- Collection of two surface water samples from Pekisko Creek, one sample hydraulically up-gradient of the waste middens and one sample hydraulically down-gradient of the waste middens; and
- Submission of one groundwater and two surface water samples, to Maxxam for analysis of PAHs, metals, and routine chemistry parameters.

Soil conditions observed at the Site were generally consistent with those encountered during previous investigations of the Site. A dark brown, fine-grained silty clay stratum with some rootlets was encountered from ground surface to a depth of 1.3 m bgs underlain by brown, fine-grained silty clay with some gravel and trace coal until the maximum depth investigated of 6.1 m bgs. Reported concentrations of all parameters analyzed were below the applicable guidelines for the soil sample submitted for laboratory analysis, with the exception of the following:

- Soluble conductivity concentration of 5.2 dS/m exceeded the applicable guideline of 2.0 dS/m

During the July sampling event, depth to groundwater at the Site ranged between 1.79 metres below top of casing (m btoc) (MW6) and 4.66 m btoc (MW4). Depth to groundwater at GMW18 in November was 4.90 m btoc. It is anticipated that the direction of shallow groundwater flow at the Site is towards Pekisko Creek to the east-southeast. Reported concentrations of all parameters analyzed were below the applicable guidelines for all groundwater samples collected, with the exception of the following:

- Concentration of dissolved nitrate (NO_3) exceeds the applicable guideline of 13 mg/L in groundwater sample MW7 (37 mg/L).
- Concentrations of total dissolved solids (TDS) exceed the applicable guideline of 500 mg/L in groundwater samples MW1 (4,100 mg/L), MW2 (2,500 mg/L), MW3 (6,200 mg/L), MW6 (3,000 mg/L), MW7 (12,000 mg/L), MW8 (11,000 mg/L), MW9 (2,500 mg/L), MW12 (2,100 mg/L), and GMW18 (11,000 mg/L).
- Concentrations of dissolved sulphate (SO_4) exceed the applicable guideline of 100 mg/L in groundwater samples MW1 (2,700 mg/L), MW2 (1,500 mg/L), MW3 (4,200 mg/L), MW6 (1,600 mg/L), MW7 (8,300 mg/L), MW8 (8,200 mg/L), MW9 (1,600 mg/L), MW12 (1,200 mg/L), and GMW18 (8,100 mg/L).
- Concentration of dissolved chloride exceeds the applicable guideline of 100 mg/L in groundwater sample MW7 (130 mg/L).

- Concentrations of dissolved cadmium exceed the applicable guideline of 0.000017 mg/L in groundwater samples MW1 (0.000054 mg/L), MW2 (0.00020 mg/L), MW3 (0.00025 mg/L), MW7 (0.000074 mg/L), MW8 (0.00022 mg/L), MW9 (0.000037 mg/L), MW12 (0.000061 mg/L), and GMW18 (0.00026 mg/L).
- Concentrations of dissolved copper exceed the applicable guideline of 0.0040 mg/L in groundwater samples MW7 (0.0082 mg/L) and MW8 (0.0043 mg/L).
- Concentrations of dissolved iron exceed the applicable guideline of 0.30 mg/L in groundwater samples MW1 (0.57 mg/L), MW2 (0.33 mg/L), MW3 (0.54 mg/L), MW6 (1.8 mg/L), MW7 (0.72 mg/L), MW8 (0.74 mg/L), and MW9 (0.43 mg/L).
- Concentrations of dissolved manganese exceed the applicable guideline of 0.05 mg/L in groundwater samples MW1 (1.9 mg/L), MW2 (0.64 mg/L), MW3 (0.15 mg/L), MW6 (0.26 mg/L), MW8 (2.9 mg/L), MW9 (2.2 mg/L), MW12 (0.12 mg/L), and GMW18 (0.98 mg/L).
- Concentrations of dissolved selenium exceed the applicable guideline of 0.0010 mg/L in groundwater samples MW2 (0.0019 mg/L), MW6 (0.020 mg/L), MW7 (0.018 mg/L), and GMW18 (0.0024 mg/L).
- Concentrations of dissolved silver exceed the applicable guideline of 0.00010 mg/L in groundwater samples MW7 (0.00046 mg/L), MW8 (0.00050 mg/L), MW9 (0.00027 mg/L), and MW12 (0.00016 mg/L).
- Concentrations of dissolved sodium exceed the applicable guideline of 200 mg/L in groundwater samples MW1 (380 mg/L), MW2 (220 mg/L), MW3 (340 mg/L), MW6 (230 mg/L), MW7 (930 mg/L), MW8 (1,000 mg/L), and GMW18 (1,000 mg/L).
- Concentrations of dissolved uranium exceed the applicable guideline of 0.010 mg/L in groundwater samples MW1 (0.019 mg/L), MW2 (0.023 mg/L), MW3 (0.028 mg/L), MW7 (0.099 mg/L), MW8 (0.050 mg/L), MW9 (0.020 mg/L), MW12 (0.021 mg/L), and GMW18 (0.080 mg/L).
- Concentrations of dissolved zinc exceed the applicable guideline of 0.010 mg/L in groundwater samples MW2 (0.020 mg/L), MW3 (0.042 mg/L), MW8 (0.023 mg/L), and MW9 (0.027 mg/L).
- Concentration of benzo(a)pyrene exceeds the applicable guideline of 0.000010 mg/L in groundwater sample MW12 (0.000012 mg/L).
- Concentrations of pyrene exceed the applicable guideline of 0.000025 mg/L in groundwater samples MW8 (0.000037 mg/L) and MW12 (0.000052 mg/L).

In addition, two surface water samples were collected from Pekisko Creek. Reported concentrations of all parameters analyzed were below the applicable guidelines for both surface water samples collected.

Based on the results from the installation of the background monitoring well, soil conditions at the Site appear to be naturally saline. Concentrations of sodium (190 mg/kg), calcium (170 mg/kg), magnesium (240 mg/kg), sulphate (1,700 mg/kg), and conductivity (5.2 dS/m) are all significantly elevated compared to non-saline soil. In addition, the groundwater results from the background monitoring well (GMW18) reported exceedances of TDS, dissolved sulphate (SO4), dissolved cadmium, dissolved manganese, dissolved selenium, dissolved sodium, and dissolved uranium. As a result, the exceedances of TDS, dissolved sulphate (SO4), dissolved cadmium, dissolved manganese, dissolved selenium, dissolved sodium, and dissolved uranium reported in groundwater samples collected during the July sampling event are likely associated with background conditions at the Site.

The dissolved nitrate (NO_3) and dissolved chloride groundwater exceedances reported during the July sampling event were localized at monitoring well MW7. Due to the elevated concentrations of the parameters at MW7 compared to all other monitoring wells and the current use of the Site by cattle for grazing, it is anticipated that these exceedances may be associated with cattle manure as previous studies have indicated that the application of manure can significantly affect soil and groundwater quality, with a build-up of nutrients in soil and the movement of nitrate and chloride into groundwater (Olson et. al, 2003).

It is likely that the benzo(a)pyrene and pyrene exceedances are associated with the former waste disposal middens as these exceedances were present in monitoring wells located on the edge and/or down gradient of the former waste disposal middens (MW8 and MW12). In addition, it should be noted that PAH exceedances have been historically reported in soil samples collected from the former waste disposal middens. However, benzo(a)pyrene and pyrene can also be associated with the presence of coal in clay till. PAHs occur naturally in bituminous fossil fuels such as coal and crude oil. Benzo(a)anthracene, benzo(a)pyrene, benzo(e)pyrene, perylene and phenanthrene have been identified in coal (Knagpal 1993). Given the stratigraphy of the Site, there is potential that these exceedances may be related to coal present in the soil at the Site as historical borehole logs have identified coal in soil.

For the remaining groundwater exceedances reported during the July sampling event (dissolved copper, dissolved iron, dissolved silver, and dissolved zinc) are often seen in groundwater in Alberta and are typically associated with glacio-lacustrine clays, similar to the soil conditions at the Site. While exceedances of these parameters were not reported in the background groundwater sample, it is still likely that they are associated with natural background conditions. As described by Thorbjornsen and Myers (2007), these associations can stem from trace metals adsorbed onto fine, colloidal size particulates of iron or aluminum hydroxides, dislodged from the aquifer to the groundwater and possibly ineffectively filtered upon sampling, rather than the presence of contaminants in groundwater.

Surface water samples were collected from two locations. One sample (SW15-01) is located approximately 305 m southeast of midden #1, hydraulically up-gradient of the former waste disposal middens and the second sample (SW15-02) is located approximately 350 m northeast of midden #2, hydraulically down-gradient of the former waste disposal middens. Each sample was collected from areas where similar ecological and geographical conditions existed and the samples could be collected safely from the creek bank. The results of the surface water samples collected from Pekisko Creek indicated that the concentrations of all parameters analyzed were similar between both locations (upstream and downstream of the former waste disposal middens). The lack of variation in the analytical results collected at both locations indicates that groundwater discharge is likely not resulting in significant changes to surface water quality at Pekisko Creek.

It is understood that PCAs objective for the Site is to document activities conducted as part of the Federal Contaminated Sites Action Plan (FCSAP) 10-step process and demonstrate that site closure has been achieved using the Site Closure Tool (SCT). Based on the groundwater and surface water analytical results collected as part of the 2015 long term monitoring program, it is recommended that a Preliminary Quantitative Risk Assessment (PQRA) Update be completed for the Site to assess potential risks associated with the low concentration groundwater exceedances identified. However it should be noted that as the clay cap is only approximately 0.15 m thick, the PQRA Update will likely still identify risks associated with direct soil contact. Therefore the risks associated with direct soil contact will need to be addressed before the SCT can be completed for the Site. It is

recommended that a shallow soil sampling program of the clay cap be completed to confirm the thickness of the clay cap and that the current clay cap be improved as per the specific recommendations provided by Meridian.

Due to the limited data set from the initial background monitoring well, it is recommended that further sampling of the background well (GMW18) and the installation of additional background wells be completed. Background sample location selection and sampling should be completed in accordance with FCSAP guidance. In addition, cattle guards should be placed around the remaining monitoring wells to protect them from potential damage due to cattle traffic. An updated groundwater elevation survey of the existing monitoring wells should also be completed. Furthermore, given that only two surface water samples (one upstream/background and one downstream) were collected, additional background and exposure surface water samples should be collected. Given that sediment in Pekisko Creek has not been evaluated historically, it is also recommended that sediment samples be collected. However, it should be noted that given the historical flooding and erosion events at the Site, it is likely that any sediment sampling would be unrepresentative of historical impacts.

Table of Contents

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by Public Works and Government Services Canada (PWGSC), on behalf of Parks Canada Agency (PCA), in July 2015 to complete the 2015 long term monitoring program at the Bar U Ranch National Historic Site located near Longview, Alberta (hereafter referred to as the Site). The Site location is presented on Figure 1, a topographic map of the Site is presented on Figure 2, and a Site locality map is presented on Figure 3. The objective of the 2015 long term monitoring program was to determine whether historical Site activities, have affected groundwater and surface water quality at the Site and the nearby Pekisko Creek. In addition, Golder understands that a future objective for the Site is to determine its suitability for closure.

2.0 BACKGROUND INFORMATION

The Site is located approximately 13 km south of Longview, Alberta. The Site consists of agricultural land used for cattle grazing with Pekisko Creek passing through the Site, which is used for watering livestock. The Site became a National Historic Site operated by PCA on December 31, 1991.

There are two waste disposal middens (coulees backfilled with waste) located in the northern portion of the Site, approximately 210 m and 140 m northwest of the creek, respectively. Midden # 1 is furthest to the west and measures approximately 35 m x 8 m. Midden # 2 is the easterly of the two middens and measures approximately 60 m x 10 m. The waste middens are roughly 100 m apart and slope towards the southeast. Waste generated by historic ranching activities at the Bar U Ranch during the over 100 years of operation (since 1881) has been placed in these coulees. The waste middens potentially contain waste oil and fuel containers, pesticide and herbicide containers, glycol, batteries, creosote treated lumber, scrap metal, vehicles and paint containers.

In 2004, a Phase II ESA was completed by Jacques Whitford Limited (Jacques). Activities included the completion of an electromagnetic (EM) survey of the waste middens, the advancement of sixteen test pits, six boreholes, three shallow soil samples, the installation of ground water monitoring wells MW1 through MW6, and the completion of soil and groundwater sampling. Concentrations of benzene, toluene, ethylbenzene, and xylenes (BTEX), petroleum hydrocarbon (PHC) Fractions F1 through F4, volatile organic compounds (VOCs), polycyclic aromatic compounds (PAHs), metals, phenols, glycols, pesticides, and herbicides were below the applicable guidelines for all soil and groundwater samples submitted for laboratory analysis, with the exception of numerous metals and PAH parameters in select soil and groundwater samples.

In 2006, an additional investigation was completed by Meridian Environmental Inc. (Meridian). Activities included the advancement of seven boreholes, eleven shallow test holes, the installation of ground water monitoring wells MW7 through MW13, and the completion of soil, groundwater, surface water, and vegetation sampling. Concentrations of BTEX, PHC Fractions F1 through F4, VOCs, PAHs, salinity parameters, metals, glycols, phenols, pesticides, and herbicides were below the applicable guidelines for all soil and groundwater samples submitted for laboratory analysis, with the exception of numerous metals and PAH parameters in select soil and groundwater samples.

In 2007, a Risk Management Plan and a Human Health and Ecological Risk Assessment (HHERA) were completed by Meridian. The HHERA identified risks associated with direct soil and groundwater contact with the waste within the middens and recommended the capping of the middens. In 2008, the middens were capped with clay fill material and four additional groundwater monitoring wells (MW14 through MW17) were advanced by AECOM Canada Ltd. (AECOM). The capping of the middens was contracted by PWGSC on behalf of PCA. The ground contour of the final clay cap blended in with the natural grades of the adjacent slopes, with a positive

drainage away from the waste middens. PWGSC reviewed historical project files for additional cap design information and concluded that the final clay cap was not an engineered design but based on landscaping for surface water drainage. No historical data was available to confirm cap thickness over the middens.

A ground penetrating radar (GPR) survey of the middens was completed by PCA in September 2015 to provide preliminary qualitative information regarding the thickness and uniformity of the clay cap. The GPR survey identified the thickness of the clay cap as approximately 0.15 m; however the thickness of the clay cap was variable.

In December 2014, a groundwater monitoring program was conducted by Golder. Only ten of the seventeen monitoring wells could be located due to lack of historical survey data, damage caused to the wells by cattle traffic, and flooding and erosion events along the creek bank. All ten monitoring wells at the Site were monitored and due to insufficient water in two of the wells, only eight samples were collected and submitted for laboratory analysis of BTEX, PHC Fractions F1 and F2, PAHs, dissolved metals, total metals, organochlorinated pesticides, and routine chemistry parameters. All parameters analyzed were below the applicable guidelines for all groundwater samples collected, with the exceptions of numerous metals, anthracene, fluoranthene, and pyrene in select groundwater samples. Based on the results of the groundwater monitoring and sampling program, the following recommendations were provided:

- Attempt to find the remaining monitoring wells during the Spring when there is no snow cover or tall grass. The monitoring wells should be flagged to allow for easy identification.
- Complete additional groundwater sampling events.
- Since the removal of contamination is not practical at the Site, an updated Human Health and Ecological Risk Assessment should be undertaken to determine whether the contamination levels on the Site are posing a risk to human and ecological receptors.

3.0 SCOPE OF WORK

The scope of work for the 2015 long term monitoring program was developed in collaboration with PWGSC and PCA and was outlined in Golder's proposal dated June 30, 2015. An amendment to the original scope of work was submitted on October 30, 2015. In summary, the scope of work for the 2015 long term monitoring program included the following:

- Completion of a groundwater monitoring and sampling event of the existing groundwater monitoring wells at the Site in July 2015;
- Submission of select groundwater samples, plus three duplicate samples for quality assurance/quality control (QA/QC) purposes (one blind duplicate sample, one field blank sample, and one trip blank sample), to Maxxam Analytics (Maxxam) located in Calgary, Alberta for analysis of BTEX, PHC Fractions F1 and F2, PAHs, VOCs, dissolved metals, total metals, organochlorinated pesticides, and routine chemistry parameters;
- Advancement of a borehole to a maximum depth of 6.1 m below ground surface (bgs), to be completed as an initial background groundwater monitoring well;

- Submission of one soil sample to Maxxam for analysis of PAHs, metals, salinity parameters, grain size, and waste characterization parameters;
- Completion of a groundwater monitoring and sampling event of the initial background groundwater monitoring well in November 2015;
- Collection of two surface water samples from Pekisko Creek, one sample hydraulically up-gradient of the waste middens and one sample hydraulically down-gradient of the waste middens; and
- Submission of one groundwater and two surface water samples, to Maxxam for analysis of PAHs, metals, and routine chemistry parameters.

4.0 REGULATORY GUIDELINES

As the Site is a National Historic Site, the environmental quality of soil and groundwater at the Site falls under federal jurisdiction. The Canadian Council of Ministers of the Environment (CCME) Guidelines, the Federal Contaminated Sites Action Plan (FCSAP) Interim Groundwater Quality Guidelines, and the Canadian Drinking Water Quality (CDWQ) Guidelines were selected to evaluate the analytical results. These generic, risk-based guidelines account for risks to applicable receptors based on land use and soil type. The following sections outline the relevant federal guidelines and the rationale for selecting those guidelines.

4.1 Canadian Council of Ministers of the Environment

The CCME Canadian Environmental Quality Guidelines (CCME Guidelines 1999a, 1999b, and 1999c) provide soil, surface water, and sediment quality criteria for the assessment of federal sites impacted with contaminants. The CCME Guidelines provide soil guidelines for agricultural, residential/parkland, commercial, and industrial land uses and surface water guidelines for both protection of aquatic life and agricultural water uses.

4.2 Federal Contaminated Sites Action Plan

The FCSAP Interim Groundwater Quality Guidelines (FCSAP Guidelines, 2015) are to be used in connection with groundwater investigation and remediation activities at federal contaminated sites. The FCSAP Guidelines follow a tiered framework, consistent with the Canadian Environmental Quality Guidelines developed by the CCME. The tiers are:

- Tier 1: direct application of the generic numerical guidelines; specifically, application of the lowest guideline for any pathway.
- Tier 2: allows for the development of site-specific remediation objectives through the consideration of site-specific conditions, by modifying (within limits) the numerical guidelines based on site-specific conditions and focusing on exposure pathways and receptors that are applicable to the site.
- Tier 3: use of site-specific risk assessment to develop Site-Specific Remediation Objectives.

4.3 Canadian Drinking Water Guidelines

The guidelines for Canadian Drinking Water Quality (CDWQ Guidelines, 2014) were established by the Federal-Provincial-Territorial Committee on Drinking Water and published by Health Canada in October 2014. Each guideline was established from current, published scientific research related to health effects, aesthetic effects, and operational considerations.

4.4 Rationale for Selection of Criteria

The following rationale is provided to demonstrate the appropriate generic criteria selection for the Site:

- The Site is currently operating as a cattle ranch and special events occur in the middens area, including dog shows and races. The middens area may continue to be a grazing area for animals such as cattle and sheep in the future. As a result, based on the land descriptions provided in the CCME and FCSAP Guidelines, the Site is classified as agricultural land use.
- Grain size analysis has been historically completed on representative soil samples collected from the Site. Based on the results, the soil at the Site predominantly consists of fine-grained silty clay till.
- Pekisko Creek passes through the Site and the waste middens are located approximately 210 m and 140 m northwest of the creek, respectively. Pekisko Creek is used for watering livestock.
- There are twenty-two water wells within a 1 km radius of the Site. It was previously confirmed that privately-owned groundwater wells are located within 500 m of the Site and PCA drinking water wells are approximately 700 m from the middens.

Based on the land use, soil grain size, and applicable exposure pathways, the following guidelines were selected to assess soil, groundwater, and surface water quality at the Site:

- Soil analytical results were compared to the CCME Soil Guidelines for agricultural land use.
- Groundwater analytical results were compared to the FCSAP Groundwater Guidelines for fine-grained soils and agricultural land use and the CDWQ Guidelines.
- Surface water analytical results were compared to the CCME SW Guidelines for the Protection of Freshwater Aquatic Life and the Protection of Agricultural Water Uses including Irrigation and Livestock Watering.

5.0 INVESTIGATION METHODOLOGY

5.1 Groundwater Sampling

The initial groundwater monitoring and sampling event occurred on July 9, 10, and 13, 2015. During the sampling event, each monitoring well was monitored for combustible headspace vapour concentrations, depth to water, and thickness of any free phase product, if present. Measurement of combustible vapour concentrations within each monitor well was completed using a RKI Eagle combustible gas detector calibrated to hexane reference gas.

Following the monitoring activities, each monitoring well was purged of three well volumes or until dry using a dedicated disposable bailer to ensure collection of representative formation water. Electrical conductivity (EC), pH, temperature, dissolved oxygen (DO), and redox measurements of the purged water were recorded periodically during the purging process to ensure that representative formation groundwater was sampled. Purge water from the development and purging of the monitor wells was placed in clearly labelled drums. A summary of groundwater monitoring results is presented in Table 1 and photographs taken during field activities are provided in Appendix A. Monitoring well locations are presented on Figure 4.

All groundwater samples were collected and placed in clean dedicated bottles provided by Maxxam as per laboratory instructions (e.g., addition of appropriate preservatives and sample bottles for volatiles and semi-volatiles with no headspace). Samples were labelled, placed in a cooler with ice, and kept cool prior to being

submitted to Maxxam in Calgary, Alberta for chemical analysis of BTEX, PHC Fractions F1 and F2, PAHs, VOCs, dissolved metals, total metals, organochlorinated pesticides, and routine chemistry parameters.

5.2 Borehole Drilling and Soil Sampling

Upon receipt of the laboratory results from the initial groundwater monitoring and sampling event, PWGSC and PCA requested that Golder install an initial background groundwater monitoring well at the Site, to be located hydraulically up-gradient of the former waste disposal middens. The background monitoring well is located in an area containing similar ecological, geographical and soil characteristics as the areas surrounding the existing wells. Prior to commencing drilling activities, underground utility services were identified by Alberta One-Call and The Utility Locators from Calgary, Alberta under the supervision of Golder personnel. Golder ensured that the drilling location was clear of any underground utility services prior to commencement of field activities. Photographs taken during drilling activities are provided in Appendix A.

On November 20, 2015, one borehole located approximately 80 m northwest (up-gradient) of midden #1, was advanced at the Site to a maximum depth of 6.1 m bgs. Golder retained Mobile Augers and Research Ltd. (Mobile) to advance the boreholes using a M4 track mounted drill rig, equipped with solid stem augers. The borehole was completed as monitoring well GMW18. All soil cuttings produced during drilling activities were stored in a soil bag and left on-Site. The borehole/monitoring well location is shown on Figure 4. The borehole log and monitoring well completion details are provided in Appendix B.

Soil samples were collected directly from the auger flights at 0.75 m intervals or where stratigraphic changes were observed. Samples were trimmed and split into two sub-samples. One of the sub-samples was placed directly into appropriate (pre-treated) glass sample jars for possible chemical analysis. The other sub-sample was placed into plastic re-sealable bags for measurement of combustible soil vapour concentrations using a RKI Eagle combustible gas detector calibrated to hexane reference gas. The soil samples were then labelled, placed in a cooler with ice, and kept cool prior to shipment to the analytical laboratory.

Based on visual observations, the anticipated groundwater interface level, and combustible headspace vapour readings, one soil sample (GMW18-7) was submitted along with an accompanying chain-of-custody form to Maxxam in Calgary, Alberta, for laboratory analysis. The soil sample was analyzed for PAHs, metals, and salinity parameters including sodium, chloride and sulphate to address contaminants of concern. In addition to the contaminants of concern the soil sample was also analyzed for grain size, and waste characterization parameters.

5.3 Monitoring Well Installation

Groundwater monitoring well GMW18 was installed on November 20, 2015. The monitoring well was constructed of 50 mm diameter, schedule 40 washed and wrapped polyvinyl chloride (PVC) screen and solid well casing. The well completion zone consisted of a 1.5 m screened interval with 0.010” slots and 10/20 sand filter pack placed around the screen to a depth of approximately 0.3 m above the top of the screen. A solid PVC riser was extended from the well screen to above the ground surface. Above the sand pack, the borehole annulus around the solid PVC casing was sealed with hydrated bentonite chips to approximately 0.3 m bgs. A protective flush mounted metal casing was installed over the monitoring well and secured in place with concrete. Global positioning system (GPS) coordinates were obtained for the monitoring well location to accurately identify the monitoring well location relative to Site features.

5.4 Additional Groundwater and Surface Water Sampling

A secondary groundwater monitoring and sampling event occurred November 27th, 2015. During the sampling event, monitoring well GMW18 was monitored for combustible headspace vapour concentrations, depth to water, and thickness of any free phase product, if present. Measurement of combustible vapour concentrations within the monitoring well was completed using a RKI Eagle combustible gas detector calibrated to hexane reference gas.

Following the monitoring activities, GMW18 was purged of three well volumes or until dry using PVC tubing and a peristaltic pump. Electrical conductivity (EC), pH, temperature, DO, and redox measurements of the purged water were recorded periodically during the purging process to ensure that representative formation groundwater was sampled. Purge water from the development and purging of the monitoring well was placed in a clearly labelled drum. A summary of groundwater monitoring results is presented in Table 1 and photographs taken during field activities are provided in Appendix A. The monitoring well location is presented on Figure 4.

Surface water samples were collected from two locations on November 27, 2015. One sample (SW15-01) is located approximately 305 m southeast of midden #1, hydraulically up-gradient of the former waste disposal middens and the second sample (SW15-02) is located approximately 350 m northeast of midden #2, hydraulically down-gradient of the former waste disposal middens. Each sample was collected from areas where similar ecological and geographical conditions existed and the samples could be collected safely from the creek bank. The surface water samples were collected from Pekisko Creek by submerging the clean dedicated bottles provided by Maxxam approximately 50 millimetres (mm) below the water surface and free of suspended solids. Refer to Figure 3 for surface water sample locations.

All groundwater and surface water samples were collected and placed in clean dedicated bottles provided by Maxxam as per laboratory instructions (e.g., addition of appropriate preservatives and sample bottles for volatiles and semi-volatiles with no headspace). Samples were labelled, placed in a cooler with ice, and kept cool prior to being submitted to Maxxam in Calgary, Alberta for chemical analysis of PAHs, metals, and routine chemistry parameters.

6.0 INVESTIGATION RESULTS

6.1 Soil Conditions

Soil conditions observed at the Site were generally consistent with those encountered during previous investigations of the Site. A dark brown, silty clay stratum with some rootlets was encountered from ground surface to a depth of 1.3 m bgs underlain by brown, silty clay with some gravel and trace coal until the maximum depth investigated of 6.1 m bgs.

One soil sample representative of Site conditions collected from a depth of 4.50 m bgs to 5.25 m bgs (GMW18-7) was submitted to Maxxam for grain size analysis. The results of the grain size analysis are summarized in Table 2 and indicate that the soil at the Site consists of a fine-grained silty clay material.

Soil samples were collected at regular intervals and field screened for combustible headspace vapour concentrations prior to selection for chemical analysis. Combustible headspace vapour concentrations in the soil samples collected from the borehole ranged from 25 parts per million (ppm) to 85 ppm.

Details of the subsurface conditions are provided on the borehole log in Appendix B.

6.2 Soil Chemistry

Current soil analytical results are summarized in Tables 3 through 6 and the laboratory certificates of analysis are provided in Appendix C. Historical soil analytical results are provided in Appendix D. However, it should be noted that soil samples have only been collected historically from three locations which were considered background: (i) TP1 (Jacques 2004 Phase II ESA); (ii) MW7 (Meridian 2006 Investigation); and (iii) MW10 (Meridian 2006 Investigation). These background samples were analyzed for select parameters including PHCs, metals, and salinity. All remaining historical soil samples were collected from within the waste middens and/or down-gradient of the waste middens.

6.2.1 Polycyclic Aromatic Hydrocarbons (PAHs)

One soil sample collected from a depth of 4.50 m bgs to 5.25 m bgs (GMW18-7) was submitted for chemical analysis of PAHs. The analytical results indicated that reported concentrations of PAH parameters were below the laboratory detections limits with the exceptions of benzo(b&j)fluoranthene, benzo(g,h,i)perylene, benzo(a)pyrene (B(a)P), indeno(1,2,3-cd)pyrene, perylene, B(a)P total potency equivalent (TPE), and index of additive cancer risk (IACR). All PAH parameters were below the applicable CCME Soil Guidelines.

Concentrations of PAH parameters in historical soil samples collected from within and/or down-gradient of the waste middens exceed the applicable CCME Soil Guidelines for naphthalene, phenanthrene, and pyrene. The analytical results for PAHs are summarized in Table 3 and historical soil analytical results are provided in Appendix D.

6.2.2 Metals

One soil sample collected from a depth of 4.50 m bgs to 5.25 m bgs (GMW18-7) was submitted for chemical analysis of metals. The analytical results indicated that overall, concentrations of metals parameters were above the laboratory detection limits, however all metal parameters were below the applicable CCME Soil Guidelines. In general the reported concentrations of the metal parameters were approximately five times lower than the applicable guidelines.

Concentrations of metal parameters in historical background soil samples are also below the applicable CCME Soil Guidelines. Concentrations of metal parameters in historical soil samples collected from within and/or down-gradient of the waste middens exceed the applicable CCME Soil Guidelines for arsenic, beryllium, cadmium, copper, lead, molybdenum, selenium, tin, and zinc. The analytical results for metals are summarized in Table 4 and historical soil analytical results are provided in Appendix D.

6.2.3 Salinity Parameters

One soil sample collected from a depth of 4.50 m bgs to 5.25 m bgs (GMW18-7) was submitted for chemical analysis of detailed salinity parameters. The analytical results indicated that reported concentrations of all detailed salinity parameters were below the applicable CCME Soil Guidelines, with the following exception:

- Soluble conductivity concentration of 5.2 dS/m exceeded the applicable guideline of 2.0 dS/m.

Concentrations of detailed salinity parameters in historical background soil samples are also below the applicable CCME Soil Guidelines, with the exception of conductivity in a soil sample collected from MW7 (5.74 dS/m). Concentrations of detailed salinity parameters in historical soil samples collected from within and/or down-gradient of the waste middens exceed the applicable CCME Soil Guidelines for pH and conductivity. The analytical results

for detailed salinity parameters are summarized in Table 5 and historical soil analytical results are provided in Appendix D.

6.2.4 Waste Characterization Parameters

One soil sample (GMW18-7), representative of the soil cuttings produced during drilling activities, was submitted for chemical analysis of waste characterization parameters. This was completed to ensure that the soil cuttings produced during drilling activities met the Alberta contaminated soil landfill disposal requirements for future disposal. The analytical results indicated that the reported concentrations of waste characterization parameters were all below the applicable ESRD Alberta Users Guide for Waste Management Guidelines. The analytical results for waste characterization parameters are summarized in Table 6.

6.3 Groundwater Conditions

During the July sampling event, depth to groundwater at the Site ranged between 1.79 metres below top of casing (m btoc) (MW6) and 4.66 m btoc (MW4) (refer to Figure 5). Depth to groundwater at GMW18 in November was 4.90 m btoc. Monitoring well MW4 contained insufficient groundwater to collect samples, while monitoring well MW5 contained insufficient groundwater to collect field parameters and only sufficient groundwater to submit a sample for laboratory analysis of BTEX and PHC Fractions F1 and F2. In addition, monitoring wells MW10, MW11, and MW13 through MW17 were missing and are assumed to be destroyed. It should be noted that MW17 was not sampled when it was installed in 2008 and has been missing (presumed destroyed) since. Based on the 2015 groundwater elevation contours shown on Figure 5, the direction of shallow groundwater flow at the Site is to the east-southeast towards Pekisko Creek. No free phase product was encountered and a summary of groundwater conditions is provided in Table 1.

6.4 Groundwater and Surface Water Chemistry

During the July sampling event, groundwater samples were collected from monitoring wells MW1, MW2, MW3, MW5 through MW9, and MW12, along with a blind duplicate of MW1 (DUP15-01), a field blank (DUP15-02), and a trip blank (DUP15-03), and submitted for laboratory analysis. In addition during the November sampling event, a ground water sample was collected from monitoring well GMW18 and two surface water samples from Pekisko Creek, one sample hydraulically up-gradient of the former waste disposal middens (SW15-01) and one sample hydraulically down-gradient of the former waste disposal middens (SW15-02), were also submitted for laboratory analysis. Surface water sample locations are shown on Figure 3.

Groundwater and surface water analytical results are summarized in Tables 7 through 16 and the laboratory certificates of analysis are provided in Appendix C. Groundwater exceedances are presented on Figure 6.

6.4.1 BTEX and PHC Fractions F1 and F2

Reported concentrations of BTEX and PHC Fractions F1 and F2 were below the laboratory detection limits and the applicable FCSAP Guidelines and CDWQ Guidelines for all groundwater samples collected. The analytical results for BTEX and PHC Fractions F1 and F2 are summarized in Table 7.

6.4.2 Routine Chemistry Parameters

Reported concentrations of routine chemistry parameters were below the applicable FCSAP Guidelines and CDWQ Guidelines for all groundwater samples collected, with the exception of the following:

- Concentration of dissolved nitrate (NO_3) exceeds the applicable FCSAP Guideline of 13 mg/L in groundwater sample MW7 (37 mg/L).
- Concentrations of total dissolved solids (TDS) exceed the applicable CDWQ Guideline of 500 mg/L in groundwater samples MW1 (4,100 mg/L), MW2 (2,500 mg/L), MW3 (6,200 mg/L), MW6 (3,000 mg/L), MW7 (12,000 mg/L), MW8 (11,000 mg/L), MW9 (2,500 mg/L), MW12 (2,100 mg/L), and GMW18 (11,000 mg/L).
- Concentrations of dissolved sulphate (SO_4) exceed the applicable FCSAP Guideline of 100 mg/L in groundwater samples MW1 (2,700 mg/L), MW2 (1,500 mg/L), MW3 (4,200 mg/L), MW6 (1,600 mg/L), MW7 (8,300 mg/L), MW8 (8,200 mg/L), MW9 (1,600 mg/L), MW12 (1,200 mg/L), and GMW18 (8,100 mg/L).
- Concentration of dissolved chloride exceeds the applicable FCSAP Guideline of 100 mg/L in groundwater sample MW7 (130 mg/L).

In addition, concentrations of routine chemistry parameters were below the applicable CCME SW Guidelines for all surface water samples collected. The analytical results for routine chemistry parameters are summarized in Tables 8 and 14.

6.4.3 Dissolved Metals

Reported concentrations of dissolved metals were below the applicable FCSAP Guidelines and CDWQ Guidelines for all groundwater samples collected, with the exception of the following:

- Concentrations of dissolved cadmium exceed the applicable FCSAP Guideline of 0.000017 mg/L in groundwater samples MW1 (0.000054 mg/L), MW2 (0.00020 mg/L), MW3 (0.00025 mg/L), MW7 (0.000074 mg/L), MW8 (0.00022 mg/L), MW9 (0.000037 mg/L), MW12 (0.000061 mg/L), and GMW18 (0.00026 mg/L).
- Concentrations of dissolved copper exceed the applicable FCSAP Guideline of 0.0040 mg/L in groundwater samples MW7 (0.0082 mg/L) and MW8 (0.0043 mg/L).
- Concentrations of dissolved iron exceed the applicable CDWQ and FCSAP Guideline of 0.30 mg/L in groundwater samples MW1 (0.57 mg/L), MW2 (0.33 mg/L), MW3 (0.54 mg/L), MW6 (1.8 mg/L), MW7 (0.72 mg/L), MW8 (0.74 mg/L), and MW9 (0.43 mg/L).
- Concentrations of dissolved manganese exceed the applicable CDWQ Guideline of 0.05 mg/L in groundwater samples MW1 (1.9 mg/L), MW2 (0.64 mg/L), MW3 (0.15 mg/L), MW6 (0.26 mg/L), MW8 (2.9 mg/L), MW9 (2.2 mg/L), MW12 (0.12 mg/L), and GMW18 (0.98 mg/L).
- Concentrations of dissolved selenium exceed the applicable FCSAP Guideline of 0.0010 mg/L in groundwater samples MW2 (0.0019 mg/L), MW6 (0.020 mg/L), MW7 (0.018 mg/L), and GMW18 (0.0024 mg/L).
- Concentrations of dissolved silver exceed the applicable FCSAP Guideline of 0.00010 mg/L in groundwater samples MW7 (0.00046 mg/L), MW8 (0.00050 mg/L), MW9 (0.00027 mg/L), and MW12 (0.00016 mg/L).

- Concentrations of dissolved sodium exceed the applicable CDWQ Guideline of 200 mg/L in groundwater samples MW1 (380 mg/L), MW2 (220 mg/L), MW3 (340 mg/L), MW6 (230 mg/L), MW7 (930 mg/L), MW8 (1,000 mg/L), and GMW18 (1,000 mg/L).
- Concentrations of dissolved uranium exceed the applicable FCSAP Guideline of 0.010 mg/L in groundwater samples MW1 (0.019 mg/L), MW2 (0.023 mg/L), MW3 (0.028 mg/L), MW7 (0.099 mg/L), MW8 (0.050 mg/L), MW9 (0.020 mg/L), MW12 (0.021 mg/L), and GMW18 (0.080 mg/L).
- Concentrations of dissolved zinc exceed the applicable FCSAP Guideline of 0.010 mg/L in groundwater samples MW2 (0.020 mg/L), MW3 (0.042 mg/L), MW8 (0.023 mg/L), and MW9 (0.027 mg/L).

The analytical results for dissolved metals are summarized in Table 9.

6.4.4 Total Metals

Reported concentrations of total metals were below the applicable FCSAP Guidelines and CDWQ Guidelines for all groundwater samples collected. In addition, concentrations of total metals were below the applicable CCME SW Guidelines for all surface water samples collected. The analytical results for total metals are summarized in Tables 10 and 15.

6.4.5 Polycyclic Aromatic Hydrocarbons (PAHs)

Reported concentrations of PAHs were below the applicable FCSAP Guidelines and CDWQ Guidelines for all groundwater samples collected, with the exception of the following:

- Concentration of benzo(a)pyrene exceeds the applicable CDWQ and FCSAP Guideline of 0.000010 mg/L in groundwater sample MW12 (0.000012 mg/L); and
- Concentrations of pyrene exceed the applicable FCSAP Guideline of 0.000025 mg/L in groundwater samples MW8 (0.000037 mg/L) and MW12 (0.000052 mg/L).

In addition, concentrations of PAHs were below the applicable CCME SW Guidelines for all surface water samples collected. The analytical results for PAHs are summarized in Tables 11 and 16.

6.4.6 Organochlorinated Pesticides

Reported concentrations of organochlorinated pesticides were below the applicable FCSAP Guidelines and CDWQ Guidelines for all groundwater samples collected. The analytical results for organochlorinated pesticides are summarized in Table 12.

6.4.7 Volatile Organic Compounds (VOCs)

Reported concentrations of VOCs were below the applicable FCSAP Guidelines and CDWQ Guidelines for all groundwater samples collected. The analytical results for VOCs are summarized in Table 13.

7.0 QUALITY ASSURANCE AND QUALITY CONTROL

Soil, groundwater, and surface water samples were collected using appropriate handling protocols and were placed in sample containers provided by Maxxam. Sample preservation was conducted in the field as required by the analytical laboratory. These tasks were completed in accordance with Golder's Field Technical Procedures. All field equipment involved in the sampling and monitoring of soil, groundwater, and surface water were decontaminated in accordance with Golder's Technical Procedures.

The objective of the Quality Assurance/Quality Control (QA/QC) assessment was to evaluate the quality and appropriateness of the analytical data for QA/QC samples collected by Golder in the field. In addition, Golder also reviewed the summary of laboratory QA/QC provided by Maxxam for surrogate spikes, matrix spikes and method blanks. The laboratory QA/QC proved satisfactory and met all the QA/QC requirements. The laboratory certificates of analysis are provided in Appendix C and a summary of the laboratory QA/QC is provided in Appendix E.

The measure of the reproducibility or precision of the data was quantified by calculating the Relative Percent Difference (RPD). The RPD was calculated as follows:

$$\text{RPD}\% = \frac{[S - D]}{\frac{1}{2}(S + D)} x\ 100$$

Where: RPD = Relative Percent Difference
S = sample value
D = duplicate or replicate value

Theoretically, the samples should have identical chemical concentrations (i.e., RPD = 0). However, due to factors such as sample matrix heterogeneity, natural variations or variations in sample collection, handling or analysis, a minor variation in chemical concentration may occur (i.e., RPD > 0). Moreover, the reproducibility of replicate analyses at concentrations near the reported detection limit (RDL) can be poor, resulting in RPD values of greater than the allowable limits. Therefore, for duplicate concentrations where the concentrations of both the original and blind field duplicate samples were greater than five times the RDL, a relative percent difference value of +/-30% is considered acceptable. For duplicate concentrations where either the concentrations of the original or blind field duplicate samples were less than five times the RDL, a value of +/- 2 detection limits is considered acceptable. Relative Percent Difference (RPD) values greater than the project objectives suggest variability had been introduced through sample collection, sampling handling, or sample analysis.

One blind duplicate sample, one field blank sample, and one trip blank sample were collected during each sampling event. The results of the duplicate analysis are provided in Table 17. The results indicate that for concentrations above five times the RDL, the relative percent difference is less than 30% for all parameters analyzed. For concentrations within five times the RDL, the results are within +/- two times the detection limit. Based on the review of the QA/QC results, the data presented in this report is considered to be reliable.

8.0 DISCUSSION

During the July sampling event, exceedances of numerous routine chemistry parameters (dissolved nitrate [NO_3], TDS, dissolved sulphate [SO_4], and dissolved chloride) and dissolved metals (cadmium, copper, iron, manganese, selenium, silver, sodium, uranium, and zinc) were reported in groundwater samples collected from several monitoring wells. In addition, exceedances of benzo(a)pyrene and pyrene were reported in groundwater samples collected from two monitoring wells. Based on these results it was determined that many of these exceedances may be associated with background groundwater conditions at the Site; however due to the limited background data available for the Site, it was recommended that a background groundwater monitoring well be installed, up-gradient of the former waste disposal middens. In addition, it was recommended that surface water samples be collected from Pekisko Creek to determine whether groundwater discharge was resulting in significant changes to the surface water quality of Pekisko Creek.

Based on the results from the installation of the background monitoring well, soil conditions at the Site appear to be naturally saline. Concentrations of sodium (190 mg/kg), calcium (170 mg/kg), magnesium (240 mg/kg), sulphate (1,700 mg/kg), and conductivity (5.2 dS/m) are all significantly elevated compared to non-saline soil. In addition, the groundwater results from the background monitoring well (GMW18) reported exceedances of TDS, dissolved sulphate (SO_4), dissolved cadmium, dissolved manganese, dissolved selenium, dissolved sodium, and dissolved uranium. As a result, the exceedances of TDS, dissolved sulphate (SO_4), dissolved cadmium, dissolved manganese, dissolved selenium, dissolved sodium, and dissolved uranium reported in groundwater samples collected during the July sampling event are likely associated with background conditions at the Site.

The dissolved nitrate (NO_3) and dissolved chloride groundwater exceedances reported during the July sampling event were localized at monitoring well MW7. Due to the elevated concentrations of the parameters at MW7 compared to all other monitoring wells and the current use of the Site by cattle for grazing, it is anticipated that these exceedances may be associated with cattle manure as previous studies have indicated that the application of manure can significantly affect soil and groundwater quality, with a build-up of nutrients in soil and the movement of nitrate and chloride into groundwater (Olson et al. 2003).

It is likely that the benzo(a)pyrene and pyrene exceedances are associated with the former waste disposal middens as these exceedances were present in monitoring wells located on the edge and/or down gradient of the former waste disposal middens (MW8 and MW12). In addition, it should be noted that PAH exceedances have been historically reported in soil samples collected from the former waste disposal middens. However, benzo(a)pyrene and pyrene can also be associated with the presence of coal in clay till. PAHs occur naturally in bituminous fossil fuels such as coal and crude oil. Benzo(a)anthracene, benzo(a)pyrene, benzo(e)pyrene, perylene and phenanthrene have been identified in coal (Knagpal 1993). Given the stratigraphy of the Site, there is potential that these exceedances may be related to coal present in the soil at the Site as historical borehole logs have identified coal in soil.

For the remaining groundwater exceedances reported during the July sampling event (dissolved copper, dissolved iron, dissolved silver, and dissolved zinc) are often seen in groundwater in Alberta and are typically associated with glacio-lacustrine clays, similar to the soil conditions at the Site. While exceedances of these parameters were not reported in the background groundwater sample, it is still likely that they are associated with natural background conditions. As described by Thorbjornsen and Myers (2007), these associations can stem from trace metals adsorbed onto fine, colloidal size particulates of iron or aluminum hydroxides, dislodged from the aquifer to the

groundwater and possibly ineffectively filtered upon sampling, rather than the presence of contaminants in groundwater.

Surface water samples were collected from two locations. One sample (SW15-01) is located approximately 305 m southeast of midden #1, hydraulically up-gradient of the former waste disposal middens and the second sample (SW15-02) is located approximately 350 m northeast of midden #2, hydraulically down-gradient of the former waste disposal middens. Each sample was collected from areas where similar ecological and geographical conditions existed and the samples could be collected safely from the creek bank. The results of the surface water samples collected from Pekisko Creek indicated that the concentrations of all parameters analyzed were similar between both locations (upstream and downstream of the former waste disposal middens). The lack of variation in the analytical results collected at both locations indicates that groundwater discharge is likely not resulting in significant changes to surface water quality at Pekisko Creek.

9.0 CONCLUSIONS/RECOMMENDATIONS

A Human Health and Ecological Risk Assessment (HHERA) was completed for the Site by Meridian in 2007. The HHERA identified risks associated with direct soil and groundwater contact and recommended the capping of the former waste disposal middens. In 2008, the former waste disposal middens were capped with clay material. The capping of the middens was contracted by PWGSC on behalf of PCA. The ground contour of the final clay cap blended in with the natural grades of the adjacent slopes, with a positive drainage away from the waste middens. PWGSC reviewed historical project files for additional cap design information and concluded that the final clay cap was not an engineered design but based on landscaping for surface water drainage. No historical data was available to confirm cap thickness over the middens. A ground penetrating radar (GPR) survey of the middens was completed by PCA in September 2015 to provide preliminary qualitative information regarding the thickness and uniformity of the clay cap. The GPR survey identified the thickness of the clay cap as approximately 0.15 m; however the thickness of the clay cap was variable.

It is understood that PCAs objective for the Site is to document activities conducted as part of the Federal Contaminated Sites Action Plan (FCSAP) 10-step process and demonstrate that site closure has been achieved using the Site Closure Tool (SCT). Based on the groundwater and surface water analytical results collected as part of the 2015 long term monitoring program, it is recommended that a Preliminary Quantitative Risk Assessment (PQRA) Update be completed for the Site to assess potential risks associated with the low concentration groundwater exceedances identified. However it should be noted that as the clay cap is only approximately 0.15 m thick, the PQRA Update will likely still identify risks associated with direct soil contact. Therefore the risks associated with direct soil contact will need to be addressed before the SCT can be completed for the Site. It is recommended that a shallow soil sampling program of the clay cap be completed to confirm the thickness of the clay cap and that the current clay cap be improved as per the specific recommendations provided by Meridian.

Due to the limited data set from the initial background monitoring well, it is recommended that further sampling of the background well (GMW18) and the installation of additional background wells be completed. Background sample location selection and sampling should be completed in accordance with FCSAP guidance. In addition, cattle guards should be placed around the remaining monitoring wells to protect them from potential damage due to cattle traffic. An updated groundwater elevation survey of the existing monitoring wells should also be completed. Furthermore, given that only two surface water samples (one upstream/background and one downstream) were collected, additional background and exposure surface water samples should be collected. Given that sediment in Pekisko Creek has not been evaluated historically, it is also recommended that sediment

samples be collected. However, it should be noted that given the historical flooding and erosion events at the Site, it is likely that any sediment sampling would be unrepresentative of historical impacts.

10.0 LIMITATIONS

This report was prepared for the exclusive use of Public Works and Government Services Canada. The report, which specifically includes all tables, figures, and appendices, is based on data and information collected during the Site activities conducted by Golder Associates Ltd. and is based solely on the conditions of the property at the time of the Site field program and data obtained by Golder Associates Ltd. as described in this report.

The services performed as described in this report were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions.

Any use which a third party makes of this report, or any reliance on, or decisions to be made based on it, are the responsibilities of such third parties. Golder Associates Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The content of this report is based on information collected during our assessment, our present understanding of the Site conditions, and our professional judgement in light of such information at the time of this report. This report provides a professional opinion and therefore no warranty is either expressed, implied, or made as to the conclusions, advice and recommendations offered in this report. This report does not provide a legal opinion regarding compliance with applicable laws. With respect to regulatory compliance issues, it should be noted that regulatory statutes and the interpretation of regulatory statues are subject to change. The findings and conclusions of this report are valid only as of the date of this report. If new information is discovered in future work, including excavations, borings, or other studies, Golder Associates Ltd. should be requested to re-evaluate the conclusions of this report, and to provide amendments as required.

CLOSURE

We trust the above meets your present requirements. If you have any questions or require additional details, please contact the undersigned.

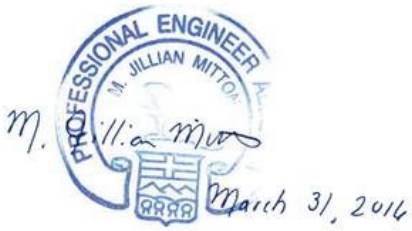
Sincerely,

GOLDER ASSOCIATES LTD.
APEGA Permit to Practice #05122

Prepared By:

Steven Fiddler, B.Sc.
Environmental Scientist

Reviewed By:



Jillian Mitton, M.Sc., P.Eng
Principal, Senior Environmental Engineer

SF/JM/pls

\\golder\gal\edmonton\active\2015\3 proj\1526784 public works - parks canada\project\report\final bar u report\1526784-2000 bar u ltm report_mar16.docx

11.0 REFERENCES

AECOM (AECOM Canada Ltd.). 2009. Monitoring Well Installation/Sampling & Capping of Waste Disposal Middens Bar U Ranch National Historic Site, Longview, Alberta. Report prepared for Public Works and Government Services Canada, Edmonton, AB. Dated April 8, 2009.

CCME (Canadian Council of Ministers of the Environment). 1999a. Canadian Water Quality Guidelines for the Protection of Aquatic Life. Dated 1999.

CCME. 1999b. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses. Dated 1999.

CCME. 1999c. Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Dated 1999.

FCSAP (Federal Contaminated Sites Action Plan). 2015. Guidance Document on Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites. Dated November 2015 (Version 3)

Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and the Environment. 2014. Guidelines for Canadian Drinking Water Quality Summary Table. Published by Health Canada. Dated October 2014.

Golder (Golder Associates Ltd.). 2015. 2014 Bar U Ranch Waste Middens Groundwater Monitoring and Sampling Report Bar U Ranch National Historic Site, Longview, Alberta. Report prepared for Parks Canada, Calgary, AB. Dated April 2, 2015.

Jacques (Jacques Whitford Limited). 2004. Waste Dump Site Assessment Bar U Ranch National Historic Site Longview, Alberta. Report prepared for Parks Canada, Calgary, AB. Dated December 17, 2004.

Knagpal, N. 1993. Ambient Water Quality Criteria for Polycyclic Aromatic Hydrocarbons. Ministry of Environment, Lands and Parks, Province of British Columbia, Dated February 1993.

Meridian (Meridian Environmental Inc.). 2007a. Waste Middens Investigation Bar U Ranch National Historic Site. Report prepared for Parks Canada, Calgary, AB. Dated January 9, 2007.

Meridian. 2007b. Human Health and Ecological Risk Assessment Former Waste Disposal Middens Bar U Ranch National Historic Site. Report prepared for Parks Canada, Calgary, AB. Dated March 14, 2007.

Meridian. 2007c. Risk Management Plan Preliminary Design and Cost Estimate Bar U Ranch National Historic Site, Alberta. Letter prepared for Parks Canada, Calgary, AB. Dated March 29, 2007.

Olson, B.M., McKenzie, R.H., Bennett, D.R., Ormann, T., and Atkins, R.P. 2003. Manure application effects on soil and groundwater quality under irrigation in southern Alberta. Alberta Agriculture, Food and Rural Development, Lethbridge, Alberta, Canada. Dated September 2003.

Parks Canada Agency. 2015. Ground Penetrating Radar Survey, Bar U Ranch NHS, Contaminated Soil Assessment. Dated September 2015.

Thorbjornsen K and Myers J. 2007. Identifying Metals Contamination in Groundwater Using Geochemical Correlation Evaluation. Environmental Forensics 8: 25-35.

TABLES

Table 1
Summary of Groundwater and Surface Water Field Monitoring Results
Bar U Ranch National Historic Site, Alberta
Public Works and Government Services Canada

ID	Date	Depth to Groundwater (mbtoc)	Product Thickness (m)	Headspace Vapours (ppm)	Electrical Conductivity (µS/m)	pH	Temperature (°C)	GPS Coordinates
MW1	9-Jul-15	1.93	n/d	20	3,082	6.87	9.1	11 U 0695242, 5589552
MW2	10-Jul-15	2.08	n/d	15	1,820	6.84	9.1	11 U 0695299, 5589534
MW3	10-Jul-15	2.60	n/d	5	3,777	6.54	10.6	11 U 0695301, 5589525
MW4	10-Jul-15	4.66	n/d	15	Insufficient Water to Collect Sample			11 U 0695405, 5589620
MW5	10-Jul-15	2.80	n/d	5	Insufficient Water to Collect Parameters			11 U 0695484, 5589617
MW6	10-Jul-15	1.79	n/d	60	2,785	6.70	10.4	11 U 0695473, 5589601
MW7	9-Jul-15	2.37	n/d	10	6,563	6.71	6.9	11 U 0695250, 5589574
MW8	9-Jul-15	2.17	n/d	80	6,435	6.93	6.3	11 U 0695243, 5589552
MW9	9-Jul-15	2.05	n/d	40	2,012	7.04	10.6	11 U 0695243, 5589553
MW10	9-Jul-15	Well Missing						NA
MW11	9-Jul-15	Removed in 2009						NA
MW12	10-Jul-15	2.00	n/d	15	1,831	6.67	10.9	11 U 0695491, 5589600
MW13	9-Jul-15	Well Missing						NA
MW14	9-Jul-15	Well Missing						NA
MW15	9-Jul-15	Well Missing						NA
MW16	9-Jul-15	Well Missing						NA
MW17	9-Jul-15	Well Missing						NA
GMW18	27-Nov-15	4.90	n/d	0	9,393	7.06	5.7	11 U 0695157, 5589584
SW15-01	27-Nov-15	NA	NA	NA	449.5	8.30	-0.3	11U 0695620, 5589115
SW15-02	27-Nov-15	NA	NA	NA	454.5	8.31	-0.4	11U 0695766, 5589619

Notes:

mbgs - metres below top of casing

m - metres

ppm - parts per million

µS/m - microSiemens per metre

°C - degrees Celsius

n/d - not detected

NA - not available

Table should be read in conjunction with accompanying report.

Table 2
Soil Chemistry Results - Grain Size Analysis
Bar U Ranch National Historic Site, Alberta
Public Works and Government Services Canada

Sample Identification			GMW18-7
Sample Depth (m bgs)			4.5 - 5.25
Headspace Combustible Vapour (ppm)			85
Sample Collection Date			20-Nov-15
Parameter	**Units[a]**	**RDL**	
Sieve - Pan	%	0.2	81
Sieve - #200 (>0.075 mm)[b]	%	0.2	19
Grain Size	%	0.2	FINE

Notes:

(a) Percentage by weight.

(b) Indicates percentage retained on #200 sieve. Coarse-grained defined as over 50% retained.

RDL - reported detection limit

Table should be read in conjunction with accompanying report.

Table 3
Soil Chemistry Results - Polycyclic Aromatic Hydrocarbons
Bar U Ranch National Historic Site, Alberta
Public Works and Government Services Canada

Sample Identification			GMW18-7	CCME Human Health Guidelines[a][b]	CCME Environmental Health Guidelines[a][b]
Sample Depth (m bgs)			4.5 - 5.25		
Headspace Combustible Vapour (ppm)			85		
Sample Collection Date			20-Nov-15		
Parameter	**Units**	**RDL**			
Acenaphthene	mg/kg	0.005	<0.0050	**5,300[c]**	**0.28**
Benzo[a]pyrene equivalency	mg/kg	0.1	<0.10	**0.6**	**NG**
Acenaphthylene	mg/kg	0.005	<0.0050	**NG[c]**	**320**
Acridine	mg/kg	0.01	<0.010	**NG**	**NG**
Anthracene	mg/kg	0.004	<0.0040	**24,000[c]**	**2.5**
Benzo(a)anthracene	mg/kg	0.005	<0.0050	**B(a)P TPE<0.6; IACR<1**	**0.1**
Benzo(b&j)fluoranthene	mg/kg	0.005	0.013	**B(a)P TPE<0.6; IACR<1**	**0.1**
Benzo(k)fluoranthene	mg/kg	0.005	<0.0050	**B(a)P TPE<0.6; IACR<1**	**0.1**
Benzo(g,h,i)perylene	mg/kg	0.005	0.0068	**B(a)P TPE<0.6; IACR<1**	**NG**
Benzo(c)phenanthrene	mg/kg	0.005	<0.0050	**NG**	**NG**
Benzo(a)pyrene	mg/kg	0.005	<0.0050	**B(a)P TPE<0.6; IACR<1**	**20**
Benzo[e]pyrene	mg/kg	0.005	0.0081	**NG**	**NG**
Chrysene	mg/kg	0.005	<0.0050	**B(a)P TPE<0.6; IACR<1**	**6.2**
Dibenz(a,h)anthracene	mg/kg	0.005	<0.0050	**B(a)P TPE<0.6; IACR<1**	**0.1**
Fluoranthene	mg/kg	0.005	<0.0050	**3,500[c]**	**50**
Fluorene	mg/kg	0.005	<0.0050	**2,700[c]**	**0.25**
Indeno(1,2,3-cd)pyrene	mg/kg	0.005	0.0055	**B(a)P TPE<0.6; IACR<1**	**0.1**
2-Methylnaphthalene	mg/kg	0.005	<0.0050	**NG**	**NG**
Naphthalene	mg/kg	0.005	<0.0050	**28[c]**	**0.013**
Phenanthrene	mg/kg	0.005	<0.0050	**NG[c]**	**0.046**
Perylene	mg/kg	0.005	0.0056	**NG**	**NG**
Pyrene	mg/kg	0.005	<0.0050	**2,100[c]**	**0.1**
Quinoline	mg/kg	0.01	<0.010	**0.1**	**0.1**
B(a)P TPE[d]	mg/kg	N/A	0.013	**0.6**	**NG**
IACR[d]	mg/kg	N/A	0.17	**1**	**NG**

Notes:

(a) Canadian Council of Ministers of the Environment (CCME) Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health for agricultural land use, 1999.

(b) There is no single Canadian Soil Quality Guideline that protects both human and environmental health for PAH parameters. As a result, guidelines for both the protection of human and environmental health are provided.

(c) Protection of human health from non-carcinogenic effects was not assessed by CCME. As a result, Alberta Environment and Parks Tier 1 Soil Quality Guidelines were consulted to provide guidelines.

(d) Refer to CCME Canadian Soil Quality Guidelines for formulas used to calculate B(a)P TPE and IACR.

B(a)P TPE - Benzo(a)pyrene Total Potency Equivalents, which is the sum of estimated cancer potency relative to B(a)P for all potentially carcinogenic unsubstituted PAHs.

IACR - Index of Additive Cancer Risk assesses potential threats to potable groundwater quality from leaching of carcinogenic PAH mixtures from soil.

mg/kg - milligrams per kilogram

ppm - parts per million

m bgs - metres below ground surface

RDL - reported detection limit

N/A - not applicable

NG - No Guideline

BOLD indicates samples in exceedance of applicable guidelines.

Table should be read in conjunction with accompanying report.

Table 4
Soil Chemistry Results - Metals
Bar U Ranch National Historic Site, Alberta
Public Works and Government Services Canada

Sample Identification			GMW18-7	**CCME Guidelines[(a)]**
Sample Depth (m bgs)			4.5 - 5.25	
Headspace Combustible Vapour (ppm)			85	
Sample Collection Date			20-Nov-15	
Parameter	**Units**	**RDL**		
Total Antimony (Sb)	mg/kg	0.5	<0.50	**20**
Total Arsenic (As)	mg/kg	1	5.9	**12**
Total Barium (Ba)	mg/kg	1	190	**750**
Total Beryllium (Be)	mg/kg	0.4	0.51	**4**
Soluble (Hot water) Boron (B)	mg/kg	0.1	0.29	**2**
Total Cadmium (Cd)	mg/kg	0.05	0.6	**1.4**
Hex. Chromium (Cr 6+)	mg/kg	0.08	<0.080	**0.4**
Total Chromium (Cr)	mg/kg	1	18	**64**
Total Cobalt (Co)	mg/kg	0.5	6.6	**40**
Total Copper (Cu)	mg/kg	1	17	**63**
Total Lead (Pb)	mg/kg	0.5	9.9	**70**
Total Mercury (Hg)	mg/kg	0.05	0.13	**6.6**
Total Molybdenum (Mo)	mg/kg	0.4	0.92	**5**
Total Nickel (Ni)	mg/kg	1	23	**45**
Total Selenium (Se)	mg/kg	0.5	0.51	**1**
Total Silver (Ag)	mg/kg	0.2	<0.20	**20**
Total Thallium (Tl)	mg/kg	0.1	0.19	**1**
Total Tin (Sn)	mg/kg	1	<1.0	**5**
Total Uranium (U)	mg/kg	0.2	0.88	**23**
Total Vanadium (V)	mg/kg	1	21	**130**
Total Zinc (Zn)	mg/kg	10	60	**200**

Notes:

(a) Canadian Council of Ministers of the Environment (CCME) Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health for agricultural land use, 1999.

mg/kg - milligrams per kilogram

ppm - parts per million

m bgs - metres below ground surface

RDL - reported detection limit

BOLD indicates samples in exceedance of applicable guidelines.

Table should be read in conjunction with accompanying report.

Table 5
Soil Chemistry Results - Detailed Salinity Parameters
Bar U Ranch National Historic Site, Alberta
Public Works and Government Services Canada

Sample Identification			GMW18-7	**CCME Guidelines[(a)]**
Sample Depth (m bgs)			4.5 - 5.25	
Headspace Combustible Vapour (ppm)			85	
Sample Collection Date			20-Nov-15	
Parameter	**Units**	**RDL**		
Calculated Parameters				
Anion Sum	meq/L	N/A	73	**NG**
Cation Sum	meq/L	N/A	73	**NG**
Cation/EC Ratio	N/A	0.1	14	**NG**
Ion Balance	N/A	0.01	1	**NG**
Calculated Calcium (Ca)	mg/kg	0.74	170	**NG**
Calculated Magnesium (Mg)	mg/kg	0.5	240	**NG**
Calculated Sodium (Na)	mg/kg	1.2	190	**NG**
Calculated Potassium (K)	mg/kg	0.64	10	**NG**
Calculated Chloride (Cl)	mg/kg	2.5	3.5	**NG**
Calculated Sulphate (SO4)	mg/kg	2.5	1,700	**NG**
Calculated Nitrate (N)	mg/kg	0.099	0.12	**NG**
Calculated Bicarbonate (HCO3)	mg/kg	5	23	**NG**
Calculated Carbonate (CO3)	mg/kg	5	<5.0	**NG**
Calculated Hydroxide (OH)	mg/kg	5	<5.0	**NG**
Soluble Parameters				
Soluble Bicarbonate (HCO3)	mg/L	10	45	**NG**
Soluble Carbonate (CO3)	mg/L	10	<10	**NG**
Soluble Chloride (Cl)	mg/L	5	7.2	**NG**
Soluble Conductivity	dS/m	0.02	**5.2**	**2**
Soluble Hydroxide (OH)	mg/L	10	<10	**NG**
Soluble (CaCl2) pH	pH	N/A	7.74	**6.0 - 8.0**
Sodium Adsorption Ratio	N/A	0.1	3.2	**5**
Soluble Calcium (Ca)	mg/L	1.5	340	**NG**
Soluble Magnesium (Mg)	mg/L	1	480	**NG**
Soluble Nitrate (N)	mg/L	0.2	0.24	**NG**
Soluble Sodium (Na)	mg/L	2.5	380	**NG**
Soluble Potassium (K)	mg/L	1.3	21	**NG**
Soluble Sulphate (SO4)	mg/L	5	3,500	**NG**
Theoretical Gypsum Requirement	tonnes/ha	0.2	<0.20	**NG**

Notes:

(a) Canadian Council of Ministers of the Environment (CCME) Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health for agricultural land use, 1999.

meq/L - milliequivalents per litre

mg/kg - milligrams per kilogram

mg/L - milligram per litre

dS/m - decisiemens per metre

tonnes/ha - tonnes per hectare

ppm - parts per million

m bgs - metres below ground surface

RDL - reported detection limit

NG - No Guideline

N/A - not applicable

BOLD indicates samples in exceedance of applicable guidelines.

Table should be read in conjunction with accompanying report.

Table 6
Soil Chemistry Results - Waste Classification Analysis
Bar U Ranch National Historic Site, Alberta
Public Works and Government Services Canada

Sample Identification			GMW18-7	**AEP Waste Guidelines[(a)]**
Sample Depth (m bgs)			4.5 - 5.25	
Headspace Combustible Vapour (ppm)			85	
Sample Collection Date			20-Nov-15	
Parameters	**Units**	**RDL**		
Leachable BTEX				
Leachable (ZH) Benzene	mg/L	0.01	<0.010	**0.5**
Leachable (ZH) Toluene	mg/L	0.01	<0.010	**0.5**
Leachable (ZH) Ethylbenzene	mg/L	0.01	<0.010	**0.5**
Leachable (ZH) Xylenes (Total)	mg/L	0.02	<0.020	**0.5**
Leachable Metals				
Leachable Antimony (Sb)	mg/L	1	<1.0	**500**
Leachable Arsenic (As)	mg/L	0.5	<0.50	**5**
Leachable Barium (Ba)	mg/L	1	<1.0	**100**
Leachable Beryllium (Be)	mg/L	0.5	<0.50	**5**
Leachable Boron (B)	mg/L	1	<1.0	**500**
Leachable Cadmium (Cd)	mg/L	0.1	<0.10	**1**
Leachable Chromium (Cr)	mg/L	0.5	<0.50	**5**
Leachable Cobalt (Co)	mg/L	1	<1.0	**100**
Leachable Copper (Cu)	mg/L	1	<1.0	**100**
Leachable Iron (Fe)	mg/L	1	1.7	**1,000**
Leachable Lead (Pb)	mg/L	0.5	<0.50	**5**
Leachable Mercury (Hg)	mg/L	0.02	<0.020	**0.2**
Leachable Nickel (Ni)	mg/L	0.5	<0.50	**5**
Leachable Selenium (Se)	mg/L	0.1	<0.10	**1**
Leachable Silver (Ag)	mg/L	0.5	<0.50	**5**
Leachable Thallium (Tl)	mg/L	0.5	<0.50	**5**
Leachable Uranium (U)	mg/L	0.2	<0.20	**2**
Leachable Vanadium (V)	mg/L	1	<1.0	**100**
Leachable Zinc (Zn)	mg/L	1	<1.0	**500**
Leachable Zirconium (Zr)	mg/L	1	<1.0	**500**
For Oil Analyses				
Flashpoint	°C	N/A	>61	**>61**
Physical Properties				
Free Liquid	N/A	N/A	PASS	**-**
Soluble Parameters				
Soluble (1:1) pH	pH	N/A	7.90	**>2, <12.5**

Notes:

(a) Alberta Environment and Parks (AEP), "Alberta User Guide for Waste Managers" Table 2 Class 9.3 Substances

RDL - reported detection limit

mg/L - milligrams per litre

°C - degrees Celsius

N/A - not applicable

BOLD indicates samples in exceedance of applicable guidelines.

Table should be read in conjunction with accompanying report.

Table 7
Summary of Current and Historical Groundwater Analytical Results - Petroleum Hydrocarbons
Bar U Ranch National Historic Site, Alberta
Public Works and Government Services Canada

Monitoring Well	Sample Collection Date	Maxxam Sample ID	Parameters					
			Benzene	Toluene	Ethylbenzene	Xylenes (Total)	PHC F1 (C6-C10) - BTEX	PHC F2 (C10-C16)
Units			**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Reportable Detection Limit			**0.00040**	**0.00040**	**0.00040**	**0.00080**	**0.10**	**0.10**
Applicable Guideline			**0.005[a]**	**0.06[a]**	**0.14[a]**	**0.09[a]**	**6.5[b]**	**1.8[b]**
MW1	20-Oct-04	N/A	<0.00020	0.00073	<0.00020	<0.00040	<0.10	<0.10
	16-Dec-14	LJ9563	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
	9-Jul-15	MQ2964	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
DUP15-01 (Duplicate of MW1)	9-Jul-15	MQ2961	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
MW2	4-Nov-04	N/A	<0.01	0.0003	<0.00050	<0.00010	<0.10	<0.10
	16-Dec-14	LJ9567	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
	13-Jul-15	MQ5586	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
MW3	15-Sep-06	N/A	<0.00050	<0.00050	<0.00050	<0.00050	<0.10	<0.05
	31-Oct-06	N/A	<0.00050	<0.00050	<0.00050	<0.00050	<0.10	0.13
	18-Dec-14	LK1840	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
	13-Jul-15	MQ5585	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
MW4	20-Oct-04	N/A	<0.00020	<0.00020	<0.00020	<0.00040	<0.10	<0.10
MW5	13-Jul-15	MQ5587	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
MW6	20-Oct-04	N/A	<0.00020	<0.00020	<0.00020	<0.00040	<0.10	<0.10
	18-Dec-14	LK1839	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
	13-Jul-15	MQ5588	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
MW7	16-Dec-14	LJ9566	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
	9-Jul-15	MQ2965	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
MW8	16-Dec-14	LJ9564	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
	9-Jul-15	MQ2966	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
MW9	31-Oct-06	N/A	<0.00050	<0.00050	<0.00050	<0.00050	<0.10	<0.05
	16-Dec-14	LJ9565	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
	9-Jul-15	MQ2967	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
MW12	18-Dec-14	LK1838	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	0.19
	9-Jul-15	MQ2968	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
DUP15-02 (Field Blank)	9-Jul-15	MQ2962	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
DUP15-03 (Trip Blank)	9-Jul-15	MQ2963	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10

Notes:

(a) Health Canada Guidelines for Canadian Drinking Water Quality, October 2014.

(b) Federal Contaminated Sites Action Plan Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites, Tier 1 Guidelines for fine-grained soil and agricultural land use, November 2015.

RDL - reported detection limit

mg/L - milligrams per litre

N/A - not available

< - less than

BOLD indicates samples in exceedance of applicable guideline.

Table should be read in conjunction with accompanying report.

Table 8
Summary of Current and Historical Groundwater Analytical Results - Routine Chemistry Parameters
Bar U Ranch National Historic Site, Alberta
Public Works and Government Services Canada

Monitoring Well	Sample Collection Date	Maxxam Sample ID	Parameters																	
			Anion Sum	Cation Sum	Hardness (CaCO3)	Ion Balance	Dissolved Nitrate (NO3)	Nitrate plus Nitrite (N)	Dissolved Nitrite (NO2)	Total Dissolved Solids	Conductivity	pH	Alkalinity (PP as CaCO3)	Alkalinity (Total as CaCO3)	Bicarbonate (HCO3)	Carbonate (CO3)	Hydroxide (OH)	Dissolved Sulphate (SO4)	Dissolved Chloride (Cl)	Dissolved Nitrite (N)	Dissolved Nitrate (N)
Units			meq/L	meq/L	mg/L	N/A	mg/L	mg/L	mg/L	mg/L	uS/cm	pH	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Reportable Detection Limit			N/A	N/A	0.50	0.010	0.044	0.020	0.033	10	1.0	N/A	0.50	0.50	0.50	0.50	0.50	1.0	1.0	0.010	0.010
Applicable Guideline			NG	NG	NG	NG	13[(b)]	100[(b)]	3[(a)]	500[(a)]	NG	6.5 - 8.5[(a)]	NG	NG	NG	NG	NG	100[(b)]	100[(b)]	0.06[(b)]	10[(a)]
MW1	31-Oct-06	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**6,880**	N/A	7.80	N/A	N/A	N/A	N/A	N/A	**4,670**	8	<0.050	<0.05
	16-Dec-14	LJ9563	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**4,100**	N/A	7.47	N/A	N/A	N/A	N/A	N/A	**2,800**	13	<0.010	0.017
	9-Jul-15	MQ2964	68	58	2,100	0.86	0.23	0.051	<0.033	**4,100**	4,500	7.74	<0.50	550	670	<0.50	<0.50	**2,700**	13	<0.010	0.051
DUP15-01 (Duplicate of MW1)	9-Jul-15	MQ2961	68	58	2,100	0.85	0.21	0.047	<0.033	**4,100**	4,500	7.74	<0.50	550	670	<0.50	<0.50	**2,700**	13	<0.010	0.047
MW2	16-Dec-14	LJ9567	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**1,600**	N/A	7.84	N/A	N/A	N/A	N/A	N/A	**790**	11	<0.010	<0.010
	13-Jul-15	MQ5585	43	38	1,400	0.88	0.33	0.075	<0.033	**2,500**	3,200	7.86	<0.50	530	650	<0.50	<0.50	**1,500**	11	<0.010	0.075
MW3	15-Sep-06	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**2,430**	N/A	7.90	N/A	N/A	N/A	N/A	N/A	**1,510**	21.8	<0.050	0.18
	3-Nov-06	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**3,310**	N/A	7.60	N/A	N/A	N/A	N/A	N/A	**2,140**	34.3	<0.050	0.21
	18-Dec-14	LK1840	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**3,400**	N/A	7.54	N/A	N/A	N/A	N/A	N/A	**2,100**	21	0.012	1.5
	13-Jul-15	MQ5586	100	94	3,900	0.93	0.88	0.2	<0.16	**6,200**	6,300	7.92	<0.50	620	760	<0.50	<0.50	**4,200**	32	<0.050	0.20
MW4	31-Oct-06	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**6,670**	N/A	7.80	N/A	N/A	N/A	N/A	N/A	**4,220**	1.7	<0.050	<0.05
MW6	15-Sep-06	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**2,100**	N/A	8.00	N/A	N/A	N/A	N/A	N/A	**1,030**	50.6	<0.050	<0.05
	18-Dec-14	LK1839	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**2,600**	N/A	7.59	N/A	N/A	N/A	N/A	N/A	**1,200**	44	<0.010	0.012
	13-Jul-15	MQ5588	54	46	1,800	0.85	0.25	0.057	<0.16	**3,000**	3,900	7.84	<0.50	880	1,100	<0.50	<0.50	**1,600**	77	<0.050	0.057
MW7	31-Oct-06	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**4,950**	N/A	7.90	N/A	N/A	N/A	N/A	N/A	**3,330**	7.2	<0.050	0.28
	16-Dec-14	LJ9566	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**9,700**	N/A	7.73	N/A	N/A	N/A	N/A	N/A	**6,600**	**120**	<0.010	7.6
	9-Jul-15	MQ2965	190	190	7,200	0.98	**37**	8.3	<0.066	**12,000**	10,000	7.82	<0.50	530	640	<0.50	<0.50	**8,300**	**130**	<0.020	8.3
MW8	31-Oct-06	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**12,000**	N/A	7.80	N/A	N/A	N/A	N/A	N/A	**8,390**	3.1	<0.050	0.08
	16-Dec-14	LJ9564	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**9,100**	N/A	7.58	N/A	N/A	N/A	N/A	N/A	**6,600**	9.6	<0.020	<0.020
	9-Jul-15	MQ2966	180	190	7,100	1	<0.44	<0.020	<0.33	**11,000**	9,700	7.88	<0.50	630	770	<0.50	<0.50	**8,200**	9.2	<0.10	<0.10
MW9	3-Nov-06	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**3,350**	N/A	7.90	N/A	N/A	N/A	N/A	N/A	**2,150**	18.4	<0.050	0.26
	16-Dec-14	LJ9565	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**1,700**	N/A	7.89	N/A	N/A	N/A	N/A	N/A	**840**	23	<0.010	0.035
	9-Jul-15	MQ2967	45	40	1,700	0.88	0.15	0.034	<0.033	**2,500**	3,100	8.06	<0.50	570	700	<0.50	<0.50	**1,600**	27	<0.010	0.034
MW10	31-Oct-06	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**9,940**	N/A	7.90	N/A	N/A	N/A	N/A	N/A	**7,120**	3.6	<0.050	0.89
MW12	31-Oct-06	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**1,260**	N/A	8.00	N/A	N/A	N/A	N/A	N/A	**656**	16.4	<0.050	<0.05
	18-Dec-14	LK1838	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**1,700**	N/A	7.70	N/A	N/A	N/A	N/A	N/A	**870**	13	<0.010	0.035
	9-Jul-15	MQ2968	35	33	1,400	0.94	0.12	0.027	<0.066	**2,100**	2,500	7.93	<0.50	480	590	<0.50	<0.50	**1,200**	16	<0.020	0.027
MW13	31-Oct-06	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**1,300**	N/A	8.00	N/A	N/A	N/A	N/A	N/A	**647**	14.9	<0.050	1
MW14	28-Nov-08	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**606**	N/A	8.00	N/A	N/A	N/A	N/A	N/A	**184**	NA	<0.050	6.36
MW16	28-Nov-08	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	294	N/A	8.09	N/A	N/A	N/A	N/A	N/A	47	NA	<0.050	0.21
GMW18	27-Nov-15	NS8667	190	170	6,200	0.91	0.43	0.096	<0.16	**11,000**	10,000	7.81	<0.50	820	1,000	<0.50	<0.50	**8,100**	11	<0.050	0.096
DUP15-02 (Field Blank)	9-Jul-15	MQ2962	0	0.003	<0.50	NC	<0.044	<0.020	<0.033	<10	<1.0	**5.49**	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0	<0.010	<0.010
DUP15-03 (Trip Blank)	9-Jul-15	MQ2963	0	0.004	<0.50	NC	<0.044	<0.020	<0.033	<10	<1.0	**5.35**	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0	<0.010	<0.010

Notes:

(a) Health Canada Guidelines for Canadian Drinking Water Quality, October 2014.

(b) Federal Contaminated Sites Action Plan Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites, Tier 1 Guidelines for fine-grained soil and agricultural land use, November 2015.

NG - no guideline

RDL - reported detection limit

mg/L - milligrams per litre

meq/L - milliequivalent per litre

uS/cm - microSiemens per centimeter

N/A - not available

< - less than

NC - not calculated

BOLD indicates samples in exceedance of applicable guideline.

Table should be read in conjunction with accompanying report.

Table 9
Summary of Current and Historical Groundwater Analytical Results - Dissolved Metals
Bar U Ranch National Historic Site, Alberta
Public Works and Government Services Canada

Monitoring Well	Sample Collection Date	Maxxam Sample ID	Parameters																														
			Dissolved Aluminum (Al)	Dissolved Antimony (Sb)	Dissolved Arsenic (As)	Dissolved Barium (Ba)	Dissolved Beryllium (Be)	Dissolved Boron (B)	Dissolved Cadmium (Cd)	Dissolved Calcium (Ca)	Dissolved Chromium (Cr)	Dissolved Cobalt (Co)	Dissolved Copper (Cu)	Dissolved Iron (Fe)	Dissolved Lead (Pb)	Dissolved Lithium (Li)	Dissolved Magnesium (Mg)	Dissolved Manganese (Mn)	Dissolved Molybdenum (Mo)	Dissolved Nickel (Ni)	Dissolved Phosphorus (P)	Dissolved Potassium (K)	Dissolved Selenium (Se)	Dissolved Silicon (Si)	Dissolved Silver (Ag)	Dissolved Sodium (Na)	Dissolved Strontium (Sr)	Dissolved Sulphur (S)	Dissolved Thallium (Tl)	Dissolved Tin (Sn)	Dissolved Titanium (Ti)	Dissolved Uranium (U)	Dissolved Vanadium (V)	Dissolved Zinc (Zn)
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Reportable Detection Limit			**0.0030**	**0.00060**	**0.00020**	**0.010**	**0.0010**	**0.020**	**0.00002**	**0.30**	**0.0010**	**0.00030**	**0.00020**	**0.060**	**0.00020**	**0.020**	**0.20**	**0.0040**	**0.00020**	**0.00050**	**0.10**	**0.30**	**0.00020**	**0.10**	**0.00010**	**0.50**	**0.020**	**0.20**	**0.00020**	**0.0010**	**0.0010**	**0.00010**	**0.0010**	**0.0030**
Applicable Guideline			**0.1**[a][b]	**0.006**[a]	**0.005**[b]	**0.5**[b]	**0.0053**[b]	**0.5**[b]	**0.000017**[b]	**NG**	**0.0089**[b]	**0.05**[b]	**0.004**[b]	**0.3**[a][b]	**0.007**[b]	**NG**	**NG**	**0.05**[a]	**0.073**[b]	**0.15**[b]	**NG**	**NG**	**0.001**[b]	**NG**	**0.0001**[b]	**200**[a]	**NG**	**NG**	**0.0008**[b]	**NG**	**0.1**[b]	**0.01**[b]	**0.1**[b]	**0.01**[b]
MW1	20-Oct-04	N/A	<0.005	0.0011	<0.002	0.081	N/A	0.083	<0.0001	N/A	<0.005	N/A	0.0008	<0.03	<0.0005	N/A	N/A	<0.005	N/A	<0.01	N/A	N/A	**0.005**	N/A	<0.00010	N/A	N/A	N/A	N/A	N/A	N/A	**0.0201**	N/A	<0.05
	28-Nov-08	N/A	0.05	N/A	N/A	0.026	N/A	0.12	<0.001	N/A	<0.005	N/A	**0.007**	0.117	<0.005	N/A	N/A	**2.74**	N/A	0.028	N/A	N/A	N/A	N/A	<0.005	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.004
	16-Dec-14	LJ9563	0.005	<0.00060	0.00076	0.03	N/A	0.093	<0.000020	350	<0.0010	N/A	0.00049	0.21	<0.00020	N/A	290	**1.8**	N/A	0.011	N/A	9.8	**0.0066**	N/A	<0.00010	**370**	N/A	N/A	N/A	N/A	N/A	**0.02**	N/A	<0.0030
	9-Jul-15	MQ2964	0.0057	<0.00060	0.00063	0.015	<0.0010	0.097	**0.000038**	390	<0.0010	0.0032	0.0012	**0.56**	0.00049	0.063	270	**1.9**	0.0011	0.01	<0.10	6.5	<0.00020	4.7	<0.00010	**380**	4.6	910	<0.00020	<0.0010	<0.0010	**0.019**	<0.0010	0.0092
DUP15-01 (Duplicate of MW1)	9-Jul-15	MQ2961	0.0065	<0.00060	0.0007	0.015	<0.0010	0.1	**0.000054**	390	<0.0010	0.0033	0.0012	**0.57**	0.00044	0.067	260	**1.9**	0.0012	0.011	<0.10	6.5	<0.00020	4.7	<0.00010	**380**	4.7	840	<0.00020	<0.0010	<0.0010	**0.019**	<0.0010	0.0088
MW2	4-Nov-04	N/A	<0.005	<0.0005	<0.002	0.07	N/A	0.117	<0.0001	N/A	<0.005	N/A	0.0017	<0.03	<0.0005	N/A	N/A	<0.005	N/A	<0.001	N/A	N/A	**0.021**	N/A	<0.00010	N/A	N/A	N/A	N/A	N/A	N/A	**0.0243**	N/A	<0.005
	16-Dec-14	LJ9567	0.0037	<0.00060	0.00076	0.025	N/A	0.066	<0.000020	140	<0.0010	N/A	0.0024	**1.5**	<0.00020	N/A	130	**0.52**	N/A	0.0054	N/A	4.5	0.00068	N/A	<0.00010	180	N/A	N/A	N/A	N/A	N/A	**0.029**	N/A	<0.0030
	13-Jul-15	MQ5586	<0.0030	<0.00060	0.00059	0.026	<0.0010	0.11	**0.0002**	260	<0.0010	0.0025	0.00084	**0.33**	0.0003	0.053	180	**0.64**	0.0011	0.0077	<0.10	6.1	**0.0019**	4.2	<0.00010	**220**	3.1	430	<0.00020	<0.0010	<0.0010	**0.023**	<0.0010	**0.02**
MW3	15-Sep-06	N/A	<0.01	N/A	N/A	0.086	N/A	0.15	<0.001	275	<0.005	N/A	**0.005**	0.016	<0.005	N/A	205	**0.671**	N/A	0.015	N/A	18.9	**0.0027**	N/A	<0.005	148	N/A	N/A	N/A	N/A	N/A	<0.05	N/A	**0.026**
	31-Oct-06	N/A	<0.01	0.0007	0.0012	0.085	N/A	0.19	**0.0002**	364	<0.005	N/A	0.004	0.089	<0.0001	N/A	285	**1.46**	N/A	0.018	N/A	23.1	**0.0017**	N/A	**0.0002**	187	N/A	N/A	N/A	N/A	N/A	**0.0130**	N/A	**0.052**
	28-Nov-08	N/A	<0.01	N/A	N/A	0.043	N/A	0.06	<0.001	N/A	<0.005	N/A	0.002	0.006	<0.005	N/A	N/A	**0.152**	N/A	0.005	N/A	N/A	N/A	N/A	<0.005	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.003
	18-Dec-14	LK1840	0.0044	<0.00060	0.00077	0.036	N/A	0.12	**0.000032**	300	<0.0010	N/A	0.0021	0.1	<0.00020	N/A	330	**0.13**	N/A	0.0053	N/A	17	0.00082	N/A	<0.00010	**250**	N/A	N/A	N/A	N/A	N/A	**0.016**	N/A	0.0052
	13-Jul-15	MQ5585	0.0039	<0.00060	0.00084	0.053	<0.0010	0.11	**0.00025**	560	<0.0010	0.00058	0.0037	**0.54**	0.0003	0.04	620	**0.15**	0.0017	0.008	<0.10	19	0.00041	5.2	<0.00010	**340**	3.1	1,300	<0.00020	<0.0010	<0.0010	**0.028**	<0.0010	**0.042**
MW4	20-Oct-04	N/A	<0.005	0.0014	<0.002	0.055	N/A	0.168	<0.0001	N/A	<0.005	N/A	<0.005	0.03	<0.0005	N/A	N/A	0.008	N/A	0.015	N/A	N/A	**0.008**	N/A	<0.00010	N/A	N/A	N/A	N/A	N/A	N/A	**0.0253**	N/A	<0.05
	28-Nov-08	N/A	0.1	N/A	N/A	0.035	N/A	0.17	<0.001	N/A	<0.005	N/A	**0.008**	**2.88**	<0.005	N/A	N/A	**2.63**	N/A	0.057	N/A	N/A	N/A	N/A	<0.005	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.007
MW6	20-Oct-04	N/A	<0.005	0.0006	<0.002	0.256	N/A	0.049	<0.0001	N/A	<0.005	N/A	0.0017	0.07	<0.0005	N/A	N/A	**0.934**	N/A	0.013	N/A	N/A	N/A	N/A	<0.00010	N/A	N/A	N/A	N/A	N/A	N/A	0.0076	N/A	<0.005
	28-Nov-08	N/A	0.01	N/A	N/A	0.053	N/A	0.08	<0.001	N/A	<0.005	N/A	0.002	**1.17**	<0.005	N/A	N/A	**0.282**	N/A	0.005	N/A	N/A	N/A	N/A	<0.005	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.002
	18-Dec-14	LK1839	0.0055	<0.00060	**0.0057**	0.042	N/A	0.088	<0.000020	270	<0.0010	N/A	<0.00020	**3**	<0.00020	N/A	240	**0.19**	N/A	0.0038	N/A	18	**0.0066**	N/A	<0.00010	**210**	N/A	N/A	N/A	N/A	N/A	0.0092	N/A	<0.0030
	13-Jul-15	MQ5588	0.005	<0.00060	0.001	0.034	<0.0010	0.089	<0.000020	280	<0.0010	<0.00030	<0.00020	**1.8**	0.00066	0.089	260	**0.26**	0.0012	0.0014	0.1	17	**0.02**	4.3	<0.00010	**230**	3.4	770	<0.00020	<0.0010	<0.0010	0.0046	0.0017	<0.0030
MW7	31-Oct-06	N/A	<0.01	0.0004	0.0010	0.076	N/A	0.12	<0.0001	488	<0.005	N/A	**0.005**	<0.005	<0.00001	N/A	383	<0.001	N/A	0.013	N/A	12	**0.0040**	N/A	<0.00010	**434**	N/A	N/A	N/A	N/A	N/A	**0.0385**	N/A	**0.024**
	16-Dec-14	LJ9566	<0.0030	<0.00060	0.0014	0.023	N/A	0.076	**0.000053**	440	<0.0010	N/A	**0.0077**	<0.060	<0.00020	N/A	1,300	<0.0040	N/A	0.0048	N/A	12	**0.019**	N/A	<0.00010	**850**	N/A	N/A	N/A	N/A	N/A	**0.1**	N/A	<0.0030
	9-Jul-15	MQ2965	0.0042	<0.00060	0.0011	0.018	<0.0010	0.064	**0.000074**	460	<0.0010	0.00088	**0.0082**	**0.72**	0.0016	0.12	1,500	<0.0040	0.0016	0.0045	0.11	11	**0.018**	3.8	**0.00046**	**930**	11	2,800	<0.00020	<0.0010	<0.0010	**0.099**	<0.0010	<0.0030
MW8	31-Oct-06	N/A	<0.01	0.0004	0.0020	0.068	N/A	0.07	**0.0001**	620	<0.005	N/A	**0.012**	<0.005	<0.0001	N/A	1,480	**0.183**	N/A	0.021	N/A	13.8	**0.0019**	N/A	<0.00010	**1,130**	N/A	N/A	N/A	N/A	N/A	**0.0474**	N/A	**0.023**
	16-Dec-14	LJ9564	0.0041	<0.00060	0.0013	0.05	N/A	0.043	**0.000027**	290	<0.0010	N/A	0.0013	0.085	<0.00020	N/A	1,100	**2.4**	N/A	0.026	N/A	12	0.00086	N/A	<0.00010	**760**	N/A	N/A	N/A	N/A	N/A	**0.047**	N/A	0.0063
	9-Jul-15	MQ2966	0.0048	<0.00060	0.0013	0.014	<0.0010	0.041	**0.00022**	320	<0.0010	0.0067	**0.0043**	**0.74**	0.0016	0.068	1,500	**2.9**	0.0021	0.026	0.11	6.5	0.00064	4.2	**0.0005**	**1,000**	6.9	2,800	0.00022	<0.0010	<0.0010	**0.05**	<0.0010	**0.023**
MW9	31-Oct-06	N/A	<0.01	0.0013	0.0013	0.132	N/A	0.13	<0.0001	165	<0.005	N/A	**0.006**	<0.005	<0.0001	N/A	347	0.022	N/A	0.009	N/A	5	**0.0088**	N/A	<0.00010	**298**	N/A	N/A	N/A	N/A	N/A	**0.0361**	N/A	**0.023**
	9-Jul-15	MQ2967	0.0084	<0.00060	0.0011	0.11	<0.0010	0.11	**0.000037**	150	<0.0010	0.0054	0.0027	**0.43**	0.00081	0.049	330	**2.2**	0.0024	0.017	<0.10	4.1	0.00042	5.4	**0.00027**	130	2.2	440	<0.00020	<0.0010	<0.0010	**0.020**	0.0023	**0.027**
MW10	31-Oct-06	N/A	<0.01	<0.0004	0.0014	0.072	N/A	0.11	<0.0001	556	0.007	N/A	**0.012**	<0.005	<0.001	N/A	1,040	<0.001	N/A	0.017	N/A	17.9	**0.0502**	N/A	<0.00010	**933**	N/A	N/A	N/A	N/A	N/A	**0.0503**	N/A	**0.016**
MW12	31-Oct-06	N/A	<0.001	0.0004	0.0007	0.181	N/A	0.08	<0.0001	166	<0.005	N/A	0.003	0.008	<0.0001	N/A	95.1	**0.123**	N/A	0.007	N/A	10.2	**0.0021**	N/A	<0.00010	61	N/A	N/A	N/A	N/A	N/A	0.0095	N/A	**0.024**
	18-Dec-14	LK1838	0.0039	<0.00060	0.00041	0.085	N/A	0.055	**0.00003**	260	<0.0010	N/A	0.0021	0.077	<0.00020	N/A	150	**0.38**	N/A	0.0027	N/A	10	0.00027	N/A	<0.00010	82	N/A	N/A	N/A	N/A	N/A	**0.019**	N/A	<0.0030
	9-Jul-15	MQ2968	0.0085	<0.00060	0.00031	0.079	<0.0010	0.06	**0.000061**	300	<0.0010	0.00037	0.0036	0.25	0.00053	0.021	170	**0.12**	0.0016	0.0032	<0.10	11	0.00038	3.8	**0.00016**	99	1.7	360	<0.00020	<0.0010	<0.0010	**0.021**	<0.0010	0.0067
MW13	31-Oct-06	N/A	<0.01	0.0007	0.0007	0.047	N/A	0.10	<0.0001	161	<0.005	N/A	0.003	<0.005	<0.0001	N/A	114	**0.093**	N/A	0.005	N/A	6.6	**0.0107**	N/A	<0.00010	78	N/A	N/A	N/A	N/A	N/A	**0.0179**	N/A	**0.015**
MW14	28-Nov-08	N/A	<0.01	N/A	N/A	0.093	N/A	0.05	<0.001	N/A	<0.005	N/A	0.002	0.006	<0.005	N/A	N/A	**0.113**	N/A	0.003	N/A	N/A	N/A	N/A	<0.005	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.002
MW16	28-Nov-08	N/A	<0.01	N/A	N/A	0.11	N/A	<0.05	<0.001	N/A	<0.005	N/A	<0.001	<0.005	<0.005	N/A	N/A	0.008	N/A	0.003	N/A	N/A	N/A	N/A	<0.005	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.002
GMW18	27-Nov-15	NS8667	0.0056	<0.00060	0.0014	0.023	<0.0010	0.14	**0.00026**	410	<0.0010	0.0062	0.0034	<0.060	<0.00020	0.15	1,300	**0.98**	0.003	0.022	<0.10	17	**0.0024**	5.9	<0.00010	**1,000**	9.3	2,400	<0.00020	<0.0010	<0.0010	**0.08**	<0.0010	0.0057
DUP15-02 (Field Blank)	9-Jul-15	MQ2962	0.0046	<0.00060	<0.00020	<0.010	<0.0010	<0.020	<0.000020	<0.30	<0.0010	<0.00030	0.00028	<0.060	0.00024	<0.020	<0.20	<0.0040	<0.00020	<0.00050	<0.10	<0.30	<0.00020	<0.10	<0.00010	<0.50	<0.020	<0.20	<0.00020	<0.0010	<0.0010	<0.00010	<0.0010	<0.0030
DUP15-03 (Trip Blank)	9-Jul-15	MQ2963	<0.0030	<0.00060	<0.00020	<0.010	<0.0010	<0.020	<0.000020	<0.30	<0.0010	<0.00030	<0.00020	<0.060	0.00025	<0.020	<0.20	<0.0040	<0.00020	<0.00050	<0.10	<0.30	<0.00020	<0.10	<0.00010	<0.50	<0.020	<0.20	<0.00020	<0.0010	<0.0010	<0.00010	<0.0010	<0.0030

Notes:

(a) Health Canada Guidelines for Canadian Drinking Water Quality, October 2014.

(b) Federal Contaminated Sites Action Plan Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites, Tier 1 Guidelines for fine-grained soil and agricultural land use, November 2015.

NG - no guideline

RDL - reported detection limit

mg/L - milligrams per litre

N/A - not available

< - less than

BOLD indicates samples in exceedance of applicable guideline.

Table should be read in conjunction with accompanying report.

Table 10
Summary of Current and Historical Groundwater Analytical Results - Total Metals
Bar U Ranch National Historic Site, Alberta
Public Works and Government Services Canada

Monitoring Well	Sample Collection Date	Maxxam Sample ID	Parameters																														
			Total Aluminum (Al)	Total Antimony (Sb)	Total Arsenic (As)	Total Barium (Ba)	Total Beryllium (Be)	Total Boron (B)	Total Cadmium (Cd)	Total Calcium (Ca)	Total Chromium (Cr)	Total Cobalt (Co)	Total Copper (Cu)	Total Iron (Fe)	Total Lead (Pb)	Total Lithium (Li)	Total Magnesium (Mg)	Total Manganese (Mn)	Total Molybdenum (Mo)	Total Nickel (Ni)	Total Phosphorus (P)	Total Potassium (K)	Total Selenium (Se)	Total Silicon (Si)	Total Silver (Ag)	Total Sodium (Na)	Total Strontium (Sr)	Total Sulphur (S)	Total Thallium (Tl)	Total Tin (Sn)	Total Titanium (Ti)	Total Uranium (U)	Total Vanadium (V)	Total Zinc (Zn)
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Reportable Detection Limit			**0.0030**	**0.00060**	**0.00020**	**0.010**	**0.0010**	**0.020**	**0.00002**	**0.30**	**0.0010**	**0.00030**	**0.00020**	**0.060**	**0.00020**	**0.020**	**0.20**	**0.0040**	**0.00020**	**0.00050**	**0.10**	**0.30**	**0.00020**	**0.10**	**0.00010**	**0.50**	**0.020**	**0.20**	**0.00020**	**0.0010**	**0.0010**	**0.00010**	**0.0010**	**0.0030**
Applicable Guideline			**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**	**NG**
MW1	16-Dec-14	LJ9563	0.53	<0.00060	0.0014	0.073	N/A	0.11	0.00028	N/A	0.0012	N/A	0.0051	1.5	0.001	N/A	N/A	2.5	N/A	0.014	N/A	N/A	0.00034	N/A	<0.00010	N/A	N/A	N/A	N/A	N/A	N/A	0.018	N/A	0.026
	9-Jul-15	MQ2964	20	0.0041	0.032	1.4	0.002	0.12	0.0047	610	0.047	0.033	0.074	60	0.053	0.093	300	4	0.0061	0.09	2.5	11	0.002	36	0.0003	370	4.8	820	0.0015	0.0091	0.89	0.024	0.077	0.51
DUP15-01 (Duplicate of MW1)	9-Jul-15	MQ2961	20	0.0034	0.033	1.5	0.0017	0.12	0.0048	540	0.048	0.035	0.077	64	0.052	0.094	300	4.2	0.0058	0.094	2.5	12	0.002	36	0.00038	380	4.9	710	0.0015	0.0091	0.86	0.024	0.081	0.53
MW2	16-Dec-14	LJ9567	84	<0.00060	0.12	0.68	N/A	<0.20	0.0083	N/A	0.14	N/A	0.19	37	0.25	N/A	N/A	1.1	N/A	0.26	N/A	N/A	0.014	N/A	0.0016	N/A	N/A	N/A	N/A	N/A	N/A	0.087	N/A	1
	13-Jul-15	MQ5586	6.9	0.00072	0.011	0.57	<0.0010	0.12	0.0016	310	0.013	0.0086	0.031	22	0.012	0.066	210	1.1	0.0022	0.026	0.7	7.8	0.0046	16	0.00011	230	3.2	460	0.00033	0.0013	0.22	0.028	0.025	0.11
MW3	18-Dec-14	LK1840	41	0.0013	0.048	2.5	N/A	0.15	0.0052	N/A	0.07	N/A	0.12	110	0.069	N/A	N/A	2.3	N/A	0.14	N/A	N/A	0.0024	N/A	0.0011	N/A	N/A	N/A	N/A	N/A	N/A	0.024	N/A	0.6
	13-Jul-15	MQ5585	14	0.00083	0.013	0.59	0.001	0.12	0.0011	620	0.019	0.0095	0.032	26	0.016	0.054	670	0.63	0.003	0.039	1.1	22	0.00092	27	0.00027	370	3.4	1,400	0.00038	0.0012	0.13	0.029	0.036	0.15
MW6	18-Dec-14	LK1839	29	0.0018	0.11	0.98	N/A	0.13	0.0041	N/A	0.059	N/A	0.14	200	0.053	N/A	N/A	3.2	N/A	0.18	N/A	N/A	0.035	N/A	0.00073	N/A	N/A	N/A	N/A	N/A	N/A	0.0087	N/A	0.42
	13-Jul-15	MQ5588	45	0.0029	0.18	1.1	0.0045	0.12	0.0059	420	0.084	0.095	0.22	260	0.082	0.16	320	2.7	0.034	0.24	3.5	23	0.089	60	0.00094	240	3.7	660	0.0024	0.0022	0.33	0.011	0.16	0.57
MW7	16-Dec-14	LJ9566	13	0.0013	0.032	1.9	N/A	0.076	0.0013	N/A	0.036	N/A	0.048	62	0.027	N/A	N/A	2.9	N/A	0.081	N/A	N/A	0.018	N/A	0.00023	N/A	N/A	N/A	N/A	N/A	N/A	0.087	N/A	0.14
	9-Jul-15	MQ2965	34	0.0017	0.065	0.74	0.0033	0.078	0.0027	800	0.077	0.11	0.09	130	0.052	0.17	1,400	6.4	0.0091	0.17	4.8	18	0.021	53	0.0005	810	10	2,400	0.0021	0.0033	1.3	0.11	0.13	0.3
MW8	16-Dec-14	LJ9564	15	0.00093	0.019	1.4	N/A	0.061	0.0045	N/A	0.018	N/A	0.11	33	0.055	N/A	N/A	3.1	N/A	0.067	N/A	N/A	0.0089	N/A	0.0004	N/A	N/A	N/A	N/A	N/A	N/A	0.047	N/A	0.32
	9-Jul-15	MQ2966	36	0.0012	0.045	0.99	0.0039	0.072	0.01	450	0.055	0.035	0.23	86	0.084	0.11	1,400	4.3	0.0069	0.13	3.1	13	0.015	56	0.00065	870	6.5	2,400	0.0018	0.0054	0.58	0.057	0.099	0.61
MW9	9-Jul-15	MQ2967	130	0.0012	0.091	4.6	0.011	0.15	0.021	760	0.2	0.12	0.39	260	0.22	0.21	480	6.6	0.01	0.42	9.8	22	0.0088	160	0.0026	120	3.1	420	0.0045	0.0058	0.49	0.029	0.34	4
MW12	18-Dec-14	LK1838	28	0.0012	0.053	1.3	N/A	0.076	0.0027	N/A	0.064	N/A	0.002	130	0.047	N/A	N/A	3.4	N/A	0.13	N/A	N/A	0.0035	N/A	0.00076	N/A	N/A	N/A	N/A	N/A	N/A	0.018	N/A	0.41
	9-Jul-15	MQ2968	29	0.0013	0.055	1	0.0024	0.071	0.0018	360	0.059	0.035	0.095	100	0.046	0.059	180	2.3	0.016	0.11	2.2	13	0.0056	36	0.00074	91	1.7	350	0.00063	0.0014	0.13	0.026	0.1	0.37
DUP15-02 (Field Blank)	9-Jul-15	MQ2962	0.0036	<0.00060	<0.00020	<0.010	<0.0010	<0.020	<0.000020	<0.30	<0.0010	<0.00030	0.00034	<0.060	<0.00020	<0.020	<0.20	<0.0040	<0.00020	<0.00050	0.11	<0.30	<0.00020	<0.10	<0.00010	0.72	<0.020	<0.20	<0.00020	<0.0010	<0.0010	<0.00010	<0.0010	<0.0030
DUP15-03 (Trip Blank)	9-Jul-15	MQ2963	0.0031	<0.00060	<0.00020	<0.010	<0.0010	<0.020	<0.000020	<0.30	<0.0010	<0.00030	0.00029	<0.060	<0.00020	<0.020	<0.20	<0.0040	<0.00020	<0.00050	<0.10	<0.30	<0.00020	<0.10	<0.00010	0.5	<0.020	<0.20	<0.00020	<0.0010	<0.0010	<0.00010	<0.0010	<0.0030

Notes:

(a) Health Canada Guidelines for Canadian Drinking Water Quality, October 2014.

(b) Federal Contaminated Sites Action Plan Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites, Tier 1 Guidelines for fine-grained soil and agricultural land use, November 2015.

NG - no guideline

RDL - reported detection limit

mg/L - milligrams per litre

N/A - not available

< - less than

BOLD indicates samples in exceedance of applicable guideline.

Table should be read in conjunction with accompanying report.

Table 11
Summary of Current and Historical Groundwater Analytical Results - Polycyclic Aromatic Hydrocarbons
Bar U Ranch National Historic Site, Alberta
Public Works and Government Services Canada

Monitoring Well	Sample Collection Date	Maxxam Sample ID	Parameters																						
			Acenaphthene	Acenaphthylene	Acridine	Anthracene	Benzo[a]anthracene	Benzo [b,j] fluoranthene	Benzo[k]fluoranthene	Benzo[g,h,i]perylene	Benzo[c]phenanthrene	Benzo[a]pyrene	Benzo[e]pyrene	Chrysene	Dibenzo[a,h]anthracene	Fluoranthene	Fluorene	Indeno[1,2,3-cd]pyrene	2-Methylnaphthalene	Naphthalene	Perylene	Phenanthrene	Pyrene	Quinoline	B(a)P Equivalency
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Reportable Detection Limit			**0.0001**	**0.0001**	**0.0002**	**0.00001**	**0.0000085**	**0.0000085**	**0.0000085**	**0.0000085**	**0.00005**	**0.0000075**	**0.00005**	**0.0000085**	**0.0000075**	**0.00001**	**0.00005**	**0.0000085**	**0.0001**	**0.0001**	**0.00005**	**0.00005**	**0.00002**	**0.0002**	**0.00001**
Applicable Guideline			**0.0058[b]**	**0.046[b]**	**0.00005[b]**	**0.000012[b]**	**0.000018[b]**	**0.00048[b]**	**0.00048[b]**	**0.00021[b]**	**NG**	**0.00001[a][b]**	**NG**	**0.0001[b]**	**0.00028[b]**	**0.00004[b]**	**0.003[b]**	**0.00023[b]**	**NG**	**0.0011[b]**	**NG**	**0.0004[b]**	**0.000025[b]**	**0.0034[b]**	**NG**
MW1	20-Oct-04	N/A	<0.00005	<0.00005	N/A	**0.00002**	<0.000010	0.000015	<0.000010	0.000013	N/A	0.00001	N/A	0.000017	<0.000010	0.000015	<0.000050	<0.000010	N/A	0.000051	N/A	0.000064	**0.000036**	N/A	0.000012
	28-Nov-08	N/A	<0.00001	N/A	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	N/A	N/A	<0.000010	N/A	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	N/A	<0.00001	N/A	0.00003	<0.000010	<0.00001	N/A
	16-Dec-14	LJ9563	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.000050	<0.0000075	<0.000050	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	N/A	<0.00010	<0.000050	<0.000050	<0.000020	<0.00020	<0.000010
	9-Jul-15	MQ2964	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.000050	<0.0000075	<0.000050	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000050	<0.000050	<0.000020	<0.00020	<0.000010
DUP15-01 (Duplicate of MW1)	9-Jul-15	MQ2961	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.000050	<0.0000075	<0.000050	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000050	<0.000050	<0.000020	<0.00020	<0.000010
MW2	3-Nov-06	N/A	<0.00001	<0.00001	N/A	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	N/A	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	N/A	<0.00001	N/A	<0.000010	<0.000010	N/A	<0.000030
	16-Dec-14	LJ9567	<0.00025	<0.00025	<0.00050	<0.000025	<0.000021	<0.000021	<0.000021	<0.000021	<0.00013	<0.000019	<0.00013	<0.000021	<0.000019	0.000037	<0.00013	<0.000021	N/A	<0.00025	<0.00013	<0.00013	**0.000054**	<0.00050	0.000023
	13-Jul-15	MQ5586	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.000050	<0.0000075	<0.000050	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000050	<0.000050	<0.000020	<0.00020	<0.000010
MW3	28-Nov-08	N/A	<0.00001	N/A	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	N/A	N/A	<0.000010	N/A	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	N/A	<0.00001	N/A	<0.000010	<0.000010	<0.00001	N/A
	18-Dec-14	LK1840	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.000050	<0.0000075	<0.000050	<0.0000085	<0.0000075	**0.000043**	<0.000050	<0.0000085	N/A	<0.00010	<0.000050	<0.000050	**0.000042**	<0.00020	<0.000010
	13-Jul-15	MQ5585	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.000050	<0.0000075	<0.000050	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000050	<0.000050	<0.000020	<0.00020	<0.000010
MW4	20-Oct-04	N/A	<0.00020	<0.00020	N/A	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	N/A	0.000007	N/A	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	N/A	<0.00020	N/A	<0.00020	<0.00020	N/A	N/A
	28-Nov-08	N/A	<0.00001	N/A	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	N/A	N/A	<0.000010	N/A	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	N/A	<0.00001	N/A	<0.000010	<0.000010	<0.00001	N/A
MW5	13-Jul-15	MQ5587	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.000050	<0.0000075	<0.000050	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000050	<0.000050	<0.000020	<0.00020	<0.000010
MW6	20-Oct-04	N/A	<0.00005	<0.00005	N/A	0.000012	**0.00002**	0.000051	0.000013	0.000038	N/A	**0.000024**	N/A	0.000078	0.000012	**0.000053**	0.000099	0.000015	N/A	0.000178	N/A	0.000346	**0.000116**	N/A	N/A
	28-Nov-08	N/A	<0.00001	N/A	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	N/A	N/A	<0.000010	N/A	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	N/A	0.00003	N/A	0.00003	<0.000010	<0.00001	N/A
	18-Dec-14	LK1839	<0.00010	<0.00010	<0.00020	**0.000014**	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.000050	<0.0000075	<0.000050	0.000011	<0.0000075	**0.000062**	0.000071	<0.0000085	N/A	<0.00010	<0.000050	0.00019	**0.000088**	<0.00020	<0.000010
	13-Jul-15	MQ5588	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.000050	<0.0000075	<0.000050	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000050	<0.000050	<0.000020	<0.00020	<0.000010
MW7	16-Dec-14	LJ9566	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.000050	<0.0000075	<0.000050	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	N/A	<0.00010	<0.000050	<0.000050	<0.000020	<0.00020	<0.000010
	9-Jul-15	MQ2965	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.000050	<0.0000075	<0.000050	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000050	<0.000050	<0.000020	<0.00020	<0.000010
MW8	31-Oct-06	N/A	<0.00001	<0.00001	N/A	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	N/A	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	N/A	<0.00001	N/A	<0.000010	<0.000010	N/A	<0.000030
	16-Dec-14	LJ9564	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.000050	<0.0000075	<0.000050	<0.0000085	<0.0000075	0.000021	<0.000050	<0.0000085	N/A	<0.00010	<0.000050	<0.000050	**0.000041**	<0.00020	<0.000010
	9-Jul-15	MQ2966	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.000050	<0.0000075	<0.000050	<0.0000085	<0.0000075	0.000012	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000050	<0.000050	**0.000037**	<0.00020	<0.000010
MW9	31-Oct-06	N/A	<0.00001	<0.00001	N/A	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	N/A	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	N/A	<0.00001	N/A	<0.000010	<0.000010	N/A	<0.000030
	16-Dec-14	LJ9565	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.000050	<0.0000075	<0.000050	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	N/A	<0.00010	<0.000050	<0.000050	**0.000032**	<0.00020	<0.000010
	9-Jul-15	MQ2967	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.000050	<0.0000075	<0.000050	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000050	<0.000050	<0.000020	<0.00020	<0.000010
MW12	31-Oct-06	N/A	<0.00001	<0.00001	N/A	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	N/A	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	N/A	<0.00001	N/A	0.00002	<0.000010	N/A	<0.000030
	18-Dec-14	LK1838	<0.00025	<0.00025	<0.00050	<0.000025	<0.000021	<0.000021	<0.000021	<0.000021	<0.00013	<0.000019	<0.00013	<0.000021	<0.000019	<0.000025	<0.00013	<0.000021	N/A	<0.00025	<0.00013	0.00015	**0.000064**	<0.00050	0.000023
	9-Jul-15	MQ2968	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	0.000026	0.000013	0.000015	<0.000050	**0.000012**	<0.000050	0.000014	0.000012	0.000023	<0.000050	0.000013	<0.00010	<0.00010	<0.000050	0.000091	**0.000052**	<0.00020	<0.000010
MW13	31-Oct-06	N/A	<0.00001	<0.00001	N/A	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	N/A	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	N/A	<0.00001	N/A	<0.000010	<0.000010	N/A	<0.000030
MW14	28-Nov-08	N/A	0.00002	N/A	<0.00001	<0.000010	<0.000010	0.00002	<0.000010	N/A	N/A	**0.00002**	N/A	0.00002	<0.000010	0.00003	0.00004	<0.000010	N/A	0.00003	N/A	0.00012	**0.00007**	<0.00001	N/A
MW16	28-Nov-08	N/A	<0.00001	N/A	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	N/A	N/A	<0.000010	N/A	<0.000010	<0.000010	<0.000010	0.00002	<0.000010	N/A	0.00002	N/A	0.00003	**0.00003**	<0.00001	N/A
GMW18	27-Nov-15	NS8667	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.000050	<0.0000075	<0.000050	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000050	<0.000050	<0.000020	<0.00020	<0.000010
DUP15-02 (Field Blank)	9-Jul-15	MQ2962	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.000050	<0.0000075	<0.000050	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000050	<0.000050	<0.000020	<0.00020	<0.000010
DUP15-03 (Trip Blank)	9-Jul-15	MQ2963	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.000050	<0.0000075	<0.000050	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000050	<0.000050	<0.000020	<0.00020	<0.000010

Notes:

(a) Health Canada Guidelines for Canadian Drinking Water Quality, October 2014.

(b) Federal Contaminated Sites Action Plan Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites, Tier 1 Guidelines for fine-grained soil and agricultural land use, November 2015.

NG - no guideline

RDL - reported detection limit

mg/L - milligrams per litre

N/A - not available

< - less than

BOLD indicates samples in exceedance of applicable guideline.

Table should be read in conjunction with accompanying report.

Table 12
Summary of Current and Historical Groundwater Analytical Results - Organochlorinated Pesticides
Bar U Ranch National Historic Site, Alberta
Public Works and Government Services Canada

Monitoring Well	Sample Collection Date	Maxxam Sample ID	Aldrin + Dieldrin	Chlordane (Total)	DDT + Metabolites	Heptachlor + Heptachlor epoxide	o,p-DDD + p,p-DDD	o,p-DDE + p,p-DDE	o,p-DDT + p,p-DDT	Total Endosulfan	Total PCB	Aldrin	alpha-BHC	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	beta-BHC	a-Chlordane	g-Chlordane	delta-BHC
Units			ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Reportable Detection Limit			0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.05	0.005	0.005	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.005	0.005	0.005	0.005
Applicable Guideline			NG	15[b]	0.001[b]	NG	NG	NG	NG	0.02[b]	NG	3[b]	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
MW1	20-Oct-04	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.002	<0.002	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.002	<0.002	<0.002	<0.002
	28-Nov-08	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.1	<0.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.1	<0.1	<0.1	N/A
	16-Dec-14	YY0272	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005
	9-Jul-15	MQ2964	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005
DUP15-01 (Duplicate of MW1)	9-Jul-15	MQ2961	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005
MW2	16-Dec-14	YY0276	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005
	13-Jul-15	MQ5586	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005
MW3	28-Nov-08	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.1	<0.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.1	<0.1	<0.1	N/A
	13-Jul-15	MQ5585	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005
MW4	4-Nov-04	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.002	<0.002	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.002	<0.002	<0.002	<0.002
MW6	20-Oct-04	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.002	<0.002	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.002	<0.002	<0.002	<0.002
	18-Dec-14	YY3472	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005
	13-Jul-15	MQ5588	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005
MW7	16-Dec-14	YY0275	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005
	9-Jul-15	MQ2965	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005
MW8	16-Dec-14	YY0273	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005
	9-Jul-15	MQ2966	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005
MW9	16-Dec-14	YY0274	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005
	9-Jul-15	MQ2967	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005
MW12	18-Dec-14	YY3471	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005
	9-Jul-15	MQ2968	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005
MW14	28-Nov-08	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.1	<0.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.1	<0.1	<0.1	N/A
DUP15-02 (Field Blank)	9-Jul-15	MQ2962	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005
DUP15-03 (Trip Blank)	9-Jul-15	MQ2963	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005

Monitoring Well	Sample Collection Date	Maxxam Sample ID	Dieldrin	Endosulfan I (alpha)	Endosulfan II	Endosulfan Sulfate	Endrin	Endrin Aldehyde	Endrin Ketone	Heptachlor	Heptachlor Epoxide	Hexachlorobenzene	Lindane	Methoxychlor	Mirex	o,p-DDD	o,p-DDE	o,p-DDT	Octachlorostyrene	Oxychlordane	p,p-DDD	p,p-DDE	p,p-DDT	Toxaphene
Units			ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Reportable Detection Limit			0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.003	0.01	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.2
Applicable Guideline			0.056[b]	NG	NG	NG	0.036[b]	NG	NG	NG	0.0038[b]	0.52[b]	0.01[b]	0.03[b]	NG	NG	NG	NG	NG	NG	NG	NG	NG	0.0002[b]
MW1	20-Oct-04	N/A	<0.002	<0.004	<0.004	<0.004	<0.004	<0.01	<0.004	<0.002	<0.002	N/A	<0.002	<0.04	<0.004	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.3
	28-Nov-08	N/A	<0.1	<0.1	<0.1	N/A	<0.1	N/A	N/A	<0.1	N/A	N/A	<0.1	<0.2	<0.1	N/A	N/A	N/A	N/A	<0.1	<0.1	<0.1	<0.1	N/A
	16-Dec-14	YY0272	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.2
	9-Jul-15	MQ2964	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.2
DUP15-01 (Duplicate of MW1)	9-Jul-15	MQ2961	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.2
MW2	16-Dec-14	YY0276	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.2
	13-Jul-15	MQ5586	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.2
MW3	28-Nov-08	N/A	<0.1	<0.1	<0.1	N/A	<0.1	N/A	N/A	<0.1	N/A	N/A	<0.1	<0.2	<0.1	N/A	N/A	N/A	N/A	<0.1	<0.1	<0.1	<0.1	N/A
	13-Jul-15	MQ5585	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.2
MW4	4-Nov-04	N/A	<0.002	<0.004	<0.004	<0.004	<0.004	<0.01	<0.004	<0.002	<0.002	N/A	<0.002	<0.04	<0.004	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.3
MW6	20-Oct-04	N/A	<0.002	<0.004	<0.004	<0.004	<0.004	<0.01	<0.004	<0.002	<0.002	N/A	<0.002	<0.04	<0.004	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.3
	18-Dec-14	YY3472	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.2
	13-Jul-15	MQ5588	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.2
MW7	16-Dec-14	YY0275	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.2
	9-Jul-15	MQ2965	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.2
MW8	16-Dec-14	YY0273	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.2
	9-Jul-15	MQ2966	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.2
MW9	16-Dec-14	YY0274	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.2
	9-Jul-15	MQ2967	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.2
MW12	18-Dec-14	YY3471	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.2
	9-Jul-15	MQ2968	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.2
MW14	28-Nov-08	N/A	<0.1	<0.1	<0.1	N/A	<0.1	N/A	N/A	<0.1	N/A	N/A	<0.1	<0.2	<0.1	N/A	N/A	N/A	N/A	<0.1	<0.1	<0.1	<0.1	N/A
DUP15-02 (Field Blank)	9-Jul-15	MQ2962	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.2
DUP15-03 (Trip Blank)	9-Jul-15	MQ2963	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.2

Notes:

(a) Health Canada Guidelines for Canadian Drinking Water Quality, October 2014.

(b) Federal Contaminated Sites Action Plan Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites, Tier 1 Guidelines for fine-grained soil and agricultural land use, November 2015.

NG - no guideline

RDL - reported detection limit

ug/L - micrograms per litre

N/A - not available

< - less than

BOLD indicates samples in exceedance of applicable guideline.

Table should be read in conjunction with accompanying report.

Table 13
Summary of Current Groundwater Analytical Results - Volatile Organic Compounds
Bar U Ranch National Historic Site, Alberta
Public Works and Government Services Canada

Monitoring Well	Sample Collection Date	Maxxam Sample ID	Parameters																																				
			Bromodichloromethane	Bromoform	Bromomethane	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroethane	Chloroform	Chloromethane	1,2-Dibromoethane	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Dichloromethane	1,2-Dichloropropane	cis-1,3-Dichloropropene	trans-1,3-Dichloropropene	Methyl Methacrylate	Methyl tert-Butyl Ether (MTBE)	Styrene	1,1,1,2-Tetrachloroethane	1,1,2,2-Tetrachloroethane	Tetrachloroethene (PCE)	1,2,3-Trichlorobenzene	1,2,4-Trichlorobenzene	1,3,5-Trichlorobenzene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	Trichloroethene (TCE)	Trichlorofluoromethane	Trihalomethanes (total)	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	Vinyl Chloride
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Reportable Detection Limit			0.0005	0.0005	0.002	0.0005	0.0005	0.001	0.001	0.0005	0.002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.002	0.002	0.0005	0.001	0.001	0.0005	0.0005	0.0005	0.0005	0.0005	0.002	0.0005	0.0005	0.0005
Applicable Guideline			**8.5**[b]	**77**[b]	**0.0056**[b]	**0.002**[a]	**0.0013**[b]	**0.1**[b]	**NG**	**0.0018**[b]	**NG**	**NG**	**0.0007**[b]	**0.042**[b]	**0.005**[a]	**3.1**[a]	**0.005**[a][b]	**0.014**[a]	**0.017**[b]	**0.017**[b]	**0.05**[a][b]	**0.14**[b]	**NG**	**NG**	**17**[b]	**0.015**[a]	**0.072**[b]	**0.028**[b]	**0.015**[b]	**0.03**[a]	**0.008**[b]	**0.0054**[b]	**0.38**[b]	**1.1**[b]	**0.03**[b]	**0.005**[a]	**NG**	**0.1**[a]	**NG**	**NG**	**0.018**[b]
MW1	9-Jul-15	MQ2964	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.0010	<0.0010	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.0020	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050
DUP15-01 (Duplicate of MW1)	9-Jul-15	MQ2961	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.0010	<0.0010	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.0020	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050
MW2	13-Jul-15	MQ5586	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.0010	<0.0010	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.0020	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050
MW3	13-Jul-15	MQ5585	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.0010	<0.0010	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.0020	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050
MW5	13-Jul-15	MQ5587	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.0010	<0.0010	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.0020	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050
MW6	13-Jul-15	MQ5588	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.0010	<0.0010	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.0020	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050
MW7	9-Jul-15	MQ2965	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.0010	<0.0010	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.0020	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050
MW8	9-Jul-15	MQ2966	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.0010	<0.0010	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.0020	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050
MW9	9-Jul-15	MQ2967	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.0010	<0.0010	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.0020	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050
MW12	9-Jul-15	MQ2968	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.0010	<0.0010	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.0020	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050
DUP15-02 (Field Blank)	9-Jul-15	MQ2962	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.0010	<0.0010	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.0020	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050
DUP15-03 (Trip Blank)	9-Jul-15	MQ2963	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.0010	<0.0010	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.0020	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050

Notes:

(a) Health Canada Guidelines for Canadian Drinking Water Quality, October 2014.

(b) Federal Contaminated Sites Action Plan Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites, Tier 1 Guidelines for fine-grained soil and agricultural land use, November 2015.

NG - no guideline

RDL - reported detection limit

mg/L - milligrams per litre

N/A - not available

< - less than

BOLD indicates samples in exceedance of applicable guideline.

Table should be read in conjunction with accompanying report.

Table 14
Summary of Current Surface Water Analytical Results - Routine Chemistry Parameters
Bar U Ranch National Historic Site, Alberta
Public Works and Government Services Canada

Sample Location	Sample Collection Date	Maxxam Sample ID	Parameters																	
			Anion Sum	Cation Sum	Hardness (CaCO3)	Ion Balance	Dissolved Nitrate (NO3)	Nitrate plus Nitrite (N)	Dissolved Nitrite (NO2)	Total Dissolved Solids	Conductivity	pH	Alkalinity (PP as CaCO3)	Alkalinity (Total as CaCO3)	Bicarbonate (HCO3)	Carbonate (CO3)	Hydroxide (OH)	Dissolved Sulphate (SO4)	Dissolved Chloride (Cl)	Dissolved Nitrite (N)	Dissolved Nitrate (N)
Units			meq/L	meq/L	mg/L	N/A	mg/L	mg/L	mg/L	mg/L	uS/cm	pH	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Reportable Detection Limit			N/A	N/A	0.50	0.010	0.044	0.020	0.033	10	1.0	N/A	0.50	0.50	0.50	0.50	0.50	1.0	1.0	0.010	0.010
Applicable Guideline			NG	NG	NG	NG	13[(a)]	100[(b)]	NG	500[(b)]	NG	6.5 - 9.0[(a)]	NG	NG	NG	NG	NG	1,000[(b)]	100[(b)]	0.06[(a)]	NG
SW15-01 (Upstream)	27-Nov-15	NS8665	5.0	5.4	250	1.1	0.17	0.038	<0.033	260	480	8.24	<0.50	210	260	<0.50	<0.50	35	1.1	<0.010	0.038
SW15-02 (Downstream)	27-Nov-15	NS8666	5.1	5.2	240	1.0	0.19	0.043	<0.033	260	480	8.23	<0.50	220	260	<0.50	<0.50	35	1.1	<0.010	0.043

Notes:

(a) Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), 1999.

(b) Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (Irrigation and Livestock Water), 1999.

NG - no guideline

RDL - reported detection limit

mg/L - milligrams per litre

meq/L - milliequivalent per litre

uS/cm - microSiemens per centimeter

N/A - not available

< - less than

NC - not calculated

BOLD indicates samples in exceedance of applicable guideline.

Table should be read in conjunction with accompanying report.

Table 15
Summary of Current Surface Water Analytical Results - Total Metals
Bar U Ranch National Historic Site, Alberta
Public Works and Government Services Canada

Sample Location	Sample Collection Date	Maxxam Sample ID	Parameters																														
			Total Aluminum (Al)	Total Antimony (Sb)	Total Arsenic (As)	Total Barium (Ba)	Total Beryllium (Be)	Total Boron (B)	Total Cadmium (Cd)	Total Calcium (Ca)	Total Chromium (Cr)	Total Cobalt (Co)	Total Copper (Cu)	Total Iron (Fe)	Total Lead (Pb)	Total Lithium (Li)	Total Magnesium (Mg)	Total Manganese (Mn)	Total Molybdenum (Mo)	Total Nickel (Ni)	Total Phosphorus (P)	Total Potassium (K)	Total Selenium (Se)	Total Silicon (Si)	Total Silver (Ag)	Total Sodium (Na)	Total Strontium (Sr)	Total Sulphur (S)	Total Thallium (Tl)	Total Tin (Sn)	Total Titanium (Ti)	Total Uranium (U)	Total Vanadium (V)	Total Zinc (Zn)
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Reportable Detection Limit			**0.0030**	**0.00060**	**0.00020**	**0.010**	**0.0010**	**0.020**	**0.00002**	**0.30**	**0.0010**	**0.00030**	**0.00020**	**0.060**	**0.00020**	**0.020**	**0.20**	**0.0040**	**0.00020**	**0.00050**	**0.10**	**0.30**	**0.00020**	**0.10**	**0.00010**	**0.50**	**0.020**	**0.20**	**0.00020**	**0.0010**	**0.0010**	**0.00010**	**0.0010**	**0.0030**
Applicable Guideline			**0.1[a]**	**NG**	**0.005[a]**	**NG**	**0.1[b]**	**0.5[b]**	**0.00009[a]**	**1,000[b]**	**NG**	**0.05[b]**	**0.004[a]**	**0.3[a]**	**0.007[a]**	**2.5[b]**	**NG**	**0.2[b]**	**0.01[b]**	**0.15[a]**	**NG**	**NG**	**0.001[a]**	**NG**	**0.00025[a]**	**NG**	**NG**	**NG**	**0.0008[a]**	**NG**	**NG**	**0.01[b]**	**0.1[b]**	**0.03[a]**
SW15-01 (Upstream)	27-Nov-15	NS8665	0.0084	<0.00060	0.00031	0.14	<0.0010	<0.020	<0.000020	76	<0.0010	<0.00030	0.00043	<0.060	<0.00020	<0.020	17	<0.0040	0.00088	0.00069	<0.10	0.54	0.00052	2.4	<0.00010	5.5	0.36	11	<0.00020	<0.0010	<0.0010	0.00067	<0.0010	<0.0030
SW15-02 (Downstream)	27-Nov-15	NS8666	0.015	<0.00060	0.00021	0.13	<0.0010	<0.020	<0.000020	76	<0.0010	<0.00030	0.00043	<0.060	<0.00020	<0.020	17	<0.0040	0.00081	0.00052	<0.10	0.77	0.00072	2.4	<0.00010	5.5	0.37	11	<0.00020	<0.0010	<0.0010	0.00066	<0.0010	<0.0030

Notes:

(a) Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), 1999.

(b) Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (Irrigation and Livestock Water), 1999.

NG - no guideline

RDL - reported detection limit

mg/L - milligrams per litre

N/A - not available

< - less than

BOLD indicates samples in exceedance of applicable guideline.

Table should be read in conjunction with accompanying report.

Table 16
Summary of Current Surface Water Analytical Results - Polycyclic Aromatic Hydrocarbons
Bar U Ranch National Historic Site, Alberta
Public Works and Government Services Canada

Sample Location	Sample Collection Date	Maxxam Sample ID	Parameters																					
			Acenaphthene	Acenaphthylene	Acridine	Anthracene	Benzo[a]anthracene	Benzo [b,j] fluoranthene	Benzo[k]fluoranthene	Benzo[g,h,i]perylene	Benzo[c]phenanthrene	Benzo[a]pyrene	Benzo[e]pyrene	Chrysene	Dibenzo[a,h]anthracene	Fluoranthene	Fluorene	Indeno[1,2,3-cd]pyrene	2-Methylnaphthalene	Naphthalene	Perylene	Phenanthrene	Pyrene	Quinoline	B(a)P Equivalency
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Reportable Detection Limit			0.0001	0.0001	0.0002	0.00001	0.0000085	0.0000085	0.0000085	0.0000085	0.00005	0.0000075	0.00005	0.0000085	0.0000075	0.00001	0.00005	0.0000085	0.0001	0.0001	0.00005	0.00005	0.00002	0.0002	0.00001
Applicable Guideline			**0.0058[(a)]**	**NG**	**0.0044[(a)]**	**0.000012[(a)]**	**0.000018[(a)]**	**NG**	**NG**	**NG**	**NG**	**0.000015[(a)]**	**NG**	**NG**	**NG**	**0.00004[(a)]**	**0.003[(a)]**	**NG**	**NG**	**0.0011[(a)]**	**NG**	**0.0004[(a)]**	**0.000025[(a)]**	**0.0034[(a)]**	**NG**
SW15-01 (Upstream)	27-Nov-15	NS8665	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.000050	<0.0000075	<0.000050	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000050	<0.000050	<0.000020	<0.00020	<0.000010
SW15-02 (Downstream)	27-Nov-15	NS8666	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000085	<0.0000085	<0.0000085	<0.000050	<0.0000075	<0.000050	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000050	<0.000050	<0.000020	<0.00020	<0.000010

Notes:

(a) Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), 1999.

(b) Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (Irrigation and Livestock Water), 1999.

NG - no guideline

RDL - reported detection limit

mg/L - milligrams per litre

N/A - not available

< - less than

BOLD indicates samples in exceedance of applicable guideline.

Table should be read in conjunction with accompanying report.

Table 17
Quality Assurance/Quality Control Analysis
Bar U Ranch National Historic Site, Alberta
Public Works and Government Services Canada

Sample Identification			MW1	DUP15-01	Greater than 5 X RDL?[1]	Within 2 X RDL?[2]	RPD[3]
Sample Collection Date			July 9, 2015				
Parameter	Units	RDL					
PHC Parameters							
Benzene	mg/L	0.0004	<0.00040	<0.00040	N	Y	-
Toluene	mg/L	0.0004	<0.00040	<0.00040	N	Y	-
Ethylbenzene	mg/L	0.0004	<0.00040	<0.00040	N	Y	-
Xylenes (Total)	mg/L	0.0008	<0.00080	<0.00080	N	Y	-
PHC F1 (C6-C10) - BTEX	mg/L	0.1	<0.10	<0.10	N	Y	-
PHC F2 (C10-C16)	mg/L	0.1	<0.10	<0.10	N	Y	-
Routine Parameters							
Anion Sum	meq/L	N/A	68	68	Y	-	0%
Cation Sum	meq/L	N/A	58	58	Y	-	0%
Hardness (CaCO3)	mg/L	0.5	2,100	2,100	Y	-	0%
Ion Balance	N/A	0.01	0.86	0.85	Y	-	1%
Dissolved Nitrate (NO3)	mg/L	0.044	0.23	0.21	N	Y	-
Nitrate plus Nitrite (N)	mg/L	0.02	0.051	0.047	N	Y	-
Dissolved Nitrite (NO2)	mg/L	0.033	<0.033	<0.033	N	Y	-
Total Dissolved Solids	mg/L	10	4,100	4,100	Y	-	0%
Conductivity	uS/cm	1	4,500	4,500	Y	-	0%
pH	pH	N/A	7.74	7.74	Y	-	0%
Alkalinity (PP as CaCO3)	mg/L	0.5	<0.50	<0.50	N	Y	-
Alkalinity (Total as CaCO3)	mg/L	0.5	550	550	Y	-	0%
Bicarbonate (HCO3)	mg/L	0.5	670	670	Y	-	0%
Carbonate (CO3)	mg/L	0.5	<0.50	<0.50	N	Y	-
Hydroxide (OH)	mg/L	0.5	<0.50	<0.50	N	Y	-
Dissolved Sulphate (SO4)	mg/L	1	2,700	2,700	Y	-	0%
Dissolved Chloride (Cl)	mg/L	1	13	13	Y	-	0%
Dissolved Nitrite (N)	mg/L	0.01	<0.010	<0.010	N	Y	-
Dissolved Nitrate (N)	mg/L	0.01	0.051	0.047	N	Y	-
Dissolved Metal Parameters							
Dissolved Aluminum (Al)	mg/L	0.003	0.0057	0.0065	N	Y	-
Dissolved Antimony (Sb)	mg/L	0.0006	<0.00060	<0.00060	N	Y	-
Dissolved Arsenic (As)	mg/L	0.0002	0.00063	0.0007	N	Y	-
Dissolved Barium (Ba)	mg/L	0.01	0.015	0.015	N	Y	-
Dissolved Beryllium (Be)	mg/L	0.001	<0.0010	<0.0010	N	Y	-
Dissolved Boron (B)	mg/L	0.02	0.097	0.1	N	Y	-
Dissolved Cadmium (Cd)	mg/L	0.00002	0.000038	0.000054	N	Y	-
Dissolved Calcium (Ca)	mg/L	0.3	390	390	Y	-	0%
Dissolved Chromium (Cr)	mg/L	0.001	<0.0010	<0.0010	N	Y	-
Dissolved Cobalt (Co)	mg/L	0.0003	0.0032	0.0033	Y	-	3%
Dissolved Copper (Cu)	mg/L	0.0002	0.0012	0.0012	Y	-	0%
Dissolved Iron (Fe)	mg/L	0.06	0.56	0.57	Y	-	2%
Dissolved Lead (Pb)	mg/L	0.0002	0.00049	0.00044	N	Y	-
Dissolved Lithium (Li)	mg/L	0.02	0.063	0.067	N	Y	-
Dissolved Magnesium (Mg)	mg/L	0.2	270	260	Y	-	4%
Dissolved Manganese (Mn)	mg/L	0.004	1.9	1.9	Y	-	0%
Dissolved Molybdenum (Mo)	mg/L	0.0002	0.0011	0.0012	Y	-	9%
Dissolved Nickel (Ni)	mg/L	0.0005	0.01	0.011	Y	-	10%
Dissolved Phosphorus (P)	mg/L	0.1	<0.10	<0.10	N	Y	-
Dissolved Potassium (K)	mg/L	0.3	6.5	6.5	Y	-	0%
Dissolved Selenium (Se)	mg/L	0.0002	<0.00020	<0.00020	N	Y	-
Dissolved Silicon (Si)	mg/L	0.1	4.7	4.7	Y	-	0%
Dissolved Silver (Ag)	mg/L	0.0001	<0.00010	<0.00010	N	Y	-
Dissolved Sodium (Na)	mg/L	0.5	380	380	Y	-	0%
Dissolved Strontium (Sr)	mg/L	0.02	4.6	4.7	Y	-	2%
Dissolved Sulphur (S)	mg/L	0.2	910	840	Y	-	8%
Dissolved Thallium (Tl)	mg/L	0.0002	<0.00020	<0.00020	N	Y	-
Dissolved Tin (Sn)	mg/L	0.001	<0.0010	<0.0010	N	Y	-
Dissolved Titanium (Ti)	mg/L	0.001	<0.0010	<0.0010	N	Y	-
Dissolved Uranium (U)	mg/L	0.0001	0.019	0.019	Y	-	0%
Dissolved Vanadium (V)	mg/L	0.001	<0.0010	<0.0010	N	Y	-
Dissolved Zinc (Zn)	mg/L	0.003	0.0092	0.0088	N	Y	-
Total Metal Parameters							
Total Aluminum (Al)	mg/L	0.003	20	20	Y	-	0%
Total Antimony (Sb)	mg/L	0.0006	0.0041	0.0034	Y	-	19%
Total Arsenic (As)	mg/L	0.0002	0.032	0.033	Y	-	3%
Total Barium (Ba)	mg/L	0.01	1.4	1.5	Y	-	7%
Total Beryllium (Be)	mg/L	0.001	0.002	0.0017	N	Y	-
Total Boron (B)	mg/L	0.02	0.12	0.12	Y	-	0%
Total Cadmium (Cd)	mg/L	0.00002	0.0047	0.0048	Y	-	2%
Total Calcium (Ca)	mg/L	0.3	610	540	Y	-	12%
Total Chromium (Cr)	mg/L	0.001	0.047	0.048	Y	-	2%
Total Cobalt (Co)	mg/L	0.0003	0.033	0.035	Y	-	6%
Total Copper (Cu)	mg/L	0.0002	0.074	0.077	Y	-	4%
Total Iron (Fe)	mg/L	0.06	60	64	Y	-	6%
Total Lead (Pb)	mg/L	0.0002	0.053	0.052	Y	-	2%
Total Lithium (Li)	mg/L	0.02	0.093	0.094	N	Y	-
Total Magnesium (Mg)	mg/L	0.2	300	300	Y	-	0%
Total Manganese (Mn)	mg/L	0.004	4	4.2	Y	-	5%
Total Molybdenum (Mo)	mg/L	0.0002	0.0061	0.0058	Y	-	5%
Total Nickel (Ni)	mg/L	0.0005	0.09	0.094	Y	-	4%
Total Phosphorus (P)	mg/L	0.1	2.5	2.5	Y	-	0%
Total Potassium (K)	mg/L	0.3	11	12	Y	-	9%
Total Selenium (Se)	mg/L	0.0002	0.002	0.002	Y	-	0%
Total Silicon (Si)	mg/L	0.1	36	36	Y	-	0%
Total Silver (Ag)	mg/L	0.0001	0.0003	0.00038	N	Y	-
Total Sodium (Na)	mg/L	0.5	370	380	Y	-	3%
Total Strontium (Sr)	mg/L	0.02	4.8	4.9	Y	-	2%
Total Sulphur (S)	mg/L	0.2	820	710	Y	-	14%
Total Thallium (Tl)	mg/L	0.0002	0.0015	0.0015	Y	-	0%
Total Tin (Sn)	mg/L	0.001	0.0091	0.0091	Y	-	0%
Total Titanium (Ti)	mg/L	0.001	0.89	0.86	Y	-	3%
Total Uranium (U)	mg/L	0.0001	0.024	0.024	Y	-	0%
Total Vanadium (V)	mg/L	0.001	0.077	0.081	Y	-	5%
Total Zinc (Zn)	mg/L	0.003	0.51	0.53	Y	-	4%
PAH Parameters							
Acenaphthene	mg/L	0.0001	<0.00010	<0.00010	N	Y	-
Acenaphthylene	mg/L	0.0001	<0.00010	<0.00010	N	Y	-
Acridine	mg/L	0.0002	<0.00020	<0.00020	N	Y	-
Anthracene	mg/L	0.00001	<0.000010	<0.000010	N	Y	-
Benzo[a]anthracene	mg/L	0.0000085	<0.0000085	<0.0000085	N	Y	-
Benzo [b,j] fluoranthene	mg/L	0.0000085	<0.0000085	<0.0000085	N	Y	-
Benzo[k]fluoranthene	mg/L	0.0000085	<0.0000085	<0.0000085	N	Y	-
Benzo[g,h,i]perylene	mg/L	0.0000085	<0.0000085	<0.0000085	N	Y	-
Benzo[c]phenanthrene	mg/L	0.00005	<0.000050	<0.000050	N	Y	-
Benzo[a]pyrene	mg/L	0.0000075	<0.0000075	<0.0000075	N	Y	-
Benzo[e]pyrene	mg/L	0.00005	<0.000050	<0.000050	N	Y	-
Chrysene	mg/L	0.0000085	<0.0000085	<0.0000085	N	Y	-
Dibenzo[a,h]anthracene	mg/L	0.0000075	<0.0000075	<0.0000075	N	Y	-
Fluoranthene	mg/L	0.00001	<0.000010	<0.000010	N	Y	-
Fluorene	mg/L	0.00005	<0.000050	<0.000050	N	Y	-
Indeno[1,2,3-cd]pyrene	mg/L	0.0000085	<0.0000085	<0.0000085	N	Y	-
2-Methylnaphthalene	mg/L	0.0001	<0.00010	<0.00010	N	Y	-
Naphthalene	mg/L	0.0001	<0.00010	<0.00010	N	Y	-
Perylene	mg/L	0.00005	<0.000050	<0.000050	N	Y	-
Phenanthrene	mg/L	0.00005	<0.000050	<0.000050	N	Y	-
Pyrene	mg/L	0.00002	<0.000020	<0.000020	N	Y	-
Quinoline	mg/L	0.0002	<0.00020	<0.00020	N	Y	-
B(a)P Equivalency	mg/L	0.00001	<0.000010	<0.000010	N	Y	-

Table 17
Quality Assurance/Quality Control Analysis
Bar U Ranch National Historic Site, Alberta
Public Works and Government Services Canada

Sample Identification			MW1	DUP15-01	Greater than 5 X RDL?[1]	Within 2 X RDL?[2]	RPD[3]
Sample Collection Date			July 9, 2015				
Parameter	Units	RDL					
Pesticide Parameters							
Aldrin + Dieldrin	ug/L	0.005	<0.005	<0.005	N	Y	-
Chlordane (Total)	ug/L	0.005	<0.005	<0.005	N	Y	-
DDT + Metabolites	ug/L	0.005	<0.005	<0.005	N	Y	-
Heptachlor + Heptachlor epoxide	ug/L	0.005	<0.005	<0.005	N	Y	-
o,p-DDD + p,p-DDD	ug/L	0.005	<0.005	<0.005	N	Y	-
o,p-DDE + p,p-DDE	ug/L	0.005	<0.005	<0.005	N	Y	-
o,p-DDT + p,p-DDT	ug/L	0.005	<0.005	<0.005	N	Y	-
Total Endosulfan	ug/L	0.005	<0.005	<0.005	N	Y	-
Total PCB	ug/L	0.05	<0.05	<0.05	N	Y	-
Aldrin	ug/L	0.005	<0.005	<0.005	N	Y	-
alpha-BHC	ug/L	0.005	<0.005	<0.005	N	Y	-
Aroclor 1016	ug/L	0.05	<0.05	<0.05	N	Y	-
Aroclor 1221	ug/L	0.05	<0.05	<0.05	N	Y	-
Aroclor 1232	ug/L	0.05	<0.05	<0.05	N	Y	-
Aroclor 1242	ug/L	0.05	<0.05	<0.05	N	Y	-
Aroclor 1248	ug/L	0.05	<0.05	<0.05	N	Y	-
Aroclor 1254	ug/L	0.05	<0.05	<0.05	N	Y	-
Aroclor 1260	ug/L	0.05	<0.05	<0.05	N	Y	-
beta-BHC	ug/L	0.005	<0.005	<0.005	N	Y	-
a-Chlordane	ug/L	0.005	<0.005	<0.005	N	Y	-
g-Chlordane	ug/L	0.005	<0.005	<0.005	N	Y	-
delta-BHC	ug/L	0.005	<0.005	<0.005	N	Y	-
Dieldrin	ug/L	0.005	<0.005	<0.005	N	Y	-
Endosulfan I (alpha)	ug/L	0.005	<0.005	<0.005	N	Y	-
Endosulfan II	ug/L	0.005	<0.005	<0.005	N	Y	-
Endosulfan Sulfate	ug/L	0.005	<0.005	<0.005	N	Y	-
Endrin	ug/L	0.005	<0.005	<0.005	N	Y	-
Endrin Aldehyde	ug/L	0.005	<0.005	<0.005	N	Y	-
Endrin Ketone	ug/L	0.005	<0.005	<0.005	N	Y	-
Heptachlor	ug/L	0.005	<0.005	<0.005	N	Y	-
Heptachlor Epoxide	ug/L	0.005	<0.005	<0.005	N	Y	-
Hexachlorobenzene	ug/L	0.005	<0.005	<0.005	N	Y	-
Lindane	ug/L	0.003	<0.003	<0.003	N	Y	-
Methoxychlor	ug/L	0.01	<0.01	<0.01	N	Y	-
Mirex	ug/L	0.005	<0.005	<0.005	N	Y	-
o,p-DDD	ug/L	0.005	<0.005	<0.005	N	Y	-
o,p-DDE	ug/L	0.005	<0.005	<0.005	N	Y	-
o,p-DDT	ug/L	0.005	<0.005	<0.005	N	Y	-
Octachlorostyrene	ug/L	0.005	<0.005	<0.005	N	Y	-
Oxychlordane	ug/L	0.005	<0.005	<0.005	N	Y	-
p,p-DDD	ug/L	0.005	<0.005	<0.005	N	Y	-
p,p-DDE	ug/L	0.005	<0.005	<0.005	N	Y	-
p,p-DDT	ug/L	0.005	<0.005	<0.005	N	Y	-
Toxaphene	ug/L	0.2	<0.2	<0.2	N	Y	-
VOC Parameters							
Bromodichloromethane	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
Bromoform	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
Bromomethane	mg/L	0.002	<0.0020	<0.0020	N	Y	-
Carbon Tetrachloride	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
Chlorobenzene	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
Chlorodibromomethane	mg/L	0.001	<0.0010	<0.0010	N	Y	-
Chloroethane	mg/L	0.001	<0.0010	<0.0010	N	Y	-
Chloroform	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
Chloromethane	mg/L	0.002	<0.0020	<0.0020	N	Y	-
1,2-Dibromoethane	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
1,2-Dichlorobenzene	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
1,3-Dichlorobenzene	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
1,4-Dichlorobenzene	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
1,1-Dichloroethane	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
1,2-Dichloroethane	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
1,1-Dichloroethene	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
cis-1,2-Dichloroethene	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
trans-1,2-Dichloroethene	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
Dichloromethane	mg/L	0.002	<0.0020	<0.0020	N	Y	-
1,2-Dichloropropane	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
cis-1,3-Dichloropropene	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
trans-1,3-Dichloropropene	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
Methyl Methacrylate	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
Methyl tert-Butyl Ether (MTBE)	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
Styrene	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
1,1,1,2-Tetrachloroethane	mg/L	0.002	<0.0020	<0.0020	N	Y	-
1,1,2,2-Tetrachloroethane	mg/L	0.002	<0.0020	<0.0020	N	Y	-
Tetrachloroethene (PCE)	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
1,2,3-Trichlorobenzene	mg/L	0.001	<0.0010	<0.0010	N	Y	-
1,2,4-Trichlorobenzene	mg/L	0.001	<0.0010	<0.0010	N	Y	-
1,3,5-Trichlorobenzene	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
1,1,1-Trichloroethane	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
1,1,2-Trichloroethane	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
Trichloroethene (TCE)	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
Trichlorofluoromethane	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
Trihalomethanes (total)	mg/L	0.002	<0.0020	<0.0020	N	Y	-
1,2,4-Trimethylbenzene	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
1,3,5-Trimethylbenzene	mg/L	0.0005	<0.00050	<0.00050	N	Y	-
Vinyl Chloride	mg/L	0.0005	<0.00050	<0.00050	N	Y	-

Notes:

RPD - Relative Percent Difference.

RDL - Reported Detection Limit by the Laboratory.

1. RPD is only calculated for results that are greater than 5 times the reported detection limit.

2. Applicable to results that are less than 5 times the reported detection limit.

3. Relative percent difference is only calculated for results where both results are greater than 5 times the detection limit.

mg/L - milligrams per litre

meq/L - milliequivalent per litre

uS/cm - microSiemens per centimeter

ug/L - micrograms per litre

N/A - not available

BOLD indicates the percent difference is greater than 30% or not within 2 X RDL.

Table should be read in conjunction with accompanying report.

FIGURES

INSET MAP - NOT TO SCALE

20 0 20
SCALE KILOMETRES

CLIENT
PUBLIC WORKS AND GOVERNMENT SERVICES CANADA
PHASE III ENVIRONMENTAL SITE ASSESSMENT
FORMER WASTE DISPOSAL MIDDENS
BAR U RANCH NATIONAL HISTORIC SITE, ALBERTA

TITLE

SITE LOCATION

REFERENCE

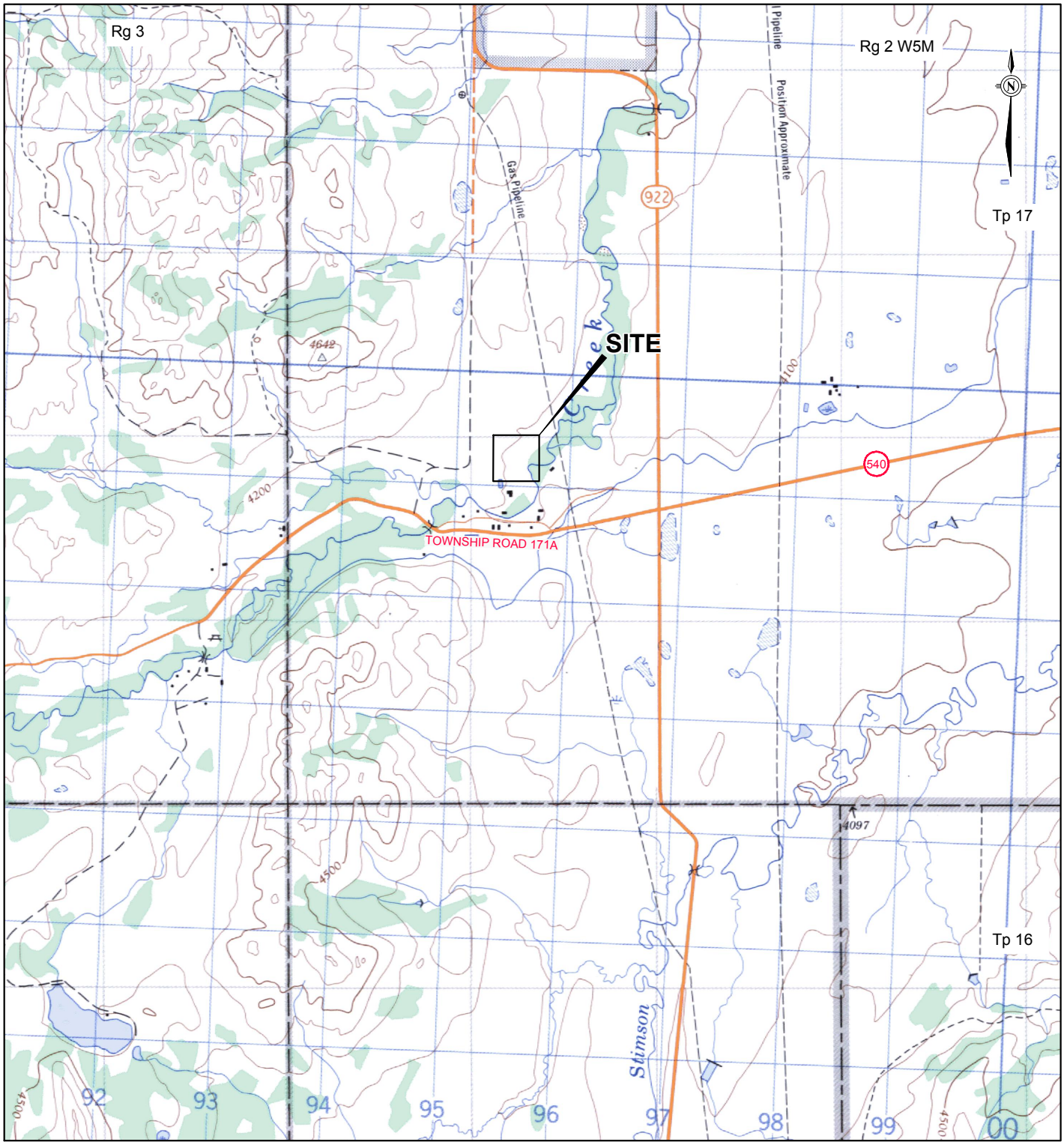
BASE MAP OBTAINED FROM ALBERTA SUSTAINABLE RESOURCE DEVELOPMENT © 2008 HER MAJESTY THE QUEEN IN RIGHT OF CANADA. DEPARTMENT OF SUSTAINABLE RESOURCES. ALL RIGHTS RESERVED. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD83 COORDINATE SYSTEM: UTM ZONE 12 REPRODUCED WITH THE PERMISSION OF ALBERTA SUSTAINABLE RESOURCE DEVELOPMENT.

Golder Associates

PROJECT		1526784	FILE No. 1526784-2003-HS-0001	
DESIGN	SF	21/01/16	SCALE AS SHOWN	REV. 0
CADD	DP	21/01/16		
CHECK	SF	30/03/16		
REVIEW	JM	30/03/16		

FIGURE: 1

N:\publicworkscanada\baruranch_longview_alberta\99_projects\1526784\02_PRODUCTION\2000-2003\DWG\1526784-2003-HS-0001.dwg Mar 30, 2016 - 1:53pm



1 0 1
SCALE KILOMETRES

CLIENT
PUBLIC WORKS AND GOVERNMENT SERVICES CANADA
PHASE III ENVIRONMENTAL SITE ASSESSMENT
FORMER WASTE DISPOSAL MIDDENS
BAR U RANCH NATIONAL HISTORIC SITE, ALBERTA

TITLE

TOPOGRAPHIC MAP

REFERENCE

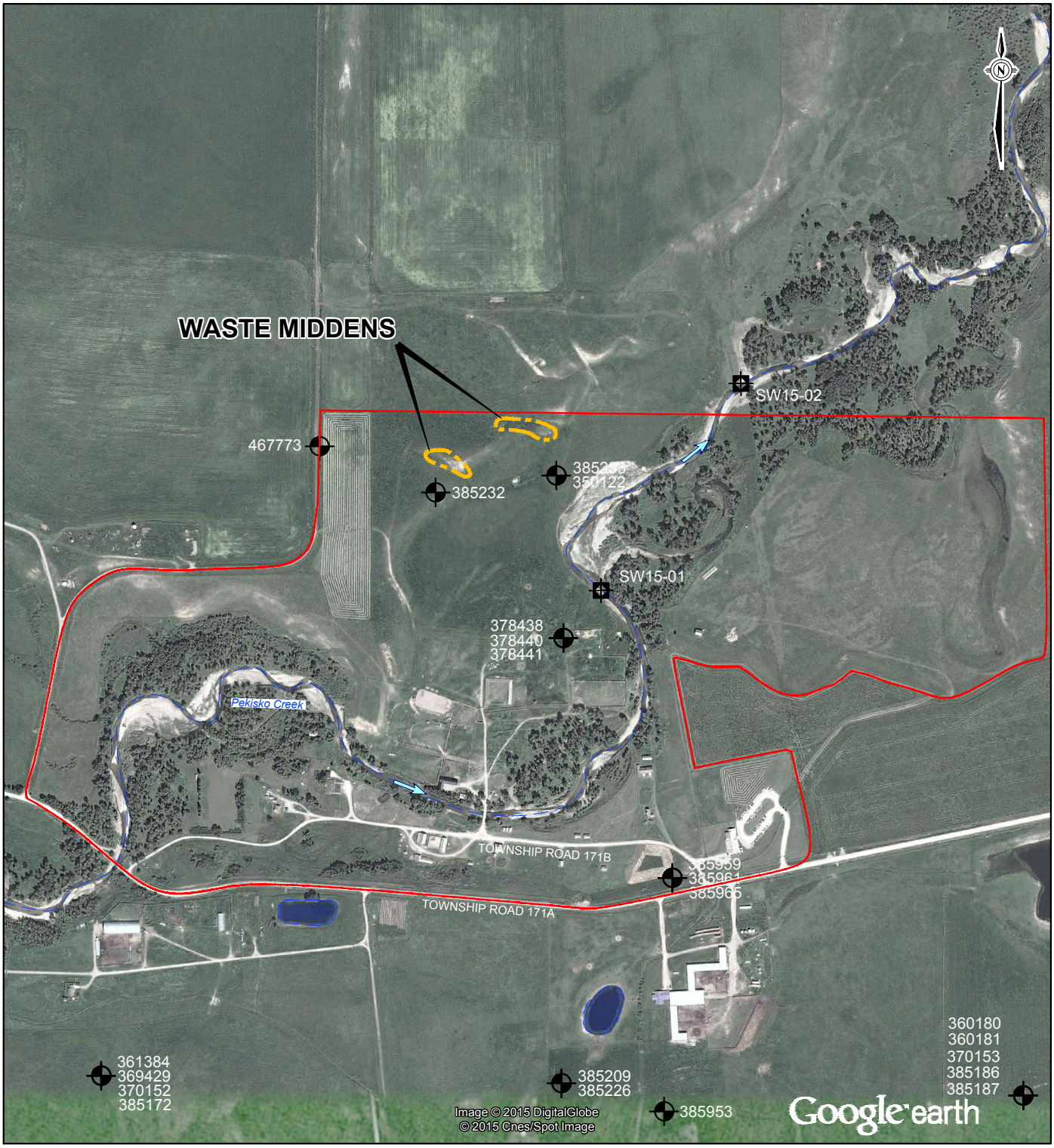
TOPOGRAPHIC MAP 82J/08 OBTAINED FROM Canmatrix. ©1979 HER MAJESTY THE QUEEN IN RIGHT OF CANADA. DEPARTMENT OF NATURAL RESOURCES. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD83 COORDINATE SYSTEM: UTM ZONE 12.

Golder Associates

PROJECT		1526784	FILE No. 1526784-2003-HS-0002	
DESIGN	SF	21/01/16	SCALE AS SHOWN	REV. 0
CADD	DP	21/01/16		
CHECK	SF	30/03/16		
REVIEW	JM	30/03/16		

FIGURE: 2

N:\publicworkscanada\baruranch_longview_alberta\99_projects\1526784\02_PRODUCTION\2000-2003\DWG\1526784-2003-HS-0002.dwg Mar 30, 2016 - 1:53pm



200 0 200
SCALE (APPROX.) METRES

LEGEND

- SITE BOUNDARY
- WASTE MIDDENS BOUNDARY (APPROXIMATE)
- WATER BODY
- WATER COURSE
- SURFACE WATER SAMPLE
- PLOW DIRECTION
- WATER WELL

REFERENCE

IMAGE OBTAINED FROM GOOGLE EARTH, USED UNDER LICENSE
IMAGERY DATE UNKNOWN. GOOGLE EARTH IMAGE IS NOT TO SCALE.

ORIGINAL DRAWING OBTAINED FROM MERIDIAN ENVIRONMENTAL INC.;
JOB No.: 11005; SCALE: 1:1,250 (APPROXIMATE); DATE: MARCH 3, 2006.

CLIENT: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA
PHASE III ENVIRONMENTAL SITE ASSESSMENT
FORMER WASTE DISPOSAL MIDDENS
BAR U RANCH NATIONAL HISTORIC SITE, ALBERTA

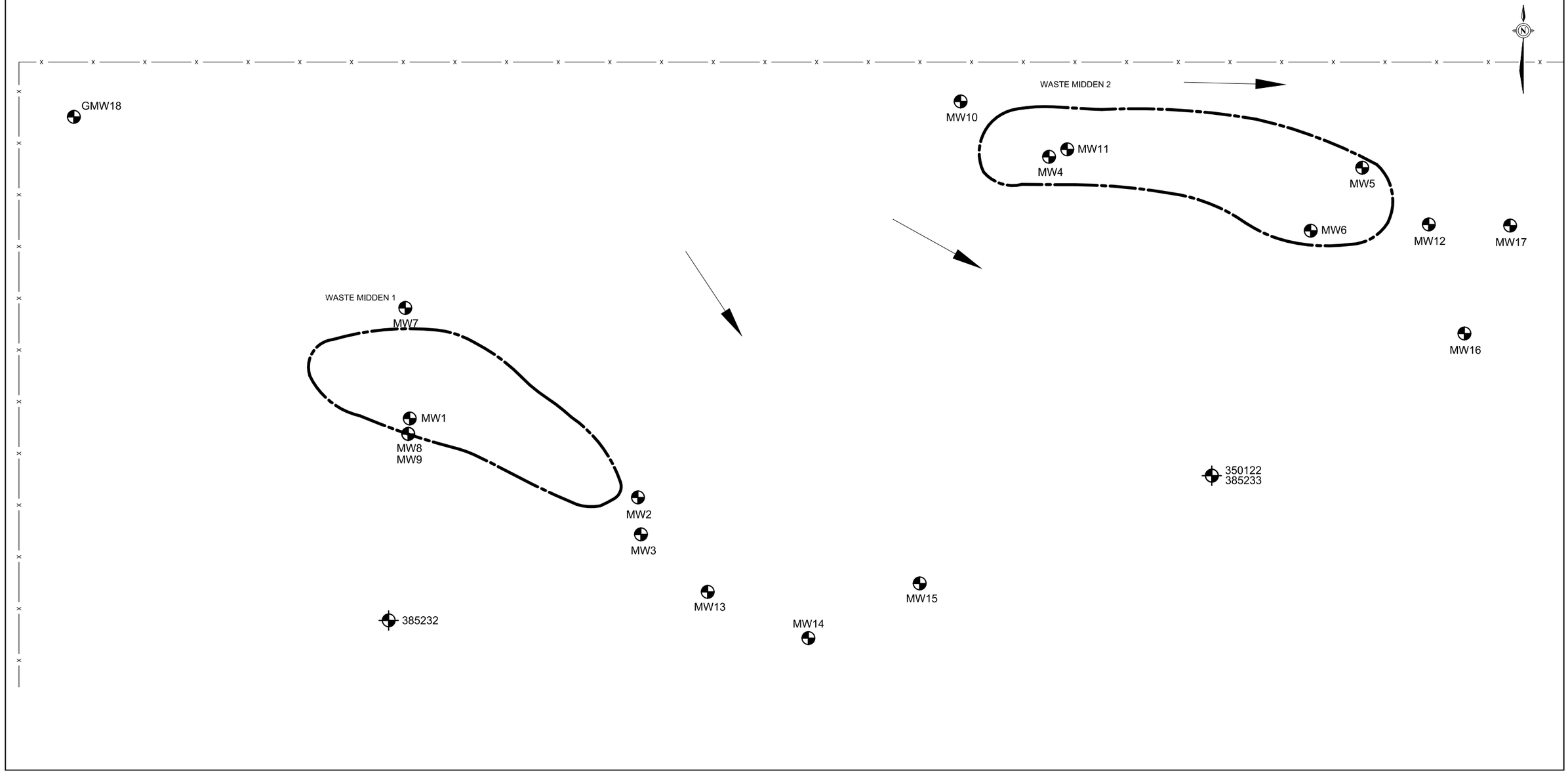
TITLE

SITE LOCALITY MAP WITH SURFACE WATER SAMPLE LOCATIONS

Golder Associates

PROJECT		1526784	FILE No. 1526784-2003-HS-0003	
DESIGN	SF	21/01/16	SCALE AS SHOWN	REV. 0
CADD	DP	21/01/16		
CHECK	SF	30/03/16		
REVIEW	JM	30/03/16		

FIGURE: 3



LEGEND

- WASTE MIDDENS BOUNDARY (APPROXIMATE)
- FENCELINE
- MONITORING WELL LOCATION
- WATER WELL
- DIRECTION OF SLOPE

REFERENCE

ORIGINAL DRAWING OBTAINED FROM MERIDIAN ENVIRONMENTAL INC.; JOB No.: 11005; SCALE: 1:1,250 (APPROXIMATE);
DATE: MARCH 3, 2006.

20 0 20
SCALE METRES

CLIENT
PUBLIC WORKS AND GOVERNMENT SERVICES CANADA
PHASE III ENVIRONMENTAL SITE ASSESSMENT
FORMER WASTE DISPOSAL MIDDENS
BAR U RANCH NATIONAL HISTORIC SITE, ALBERTA

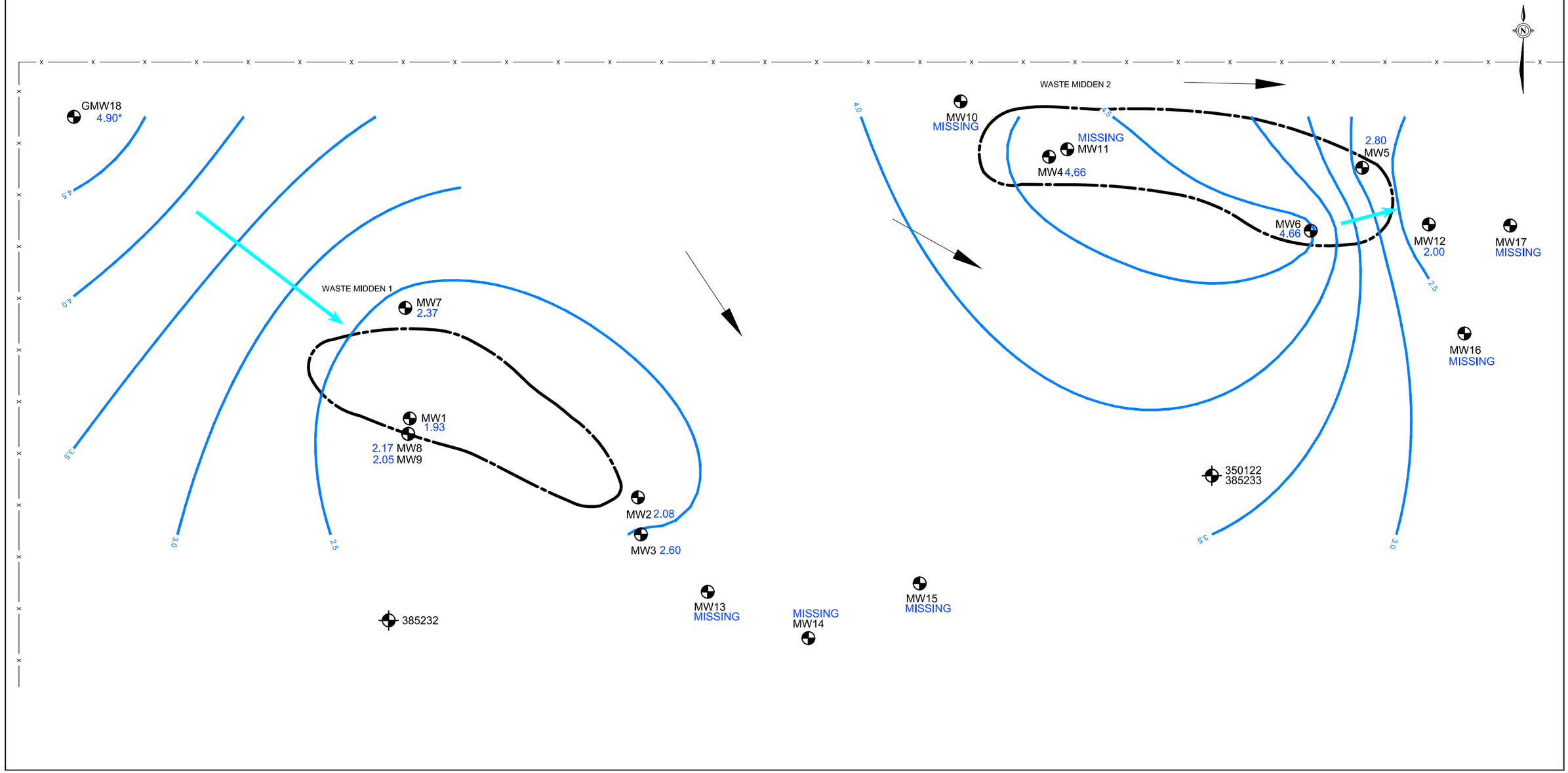
TITLE
SITE PLAN WITH MONITORING WELL LOCATIONS

Golder Associates

PROJECT		1526784	FILE No. 1526784-2003-HS-0004	
DESIGN	SF	21/01/16	SCALE AS SHOWN	REV. 0
CADD	DP	21/01/16		
CHECK	SF	30/03/16		
REVIEW	JM	30/03/16		

FIGURE: 4

N:\publicworkscanada\baruranch_longview_alberta\99_projects\1526784\02_PRODUCTION\2000-2003\DWG\1526784-2003-HS-0004.dwg Mar 30, 2016 - 1:54pm



20 0 20
SCALE METRES

LEGEND

- WASTE MIDDENS BOUNDARY (APPROXIMATE)
- x FENCELINE
- MONITORING WELL LOCATION
- WATER WELL
- DIRECTION OF SLOPE

GROUNDWATER

- 2.60 DEPTH TO GROUNDWATER (mbtoc)
- APPROXIMATE FLOW DIRECTION
- 2.5 CONTOUR (m)

LIST OF APPLICABLE ABBREVIATIONS

*	GROUNDWATER DEPTH RECORDED NOVEMBER 2015
mtboc	METRE BELOW TOP OF CASING

REFERENCE

ORIGINAL DRAWING OBTAINED FROM MERIDIAN ENVIRONMENTAL INC.; JOB No.: 11005; SCALE: 1:1,250 (APPROXIMATE);
DATE: MARCH 3, 2006.

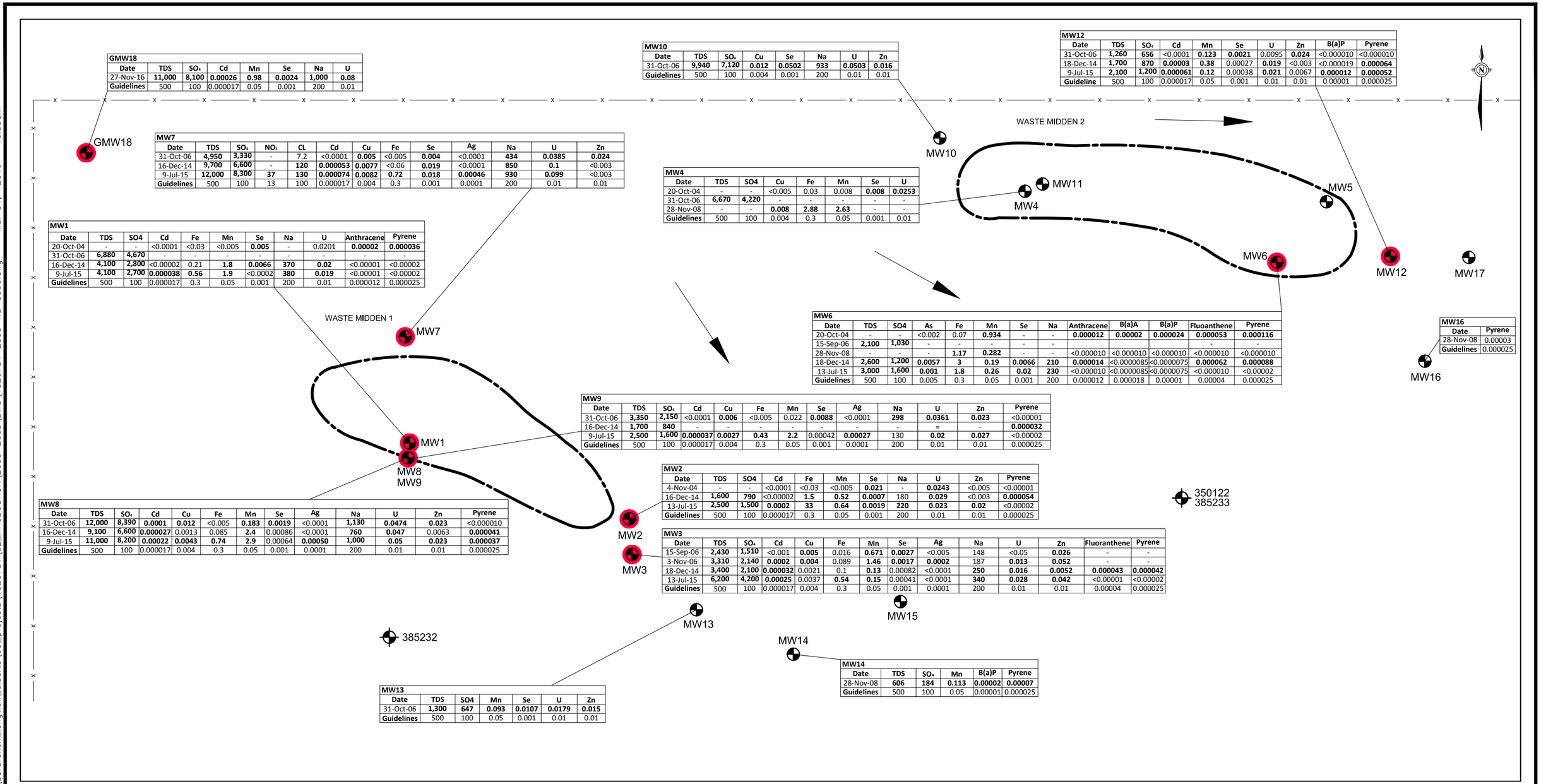
CLIENT
PUBLIC WORKS AND GOVERNMENT SERVICES CANADA
PHASE III ENVIRONMENTAL SITE ASSESSMENT
FORMER WASTE DISPOSAL MIDDENS
BAR U RANCH NATIONAL HISTORIC SITE, ALBERTA

TITLE
GROUNDWATER DEPTHS
July 2015

Golder Associates

PROJECT		1526784	FILE No. 1526784-2003-HS-0005	
DESIGN	SF	21/01/16	SCALE AS SHOWN	REV. 0
CADD	YW	30/03/16		
CHECK	SF	31/03/16		
REVIEW	JM	31/03/16		

FIGURE: 5



GMW18

Date	TDS	SO_4	Cd	Mn	Se	Na	U
27-Nov-16	**11,000**	**8,100**	**0.00026**	**0.98**	**0.0024**	**1,000**	**0.08**
Guidelines	500	100	0.000017	0.05	0.001	200	0.01

MW10

Date	TDS	SO_4	Cu	Se	Na	U	Zn
31-Oct-06	**9,940**	**7,120**	**0.012**	**0.0502**	**933**	**0.0503**	**0.016**
Guidelines	500	100	0.004	0.001	200	0.01	0.01

MW12

Date	TDS	SO_4	Cd	Mn	Se	U	Zn	B(a)P	Pyrene
31-Oct-06	**1,260**	**656**	<0.0001	**0.123**	**0.0021**	0.0095	**0.024**	<0.000010	<0.000010
18-Dec-14	**1,700**	**870**	**0.00003**	**0.38**	0.00027	**0.019**	<0.003	<0.000019	**0.000064**
9-Jul-15	**2,100**	**1,200**	**0.000061**	**0.12**	0.00038	**0.021**	0.0067	**0.000012**	**0.000052**
Guideline	500	100	0.000017	0.05	0.001	0.01	0.01	0.00001	0.000025

MW7

Date	TDS	SO_4	NO_3	CL	Cd	Cu	Fe	Se	Ag	Na	U	Zn
31-Oct-06	**4,950**	**3,330**	-	7.2	<0.0001	**0.005**	<0.005	**0.004**	<0.0001	**434**	**0.0385**	**0.024**
16-Dec-14	**9,700**	**6,600**	-	**120**	**0.000053**	**0.0077**	<0.06	**0.019**	<0.0001	**850**	**0.1**	<0.003
9-Jul-15	**12,000**	**8,300**	**37**	**130**	**0.000074**	**0.0082**	**0.72**	**0.018**	**0.00046**	**930**	**0.099**	<0.003
Guidelines	500	100	13	100	0.000017	0.004	0.3	0.001	0.0001	200	0.01	0.01

MW4

Date	TDS	SO4	Cu	Fe	Mn	Se	U
20-Oct-04	-	-	<0.005	0.03	0.008	**0.008**	**0.0253**
31-Oct-06	**6,670**	**4,220**	-	-	-	-	-
28-Nov-08	-	-	**0.008**	**2.88**	**2.63**	-	-
Guidelines	500	100	0.004	0.3	0.05	0.001	0.01

MW1

Date	TDS	SO4	Cd	Fe	Mn	Se	Na	U	Anthracene	Pyrene
20-Oct-04	-	-	<0.0001	<0.03	<0.005	**0.005**	-	0.0201	**0.00002**	**0.000036**
31-Oct-06	**6,880**	**4,670**	-	-	-	-	-	-	-	-
16-Dec-14	**4,100**	**2,800**	<0.00002	0.21	**1.8**	**0.0066**	**370**	**0.02**	<0.00001	<0.00002
9-Jul-15	**4,100**	**2,700**	**0.000038**	**0.56**	**1.9**	<0.0002	**380**	**0.019**	<0.00001	<0.00002
Guidelines	500	100	0.000017	0.3	0.05	0.001	200	0.01	0.000012	0.000025

MW6

Date	TDS	SO4	As	Fe	Mn	Se	Na	Anthracene	B(a)A	B(a)P	Fluoanthene	Pyrene
20-Oct-04	-	-	<0.002	0.07	**0.934**	-	-	**0.000012**	**0.00002**	**0.000024**	**0.000053**	**0.000116**
15-Sep-06	**2,100**	**1,030**	-	-	-	-	-				-	-
28-Nov-08	-	-	-	**1.17**	**0.282**	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
18-Dec-14	**2,600**	**1,200**	**0.0057**	**3**	**0.19**	**0.0066**	**210**	**0.000014**	<0.0000085	<0.0000075	**0.000062**	**0.000088**
13-Jul-15	**3,000**	**1,600**	**0.001**	**1.8**	**0.26**	**0.02**	**230**	<0.000010	<0.0000085	<0.0000075	<0.000010	<0.00002
Guidelines	500	100	0.005	0.3	0.05	0.001	200	0.000012	0.000018	0.00001	0.00004	0.000025

MW16

Date	Pyrene
28-Nov-08	0.00003
Guidelines	0.000025

MW9

Date	TDS	SO_4	Cd	Cu	Fe	Mn	Se	Ag	Na	U	Zn	Pyrene
31-Oct-06	**3,350**	**2,150**	<0.0001	**0.006**	<0.005	0.022	**0.0088**	<0.0001	**298**	**0.0361**	**0.023**	<0.00001
16-Dec-14	**1,700**	**840**	-	-	-	-	-	-	-	-	-	**0.000032**
9-Jul-15	**2,500**	**1,600**	**0.000037**	**0.0027**	**0.43**	**2.2**	0.00042	**0.00027**	130	**0.02**	**0.027**	<0.00002
Guidelines	500	100	0.000017	0.004	0.3	0.05	0.001	0.0001	200	0.01	0.01	0.000025

MW2

Date	TDS	SO4	Cd	Fe	Mn	Se	Na	U	Zn	Pyrene
4-Nov-04	-	-	<0.0001	<0.03	<0.005	**0.021**	-	**0.0243**	<0.005	<0.00001
16-Dec-14	**1,600**	**790**	<0.00002	**1.5**	**0.52**	**0.0007**	180	**0.029**	<0.003	**0.000054**
13-Jul-15	**2,500**	**1,500**	**0.0002**	**33**	**0.64**	**0.0019**	**220**	**0.023**	**0.02**	<0.00002
Guidelines	500	100	0.000017	0.3	0.05	0.001	200	0.01	0.01	0.000025

MW8

Date	TDS	SO_4	Cd	Cu	Fe	Mn	Se	Ag	Na	U	Zn	Pyrene
31-Oct-06	**12,000**	**8,390**	**0.0001**	**0.012**	<0.005	**0.183**	**0.0019**	<0.0001	**1,130**	**0.0474**	**0.023**	<0.000010
16-Dec-14	**9,100**	**6,600**	**0.000027**	0.0013	0.085	**2.4**	0.00086	<0.0001	**760**	**0.047**	0.0063	**0.000041**
9-Jul-15	**11,000**	**8,200**	**0.00022**	**0.0043**	**0.74**	**2.9**	0.00064	**0.00050**	**1,000**	**0.05**	**0.023**	**0.000037**
Guidelines	500	100	0.000017	0.004	0.3	0.05	0.001	0.0001	200	0.01	0.01	0.000025

MW3

Date	TDS	SO_4	Cd	Cu	Fe	Mn	Se	Ag	Na	U	Zn	Fluoranthene	Pyrene
15-Sep-06	**2,430**	**1,510**	<0.001	**0.005**	0.016	**0.671**	**0.0027**	<0.005	148	<0.05	**0.026**	-	-
3-Nov-06	**3,310**	**2,140**	**0.0002**	**0.004**	0.089	**1.46**	**0.0017**	**0.0002**	187	**0.013**	**0.052**	-	-
18-Dec-14	**3,400**	**2,100**	**0.000032**	0.0021	0.1	**0.13**	0.00082	<0.0001	**250**	**0.016**	**0.0052**	**0.000043**	**0.000042**
13-Jul-15	**6,200**	**4,200**	**0.00025**	0.0037	**0.54**	**0.15**	0.00041	<0.0001	**340**	**0.028**	**0.042**	<0.00001	<0.00002
Guidelines	500	100	0.000017	0.004	0.3	0.05	0.001	0.0001	200	0.01	0.01	0.00004	0.000025

MW13

Date	TDS	SO4	Mn	Se	U	Zn
31-Oct-06	**1,300**	**647**	**0.093**	**0.0107**	**0.0179**	**0.015**
Guidelines	500	100	0.05	0.001	0.01	0.01

MW14

Date	TDS	SO_4	Mn	B(a)P	Pyrene
28-Nov-08	**606**	**184**	**0.113**	**0.00002**	**0.00007**
Guidelines	500	100	0.05	0.00001	0.000025

20 0 20
SCALE METRES

LEGEND

- WASTE MIDDENS BOUNDARY (APPROXIMATE)
- FENCELINE
- MONITORING WELL LOCATION
- WATER WELL
- DIRECTION OF SLOPE
- LOCATION WHERE GROUNDWATER SAMPLE EXCEEDS APPLICABLE GUIDELINES FOR AT LEAST ONE OF THE PARAMETERS ANALYZED IN 2015

LIST OF APPLICABLE ABBREVIATIONS

mg/L MILLGRAMS PER LITRE

NOTES

ALL CONCENTRATIONS IN mg/L.
MONITORING WELLS NOT HIGHLIGHTED IN RED WERE NOT SAMPLED IN 2015.

REFERENCE

ORIGINAL DRAWING OBTAINED FROM MERIDIAN ENVIRONMENTAL INC.; JOB No.: 11005; SCALE: 1:1,250 (APPROXIMATE);
DATE: MARCH 3, 2006.

CLIENT
PUBLIC WORKS AND GOVERNMENT SERVICES CANADA
PHASE III ENVIRONMENTAL SITE ASSESSMENT
FORMER WASTE DISPOSAL MIDDENS
BAR U RANCH NATIONAL HISTORIC SITE, ALBERTA

TITLE
GROUNDWATER EXCEEDANCES

Golder Associates

PROJECT		1526784	FILE No. 1526784-2003-HS-0006	
DESIGN	SF	21/01/16	SCALE AS SHOWN	REV. 0
CADD	YW	30/03/16		
CHECK	SF	31/03/16	**FIGURE: 6**	
REVIEW	JM	31/03/16		

\\golder\gal\Edmonton\CAD\publicworkscanada\baruranch_longview_alberta\99_projects\1526784\02_PRODUCTION\2000-2003\DWG\1526784-2003-HS-0006.dwg Mar 31, 2016 - 10:35am

APPENDIX A

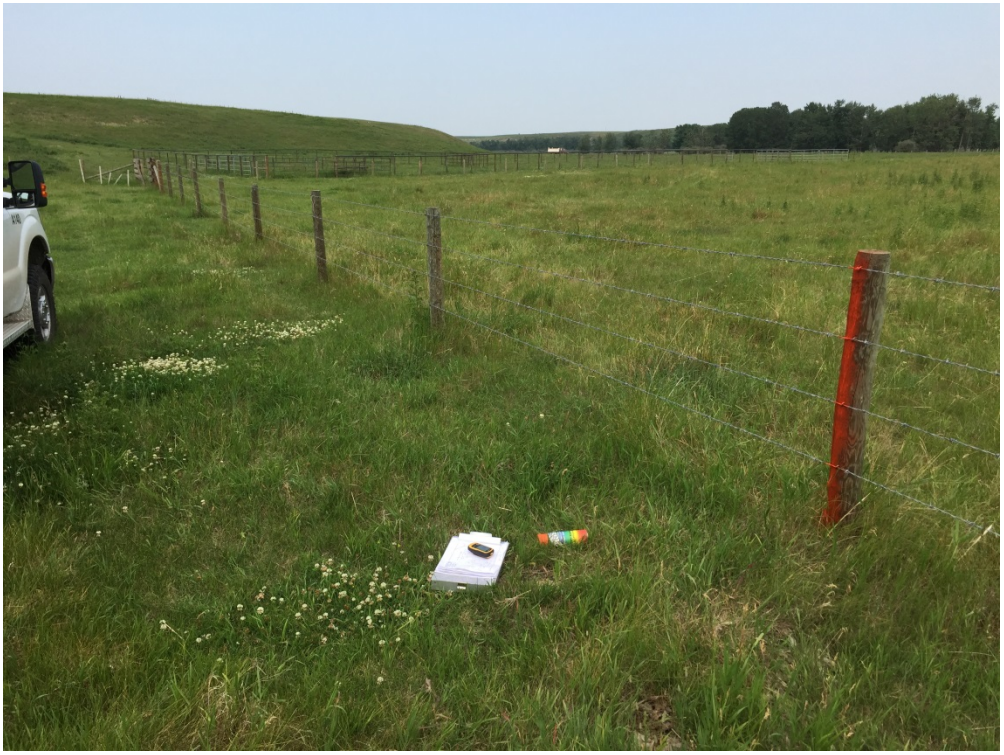
Site Photographs

Photograph 1: Northwest view of capped former waste disposal middens.

Photograph 2: Western view of monitoring well MW7 located near northern edge of waste midden 1.

Photograph 3: Northern view of monitoring well MW2 located near southern edge of waste midden 1.

Photograph 4: Northern view of monitoring well MW5 located near eastern edge of waste midden 2.



Photograph 5: Northeast view of monitoring well MW12 located adjacent to fence post.

Photograph 6: Northern view of Pekisko Creek located to the south east of the former waste disposal middens.

Photograph 7: Southern view of Pekisko Creek located to the south east of the former waste disposal middens.

Photograph 8: Northern view of drill rig crew completing installation of background monitoring well GMW18.

Photograph 9: Northern view of completed background monitoring well GMW18.

APPENDIX B

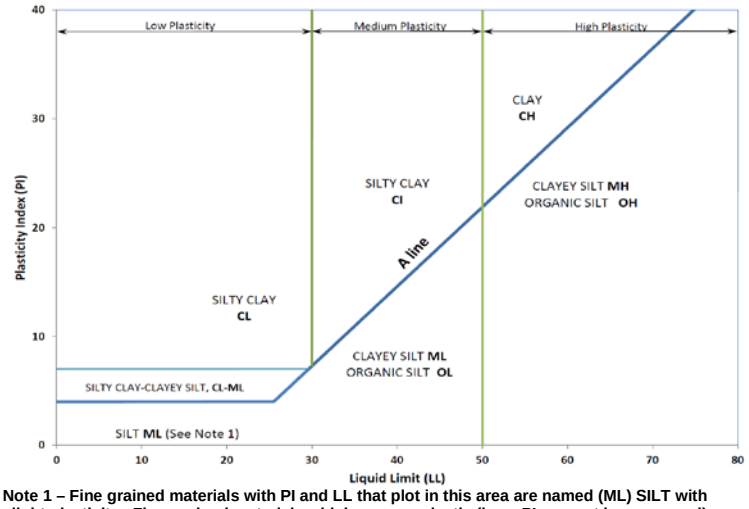
Borehole Log

METHOD OF SOIL CLASSIFICATION

The Golder Associates Ltd. Soil Classification System is based on the Unified Soil Classification System (USCS)

Organic or Inorganic	Soil Group	Type of Soil		Gradation or Plasticity	$Cu = \frac{D_{60}}{D_{10}}$	$Cc = \frac{(D_{30})^2}{D_{10} x D_{60}}$	Organic Content	USCS Group Symbol	Group Name
INORGANIC (Organic Content ≤30% by mass)	COARSE-GRAINED SOILS (>50% by mass is larger than 0.075 mm)	GRAVELS (>50% by mass of coarse fraction is larger than 4.75 mm)	Gravels with ≤12% fines (by mass)	Poorly Graded	<4	≤1 or ≥3	≤30%	GP	GRAVEL
				Well Graded	≥4	1 to 3		GW	GRAVEL
			Gravels with >12% fines (by mass)	Below A Line	n/a			GM	SILTY GRAVEL
				Above A Line	n/a			GC	CLAYEY GRAVEL
		SANDS (≥50% by mass of coarse fraction is smaller than 4.75 mm)	Sands with ≤12% fines (by mass)	Poorly Graded	<6	≤1 or ≥3		SP	SAND
				Well Graded	≥6	1 to 3		SW	SAND
			Sands with >12% fines (by mass)	Below A Line	n/a			SM	SILTY SAND
				Above A Line	n/a			SC	CLAYEY SAND

Organic or Inorganic	Soil Group	Type of Soil		Laboratory Tests	Field Indicators					Organic Content	USCS Group Symbol	Primary Name
					Dilatancy	Dry Strength	Shine Test	Thread Diameter	Toughness (of 3 mm thread)			
INORGANIC (Organic Content ≤30% by mass)	FINE-GRAINED SOILS (≥50% by mass is smaller than 0.075 mm)	SILTS (Non-Plastic or PI and LL plot below A-Line on Plasticity Chart below)		Liquid Limit <50	Rapid	None	None	>6 mm	N/A (can't roll 3 mm thread)	<5%	ML	SILT
					Slow	None to Low	Dull	3mm to 6 mm	None to low	<5%	ML	CLAYEY SILT
					Slow to very slow	Low to medium	Dull to slight	3mm to 6 mm	Low	5% to 30%	OL	ORGANIC SILT
				Liquid Limit ≥50	Slow to very slow	Low to medium	Slight	3mm to 6 mm	Low to medium	<5%	MH	CLAYEY SILT
					None	Medium to high	Dull to slight	1 mm to 3 mm	Medium to high	5% to 30%	OH	ORGANIC SILT
		CLAYS (PI and LL plot above A-Line on Plasticity Chart below)		Liquid Limit <30	None	Low to medium	Slight to shiny	~ 3 mm	Low to medium	0% to 30% **(see Note 2)**	CL	SILTY CLAY
				Liquid Limit 30 to 50	None	Medium to high	Slight to shiny	1 mm to 3 mm	Medium		CI	SILTY CLAY
				Liquid Limit ≥50	None	High	Shiny	<1 mm	High		CH	CLAY
HIGHLY ORGANIC SOILS (Organic Content >30% by mass)		Peat and mineral soil mixtures								30% to 75%	PT	SILTY PEAT, SANDY PEAT
		Predominantly peat, may contain some mineral soil, fibrous or amorphous peat								75% to 100%		PEAT



Note 1 – Fine grained materials with PI and LL that plot in this area are named (ML) SILT with slight plasticity. Fine-grained materials which are non-plastic (i.e. a PL cannot be measured) are named SILT.
Note 2 – For soils with <5% organic content, include the descriptor "trace organics" for soils with between 5% and 30% organic content include the prefix "organic" before the Primary name.

Dual Symbol — A dual symbol is two symbols separated by a hyphen, for example, GP-GM, SW-SC and CL-ML.
For non-cohesive soils, the dual symbols must be used when the soil has between 5% and 12% fines (i.e. to identify transitional material between "clean" and "dirty" sand or gravel.
For cohesive soils, the dual symbol must be used when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart (see Plasticity Chart at left).

Borderline Symbol — A borderline symbol is two symbols separated by a slash, for example, CL/CI, GM/SM, CL/ML.
A borderline symbol should be used to indicate that the soil has been identified as having properties that are on the transition between similar materials. In addition, a borderline symbol may be used to ~~or~~ indicate~~s~~ a range of similar soil types within a stratum.

ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES AND TEST PITS

PARTICLE SIZES OF CONSTITUENTS

Soil Constituent	Particle Size Description	Millimetres	Inches (US Std. Sieve Size)
BOULDERS	Not Applicable	>300	>12
COBBLES	Not Applicable	75 to 300	3 to 12
GRAVEL	Coarse Fine	19 to 75 4.75 to 19	0.75 to 3 (4) to 0.75
SAND	Coarse Medium Fine	2.00 to 4.75 0.425 to 2.00 0.075 to 0.425	(10) to (4) (40) to (10) (200) to (40)
SILT/CLAY	Classified by plasticity	<0.075	< (200)

MODIFIERS FOR SECONDARY AND MINOR CONSTITUENTS

Percentage by Mass	Modifier
>35	Use 'and' to combine major constituents (*i.e.,* SAND and GRAVEL, SAND and CLAY)
> 12 to 35	Primary soil name prefixed with "gravelly, sandy, SILTY, CLAYEY" as applicable
> 5 to 12	some
≤ 5	trace

PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) split-spoon sampler for a distance of 300 mm (12 in.).

Cone Penetration Test (CPT)

An electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm^2 pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (q_t), porewater pressure (u) and sleeve frictions are recorded electronically at 25 mm penetration intervals.

Dynamic Cone Penetration Resistance (DCPT); N_d:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in.).

PH: Sampler advanced by hydraulic pressure
PM: Sampler advanced by manual pressure
WH: Sampler advanced by static weight of hammer
WR: Sampler advanced by weight of sampler and rod

SAMPLES

AS	Auger sample
BS	Block sample
CS	Chunk sample
DO or DP	Seamless open ended, driven or pushed tube sampler – note size
DS	Denison type sample
FS	Foil sample
RC	Rock core
SC	Soil core
SS	Split spoon sampler – note size
ST	Slotted tube
TO	Thin-walled, open – note size
TP	Thin-walled, piston – note size
WS	Wash sample

SOIL TESTS

w	water content
PL , w_p	plastic limit
LL , w_L	liquid limit
C	consolidation (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test[1]
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement[1]
D_R	relative density (specific gravity, Gs)
DS	direct shear test
GS	specific gravity
M	sieve analysis for particle size
MH	combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	organic content test
SO_4	concentration of water-soluble sulphates
UC	unconfined compression test
UU	unconsolidated undrained triaxial test
V (FV)	field vane (LV-laboratory vane test)
γ	unit weight

1. Tests which are anisotropically consolidated prior to shear are shown as CAD, CAU.

NON-COHESIVE (COHESIONLESS) SOILS

Compactness[2]

Term	SPT 'N' (blows/0.3m)[1]
Very Loose	0 - 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	>50

1. SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects.
2. Definition of compactness descriptions based on SPT 'N' ranges from Terzaghi and Peck (1967) and correspond to typical average N_{60} values.

Field Moisture Condition

Term	Description
Dry	Soil flows freely through fingers.
Moist	Soils are darker than in the dry condition and may feel cool.
Wet	As moist, but with free water forming on hands when handled.

COHESIVE SOILS

Consistency

Term	Undrained Shear Strength (kPa)	SPT 'N'[1] (blows/0.3m)
Very Soft	<12	0 to 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	>200	>30

1. SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects; approximate only.

Water Content

Term	Description
w < PL	Material is estimated to be drier than the Plastic Limit.
w ~ PL	Material is estimated to be close to the Plastic Limit.
w > PL	Material is estimated to be wetter than the Plastic Limit.

Golder Associates

LIST OF SYMBOLS

Unless otherwise stated, the symbols employed in the report are as follows:

I. GENERAL

π	3.1416
ln x	natural logarithm of x
$\log_{10}$	x or log x, logarithm of x to base 10
g	acceleration due to gravity
t	time

II. STRESS AND STRAIN

γ	shear strain
Δ	change in, e.g. in stress: $\Delta\sigma$
ε	linear strain
ε_v	volumetric strain
η	coefficient of viscosity
υ	Poisson's ratio
σ	total stress
σ'	effective stress ($\sigma' = \sigma - u$)
σ'_{vo}	initial effective overburden stress
σ_1, σ_2, σ_3	principal stress (major, intermediate, minor)
σ_{oct}	mean stress or octahedral stress $= (\sigma_1 + \sigma_2 + \sigma_3)/3$
τ	shear stress
u	porewater pressure
E	modulus of deformation
G	shear modulus of deformation
K	bulk modulus of compressibility

III. SOIL PROPERTIES

(a) Index Properties

$\rho(\gamma)$	bulk density (bulk unit weight)*
$\rho_d(\gamma_d)$	dry density (dry unit weight)
$\rho_w(\gamma_w)$	density (unit weight) of water
$\rho_s(\gamma_s)$	density (unit weight) of solid particles
γ'	unit weight of submerged soil ($\gamma' = \gamma - \gamma_w$)
D_R	relative density (specific gravity) of solid particles ($D_R = \rho_s / \rho_w$) (formerly G_s)
e	void ratio
n	porosity
S	degree of saturation

* Density symbol is ρ. Unit weight symbol is γ where $\gamma = \rho g$ (i.e. mass density multiplied by acceleration due to gravity)

(a) Index Properties (continued)

w	water content
w_l or LL	liquid limit
w_p or PL	plastic limit
I_p or PI	plasticity index = $(w_l - w_p)$
w_s	shrinkage limit
I_L	liquidity index = $(w - w_p) / I_p$
I_C	consistency index = $(w_l - w) / I_p$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
I_D	density index = $(e_{max} - e) / (e_{max} - e_{min})$ (formerly relative density)

(b) Hydraulic Properties

h	hydraulic head or potential
q	rate of flow
v	velocity of flow
i	hydraulic gradient
k	hydraulic conductivity (coefficient of permeability)
j	seepage force per unit volume

(c) Consolidation (one-dimensional)

C_c	compression index (normally consolidated range)
C_r	recompression index (over-consolidated range)
C_s	swelling index
C_α	secondary compression index
m_v	coefficient of volume change
c_v	coefficient of consolidation (vertical direction)
c_h	coefficient of consolidation (horizontal direction)
T_v	time factor (vertical direction)
U	degree of consolidation
σ'_p	pre-consolidation stress
OCR	over-consolidation ratio = σ'_p / σ'_{vo}

(d) Shear Strength

τ_p, τ_r	peak and residual shear strength
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction = tan δ
c′	effective cohesion
c_u, s_u	undrained shear strength ($\phi = 0$ analysis)
p	mean total stress $(\sigma_1 + \sigma_3)/2$
p′	mean effective stress $(\sigma'_1 + \sigma'_3)/2$
q	$(\sigma_1 - \sigma_3)/2$ or $(\sigma'_1 - \sigma'_3)/2$
q_u	compressive strength $(\sigma_1 - \sigma_3)$
S_t	sensitivity

Notes: 1 $\tau = c' + \sigma' \tan \phi'$

2 shear strength = (compressive strength)/2

LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY

WEATHERINGS STATE

Fresh: no visible sign of weathering

Faintly weathered: weathering limited to the surface of major discontinuities.

Slightly weathered: penetrative weathering developed on open discontinuity surfaces but only slight weathering of rock material.

Moderately weathered: weathering extends throughout the rock mass but the rock material is not friable.

Highly weathered: weathering extends throughout rock mass and the rock material is partly friable.

Completely weathered: rock is wholly decomposed and in a friable condition but the rock and structure are preserved.

BEDDING THICKNESS

Description	Bedding Plane Spacing
Very thickly bedded	Greater than 2 m
Thickly bedded	0.6 m to 2 m
Medium bedded	0.2 m to 0.6 m
Thinly bedded	60 mm to 0.2 m
Very thinly bedded	20 mm to 60 mm
Laminated	6 mm to 20 mm
Thinly laminated	Less than 6 mm

JOINT OR FOLIATION SPACING

Description	Spacing
Very wide	Greater than 3 m
Wide	1 m to 3 m
Moderately close	0.3 m to 1 m
Close	50 mm to 300 mm
Very close	Less than 50 mm

GRAIN SIZE

Term	Size*
Very Coarse Grained	Greater than 60 mm
Coarse Grained	2 mm to 60 mm
Medium Grained	60 microns to 2 mm
Fine Grained	2 microns to 60 microns
Very Fine Grained	Less than 2 microns

Note: * Grains greater than 60 microns diameter are visible to the naked eye.

CORE CONDITION

Total Core Recovery (TCR)
The percentage of solid drill core recovered regardless of quality or length, measured relative to the length of the total core run.

Solid Core Recovery (SCR)
The percentage of solid drill core, regardless of length, recovered at full diameter, measured relative to the length of the total core run.

Rock Quality Designation (RQD)
The percentage of solid drill core, greater than 100 mm length, recovered at full diameter, measured relative to the length of the total core run. RQD varied from 0% for completely broken core to 100% for core in solid sticks.

DISCONTINUITY DATA

Fracture Index
A count of the number of discontinuities (physical separations) in the rock core, including both naturally occurring fractures and mechanically induced breaks caused by drilling.

Dip with Respect to Core Axis
The angle of the discontinuity relative to the axis (length) of the core. In a vertical borehole a discontinuity with a 90^{o} angle is horizontal.

Description and Notes
An abbreviation description of the discontinuities, whether naturally occurring separations such as fractures, bedding planes and foliation planes or mechanically induced features caused by drilling such as ground or shattered core and mechanically separated bedding or foliation surfaces. Additional information concerning the nature of fracture surfaces and infillings are also noted.

Abbreviations

JN	Joint	PL	Planar
FLT	Fault	CU	Curved
SH	Shear	UN	Undulating
VN	Vein	IR	Irregular
FR	Fracture	K	Slickensided
SY	Stylolite	PO	Polished
BD	Bedding	SM	Smooth
FO	Foliation	SR	Slightly Rough
CO	Contact	RO	Rough
AXJ	Axial Joint	VR	Very Rough
KV	Karstic Void		
MB	Mechanical Break		

DATA ENTRY: DP

PROJECT No.: 1526784

RECORD OF MONITORING WELL: GMW18

SHEET 1 OF 1

LOCATION: See Location Plan

BORING DATE: 20 November 2015

DATUM: UTM Zone 11 (Nad 83)

N: 5589584 E: 695157

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	Soil Vapour Concentration ppm (⊕ 50 100 150 200; □ ppm 100 200 300 400)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp — W — Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	M4 Track - Unit 104 Mobile Augers & Research Ltd	Ground Surface									
		(CL) SILTY CLAY; mixed light and dark brown, some rootlets, homogeneous, no staining or odour; w<PL, firm		0.00	1	AS		⊕			Cemented in Flush Mount Protective Casing
1		--- No rootlets at 1.2 m			2	AS		⊕			
		(CL) SILTY CLAY; medium brown, homogeneous, no staining or odour; w~PL, soft		1.70	3	AS		⊕			
2					4	AS		⊕			Hydrated Bentonite Chips
3		(CL) SILTY CLAY, some fine and medium subrounded gravel; medium brown, trace coal clasts, no staining or odour; w<PL, soft		3.00	5	AS		⊕			
4					6	AS		⊕			10/20 Silica Sand
					7	AS		⊕			
5											Slotted Section
6					8	AS		⊕			
		End of MONITORING WELL. Note: Standpipe installed to 6.1 m.		6.10							
7											
8											
9											
10											

BOREHOLE - EXPANDED ADD. LAB TESTING 1526784-2000-2003-GMW18.GPJ CALGARY.GDT 31/3/16

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: JF

CHECKED: SF

APPENDIX C

Laboratory Certificates of Analysis

Success Through Science®

Your Project #: 1526784
Site Location: BAR U GROUNDWATER
Your C.O.C. #: A204394

Attention:Steven Fiddler

GOLDER ASSOCIATES LTD
16820-107 AVE
EDMONTON, AB
CANADA T5P 4C3

Report Date: 2015/11/30
Report #: R2086729
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5A3973
Received: 2015/11/20, 16:16

Sample Matrix: Soil
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Carbonate and Bicarbonate @25C (Soluble)	1	2015/11/26	2015/11/26	AB SOP-00033 / AB SOP-00005	SM 22 2320 B m
Boron (Hot Water Soluble)	1	2015/11/24	2015/11/24	AB SOP-00034 / AB SOP-00042	EPA 200.7 CFR 2012 m
BTEX in Leachates by HS GC/MS/FID (1)	1	2015/11/26	2015/11/27	AB SOP-00039	EPA 8260C m
Cation/EC Ratio	1	N/A	2015/11/27	AB WI-00065	Auto Calc
Chloride (Soluble)	1	2015/11/26	2015/11/26	AB SOP-00033 / AB SOP-00020	SM 22-4500-Cl G m
Hexavalent Chromium	1	2015/11/27	2015/11/27	AB SOP-00063	SM 22 3500-Cr B m
Conductivity @25C (Soluble)	1	2015/11/26	2015/11/26	AB SOP-00033 / AB SOP-00004	SM 22 2510 B m
Flash Point	1	N/A	2015/11/25	AB SOP-00062	ASTM D3828-12A/A m
ICPMS Metals on TCLP Leachate (1)	1	2015/11/24	2015/11/24	AB SOP-00015 / AB SOP-00043	EPA 200.8 R5.4 m
Elements by ICPMS - Soils	1	2015/11/24	2015/11/25	AB SOP-00001 / AB SOP-00043	EPA 200.8 R5.4 m
Ion Balance	1	N/A	2015/11/22	AB WI-00065	Auto Calc
Sum of Cations, Anions	1	N/A	2015/11/27	AB WI-00065	Auto Calc
Moisture	1	N/A	2015/11/22	AB SOP-00002	CCME PHC-CWS
Nitrite-N and Nitrate-N (soluble)	1	2015/11/26	2015/11/26	AB SOP-00033 / AB SOP-00023	SM 22 4110 B m
Benzo[a]pyrene Equivalency	1	N/A	2015/11/24	AB SOP-00003	Auto Calc
PAH in Soil by GC/MS	1	2015/11/21	2015/11/24	AB SOP-00036 / AB SOP-00003	EPA 8270D m
Free Liquid (Paint filter)	1	N/A	2015/11/25	AB SOP-00047	EPA 9095B m
pH @25C (1:2 Calcium Chloride Extract)	1	2015/11/26	2015/11/27	AB SOP-00033 / AB SOP-00006	SM 22 4500 H+B m
TCLP pH Measurements	1	2015/11/23	2015/11/24	AB SOP-00015 / AB SOP-00006	SM 22 4500 H+B m
pH @25C (1:1 extract, solid waste)	1	2015/11/25	2015/11/25	AB SOP-00033 / AB SOP-00006	SM 22 4500 H+B m
Particle Size by Sieve (75 micron)	1	N/A	2015/11/26	AB SOP-00022	ASTM D422-63 2007 m

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Your Project #: 1526784
Site Location: BAR U GROUNDWATER
Your C.O.C. #: A204394

Attention:Steven Fiddler

GOLDER ASSOCIATES LTD
16820-107 AVE
EDMONTON, AB
CANADA T5P 4C3

Report Date: 2015/11/30
Report #: R2086729
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5A3973
Received: 2015/11/20, 16:16

Sample Matrix: Soil
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Sodium Adsorption Ratio	1	N/A	2015/11/27	AB WI-00065	Auto Calc
Ca,Mg,Na,K,SO4 (Soluble)	1	2015/11/26	2015/11/26	AB SOP-00033 / AB SOP-00042	EPA 200.7 CFR 2012 m
Soluble Paste	1	2015/11/26	2015/11/26	AB SOP-00033	Carter 2nd ed 15.2 m
Soluble Ions Calculation	1	N/A	2015/11/22	AB WI-00065	Auto Calc
Theoretical Gypsum Requirement (2)	1	N/A	2015/11/27	AB WI-00065	Auto Calc

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Samples were extracted as per EPA 1311 unless otherwise noted in the report.
(2) Units for TGR have changed from tons/acre to tonnes/ha

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Wendy Sears, Project manager
Email: WSears@maxxam.ca
Phone# (403)735-2277

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B5A3973
Report Date: 2015/11/30

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U GROUNDWATER
Sampler Initials: JF

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		NR5277		
Sampling Date		2015/11/20		
COC Number		A204394		
	UNITS	GMW18-7 @ 4.5-5.25	RDL	QC Batch
Calculated Parameters				
Anion Sum	meq/L	73	N/A	8120630
Cation Sum	meq/L	73	N/A	8120630
Cation/EC Ratio	N/A	14	0.10	8120627
Ion Balance	N/A	1.0	0.010	8120629
Calculated Calcium (Ca)	mg/kg	170	0.74	8120633
Calculated Magnesium (Mg)	mg/kg	240	0.50	8120633
Calculated Sodium (Na)	mg/kg	190	1.2	8120633
Calculated Potassium (K)	mg/kg	10	0.64	8120633
Calculated Chloride (Cl)	mg/kg	3.5	2.5	8120633
Calculated Sulphate (SO4)	mg/kg	1700	2.5	8120633
Calculated Nitrate (N)	mg/kg	0.12	0.099	8120633
Calculated Bicarbonate (HCO3)	mg/kg	23	5.0	8120633
Calculated Carbonate (CO3)	mg/kg	<5.0	5.0	8120633
Calculated Hydroxide (OH)	mg/kg	<5.0	5.0	8120633
Elements				
Soluble (Hot water) Boron (B)	mg/kg	0.29	0.10	8122878
Hex. Chromium (Cr 6+)	mg/kg	<0.080	0.080	8127817
Misc. Inorganics				
Leachable Initial pH of Sample	pH	8.79	N/A	8122544
Leachable pH after HCl	pH	4.90	N/A	8122544
Leachable Final pH of Leachate	pH	6.01	N/A	8122544
Soluble Parameters				
Soluble Bicarbonate (HCO3)	mg/L	45	10	8126354
Soluble Carbonate (CO3)	mg/L	<10	10	8126354
Soluble Chloride (Cl)	mg/L	7.2	5.0	8126542
Soluble Conductivity	dS/m	5.2	0.020	8126408
Soluble Hydroxide (OH)	mg/L	<10	10	8126354
Soluble (1:1) pH	pH	7.90	N/A	8124419
Soluble (CaCl2) pH	pH	7.74	N/A	8125706
Sodium Adsorption Ratio	N/A	3.2	0.10	8120632
Soluble Calcium (Ca)	mg/L	340	1.5	8126380
Soluble Magnesium (Mg)	mg/L	480	1.0	8126380
Soluble Nitrate (N)	mg/L	0.24	0.20	8126397

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A3973
Report Date: 2015/11/30

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U GROUNDWATER
Sampler Initials: JF

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		NR5277		
Sampling Date		2015/11/20		
COC Number		A204394		
	UNITS	**GMW18-7 @ 4.5-5.25**	**RDL**	**QC Batch**
Soluble Sodium (Na)	mg/L	380	2.5	8126380
Soluble Potassium (K)	mg/L	21	1.3	8126380
Saturation %	%	50	N/A	8123030
Soluble Sulphate (SO4)	mg/L	3500	5.0	8126380
Theoretical Gypsum Requirement	tonnes/ha	<0.20	0.20	8120634
Physical Properties				
Closed Cup Flash point	deg. C	>61	N/A	8124185
Free Liquid	N/A	PASS	N/A	8124201
Moisture	%	14	0.30	8121001
Sieve - Pan	%	81	0.20	8125793
Sieve - #200 (>0.075mm)	%	19	0.20	8125793
Grain Size	%	FINE	0.20	8125793

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A3973
Report Date: 2015/11/30

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U GROUNDWATER
Sampler Initials: JF

SEMIVOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		NR5277		
Sampling Date		2015/11/20		
COC Number		A204394		
	UNITS	**GMW18-7 @ 4.5-5.25**	**RDL**	**QC Batch**
Polycyclic Aromatics				
Acenaphthene	mg/kg	<0.0050	0.0050	8120776
Benzo[a]pyrene equivalency	mg/kg	<0.10	0.10	8120640
Acenaphthylene	mg/kg	<0.0050	0.0050	8120776
Acridine	mg/kg	<0.010	0.010	8120776
Anthracene	mg/kg	<0.0040	0.0040	8120776
Benzo(a)anthracene	mg/kg	<0.0050	0.0050	8120776
Benzo(b&j)fluoranthene	mg/kg	0.013	0.0050	8120776
Benzo(k)fluoranthene	mg/kg	<0.0050	0.0050	8120776
Benzo(g,h,i)perylene	mg/kg	0.0068	0.0050	8120776
Benzo(c)phenanthrene	mg/kg	<0.0050	0.0050	8120776
Benzo(a)pyrene	mg/kg	<0.0050	0.0050	8120776
Benzo[e]pyrene	mg/kg	0.0081	0.0050	8120776
Chrysene	mg/kg	<0.0050	0.0050	8120776
Dibenz(a,h)anthracene	mg/kg	<0.0050	0.0050	8120776
Fluoranthene	mg/kg	<0.0050	0.0050	8120776
Fluorene	mg/kg	<0.0050	0.0050	8120776
Indeno(1,2,3-cd)pyrene	mg/kg	0.0055	0.0050	8120776
2-Methylnaphthalene	mg/kg	<0.0050	0.0050	8120776
Naphthalene	mg/kg	<0.0050	0.0050	8120776
Phenanthrene	mg/kg	<0.0050	0.0050	8120776
Perylene	mg/kg	0.0056	0.0050	8120776
Pyrene	mg/kg	<0.0050	0.0050	8120776
Quinoline	mg/kg	<0.010	0.010	8120776
Surrogate Recovery (%)				
D10-ANTHRACENE (sur.)	%	94	N/A	8120776
D12-BENZO(A)PYRENE (sur.)	%	108	N/A	8120776
D8-ACENAPHTHYLENE (sur.)	%	90	N/A	8120776
TERPHENYL-D14 (sur.)	%	116	N/A	8120776

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A3973
Report Date: 2015/11/30

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U GROUNDWATER
Sampler Initials: JF

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		NR5277		
Sampling Date		2015/11/20		
COC Number		A204394		
	UNITS	GMW18-7 @ 4.5-5.25	RDL	QC Batch
Elements				
Leachable Antimony (Sb)	mg/L	<1.0	1.0	8123669
Leachable Arsenic (As)	mg/L	<0.50	0.50	8123669
Leachable Barium (Ba)	mg/L	<1.0	1.0	8123669
Leachable Beryllium (Be)	mg/L	<0.50	0.50	8123669
Leachable Boron (B)	mg/L	<1.0 (1)	1.0	8123669
Leachable Cadmium (Cd)	mg/L	<0.10	0.10	8123669
Leachable Chromium (Cr)	mg/L	<0.50	0.50	8123669
Leachable Cobalt (Co)	mg/L	<1.0	1.0	8123669
Leachable Copper (Cu)	mg/L	<1.0	1.0	8123669
Leachable Iron (Fe)	mg/L	1.7	1.0	8123669
Leachable Lead (Pb)	mg/L	<0.50	0.50	8123669
Leachable Mercury (Hg)	mg/L	<0.020	0.020	8123669
Leachable Nickel (Ni)	mg/L	<0.50	0.50	8123669
Leachable Selenium (Se)	mg/L	<0.10	0.10	8123669
Leachable Silver (Ag)	mg/L	<0.50	0.50	8123669
Leachable Thallium (Tl)	mg/L	<0.50	0.50	8123669
Leachable Uranium (U)	mg/L	<0.20 (1)	0.20	8123669
Leachable Vanadium (V)	mg/L	<1.0	1.0	8123669
Leachable Zinc (Zn)	mg/L	<1.0	1.0	8123669
Leachable Zirconium (Zr)	mg/L	<1.0	1.0	8123669
Total Antimony (Sb)	mg/kg	<0.50	0.50	8123301
Total Arsenic (As)	mg/kg	5.9	1.0	8123301
Total Barium (Ba)	mg/kg	190	1.0	8123301
Total Beryllium (Be)	mg/kg	0.51	0.40	8123301
Total Cadmium (Cd)	mg/kg	0.60	0.050	8123301
Total Chromium (Cr)	mg/kg	18	1.0	8123301
Total Cobalt (Co)	mg/kg	6.6	0.50	8123301
Total Copper (Cu)	mg/kg	17	1.0	8123301
Total Lead (Pb)	mg/kg	9.9	0.50	8123301
Total Mercury (Hg)	mg/kg	0.13	0.050	8123301
Total Molybdenum (Mo)	mg/kg	0.92	0.40	8123301
Total Nickel (Ni)	mg/kg	23	1.0	8123301
Total Selenium (Se)	mg/kg	0.51	0.50	8123301

RDL = Reportable Detection Limit

(1) Matrix Spike exceeds acceptance limits due to matrix interference. Reanalysis yields similar results.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A3973
Report Date: 2015/11/30

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U GROUNDWATER
Sampler Initials: JF

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		NR5277		
Sampling Date		2015/11/20		
COC Number		A204394		
	UNITS	**GMW18-7 @ 4.5-5.25**	**RDL**	**QC Batch**
Total Silver (Ag)	mg/kg	<0.20	0.20	8123301
Total Thallium (Tl)	mg/kg	0.19	0.10	8123301
Total Tin (Sn)	mg/kg	<1.0	1.0	8123301
Total Uranium (U)	mg/kg	0.88 (1)	0.20	8123301
Total Vanadium (V)	mg/kg	21	1.0	8123301
Total Zinc (Zn)	mg/kg	60	10	8123301

RDL = Reportable Detection Limit

(1) Matrix Spike exceeds acceptance limits due to matrix interference. Reanalysis yields similar results.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A3973
Report Date: 2015/11/30

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U GROUNDWATER
Sampler Initials: JF

BTEX BY GC-MS (SOIL)

Maxxam ID		NR5277		
Sampling Date		2015/11/20		
COC Number		A204394		
	UNITS	GMW18-7 @ 4.5-5.25	RDL	QC Batch
Volatiles				
Leachable (ZH) Benzene	ug/L	<10	10	8126541
Leachable (ZH) Toluene	ug/L	<10	10	8126541
Leachable (ZH) Ethylbenzene	ug/L	<10	10	8126541
Leachable (ZH) o-Xylene	ug/L	<10	10	8126541
Leachable (ZH) m & p-Xylene	ug/L	<20	20	8126541
Leachable (ZH) Xylenes (Total)	ug/L	<20	20	8126541
Surrogate Recovery (%)				
Leachable (ZH) 1,4-Difluorobenzene (sur.)	%	129	N/A	8126541
Leachable (ZH) 4-BROMOFLUOROBENZENE (sur.)	%	99	N/A	8126541
Leachable (ZH) D4-1,2-DICHLOROETHANE (sur.)	%	104	N/A	8126541

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A3973
Report Date: 2015/11/30

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U GROUNDWATER
Sampler Initials: JF

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A3973
Report Date: 2015/11/30

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U GROUNDWATER
Sampler Initials: JF

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8120776	LZ3	Matrix Spike	D10-ANTHRACENE (sur.)	2015/11/24		130	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2015/11/24		90	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2015/11/24		90	%	50 - 130
			TERPHENYL-D14 (sur.)	2015/11/24		130	%	50 - 130
			Acenaphthene	2015/11/24		NC	%	50 - 130
			Acenaphthylene	2015/11/24		NC	%	50 - 130
			Acridine	2015/11/24		NC	%	50 - 130
			Anthracene	2015/11/24		NC	%	50 - 130
			Benzo(a)anthracene	2015/11/24		NC	%	50 - 130
			Benzo(b&j)fluoranthene	2015/11/24		NC	%	50 - 130
			Benzo(k)fluoranthene	2015/11/24		NC	%	50 - 130
			Benzo(g,h,i)perylene	2015/11/24		NC	%	50 - 130
			Benzo(c)phenanthrene	2015/11/24		NC	%	50 - 130
			Benzo(a)pyrene	2015/11/24		NC	%	50 - 130
			Benzo[e]pyrene	2015/11/24		NC	%	50 - 130
			Chrysene	2015/11/24		NC	%	50 - 130
			Dibenz(a,h)anthracene	2015/11/24		NC	%	50 - 130
			Fluoranthene	2015/11/24		NC	%	50 - 130
			Fluorene	2015/11/24		NC	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2015/11/24		NC	%	50 - 130
			2-Methylnaphthalene	2015/11/24		NC	%	50 - 130
			Naphthalene	2015/11/24		NC	%	50 - 130
			Phenanthrene	2015/11/24		NC	%	50 - 130
			Perylene	2015/11/24		NC	%	50 - 130
			Pyrene	2015/11/24		NC	%	50 - 130
			Quinoline	2015/11/24		NC	%	50 - 130
8120776	LZ3	Spiked Blank	D10-ANTHRACENE (sur.)	2015/11/24		98	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2015/11/24		112	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2015/11/24		94	%	50 - 130
			TERPHENYL-D14 (sur.)	2015/11/24		120	%	50 - 130
			Acenaphthene	2015/11/24		97	%	50 - 130
			Acenaphthylene	2015/11/24		104	%	50 - 130
			Acridine	2015/11/24		74	%	50 - 130
			Anthracene	2015/11/24		95	%	50 - 130
			Benzo(a)anthracene	2015/11/24		105	%	50 - 130
			Benzo(b&j)fluoranthene	2015/11/24		99	%	50 - 130
			Benzo(k)fluoranthene	2015/11/24		102	%	50 - 130
			Benzo(g,h,i)perylene	2015/11/24		106	%	50 - 130
			Benzo(c)phenanthrene	2015/11/24		102	%	50 - 130
			Benzo(a)pyrene	2015/11/24		103	%	50 - 130
			Benzo[e]pyrene	2015/11/24		108	%	50 - 130
			Chrysene	2015/11/24		101	%	50 - 130
			Dibenz(a,h)anthracene	2015/11/24		115	%	50 - 130
			Fluoranthene	2015/11/24		100	%	50 - 130
			Fluorene	2015/11/24		97	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2015/11/24		120	%	50 - 130
			2-Methylnaphthalene	2015/11/24		90	%	50 - 130
			Naphthalene	2015/11/24		94	%	50 - 130
			Phenanthrene	2015/11/24		92	%	50 - 130
			Perylene	2015/11/24		107	%	50 - 130
			Pyrene	2015/11/24		100	%	50 - 130
			Quinoline	2015/11/24		108	%	50 - 130

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A3973
Report Date: 2015/11/30

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U GROUNDWATER
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8120776	LZ3	Method Blank	D10-ANTHRACENE (sur.)	2015/11/24		99	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2015/11/24		116	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2015/11/24		106	%	50 - 130
			TERPHENYL-D14 (sur.)	2015/11/24		121	%	50 - 130
			Acenaphthene	2015/11/24	<0.0050		mg/kg	
			Acenaphthylene	2015/11/24	<0.0050		mg/kg	
			Acridine	2015/11/24	<0.010		mg/kg	
			Anthracene	2015/11/24	<0.0040		mg/kg	
			Benzo(a)anthracene	2015/11/24	<0.0050		mg/kg	
			Benzo(b&j)fluoranthene	2015/11/24	<0.0050		mg/kg	
			Benzo(k)fluoranthene	2015/11/24	<0.0050		mg/kg	
			Benzo(g,h,i)perylene	2015/11/24	<0.0050		mg/kg	
			Benzo(c)phenanthrene	2015/11/24	<0.0050		mg/kg	
			Benzo(a)pyrene	2015/11/24	<0.0050		mg/kg	
			Benzo[e]pyrene	2015/11/24	<0.0050		mg/kg	
			Chrysene	2015/11/24	<0.0050		mg/kg	
			Dibenz(a,h)anthracene	2015/11/24	<0.0050		mg/kg	
			Fluoranthene	2015/11/24	<0.0050		mg/kg	
			Fluorene	2015/11/24	<0.0050		mg/kg	
			Indeno(1,2,3-cd)pyrene	2015/11/24	<0.0050		mg/kg	
			2-Methylnaphthalene	2015/11/24	<0.0050		mg/kg	
			Naphthalene	2015/11/24	<0.0050		mg/kg	
			Phenanthrene	2015/11/24	<0.0050		mg/kg	
			Perylene	2015/11/24	<0.0050		mg/kg	
			Pyrene	2015/11/24	<0.0050		mg/kg	
			Quinoline	2015/11/24	<0.010		mg/kg	
8120776	LZ3	RPD	Acenaphthene	2015/11/24	NC		%	50
			Acenaphthylene	2015/11/24	NC		%	50
			Acridine	2015/11/24	NC		%	50
			Anthracene	2015/11/24	NC		%	50
			Benzo(a)anthracene	2015/11/24	NC		%	50
			Benzo(b&j)fluoranthene	2015/11/24	4.8		%	50
			Benzo(k)fluoranthene	2015/11/24	NC		%	50
			Benzo(g,h,i)perylene	2015/11/24	2.7		%	50
			Benzo(c)phenanthrene	2015/11/24	NC		%	50
			Benzo(a)pyrene	2015/11/24	7.2		%	50
			Benzo[e]pyrene	2015/11/24	5.7		%	50
			Chrysene	2015/11/24	1.8		%	50
			Dibenz(a,h)anthracene	2015/11/24	NC		%	50
			Fluoranthene	2015/11/24	NC		%	50
			Fluorene	2015/11/24	NC		%	50
			Indeno(1,2,3-cd)pyrene	2015/11/24	23		%	50
			2-Methylnaphthalene	2015/11/24	NC		%	50
			Naphthalene	2015/11/24	5.1		%	50
			Phenanthrene	2015/11/24	NC		%	50
			Perylene	2015/11/24	4.5		%	50
			Pyrene	2015/11/24	1.8		%	50
			Quinoline	2015/11/24	NC		%	50
8121001	JA7	Method Blank	Moisture	2015/11/22	<0.30		%	
8121001	JA7	RPD	Moisture	2015/11/22	0.54		%	20
8122544	BL7	Spiked Blank	Leachable Initial pH of Sample	2015/11/24		99	%	97 - 103
			Leachable pH after HCl	2015/11/24		99	%	97 - 103

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A3973
Report Date: 2015/11/30

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U GROUNDWATER
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Leachable Final pH of Leachate	2015/11/24		99	%	97 - 103
8122544	BL7	RPD [NR5277-01]	Leachable Initial pH of Sample	2015/11/24	2.6		%	N/A
			Leachable pH after HCl	2015/11/24	15		%	N/A
			Leachable Final pH of Leachate	2015/11/24	1.8		%	N/A
8122878	SRT	Matrix Spike	Soluble (Hot water) Boron (B)	2015/11/24		96	%	75 - 125
8122878	SRT	Spiked Blank	Soluble (Hot water) Boron (B)	2015/11/24		95	%	75 - 125
8122878	SRT	Method Blank	Soluble (Hot water) Boron (B)	2015/11/24	<0.10		mg/kg	
8122878	SRT	RPD	Soluble (Hot water) Boron (B)	2015/11/24	NC		%	35
8123030	RSZ	QC Standard	Saturation %	2015/11/26		99	%	75 - 125
8123030	RSZ	RPD [NR5277-01]	Saturation %	2015/11/26	0.66		%	12
8123301	ST4	Matrix Spike [NR5277-01]	Total Antimony (Sb)	2015/11/25		78	%	75 - 125
			Total Arsenic (As)	2015/11/25		83	%	75 - 125
			Total Barium (Ba)	2015/11/25		NC	%	75 - 125
			Total Beryllium (Be)	2015/11/25		77	%	75 - 125
			Total Cadmium (Cd)	2015/11/25		87	%	75 - 125
			Total Chromium (Cr)	2015/11/25		86	%	75 - 125
			Total Cobalt (Co)	2015/11/25		83	%	75 - 125
			Total Copper (Cu)	2015/11/25		78	%	75 - 125
			Total Lead (Pb)	2015/11/25		84	%	75 - 125
			Total Mercury (Hg)	2015/11/25		79	%	75 - 125
			Total Molybdenum (Mo)	2015/11/25		90	%	75 - 125
			Total Nickel (Ni)	2015/11/25		80	%	75 - 125
			Total Selenium (Se)	2015/11/25		83	%	75 - 125
			Total Silver (Ag)	2015/11/25		86	%	75 - 125
			Total Thallium (Tl)	2015/11/25		84	%	75 - 125
			Total Tin (Sn)	2015/11/25		92	%	75 - 125
			Total Uranium (U)	2015/11/25		72 (1)	%	75 - 125
			Total Vanadium (V)	2015/11/25		94	%	75 - 125
			Total Zinc (Zn)	2015/11/25		NC	%	75 - 125
8123301	ST4	QC Standard	Total Arsenic (As)	2015/11/25		96	%	50 - 150
			Total Barium (Ba)	2015/11/25		93	%	69 - 131
			Total Chromium (Cr)	2015/11/25		87	%	41 - 159
			Total Cobalt (Co)	2015/11/25		91	%	75 - 125
			Total Copper (Cu)	2015/11/25		85	%	73 - 127
			Total Lead (Pb)	2015/11/25		89	%	54 - 146
			Total Nickel (Ni)	2015/11/25		97	%	61 - 139
			Total Vanadium (V)	2015/11/25		105	%	50 - 150
			Total Zinc (Zn)	2015/11/25		88	%	72 - 128
8123301	ST4	Spiked Blank	Total Antimony (Sb)	2015/11/25		93	%	75 - 125
			Total Arsenic (As)	2015/11/25		93	%	75 - 125
			Total Barium (Ba)	2015/11/25		92	%	75 - 125
			Total Beryllium (Be)	2015/11/25		94	%	75 - 125
			Total Cadmium (Cd)	2015/11/25		93	%	75 - 125
			Total Chromium (Cr)	2015/11/25		96	%	75 - 125
			Total Cobalt (Co)	2015/11/25		95	%	75 - 125
			Total Copper (Cu)	2015/11/25		95	%	75 - 125
			Total Lead (Pb)	2015/11/25		95	%	75 - 125
			Total Mercury (Hg)	2015/11/25		92	%	75 - 125
			Total Molybdenum (Mo)	2015/11/25		95	%	75 - 125
			Total Nickel (Ni)	2015/11/25		95	%	75 - 125
			Total Selenium (Se)	2015/11/25		95	%	75 - 125
			Total Silver (Ag)	2015/11/25		95	%	75 - 125

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A3973
Report Date: 2015/11/30

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U GROUNDWATER
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Thallium (Tl)	2015/11/25		94	%	75 - 125
			Total Tin (Sn)	2015/11/25		96	%	75 - 125
			Total Uranium (U)	2015/11/25		92	%	75 - 125
			Total Vanadium (V)	2015/11/25		99	%	75 - 125
			Total Zinc (Zn)	2015/11/25		91	%	75 - 125
8123301	ST4	Method Blank	Total Antimony (Sb)	2015/11/25	<0.50		mg/kg	
			Total Arsenic (As)	2015/11/25	<1.0		mg/kg	
			Total Barium (Ba)	2015/11/25	<1.0		mg/kg	
			Total Beryllium (Be)	2015/11/25	<0.40		mg/kg	
			Total Cadmium (Cd)	2015/11/25	<0.050		mg/kg	
			Total Chromium (Cr)	2015/11/25	<1.0		mg/kg	
			Total Cobalt (Co)	2015/11/25	<0.50		mg/kg	
			Total Copper (Cu)	2015/11/25	<1.0		mg/kg	
			Total Lead (Pb)	2015/11/25	<0.50		mg/kg	
			Total Mercury (Hg)	2015/11/25	<0.050		mg/kg	
			Total Molybdenum (Mo)	2015/11/25	<0.40		mg/kg	
			Total Nickel (Ni)	2015/11/25	<1.0		mg/kg	
			Total Selenium (Se)	2015/11/25	<0.50		mg/kg	
			Total Silver (Ag)	2015/11/25	<0.20		mg/kg	
			Total Thallium (Tl)	2015/11/25	<0.10		mg/kg	
			Total Tin (Sn)	2015/11/25	<1.0		mg/kg	
			Total Uranium (U)	2015/11/25	<0.20		mg/kg	
			Total Vanadium (V)	2015/11/25	<1.0		mg/kg	
			Total Zinc (Zn)	2015/11/25	<10		mg/kg	
8123301	ST4	RPD [NR5277-01]	Total Antimony (Sb)	2015/11/25	NC		%	35
			Total Arsenic (As)	2015/11/25	11		%	35
			Total Barium (Ba)	2015/11/25	3.1		%	35
			Total Beryllium (Be)	2015/11/25	NC		%	35
			Total Cadmium (Cd)	2015/11/25	5.4		%	35
			Total Chromium (Cr)	2015/11/25	8.9		%	35
			Total Cobalt (Co)	2015/11/25	6.9		%	35
			Total Copper (Cu)	2015/11/25	1.9		%	35
			Total Lead (Pb)	2015/11/25	0.70		%	35
			Total Mercury (Hg)	2015/11/25	NC		%	35
			Total Molybdenum (Mo)	2015/11/25	NC		%	35
			Total Nickel (Ni)	2015/11/25	3.9		%	35
			Total Selenium (Se)	2015/11/25	NC		%	35
			Total Silver (Ag)	2015/11/25	NC		%	35
			Total Thallium (Tl)	2015/11/25	NC		%	35
			Total Tin (Sn)	2015/11/25	NC		%	35
			Total Uranium (U)	2015/11/25	NC		%	35
			Total Vanadium (V)	2015/11/25	4.7		%	35
			Total Zinc (Zn)	2015/11/25	2.5		%	35
8123669	HC7	Matrix Spike [NR5277-01]	Leachable Antimony (Sb)	2015/11/24		86	%	75 - 125
			Leachable Arsenic (As)	2015/11/24		87	%	75 - 125
			Leachable Barium (Ba)	2015/11/24		NC	%	75 - 125
			Leachable Beryllium (Be)	2015/11/24		78	%	75 - 125
			Leachable Boron (B)	2015/11/24		161 (1)	%	75 - 125
			Leachable Cadmium (Cd)	2015/11/24		84	%	75 - 125
			Leachable Chromium (Cr)	2015/11/24		86	%	75 - 125
			Leachable Cobalt (Co)	2015/11/24		83	%	75 - 125
			Leachable Copper (Cu)	2015/11/24		84	%	75 - 125

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A3973
Report Date: 2015/11/30

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U GROUNDWATER
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Leachable Iron (Fe)	2015/11/24		NC	%	75 - 125
			Leachable Lead (Pb)	2015/11/24		84	%	75 - 125
			Leachable Mercury (Hg)	2015/11/24		112	%	75 - 125
			Leachable Nickel (Ni)	2015/11/24		89	%	75 - 125
			Leachable Selenium (Se)	2015/11/24		84	%	75 - 125
			Leachable Silver (Ag)	2015/11/24		84	%	75 - 125
			Leachable Thallium (Tl)	2015/11/24		85	%	75 - 125
			Leachable Uranium (U)	2015/11/24		74 (1)	%	75 - 125
			Leachable Vanadium (V)	2015/11/24		88	%	75 - 125
			Leachable Zinc (Zn)	2015/11/24		102	%	75 - 125
			Leachable Zirconium (Zr)	2015/11/24		83	%	75 - 125
8123669	HC7	Spiked Blank	Leachable Antimony (Sb)	2015/11/24		99	%	75 - 125
			Leachable Arsenic (As)	2015/11/24		97	%	75 - 125
			Leachable Barium (Ba)	2015/11/24		103	%	75 - 125
			Leachable Beryllium (Be)	2015/11/24		96	%	75 - 125
			Leachable Boron (B)	2015/11/24		109	%	75 - 125
			Leachable Cadmium (Cd)	2015/11/24		98	%	75 - 125
			Leachable Chromium (Cr)	2015/11/24		96	%	75 - 125
			Leachable Cobalt (Co)	2015/11/24		94	%	75 - 125
			Leachable Copper (Cu)	2015/11/24		98	%	75 - 125
			Leachable Iron (Fe)	2015/11/24		93	%	75 - 125
			Leachable Lead (Pb)	2015/11/24		98	%	75 - 125
			Leachable Mercury (Hg)	2015/11/24		103	%	75 - 125
			Leachable Nickel (Ni)	2015/11/24		96	%	75 - 125
			Leachable Selenium (Se)	2015/11/24		93	%	75 - 125
			Leachable Silver (Ag)	2015/11/24		96	%	75 - 125
			Leachable Thallium (Tl)	2015/11/24		95	%	75 - 125
			Leachable Uranium (U)	2015/11/24		87	%	75 - 125
			Leachable Vanadium (V)	2015/11/24		97	%	75 - 125
			Leachable Zinc (Zn)	2015/11/24		97	%	75 - 125
			Leachable Zirconium (Zr)	2015/11/24		94	%	75 - 125
8123669	HC7	Method Blank	Leachable Antimony (Sb)	2015/11/24	<1.0		mg/L	
			Leachable Arsenic (As)	2015/11/24	<0.50		mg/L	
			Leachable Barium (Ba)	2015/11/24	<1.0		mg/L	
			Leachable Beryllium (Be)	2015/11/24	<0.50		mg/L	
			Leachable Boron (B)	2015/11/24	<1.0		mg/L	
			Leachable Cadmium (Cd)	2015/11/24	<0.10		mg/L	
			Leachable Chromium (Cr)	2015/11/24	<0.50		mg/L	
			Leachable Cobalt (Co)	2015/11/24	<1.0		mg/L	
			Leachable Copper (Cu)	2015/11/24	<1.0		mg/L	
			Leachable Iron (Fe)	2015/11/24	<1.0		mg/L	
			Leachable Lead (Pb)	2015/11/24	<0.50		mg/L	
			Leachable Mercury (Hg)	2015/11/24	<0.020		mg/L	
			Leachable Nickel (Ni)	2015/11/24	<0.50		mg/L	
			Leachable Selenium (Se)	2015/11/24	<0.10		mg/L	
			Leachable Silver (Ag)	2015/11/24	<0.50		mg/L	
			Leachable Thallium (Tl)	2015/11/24	<0.50		mg/L	
			Leachable Uranium (U)	2015/11/24	<0.20		mg/L	
			Leachable Vanadium (V)	2015/11/24	<1.0		mg/L	
			Leachable Zinc (Zn)	2015/11/24	<1.0		mg/L	
			Leachable Zirconium (Zr)	2015/11/24	<1.0		mg/L	
8123669	HC7	RPD [NR5277-01]	Leachable Antimony (Sb)	2015/11/24	NC		%	35

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A3973
Report Date: 2015/11/30

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U GROUNDWATER
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Leachable Arsenic (As)	2015/11/24	NC		%	35
			Leachable Barium (Ba)	2015/11/24	NC		%	35
			Leachable Beryllium (Be)	2015/11/24	NC		%	35
			Leachable Boron (B)	2015/11/24	NC		%	35
			Leachable Cadmium (Cd)	2015/11/24	NC		%	35
			Leachable Chromium (Cr)	2015/11/24	NC		%	35
			Leachable Cobalt (Co)	2015/11/24	NC		%	35
			Leachable Copper (Cu)	2015/11/24	NC		%	35
			Leachable Iron (Fe)	2015/11/24	NC		%	35
			Leachable Lead (Pb)	2015/11/24	NC		%	35
			Leachable Mercury (Hg)	2015/11/24	NC		%	35
			Leachable Nickel (Ni)	2015/11/24	NC		%	35
			Leachable Selenium (Se)	2015/11/24	NC		%	35
			Leachable Silver (Ag)	2015/11/24	NC		%	35
			Leachable Thallium (Tl)	2015/11/24	NC		%	35
			Leachable Uranium (U)	2015/11/24	NC		%	35
			Leachable Vanadium (V)	2015/11/24	NC		%	35
			Leachable Zinc (Zn)	2015/11/24	NC		%	35
			Leachable Zirconium (Zr)	2015/11/24	NC		%	35
8124185	KKV	RPD [NR5277-02]	Closed Cup Flash point	2015/11/25	NC		%	35
8124419	EH2	QC Standard	Soluble (1:1) pH	2015/11/25		98	%	98 - 102
8124419	EH2	Spiked Blank	Soluble (1:1) pH	2015/11/25		100	%	97 - 103
8124419	EH2	RPD	Soluble (1:1) pH	2015/11/25	0.99		%	N/A
8125706	EH2	QC Standard	Soluble (CaCl2) pH	2015/11/27		99	%	98 - 102
8125706	EH2	Spiked Blank	Soluble (CaCl2) pH	2015/11/27		100	%	97 - 103
8125706	EH2	RPD	Soluble (CaCl2) pH	2015/11/27	2.2		%	N/A
8125793	MN0	QC Standard	Sieve - Pan	2015/11/26		99	%	75 - 125
			Sieve - #200 (>0.075mm)	2015/11/26		102	%	75 - 125
8125793	MN0	RPD	Sieve - Pan	2015/11/26	4.6		%	35
			Sieve - #200 (>0.075mm)	2015/11/26	27		%	35
8126354	XLI	Method Blank	Soluble Bicarbonate (HCO3)	2015/11/26	<10		mg/L	
			Soluble Carbonate (CO3)	2015/11/26	<10		mg/L	
			Soluble Hydroxide (OH)	2015/11/26	<10		mg/L	
8126354	XLI	RPD [NR5277-01]	Soluble Bicarbonate (HCO3)	2015/11/26	NC		%	35
			Soluble Carbonate (CO3)	2015/11/26	NC		%	35
			Soluble Hydroxide (OH)	2015/11/26	NC		%	35
8126380	JHC	Matrix Spike [NR5277-01]	Soluble Calcium (Ca)	2015/11/26		94	%	75 - 125
			Soluble Magnesium (Mg)	2015/11/26		NC	%	75 - 125
			Soluble Sodium (Na)	2015/11/26		98	%	75 - 125
			Soluble Potassium (K)	2015/11/26		102	%	75 - 125
8126380	JHC	QC Standard	Soluble Calcium (Ca)	2015/11/26		92	%	75 - 125
			Soluble Magnesium (Mg)	2015/11/26		101	%	75 - 125
			Soluble Sodium (Na)	2015/11/26		101	%	75 - 125
			Soluble Potassium (K)	2015/11/26		103	%	75 - 125
			Soluble Sulphate (SO4)	2015/11/26		99	%	75 - 125
8126380	JHC	Spiked Blank	Soluble Calcium (Ca)	2015/11/26		92	%	80 - 120
			Soluble Magnesium (Mg)	2015/11/26		100	%	80 - 120
			Soluble Sodium (Na)	2015/11/26		98	%	80 - 120
			Soluble Potassium (K)	2015/11/26		102	%	80 - 120
8126380	JHC	Method Blank	Soluble Calcium (Ca)	2015/11/26	<1.5		mg/L	
			Soluble Magnesium (Mg)	2015/11/26	<1.0		mg/L	
			Soluble Sodium (Na)	2015/11/26	<2.5		mg/L	

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A3973
Report Date: 2015/11/30

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U GROUNDWATER
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Soluble Potassium (K)	2015/11/26	<1.3		mg/L	
			Soluble Sulphate (SO4)	2015/11/26	<5.0		mg/L	
8126380	JHC	RPD [NR5277-01]	Soluble Calcium (Ca)	2015/11/26	3.9		%	35
			Soluble Magnesium (Mg)	2015/11/26	5.3		%	35
			Soluble Sodium (Na)	2015/11/26	2.2		%	35
			Soluble Potassium (K)	2015/11/26	0.60		%	35
			Soluble Sulphate (SO4)	2015/11/26	2.7		%	35
8126397	LZ	Matrix Spike [NR5277-01]	Soluble Nitrate (N)	2015/11/26		93	%	75 - 125
8126397	LZ	QC Standard	Soluble Nitrate (N)	2015/11/26		122	%	75 - 125
8126397	LZ	Spiked Blank	Soluble Nitrate (N)	2015/11/26		101	%	80 - 120
8126397	LZ	Method Blank	Soluble Nitrate (N)	2015/11/26	<0.20		mg/L	
8126397	LZ	RPD [NR5277-01]	Soluble Nitrate (N)	2015/11/26	NC		%	35
8126408	YU	QC Standard	Soluble Conductivity	2015/11/26		108	%	75 - 125
8126408	YU	Spiked Blank	Soluble Conductivity	2015/11/26		100	%	90 - 110
8126408	YU	Method Blank	Soluble Conductivity	2015/11/26	<0.020		dS/m	
8126408	YU	RPD [NR5277-01]	Soluble Conductivity	2015/11/26	3.2		%	35
8126541	RSA	Matrix Spike [NR5277-02]	Leachable (ZH) 1,4-Difluorobenzene (sur.)	2015/11/27		128	%	70 - 130
			Leachable (ZH) 4-BROMOFLUOROBENZENE (s	2015/11/27		101	%	70 - 130
			Leachable (ZH) D4-1,2-DICHLOROETHANE (su	2015/11/27		127	%	70 - 130
			Leachable (ZH) Benzene	2015/11/27		95	%	70 - 130
			Leachable (ZH) Toluene	2015/11/27		81	%	70 - 130
			Leachable (ZH) Ethylbenzene	2015/11/27		89	%	70 - 130
			Leachable (ZH) o-Xylene	2015/11/27		86	%	70 - 130
			Leachable (ZH) m & p-Xylene	2015/11/27		86	%	70 - 130
8126541	RSA	Spiked Blank	Leachable (ZH) 1,4-Difluorobenzene (sur.)	2015/11/27		130	%	70 - 130
			Leachable (ZH) 4-BROMOFLUOROBENZENE (s	2015/11/27		103	%	70 - 130
			Leachable (ZH) D4-1,2-DICHLOROETHANE (su	2015/11/27		125	%	70 - 130
			Leachable (ZH) Benzene	2015/11/27		95	%	70 - 130
			Leachable (ZH) Toluene	2015/11/27		83	%	70 - 130
			Leachable (ZH) Ethylbenzene	2015/11/27		92	%	70 - 130
			Leachable (ZH) o-Xylene	2015/11/27		88	%	70 - 130
			Leachable (ZH) m & p-Xylene	2015/11/27		89	%	70 - 130
8126541	RSA	Method Blank	Leachable (ZH) 1,4-Difluorobenzene (sur.)	2015/11/27		128	%	70 - 130
			Leachable (ZH) 4-BROMOFLUOROBENZENE (s	2015/11/27		100	%	70 - 130
			Leachable (ZH) D4-1,2-DICHLOROETHANE (su	2015/11/27		105	%	70 - 130
			Leachable (ZH) Benzene	2015/11/27	<10		ug/L	
			Leachable (ZH) Toluene	2015/11/27	<10		ug/L	
			Leachable (ZH) Ethylbenzene	2015/11/27	<10		ug/L	
			Leachable (ZH) o-Xylene	2015/11/27	<10		ug/L	
			Leachable (ZH) m & p-Xylene	2015/11/27	<20		ug/L	
			Leachable (ZH) Xylenes (Total)	2015/11/27	<20		ug/L	
8126541	RSA	RPD [NR5277-02]	Leachable (ZH) Benzene	2015/11/27	NC		%	50
			Leachable (ZH) Toluene	2015/11/27	NC		%	50
			Leachable (ZH) Ethylbenzene	2015/11/27	NC		%	50
			Leachable (ZH) o-Xylene	2015/11/27	NC		%	50
			Leachable (ZH) m & p-Xylene	2015/11/27	NC		%	50
			Leachable (ZH) Xylenes (Total)	2015/11/27	NC		%	50
8126542	KP9	Matrix Spike [NR5277-01]	Soluble Chloride (Cl)	2015/11/26		102	%	75 - 125
8126542	KP9	QC Standard	Soluble Chloride (Cl)	2015/11/26		106	%	75 - 125
8126542	KP9	Spiked Blank	Soluble Chloride (Cl)	2015/11/26		105	%	75 - 125
8126542	KP9	Method Blank	Soluble Chloride (Cl)	2015/11/26	5.7, RDL=5.0		mg/L	

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A3973
Report Date: 2015/11/30

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U GROUNDWATER
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8126542	KP9	RPD [NR5277-01]	Soluble Chloride (Cl)	2015/11/26	NC		%	35
8127817	TN4	Matrix Spike	Hex. Chromium (Cr 6+)	2015/11/27		102	%	75 - 125
8127817	TN4	Spiked Blank	Hex. Chromium (Cr 6+)	2015/11/27		106	%	80 - 120
8127817	TN4	Method Blank	Hex. Chromium (Cr 6+)	2015/11/27	<0.080		mg/kg	
8127817	TN4	RPD	Hex. Chromium (Cr 6+)	2015/11/27	NC		%	35

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A3973
Report Date: 2015/11/30

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U GROUNDWATER
Sampler Initials: JF

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Janet Gao, Supervisor

Harry (Peng) Liang, Senior Analyst

Jingyuan Song, Organics – Senior Analyst

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam

Calgary: 4000 19st St. NE, T2E 6P8. Ph: (403) 291-3077, Fax: (403) 735-2240, Toll free: (800) 386-7247
Edmonton: 9331 - 48 Street, T6B 2R4. Ph: (780) 577-7100, Fax: (780) 450-4187, Toll free: (877) 465-8889
www.maxxamanalytics.com

Chain of Custody

A204394

780

Page: 1 of 1

	Invoice To: C/O Report Address ☐	Report To: Same as Invoice ☑	Report Distribution (E-Mail):
Company:	Golder Associates		sfiddler@golder.com
Contact:	Steven Fiddler		GSMdataquality@golder.com
Address:	16820-107 Avenue		
	Prov: Edmonton, AB PC: T5P 4K3	Prov: PC:	
Contact #s:	Ph: 780-483-3499/ 780-984-6600	Ph: Cell:	

REGULATORY GUIDELINES:
☐ AT1
☒ CCME
☐ Regulated Drinking Water
☐ Other:

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.

PO #: 15
Project # / Name: 1526704, Bar U Groundwater Sampling
Site Location: Bar U
Quote #: Golder 2015
Sampled By: JTournier

SERVICE REQUESTED:
☐ RUSH (Contact lab to reserve) Date Required:
☒ REGULAR (5 to 7 Days)

See reverse for package specifics

	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	SOIL: BTEX F1-F4	Sieve (75 micron)	Regulated Metals (CCME/AT1)	Salinity	Assessment ICP Metals	Basic Class II Landfill	PAH	WATER: ☐VOCs	☐BTEX F1	☐BTEX F1-F2	☐BTEX F1-F4	☐ Routine Water	☐ Turb ☐ F	☐ TOC	☐ DOC	Regulated Metals (CCME/AT1) Total	Dissolved	Mercury	☐ Total ☐ Dissolved	Other Analysis	HOLD - Do not Analyze	# of Containers Submitted
1	GMW18-7	4.5-5.25	S	15/11/20		X	X	X		X	X															4
2																										
3																										
4																										
5																										
6																										
7																										
8																										
9																										
10																										
11																										
12																										

20-Nov-15 16:16
Wendy Sears
B5A3973
HT4 INS-0067

Please indicate Filtered, Preserved or Both (F, P, F/P) → F/P

Relinquished By (Signature/Print): Jaumier JTournier	Date (YY/MM/DD): 15-11-20	Time (24:00): 1615	
Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):	
Special Instructions:		# of Jars Used & Not Submitted	

LAB USE ONLY

Received By:	Date:	Time:	Maxxam Job #:		
Muhammad Akhter	2015/11/20	16:16	Custody Seal	Temperature	Ice
Lab Comments:			YES	7, 6, 6	YES

AB FCD-00331 Rev3 2010/05

Maxxam Analytics International Corporation o/a Maxxam Analytics

Your Project #: 1526784
Site Location: BAR U RANCH
Your C.O.C. #: A204483

Attention:Steven Fiddler

GOLDER ASSOCIATES LTD
16820-107 AVE
EDMONTON, AB
CANADA T5P 4C3

Report Date: 2015/12/07
Report #: R2090711
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5A6102
Received: 2015/11/27, 15:33

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	3	N/A	2015/11/30	AB SOP-00005	SM 22 2320 B m
Cadmium - low level CCME - Dissolved	1	N/A	2015/12/02	AB WI-00065	Auto Calc
Cadmium - low level CCME (Total)	2	2015/11/27	2015/11/28	AB WI-00065	Auto Calc
Chloride by Automated Colourimetry	3	N/A	2015/11/29	AB SOP-00020	SM 22-4500-Cl G m
Conductivity @25C	2	N/A	2015/11/29	AB SOP-00005	SM 22 2510 B m
Conductivity @25C	1	N/A	2015/11/30	AB SOP-00005	SM 22 2510 B m
Hardness	2	N/A	2015/11/29	AB WI-00065	Auto Calc
Hardness	1	N/A	2015/12/02	AB WI-00065	Auto Calc
Elements by ICP - Dissolved	1	N/A	2015/12/01	AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICP-Dissolved-Lab Filtered	2	N/A	2015/11/29	AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICP - Total	2	2015/11/28	2015/11/28	AB SOP-00014 / AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICPMS - Dissolved	1	N/A	2015/11/30	AB SOP-00043	EPA 200.8 R5.4 m
Elements by ICPMS - Total	2	2015/11/28	2015/11/28	AB SOP-00014 / AB SOP-00043	EPA 200.8 R5.4 m
Ion Balance	2	N/A	2015/11/28	AB WI-00065	Auto Calc
Ion Balance	1	N/A	2015/11/30	AB WI-00065	Auto Calc
Sum of cations, anions	2	N/A	2015/11/29	AB WI-00065	Auto Calc
Sum of cations, anions	1	N/A	2015/12/02	AB WI-00065	Auto Calc
Nitrate and Nitrite	3	N/A	2015/12/02	AB WI-00065	Auto Calc
Nitrate + Nitrite-N (calculated)	3	N/A	2015/12/02	AB WI-00065	Auto Calc
Nitrogen, (Nitrite, Nitrate) by IC	2	N/A	2015/12/01	AB SOP-00023	SM 22 4110 B m
Nitrogen, (Nitrite, Nitrate) by IC	1	N/A	2015/12/02	AB SOP-00023	SM 22 4110 B m
Benzo[a]pyrene Equivalency (1)	3	N/A	2015/12/01	AB SOP-00003	Auto Calc
PAH in Water by GC/MS	3	2015/11/30	2015/11/30	AB SOP-00037 / AB SOP-00003	EPA 8270D m
pH @25°C (Alkalinity titrator)	3	N/A	2015/11/30	AB SOP-00005	SM 22 4500-H+B m
Sulphate by Automated Colourimetry	3	N/A	2015/11/29	AB SOP-00018	SM 22 4500-SO4 E m
Total Dissolved Solids (Calculated)	2	N/A	2015/11/30	AB WI-00065	Auto Calc
Total Dissolved Solids (Calculated)	1	N/A	2015/12/02	AB WI-00065	Auto Calc

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Your Project #: 1526784
Site Location: BAR U RANCH
Your C.O.C. #: A204483

Attention:Steven Fiddler

GOLDER ASSOCIATES LTD
16820-107 AVE
EDMONTON, AB
CANADA T5P 4C3

Report Date: 2015/12/07
Report #: R2090711
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5A6102
Received: 2015/11/27, 15:33

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
(1) B[a]P TPE is calculated using 1/2 of the RDL for non detect results as per Alberta Environment instructions. This protocol may not apply in other jurisdictions.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Desirae Hopkinson, Project Manager
Email: DHopkinson@maxxam.ca
Phone# (780)577-7104

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A6102
Report Date: 2015/12/07

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U RANCH
Sampler Initials: JF

Sample Details/Parameters	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
NS8665 SW15-01							
Sampling Date 2015/11/27 12:20							
Matrix WATER							
RESULTS OF CHEMICAL ANALYSES OF WATER							
Calculated Parameters							
Anion Sum	5.0	N/A	meq/L	2015/11/29	2015/11/29		8127831
Cation Sum	5.4	N/A	meq/L	2015/11/29	2015/11/29		8127831
Hardness (CaCO3)	250	0.50	mg/L	2015/11/29	2015/11/29		8127828
Ion Balance	1.1	0.010	N/A	2015/11/28	2015/11/28		8127829
Dissolved Nitrate (NO3)	0.17	0.044	mg/L	2015/12/02	2015/12/02		8128076
Nitrate plus Nitrite (N)	0.038	0.020	mg/L	2015/12/02	2015/12/02		8127785
Dissolved Nitrite (NO2)	<0.033	0.033	mg/L	2015/12/02	2015/12/02		8128076
Total Dissolved Solids	260	10	mg/L	2015/11/30	2015/11/30		8128077
Misc. Inorganics							
Conductivity	480	1.0	uS/cm	2015/11/29	2015/11/29	XLI	8128966
pH	8.24	N/A	pH	2015/11/29	2015/11/30	XLI	8128965
Low Level Elements							
Total Cadmium (Cd)	<0.020	0.020	ug/L	2015/11/28	2015/11/28		8127446
Anions							
Dissolved Chloride (Cl)	1.1	1.0	mg/L	2015/11/29	2015/11/29	JH0	8128955
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	2015/11/29	2015/11/30	XLI	8128963
Alkalinity (Total as CaCO3)	210	0.50	mg/L	2015/11/29	2015/11/30	XLI	8128963
Bicarbonate (HCO3)	260	0.50	mg/L	2015/11/29	2015/11/30	XLI	8128963
Carbonate (CO3)	<0.50	0.50	mg/L	2015/11/29	2015/11/30	XLI	8128963
Hydroxide (OH)	<0.50	0.50	mg/L	2015/11/29	2015/11/30	XLI	8128963
Dissolved Sulphate (SO4)	35	1.0	mg/L	2015/11/29	2015/11/29	JH0	8128957
Nutrients							
Dissolved Nitrite (N)	<0.010	0.010	mg/L	2015/11/30	2015/12/01	NW4	8130008
Dissolved Nitrate (N)	0.038	0.010	mg/L	2015/11/30	2015/12/01	NW4	8130008
SEMIVOLATILE ORGANICS BY GC-MS (WATER)							
Polycyclic Aromatics							
Benzo[a]pyrene equivalency	<0.010	0.010	ug/L	2015/12/01	2015/12/01		8127571
Acenaphthene	<0.10	0.10	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Acenaphthylene	<0.10	0.10	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Acridine	<0.20	0.20	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Anthracene	<0.010	0.010	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Benzo(a)anthracene	<0.0085	0.0085	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Benzo(b&j)fluoranthene	<0.0085	0.0085	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Benzo(k)fluoranthene	<0.0085	0.0085	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Benzo(g,h,i)perylene	<0.0085	0.0085	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Benzo(c)phenanthrene	<0.050	0.050	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Benzo(a)pyrene	<0.0075	0.0075	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Benzo[e]pyrene	<0.050	0.050	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Chrysene	<0.0085	0.0085	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Dibenz(a,h)anthracene	<0.0075	0.0075	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Fluoranthene	<0.010	0.010	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Fluorene	<0.050	0.050	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Indeno(1,2,3-cd)pyrene	<0.0085	0.0085	ug/L	2015/11/30	2015/11/30	LZ3	8128964
2-Methylnaphthalene	<0.10	0.10	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Naphthalene	<0.10	0.10	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Phenanthrene	<0.050	0.050	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Perylene	<0.050	0.050	ug/L	2015/11/30	2015/11/30	LZ3	8128964

(1) Please note that the recovery of some compounds are outside control limits however the overall quality control for this analysis meets our acceptability criteria.

(2) Detection limits raised due to dilution to bring analyte within the calibrated range.

(3) Detection limits raised due to matrix interference.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A6102
Report Date: 2015/12/07

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U RANCH
Sampler Initials: JF

Sample Details/Parameters	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
NS8665 SW15-01							
Sampling Date 2015/11/27 12:20							
Matrix WATER							
SEMIVOLATILE ORGANICS BY GC-MS (WATER)							
Polycyclic Aromatics							
Pyrene	<0.020	0.020	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Quinoline	<0.20	0.20	ug/L	2015/11/30	2015/11/30	LZ3	8128964
D8-ACENAPHTHYLENE (sur.)	105	50 - 130	%	2015/11/30	2015/11/30	LZ3	8128964
D10-ANTHRACENE (sur.)	115	50 - 130	%	2015/11/30	2015/11/30	LZ3	8128964
D12-BENZO(A)PYRENE (sur.)	126	50 - 130	%	2015/11/30	2015/11/30	LZ3	8128964
TERPHENYL-D14 (sur.)	143(1)	50 - 130	%	2015/11/30	2015/11/30	LZ3	8128964
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)							
Elements							
Total Aluminum (Al)	0.0084	0.0030	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Antimony (Sb)	<0.00060	0.00060	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Arsenic (As)	0.00031	0.00020	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Barium (Ba)	0.14	0.010	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Beryllium (Be)	<0.0010	0.0010	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Boron (B)	<0.020	0.020	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Calcium (Ca)	76	0.30	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Chromium (Cr)	<0.0010	0.0010	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Cobalt (Co)	<0.00030	0.00030	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Copper (Cu)	0.00043	0.00020	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Iron (Fe)	<0.060	0.060	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Lead (Pb)	<0.00020	0.00020	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Lithium (Li)	<0.020	0.020	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Magnesium (Mg)	17	0.20	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Manganese (Mn)	<0.0040	0.0040	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Molybdenum (Mo)	0.00088	0.00020	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Nickel (Ni)	0.00069	0.00050	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Phosphorus (P)	<0.10	0.10	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Potassium (K)	0.54	0.30	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Selenium (Se)	0.00052	0.00020	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Silicon (Si)	2.4	0.10	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Silver (Ag)	<0.00010	0.00010	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Sodium (Na)	5.5	0.50	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Strontium (Sr)	0.36	0.020	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Sulphur (S)	11	0.20	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Thallium (Tl)	<0.00020	0.00020	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Tin (Sn)	<0.0010	0.0010	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Titanium (Ti)	<0.0010	0.0010	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Uranium (U)	0.00067	0.00010	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Vanadium (V)	<0.0010	0.0010	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Zinc (Zn)	<0.0030	0.0030	mg/L	2015/11/28	2015/11/28	HC7	8128368
Lab Filtered Elements							
Dissolved Calcium (Ca)	76	0.30	mg/L	2015/11/28	2015/11/29	JHC	8128402
Dissolved Iron (Fe)	<0.060	0.060	mg/L	2015/11/28	2015/11/29	JHC	8128402
Dissolved Magnesium (Mg)	16	0.20	mg/L	2015/11/28	2015/11/29	JHC	8128402
Dissolved Manganese (Mn)	<0.0040	0.0040	mg/L	2015/11/28	2015/11/29	JHC	8128402
Dissolved Potassium (K)	0.96	0.30	mg/L	2015/11/28	2015/11/29	JHC	8128402
Dissolved Sodium (Na)	6.4	0.50	mg/L	2015/11/28	2015/11/29	JHC	8128402

(1) Please note that the recovery of some compounds are outside control limits however the overall quality control for this analysis meets our acceptability criteria.

(2) Detection limits raised due to dilution to bring analyte within the calibrated range.

(3) Detection limits raised due to matrix interference.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A6102
Report Date: 2015/12/07

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U RANCH
Sampler Initials: JF

Sample Details/Parameters	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
NS8666 SW15-02							
Sampling Date 2015/11/27 12:40							
Matrix WATER							
RESULTS OF CHEMICAL ANALYSES OF WATER							
Calculated Parameters							
Anion Sum	5.1	N/A	meq/L	2015/11/29	2015/11/29		8127831
Cation Sum	5.2	N/A	meq/L	2015/11/29	2015/11/29		8127831
Hardness (CaCO3)	240	0.50	mg/L	2015/11/29	2015/11/29		8127828
Ion Balance	1.0	0.010	N/A	2015/11/28	2015/11/28		8127829
Dissolved Nitrate (NO3)	0.19	0.044	mg/L	2015/12/02	2015/12/02		8128076
Nitrate plus Nitrite (N)	0.043	0.020	mg/L	2015/12/02	2015/12/02		8127785
Dissolved Nitrite (NO2)	<0.033	0.033	mg/L	2015/12/02	2015/12/02		8128076
Total Dissolved Solids	260	10	mg/L	2015/11/30	2015/11/30		8128077
Misc. Inorganics							
Conductivity	480	1.0	uS/cm	2015/11/29	2015/11/29	XLI	8128966
pH	8.23	N/A	pH	2015/11/29	2015/11/30	XLI	8128965
Low Level Elements							
Total Cadmium (Cd)	<0.020	0.020	ug/L	2015/11/28	2015/11/28		8127446
Anions							
Dissolved Chloride (Cl)	1.1	1.0	mg/L	2015/11/29	2015/11/29	JH0	8128955
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	2015/11/29	2015/11/30	XLI	8128963
Alkalinity (Total as CaCO3)	220	0.50	mg/L	2015/11/29	2015/11/30	XLI	8128963
Bicarbonate (HCO3)	260	0.50	mg/L	2015/11/29	2015/11/30	XLI	8128963
Carbonate (CO3)	<0.50	0.50	mg/L	2015/11/29	2015/11/30	XLI	8128963
Hydroxide (OH)	<0.50	0.50	mg/L	2015/11/29	2015/11/30	XLI	8128963
Dissolved Sulphate (SO4)	35	1.0	mg/L	2015/11/29	2015/11/29	JH0	8128957
Nutrients							
Dissolved Nitrite (N)	<0.010	0.010	mg/L	2015/11/30	2015/12/01	NW4	8130008
Dissolved Nitrate (N)	0.043	0.010	mg/L	2015/11/30	2015/12/01	NW4	8130008
SEMIVOLATILE ORGANICS BY GC-MS (WATER)							
Polycyclic Aromatics							
Benzo[a]pyrene equivalency	<0.010	0.010	ug/L	2015/12/01	2015/12/01		8127571
Acenaphthene	<0.10	0.10	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Acenaphthylene	<0.10	0.10	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Acridine	<0.20	0.20	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Anthracene	<0.010	0.010	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Benzo(a)anthracene	<0.0085	0.0085	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Benzo(b&j)fluoranthene	<0.0085	0.0085	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Benzo(k)fluoranthene	<0.0085	0.0085	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Benzo(g,h,i)perylene	<0.0085	0.0085	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Benzo(c)phenanthrene	<0.050	0.050	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Benzo(a)pyrene	<0.0075	0.0075	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Benzo[e]pyrene	<0.050	0.050	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Chrysene	<0.0085	0.0085	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Dibenz(a,h)anthracene	<0.0075	0.0075	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Fluoranthene	<0.010	0.010	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Fluorene	<0.050	0.050	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Indeno(1,2,3-cd)pyrene	<0.0085	0.0085	ug/L	2015/11/30	2015/11/30	LZ3	8128964
2-Methylnaphthalene	<0.10	0.10	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Naphthalene	<0.10	0.10	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Phenanthrene	<0.050	0.050	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Perylene	<0.050	0.050	ug/L	2015/11/30	2015/11/30	LZ3	8128964

(1) Please note that the recovery of some compounds are outside control limits however the overall quality control for this analysis meets our acceptability criteria.

(2) Detection limits raised due to dilution to bring analyte within the calibrated range.

(3) Detection limits raised due to matrix interference.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A6102
Report Date: 2015/12/07

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U RANCH
Sampler Initials: JF

Sample Details/Parameters	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
NS8666 SW15-02							
Sampling Date 2015/11/27 12:40							
Matrix WATER							
SEMIVOLATILE ORGANICS BY GC-MS (WATER)							
Polycyclic Aromatics							
Pyrene	<0.020	0.020	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Quinoline	<0.20	0.20	ug/L	2015/11/30	2015/11/30	LZ3	8128964
D8-ACENAPHTHYLENE (sur.)	107	50 - 130	%	2015/11/30	2015/11/30	LZ3	8128964
D10-ANTHRACENE (sur.)	117	50 - 130	%	2015/11/30	2015/11/30	LZ3	8128964
D12-BENZO(A)PYRENE (sur.)	127	50 - 130	%	2015/11/30	2015/11/30	LZ3	8128964
TERPHENYL-D14 (sur.)	142(1)	50 - 130	%	2015/11/30	2015/11/30	LZ3	8128964
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)							
Elements							
Total Aluminum (Al)	0.015	0.0030	mg/L	2015/11/28	2015/11/28	HC7	8128368
Dup.Total Aluminum (Al)	0.014	0.0030	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Antimony (Sb)	<0.00060	0.00060	mg/L	2015/11/28	2015/11/28	HC7	8128368
Dup.Total Antimony (Sb)	<0.00060	0.00060	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Arsenic (As)	0.00021	0.00020	mg/L	2015/11/28	2015/11/28	HC7	8128368
Dup.Total Arsenic (As)	0.00022	0.00020	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Barium (Ba)	0.13	0.010	mg/L	2015/11/28	2015/11/28	JHC	8128373
Dup.Total Barium (Ba)	0.13	0.010	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Beryllium (Be)	<0.0010	0.0010	mg/L	2015/11/28	2015/11/28	HC7	8128368
Dup.Total Beryllium (Be)	<0.0010	0.0010	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Boron (B)	<0.020	0.020	mg/L	2015/11/28	2015/11/28	JHC	8128373
Dup.Total Boron (B)	<0.020	0.020	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Calcium (Ca)	76	0.30	mg/L	2015/11/28	2015/11/28	JHC	8128373
Dup.Total Calcium (Ca)	76	0.30	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Chromium (Cr)	<0.0010	0.0010	mg/L	2015/11/28	2015/11/28	HC7	8128368
Dup.Total Chromium (Cr)	<0.0010	0.0010	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Cobalt (Co)	<0.00030	0.00030	mg/L	2015/11/28	2015/11/28	HC7	8128368
Dup.Total Cobalt (Co)	<0.00030	0.00030	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Copper (Cu)	0.00043	0.00020	mg/L	2015/11/28	2015/11/28	HC7	8128368
Dup.Total Copper (Cu)	0.00050	0.00020	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Iron (Fe)	<0.060	0.060	mg/L	2015/11/28	2015/11/28	JHC	8128373
Dup.Total Iron (Fe)	<0.060	0.060	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Lead (Pb)	<0.00020	0.00020	mg/L	2015/11/28	2015/11/28	HC7	8128368
Dup.Total Lead (Pb)	<0.00020	0.00020	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Lithium (Li)	<0.020	0.020	mg/L	2015/11/28	2015/11/28	JHC	8128373
Dup.Total Lithium (Li)	<0.020	0.020	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Magnesium (Mg)	17	0.20	mg/L	2015/11/28	2015/11/28	JHC	8128373
Dup.Total Magnesium (Mg)	17	0.20	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Manganese (Mn)	<0.0040	0.0040	mg/L	2015/11/28	2015/11/28	JHC	8128373
Dup.Total Manganese (Mn)	<0.0040	0.0040	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Molybdenum (Mo)	0.00081	0.00020	mg/L	2015/11/28	2015/11/28	HC7	8128368
Dup.Total Molybdenum (Mo)	0.00096	0.00020	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Nickel (Ni)	0.00052	0.00050	mg/L	2015/11/28	2015/11/28	HC7	8128368
Dup.Total Nickel (Ni)	<0.00050	0.00050	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Phosphorus (P)	<0.10	0.10	mg/L	2015/11/28	2015/11/28	JHC	8128373
Dup.Total Phosphorus (P)	<0.10	0.10	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Potassium (K)	0.77	0.30	mg/L	2015/11/28	2015/11/28	JHC	8128373
Dup.Total Potassium (K)	0.69	0.30	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Selenium (Se)	0.00072	0.00020	mg/L	2015/11/28	2015/11/28	HC7	8128368
Dup.Total Selenium (Se)	0.00054	0.00020	mg/L	2015/11/28	2015/11/28	HC7	8128368

(1) Please note that the recovery of some compounds are outside control limits however the overall quality control for this analysis meets our acceptability criteria.

(2) Detection limits raised due to dilution to bring analyte within the calibrated range.

(3) Detection limits raised due to matrix interference.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A6102
Report Date: 2015/12/07

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U RANCH
Sampler Initials: JF

Sample Details/Parameters	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
NS8666 SW15-02							
Sampling Date 2015/11/27 12:40							
Matrix WATER							
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)							
Elements							
Total Silicon (Si)	2.4	0.10	mg/L	2015/11/28	2015/11/28	JHC	8128373
Dup.Total Silicon (Si)	2.4	0.10	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Silver (Ag)	<0.00010	0.00010	mg/L	2015/11/28	2015/11/28	HC7	8128368
Dup.Total Silver (Ag)	<0.00010	0.00010	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Sodium (Na)	5.5	0.50	mg/L	2015/11/28	2015/11/28	JHC	8128373
Dup.Total Sodium (Na)	5.5	0.50	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Strontium (Sr)	0.37	0.020	mg/L	2015/11/28	2015/11/28	JHC	8128373
Dup.Total Strontium (Sr)	0.36	0.020	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Sulphur (S)	11	0.20	mg/L	2015/11/28	2015/11/28	JHC	8128373
Dup.Total Sulphur (S)	11	0.20	mg/L	2015/11/28	2015/11/28	JHC	8128373
Total Thallium (Tl)	<0.00020	0.00020	mg/L	2015/11/28	2015/11/28	HC7	8128368
Dup.Total Thallium (Tl)	<0.00020	0.00020	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Tin (Sn)	<0.0010	0.0010	mg/L	2015/11/28	2015/11/28	HC7	8128368
Dup.Total Tin (Sn)	<0.0010	0.0010	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Titanium (Ti)	<0.0010	0.0010	mg/L	2015/11/28	2015/11/28	HC7	8128368
Dup.Total Titanium (Ti)	<0.0010	0.0010	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Uranium (U)	0.00066	0.00010	mg/L	2015/11/28	2015/11/28	HC7	8128368
Dup.Total Uranium (U)	0.00070	0.00010	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Vanadium (V)	<0.0010	0.0010	mg/L	2015/11/28	2015/11/28	HC7	8128368
Dup.Total Vanadium (V)	<0.0010	0.0010	mg/L	2015/11/28	2015/11/28	HC7	8128368
Total Zinc (Zn)	<0.0030	0.0030	mg/L	2015/11/28	2015/11/28	HC7	8128368
Dup.Total Zinc (Zn)	<0.0030	0.0030	mg/L	2015/11/28	2015/11/28	HC7	8128368
Lab Filtered Elements							
Dissolved Calcium (Ca)	72	0.30	mg/L	2015/11/28	2015/11/29	JHC	8128402
Dissolved Iron (Fe)	<0.060	0.060	mg/L	2015/11/28	2015/11/29	JHC	8128402
Dissolved Magnesium (Mg)	15	0.20	mg/L	2015/11/28	2015/11/29	JHC	8128402
Dissolved Manganese (Mn)	<0.0040	0.0040	mg/L	2015/11/28	2015/11/29	JHC	8128402
Dissolved Potassium (K)	1.0	0.30	mg/L	2015/11/28	2015/11/29	JHC	8128402
Dissolved Sodium (Na)	6.2	0.50	mg/L	2015/11/28	2015/11/29	JHC	8128402
NS8667 GMW18							
Sampling Date 2015/11/27 13:25							
Matrix WATER							
RESULTS OF CHEMICAL ANALYSES OF WATER							
Calculated Parameters							
Anion Sum	190	N/A	meq/L	2015/12/02	2015/12/02		8127831
Cation Sum	170	N/A	meq/L	2015/12/02	2015/12/02		8127831
Hardness (CaCO3)	6200	0.50	mg/L	2015/12/02	2015/12/02		8127828
Ion Balance	0.91	0.010	N/A	2015/11/30	2015/11/30		8127829
Dissolved Nitrate (NO3)	0.43	0.22	mg/L	2015/12/02	2015/12/02		8128076
Nitrate plus Nitrite (N)	0.096	0.020	mg/L	2015/12/02	2015/12/02		8127785
Dissolved Nitrite (NO2)	<0.16	0.16	mg/L	2015/12/02	2015/12/02		8128076
Total Dissolved Solids	11000	10	mg/L	2015/12/02	2015/12/02		8128077
Misc. Inorganics							
Conductivity	10000	1.0	uS/cm	2015/11/29	2015/11/30	XLI	8128971
pH	7.81	N/A	pH	2015/11/29	2015/11/30	XLI	8128970

(1) Please note that the recovery of some compounds are outside control limits however the overall quality control for this analysis meets our acceptability criteria.

(2) Detection limits raised due to dilution to bring analyte within the calibrated range.

(3) Detection limits raised due to matrix interference.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A6102
Report Date: 2015/12/07

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U RANCH
Sampler Initials: JF

Sample Details/Parameters	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
NS8667 GMW18							
Sampling Date 2015/11/27 13:25							
Matrix WATER							
RESULTS OF CHEMICAL ANALYSES OF WATER							
Low Level Elements							
Dissolved Cadmium (Cd)	0.26	0.020	ug/L	2015/12/02	2015/12/02		8127337
Anions							
Dissolved Chloride (Cl)	11	1.0	mg/L	2015/11/29	2015/11/29	JH0	8128955
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	2015/11/29	2015/11/30	XLI	8128968
Alkalinity (Total as CaCO3)	820	0.50	mg/L	2015/11/29	2015/11/30	XLI	8128968
Bicarbonate (HCO3)	1000	0.50	mg/L	2015/11/29	2015/11/30	XLI	8128968
Carbonate (CO3)	<0.50	0.50	mg/L	2015/11/29	2015/11/30	XLI	8128968
Hydroxide (OH)	<0.50	0.50	mg/L	2015/11/29	2015/11/30	XLI	8128968
Dissolved Sulphate (SO4)	8100(2)	50	mg/L	2015/11/29	2015/11/29	JH0	8128957
Nutrients							
Dissolved Nitrite (N)	<0.050(3)	0.050	mg/L	2015/11/30	2015/12/02	NW4	8130008
Dissolved Nitrate (N)	0.096(3)	0.050	mg/L	2015/11/30	2015/12/02	NW4	8130008
SEMIVOLATILE ORGANICS BY GC-MS (WATER)							
Polycyclic Aromatics							
Benzo[a]pyrene equivalency	<0.010	0.010	ug/L	2015/12/01	2015/12/01		8127571
Acenaphthene	<0.10	0.10	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Acenaphthylene	<0.10	0.10	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Acridine	<0.20	0.20	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Anthracene	<0.010	0.010	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Benzo(a)anthracene	<0.0085	0.0085	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Benzo(b&j)fluoranthene	<0.0085	0.0085	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Benzo(k)fluoranthene	<0.0085	0.0085	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Benzo(g,h,i)perylene	<0.0085	0.0085	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Benzo(c)phenanthrene	<0.050	0.050	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Benzo(a)pyrene	<0.0075	0.0075	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Benzo[e]pyrene	<0.050	0.050	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Chrysene	<0.0085	0.0085	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Dibenz(a,h)anthracene	<0.0075	0.0075	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Fluoranthene	<0.010	0.010	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Fluorene	<0.050	0.050	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Indeno(1,2,3-cd)pyrene	<0.0085	0.0085	ug/L	2015/11/30	2015/11/30	LZ3	8128964
2-Methylnaphthalene	<0.10	0.10	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Naphthalene	<0.10	0.10	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Phenanthrene	<0.050	0.050	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Perylene	<0.050	0.050	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Pyrene	<0.020	0.020	ug/L	2015/11/30	2015/11/30	LZ3	8128964
Quinoline	<0.20	0.20	ug/L	2015/11/30	2015/11/30	LZ3	8128964
D8-ACENAPHTHYLENE (sur.)	100	50 - 130	%	2015/11/30	2015/11/30	LZ3	8128964
D10-ANTHRACENE (sur.)	116	50 - 130	%	2015/11/30	2015/11/30	LZ3	8128964
D12-BENZO(A)PYRENE (sur.)	123	50 - 130	%	2015/11/30	2015/11/30	LZ3	8128964
TERPHENYL-D14 (sur.)	143(1)	50 - 130	%	2015/11/30	2015/11/30	LZ3	8128964
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)							
Elements							
Dissolved Aluminum (Al)	0.0056	0.0030	mg/L	2015/11/30	2015/11/30	PC5	8129376
Dissolved Antimony (Sb)	<0.00060	0.00060	mg/L	2015/11/30	2015/11/30	PC5	8129376
Dissolved Arsenic (As)	0.0014	0.00020	mg/L	2015/11/30	2015/11/30	PC5	8129376
Dissolved Barium (Ba)	0.023	0.010	mg/L	2015/11/29	2015/12/01	SRT	8128855

(1) Please note that the recovery of some compounds are outside control limits however the overall quality control for this analysis meets our acceptability criteria.

(2) Detection limits raised due to dilution to bring analyte within the calibrated range.

(3) Detection limits raised due to matrix interference.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A6102
Report Date: 2015/12/07

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U RANCH
Sampler Initials: JF

Sample Details/Parameters	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
NS8667 GMW18							
Sampling Date 2015/11/27 13:25							
Matrix WATER							
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)							
Elements							
Dissolved Beryllium (Be)	<0.0010	0.0010	mg/L	2015/11/30	2015/11/30	PC5	8129376
Dissolved Boron (B)	0.14	0.020	mg/L	2015/11/29	2015/12/01	SRT	8128855
Dissolved Calcium (Ca)	410	0.30	mg/L	2015/11/29	2015/12/01	SRT	8128855
Dissolved Chromium (Cr)	<0.0010	0.0010	mg/L	2015/11/30	2015/11/30	PC5	8129376
Dissolved Cobalt (Co)	0.0062	0.00030	mg/L	2015/11/30	2015/11/30	PC5	8129376
Dissolved Copper (Cu)	0.0034	0.00020	mg/L	2015/11/30	2015/11/30	PC5	8129376
Dissolved Iron (Fe)	<0.060	0.060	mg/L	2015/11/29	2015/12/01	SRT	8128855
Dissolved Lead (Pb)	<0.00020	0.00020	mg/L	2015/11/30	2015/11/30	PC5	8129376
Dissolved Lithium (Li)	0.15	0.020	mg/L	2015/11/29	2015/12/01	SRT	8128855
Dissolved Magnesium (Mg)	1300(2)	2.0	mg/L	2015/11/29	2015/12/01	SRT	8128855
Dissolved Manganese (Mn)	0.98	0.0040	mg/L	2015/11/29	2015/12/01	SRT	8128855
Dissolved Molybdenum (Mo)	0.0030	0.00020	mg/L	2015/11/30	2015/11/30	PC5	8129376
Dissolved Nickel (Ni)	0.022	0.00050	mg/L	2015/11/30	2015/11/30	PC5	8129376
Dissolved Phosphorus (P)	<0.10	0.10	mg/L	2015/11/29	2015/12/01	SRT	8128855
Dissolved Potassium (K)	17	0.30	mg/L	2015/11/29	2015/12/01	SRT	8128855
Dissolved Selenium (Se)	0.0024	0.00020	mg/L	2015/11/30	2015/11/30	PC5	8129376
Dissolved Silicon (Si)	5.9	0.10	mg/L	2015/11/29	2015/12/01	SRT	8128855
Dissolved Silver (Ag)	<0.00010	0.00010	mg/L	2015/11/30	2015/11/30	PC5	8129376
Dissolved Sodium (Na)	1000(2)	5.0	mg/L	2015/11/29	2015/12/01	SRT	8128855
Dissolved Strontium (Sr)	9.3(2)	0.20	mg/L	2015/11/29	2015/12/01	SRT	8128855
Dissolved Sulphur (S)	2400(2)	2.0	mg/L	2015/11/29	2015/12/01	SRT	8128855
Dissolved Thallium (Tl)	<0.00020	0.00020	mg/L	2015/11/30	2015/11/30	PC5	8129376
Dissolved Tin (Sn)	<0.0010	0.0010	mg/L	2015/11/30	2015/11/30	PC5	8129376
Dissolved Titanium (Ti)	<0.0010	0.0010	mg/L	2015/11/30	2015/11/30	PC5	8129376
Dissolved Uranium (U)	0.080	0.00010	mg/L	2015/11/30	2015/11/30	PC5	8129376
Dissolved Vanadium (V)	<0.0010	0.0010	mg/L	2015/11/30	2015/11/30	PC5	8129376
Dissolved Zinc (Zn)	0.0057	0.0030	mg/L	2015/11/30	2015/11/30	PC5	8129376

(1) Please note that the recovery of some compounds are outside control limits however the overall quality control for this analysis meets our acceptability criteria.

(2) Detection limits raised due to dilution to bring analyte within the calibrated range.

(3) Detection limits raised due to matrix interference.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A6102
Report Date: 2015/12/07

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U RANCH
Sampler Initials: JF

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	2.3°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A6102
Report Date: 2015/12/07

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8128368	HC7	Matrix Spike	Total Aluminum (Al)	2015/11/28		120	%	80 - 120
			Total Antimony (Sb)	2015/11/28		87	%	80 - 120
			Total Arsenic (As)	2015/11/28		98	%	80 - 120
			Total Beryllium (Be)	2015/11/28		108	%	80 - 120
			Total Chromium (Cr)	2015/11/28		101	%	80 - 120
			Total Cobalt (Co)	2015/11/28		99	%	80 - 120
			Total Copper (Cu)	2015/11/28		101	%	80 - 120
			Total Lead (Pb)	2015/11/28		101	%	80 - 120
			Total Molybdenum (Mo)	2015/11/28		107	%	80 - 120
			Total Nickel (Ni)	2015/11/28		99	%	80 - 120
			Total Selenium (Se)	2015/11/28		110	%	80 - 120
			Total Silver (Ag)	2015/11/28		103	%	80 - 120
			Total Thallium (Tl)	2015/11/28		98	%	80 - 120
			Total Tin (Sn)	2015/11/28		108	%	80 - 120
			Total Titanium (Ti)	2015/11/28		104	%	80 - 120
			Total Uranium (U)	2015/11/28		101	%	80 - 120
			Total Vanadium (V)	2015/11/28		105	%	80 - 120
			Total Zinc (Zn)	2015/11/28		103	%	80 - 120
8128368	HC7	Spiked Blank	Total Aluminum (Al)	2015/11/28		110	%	80 - 120
			Total Antimony (Sb)	2015/11/28		104	%	80 - 120
			Total Arsenic (As)	2015/11/28		106	%	80 - 120
			Total Beryllium (Be)	2015/11/28		101	%	80 - 120
			Total Chromium (Cr)	2015/11/28		104	%	80 - 120
			Total Cobalt (Co)	2015/11/28		104	%	80 - 120
			Total Copper (Cu)	2015/11/28		106	%	80 - 120
			Total Lead (Pb)	2015/11/28		105	%	80 - 120
			Total Molybdenum (Mo)	2015/11/28		104	%	80 - 120
			Total Nickel (Ni)	2015/11/28		105	%	80 - 120
			Total Selenium (Se)	2015/11/28		120	%	80 - 120
			Total Silver (Ag)	2015/11/28		103	%	80 - 120
			Total Thallium (Tl)	2015/11/28		99	%	80 - 120
			Total Tin (Sn)	2015/11/28		100	%	80 - 120
			Total Titanium (Ti)	2015/11/28		113	%	80 - 120
			Total Uranium (U)	2015/11/28		100	%	80 - 120
			Total Vanadium (V)	2015/11/28		104	%	80 - 120
			Total Zinc (Zn)	2015/11/28		107	%	80 - 120
8128368	HC7	Method Blank	Total Aluminum (Al)	2015/11/28	<0.0030		mg/L	
			Total Antimony (Sb)	2015/11/28	<0.00060		mg/L	
			Total Arsenic (As)	2015/11/28	<0.00020		mg/L	
			Total Beryllium (Be)	2015/11/28	<0.0010		mg/L	
			Total Chromium (Cr)	2015/11/28	<0.0010		mg/L	
			Total Cobalt (Co)	2015/11/28	<0.00030		mg/L	
			Total Copper (Cu)	2015/11/28	<0.00020		mg/L	
			Total Lead (Pb)	2015/11/28	<0.00020		mg/L	
			Total Molybdenum (Mo)	2015/11/28	<0.00020		mg/L	
			Total Nickel (Ni)	2015/11/28	<0.00050		mg/L	
			Total Selenium (Se)	2015/11/28	<0.00020		mg/L	
			Total Silver (Ag)	2015/11/28	<0.00010		mg/L	
			Total Thallium (Tl)	2015/11/28	<0.00020		mg/L	
			Total Tin (Sn)	2015/11/28	<0.0010		mg/L	
			Total Titanium (Ti)	2015/11/28	<0.0010		mg/L	
			Total Uranium (U)	2015/11/28	<0.00010		mg/L	

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A6102
Report Date: 2015/12/07

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Vanadium (V)	2015/11/28	<0.0010		mg/L	
			Total Zinc (Zn)	2015/11/28	<0.0030		mg/L	
8128368	HC7	RPD [NS8666-02]	Total Aluminum (Al)	2015/11/28	NC		%	20
			Total Antimony (Sb)	2015/11/28	NC		%	20
			Total Arsenic (As)	2015/11/28	NC		%	20
			Total Beryllium (Be)	2015/11/28	NC		%	20
			Total Chromium (Cr)	2015/11/28	NC		%	20
			Total Cobalt (Co)	2015/11/28	NC		%	20
			Total Copper (Cu)	2015/11/28	NC		%	20
			Total Lead (Pb)	2015/11/28	NC		%	20
			Total Molybdenum (Mo)	2015/11/28	NC		%	20
			Total Nickel (Ni)	2015/11/28	NC		%	20
			Total Selenium (Se)	2015/11/28	NC		%	20
			Total Silver (Ag)	2015/11/28	NC		%	20
			Total Thallium (Tl)	2015/11/28	NC		%	20
			Total Tin (Sn)	2015/11/28	NC		%	20
			Total Titanium (Ti)	2015/11/28	NC		%	20
			Total Uranium (U)	2015/11/28	5.1		%	20
			Total Vanadium (V)	2015/11/28	NC		%	20
			Total Zinc (Zn)	2015/11/28	NC		%	20
8128373	JHC	Matrix Spike	Total Barium (Ba)	2015/11/28		91	%	80 - 120
			Total Boron (B)	2015/11/28		95	%	80 - 120
			Total Calcium (Ca)	2015/11/28		NC	%	80 - 120
			Total Iron (Fe)	2015/11/28		87	%	80 - 120
			Total Lithium (Li)	2015/11/28		100	%	80 - 120
			Total Magnesium (Mg)	2015/11/28		NC	%	80 - 120
			Total Manganese (Mn)	2015/11/28		93	%	80 - 120
			Total Phosphorus (P)	2015/11/28		96	%	80 - 120
			Total Potassium (K)	2015/11/28		99	%	80 - 120
			Total Silicon (Si)	2015/11/28		85	%	80 - 120
			Total Sodium (Na)	2015/11/28		93	%	80 - 120
			Total Strontium (Sr)	2015/11/28		90	%	80 - 120
8128373	JHC	Spiked Blank	Total Barium (Ba)	2015/11/28		96	%	80 - 120
			Total Boron (B)	2015/11/28		98	%	80 - 120
			Total Calcium (Ca)	2015/11/28		100	%	80 - 120
			Total Iron (Fe)	2015/11/28		95	%	80 - 120
			Total Lithium (Li)	2015/11/28		103	%	80 - 120
			Total Magnesium (Mg)	2015/11/28		101	%	80 - 120
			Total Manganese (Mn)	2015/11/28		98	%	80 - 120
			Total Phosphorus (P)	2015/11/28		99	%	80 - 120
			Total Potassium (K)	2015/11/28		99	%	80 - 120
			Total Silicon (Si)	2015/11/28		90	%	80 - 120
			Total Sodium (Na)	2015/11/28		95	%	80 - 120
			Total Strontium (Sr)	2015/11/28		100	%	80 - 120
8128373	JHC	Method Blank	Total Barium (Ba)	2015/11/28	<0.010		mg/L	
			Total Boron (B)	2015/11/28	<0.020		mg/L	
			Total Calcium (Ca)	2015/11/28	<0.30		mg/L	
			Total Iron (Fe)	2015/11/28	<0.060		mg/L	
			Total Lithium (Li)	2015/11/28	<0.020		mg/L	
			Total Magnesium (Mg)	2015/11/28	<0.20		mg/L	
			Total Manganese (Mn)	2015/11/28	<0.0040		mg/L	
			Total Phosphorus (P)	2015/11/28	<0.10		mg/L	

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A6102
Report Date: 2015/12/07

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Potassium (K)	2015/11/28	<0.30		mg/L	
			Total Silicon (Si)	2015/11/28	<0.10		mg/L	
			Total Sodium (Na)	2015/11/28	<0.50		mg/L	
			Total Strontium (Sr)	2015/11/28	<0.020		mg/L	
			Total Sulphur (S)	2015/11/28	<0.20		mg/L	
8128373	JHC	RPD [NS8666-02]	Total Barium (Ba)	2015/11/28	1.7		%	20
			Total Boron (B)	2015/11/28	NC		%	20
			Total Calcium (Ca)	2015/11/28	0.74		%	20
			Total Iron (Fe)	2015/11/28	NC		%	20
			Total Lithium (Li)	2015/11/28	NC		%	20
			Total Magnesium (Mg)	2015/11/28	1.4		%	20
			Total Manganese (Mn)	2015/11/28	NC		%	20
			Total Phosphorus (P)	2015/11/28	NC		%	20
			Total Potassium (K)	2015/11/28	NC		%	20
			Total Silicon (Si)	2015/11/28	1.4		%	20
			Total Sodium (Na)	2015/11/28	0.92		%	20
			Total Strontium (Sr)	2015/11/28	1.3		%	20
			Total Sulphur (S)	2015/11/28	0.24		%	20
8128402	JHC	Matrix Spike	Dissolved Calcium (Ca)	2015/11/28		97	%	80 - 120
			Dissolved Iron (Fe)	2015/11/28		89	%	80 - 120
			Dissolved Magnesium (Mg)	2015/11/28		98	%	80 - 120
			Dissolved Manganese (Mn)	2015/11/28		92	%	80 - 120
			Dissolved Potassium (K)	2015/11/28		98	%	80 - 120
			Dissolved Sodium (Na)	2015/11/28		94	%	80 - 120
8128402	JHC	Spiked Blank	Dissolved Calcium (Ca)	2015/11/28		105	%	80 - 120
			Dissolved Iron (Fe)	2015/11/28		97	%	80 - 120
			Dissolved Magnesium (Mg)	2015/11/28		104	%	80 - 120
			Dissolved Manganese (Mn)	2015/11/28		101	%	80 - 120
			Dissolved Potassium (K)	2015/11/28		101	%	80 - 120
			Dissolved Sodium (Na)	2015/11/28		97	%	80 - 120
8128402	JHC	Method Blank	Dissolved Calcium (Ca)	2015/11/28	<0.30		mg/L	
			Dissolved Iron (Fe)	2015/11/28	<0.060		mg/L	
			Dissolved Magnesium (Mg)	2015/11/28	<0.20		mg/L	
			Dissolved Manganese (Mn)	2015/11/28	<0.0040		mg/L	
			Dissolved Potassium (K)	2015/11/28	<0.30		mg/L	
			Dissolved Sodium (Na)	2015/11/28	<0.50		mg/L	
8128402	JHC	RPD	Dissolved Calcium (Ca)	2015/11/28	NC		%	20
			Dissolved Iron (Fe)	2015/11/28	NC		%	20
			Dissolved Magnesium (Mg)	2015/11/28	NC		%	20
			Dissolved Manganese (Mn)	2015/11/28	NC		%	20
			Dissolved Potassium (K)	2015/11/28	NC		%	20
			Dissolved Sodium (Na)	2015/11/28	NC		%	20
8128855	SRT	Matrix Spike	Dissolved Barium (Ba)	2015/12/02		82	%	80 - 120
			Dissolved Boron (B)	2015/12/02		89	%	80 - 120
			Dissolved Calcium (Ca)	2015/12/02		NC	%	80 - 120
			Dissolved Iron (Fe)	2015/12/02		89	%	80 - 120
			Dissolved Lithium (Li)	2015/12/02		91	%	80 - 120
			Dissolved Magnesium (Mg)	2015/12/02		NC	%	80 - 120
			Dissolved Manganese (Mn)	2015/12/02		NC	%	80 - 120
			Dissolved Phosphorus (P)	2015/12/02		97	%	80 - 120
			Dissolved Potassium (K)	2015/12/02		95	%	80 - 120
			Dissolved Silicon (Si)	2015/12/02		82	%	80 - 120

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A6102
Report Date: 2015/12/07

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Sodium (Na)	2015/12/02		NC	%	80 - 120
			Dissolved Strontium (Sr)	2015/12/02		NC	%	80 - 120
8128855	SRT	Spiked Blank	Dissolved Barium (Ba)	2015/12/01		88	%	80 - 120
			Dissolved Boron (B)	2015/12/01		91	%	80 - 120
			Dissolved Calcium (Ca)	2015/12/01		94	%	80 - 120
			Dissolved Iron (Fe)	2015/12/01		88	%	80 - 120
			Dissolved Lithium (Li)	2015/12/01		93	%	80 - 120
			Dissolved Magnesium (Mg)	2015/12/01		97	%	80 - 120
			Dissolved Manganese (Mn)	2015/12/01		95	%	80 - 120
			Dissolved Phosphorus (P)	2015/12/01		95	%	80 - 120
			Dissolved Potassium (K)	2015/12/01		95	%	80 - 120
			Dissolved Silicon (Si)	2015/12/01		89	%	80 - 120
			Dissolved Sodium (Na)	2015/12/01		91	%	80 - 120
			Dissolved Strontium (Sr)	2015/12/01		91	%	80 - 120
8128855	SRT	Method Blank	Dissolved Barium (Ba)	2015/12/02	<0.010		mg/L	
			Dissolved Boron (B)	2015/12/02	<0.020		mg/L	
			Dissolved Calcium (Ca)	2015/12/02	<0.30		mg/L	
			Dissolved Iron (Fe)	2015/12/02	<0.060		mg/L	
			Dissolved Lithium (Li)	2015/12/02	<0.020		mg/L	
			Dissolved Magnesium (Mg)	2015/12/02	<0.20		mg/L	
			Dissolved Manganese (Mn)	2015/12/02	<0.0040		mg/L	
			Dissolved Phosphorus (P)	2015/12/02	<0.10		mg/L	
			Dissolved Potassium (K)	2015/12/02	<0.30		mg/L	
			Dissolved Silicon (Si)	2015/12/02	<0.10		mg/L	
			Dissolved Sodium (Na)	2015/12/02	<0.50		mg/L	
			Dissolved Strontium (Sr)	2015/12/02	<0.020		mg/L	
			Dissolved Sulphur (S)	2015/12/02	<0.20		mg/L	
8128855	SRT	RPD	Dissolved Barium (Ba)	2015/12/01	NC		%	20
			Dissolved Boron (B)	2015/12/01	1.2		%	20
			Dissolved Calcium (Ca)	2015/12/01	0.48		%	20
			Dissolved Iron (Fe)	2015/12/01	0.22		%	20
			Dissolved Lithium (Li)	2015/12/01	0.89		%	20
			Dissolved Magnesium (Mg)	2015/12/01	0.43		%	20
			Dissolved Manganese (Mn)	2015/12/01	0.32		%	20
			Dissolved Phosphorus (P)	2015/12/01	NC		%	20
			Dissolved Potassium (K)	2015/12/01	0.75		%	20
			Dissolved Silicon (Si)	2015/12/01	0.49		%	20
			Dissolved Sodium (Na)	2015/12/01	0.97		%	20
			Dissolved Strontium (Sr)	2015/12/01	0.42		%	20
			Dissolved Sulphur (S)	2015/12/01	0.40		%	20
8128955	JH0	Matrix Spike	Dissolved Chloride (Cl)	2015/11/29		NC	%	80 - 120
8128955	JH0	Spiked Blank	Dissolved Chloride (Cl)	2015/11/29		105	%	80 - 120
8128955	JH0	Method Blank	Dissolved Chloride (Cl)	2015/11/29	<1.0		mg/L	
8128955	JH0	RPD	Dissolved Chloride (Cl)	2015/11/29	0.54		%	20
8128957	JH0	Matrix Spike	Dissolved Sulphate (SO4)	2015/11/29		NC	%	80 - 120
8128957	JH0	Spiked Blank	Dissolved Sulphate (SO4)	2015/11/29		101	%	80 - 120
8128957	JH0	Method Blank	Dissolved Sulphate (SO4)	2015/11/29	<1.0		mg/L	
8128957	JH0	RPD	Dissolved Sulphate (SO4)	2015/11/29	1.8		%	20
8128963	XLI	Spiked Blank	Alkalinity (Total as CaCO3)	2015/11/29		91	%	80 - 120
8128963	XLI	Method Blank	Alkalinity (PP as CaCO3)	2015/11/29	<0.50		mg/L	
			Alkalinity (Total as CaCO3)	2015/11/29	<0.50		mg/L	
			Bicarbonate (HCO3)	2015/11/29	<0.50		mg/L	

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A6102
Report Date: 2015/12/07

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Carbonate (CO3)	2015/11/29	<0.50		mg/L	
			Hydroxide (OH)	2015/11/29	<0.50		mg/L	
8128963	XLI	RPD	Alkalinity (PP as CaCO3)	2015/11/29	NC		%	20
			Alkalinity (Total as CaCO3)	2015/11/29	1.0		%	20
			Bicarbonate (HCO3)	2015/11/29	1.0		%	20
			Carbonate (CO3)	2015/11/29	NC		%	20
			Hydroxide (OH)	2015/11/29	NC		%	20
8128964	LZ3	Matrix Spike	D10-ANTHRACENE (sur.)	2015/11/30		125	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2015/11/30		139 (1)	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2015/11/30		116	%	50 - 130
			TERPHENYL-D14 (sur.)	2015/11/30		150 (1)	%	50 - 130
			Acenaphthene	2015/11/30		110	%	50 - 130
			Acenaphthylene	2015/11/30		97	%	50 - 130
			Acridine	2015/11/30		85	%	50 - 130
			Anthracene	2015/11/30		95	%	50 - 130
			Benzo(a)anthracene	2015/11/30		110	%	50 - 130
			Benzo(b&j)fluoranthene	2015/11/30		95	%	50 - 130
			Benzo(k)fluoranthene	2015/11/30		106	%	50 - 130
			Benzo(g,h,i)perylene	2015/11/30		100	%	50 - 130
			Benzo(c)phenanthrene	2015/11/30		110	%	50 - 130
			Benzo(a)pyrene	2015/11/30		102	%	50 - 130
			Benzo[e]pyrene	2015/11/30		106	%	50 - 130
			Chrysene	2015/11/30		108	%	50 - 130
			Dibenz(a,h)anthracene	2015/11/30		105	%	50 - 130
			Fluoranthene	2015/11/30		107	%	50 - 130
			Fluorene	2015/11/30		113	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2015/11/30		104	%	50 - 130
			2-Methylnaphthalene	2015/11/30		80	%	50 - 130
			Naphthalene	2015/11/30		66	%	50 - 130
			Phenanthrene	2015/11/30		90	%	50 - 130
			Perylene	2015/11/30		100	%	50 - 130
			Pyrene	2015/11/30		106	%	50 - 130
			Quinoline	2015/11/30		65	%	50 - 130
8128964	LZ3	Spiked Blank	D10-ANTHRACENE (sur.)	2015/11/30		95	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2015/11/30		111	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2015/11/30		82	%	50 - 130
			TERPHENYL-D14 (sur.)	2015/11/30		119	%	50 - 130
			Acenaphthene	2015/11/30		107	%	50 - 130
			Acenaphthylene	2015/11/30		98	%	50 - 130
			Acridine	2015/11/30		97	%	50 - 130
			Anthracene	2015/11/30		96	%	50 - 130
			Benzo(a)anthracene	2015/11/30		113	%	50 - 130
			Benzo(b&j)fluoranthene	2015/11/30		101	%	50 - 130
			Benzo(k)fluoranthene	2015/11/30		110	%	50 - 130
			Benzo(g,h,i)perylene	2015/11/30		107	%	50 - 130
			Benzo(c)phenanthrene	2015/11/30		114	%	50 - 130
			Benzo(a)pyrene	2015/11/30		108	%	50 - 130
			Benzo[e]pyrene	2015/11/30		112	%	50 - 130
			Chrysene	2015/11/30		114	%	50 - 130
			Dibenz(a,h)anthracene	2015/11/30		110	%	50 - 130
			Fluoranthene	2015/11/30		112	%	50 - 130
			Fluorene	2015/11/30		113	%	50 - 130

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A6102
Report Date: 2015/12/07

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Indeno(1,2,3-cd)pyrene	2015/11/30		112	%	50 - 130
			2-Methylnaphthalene	2015/11/30		76	%	50 - 130
			Naphthalene	2015/11/30		81	%	50 - 130
			Phenanthrene	2015/11/30		94	%	50 - 130
			Perylene	2015/11/30		106	%	50 - 130
			Pyrene	2015/11/30		112	%	50 - 130
			Quinoline	2015/11/30		116	%	50 - 130
8128964	LZ3	Method Blank	D10-ANTHRACENE (sur.)	2015/11/30		117	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2015/11/30		128	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2015/11/30		106	%	50 - 130
			TERPHENYL-D14 (sur.)	2015/11/30		141 (1)		50 - 130
			Acenaphthene	2015/11/30	<0.10		ug/L	
			Acenaphthylene	2015/11/30	<0.10		ug/L	
			Acridine	2015/11/30	<0.20		ug/L	
			Anthracene	2015/11/30	<0.010		ug/L	
			Benzo(a)anthracene	2015/11/30	<0.0085		ug/L	
			Benzo(b&j)fluoranthene	2015/11/30	<0.0085		ug/L	
			Benzo(k)fluoranthene	2015/11/30	<0.0085		ug/L	
			Benzo(g,h,i)perylene	2015/11/30	<0.0085		ug/L	
			Benzo(c)phenanthrene	2015/11/30	<0.050		ug/L	
			Benzo(a)pyrene	2015/11/30	<0.0075		ug/L	
			Benzo[e]pyrene	2015/11/30	<0.050		ug/L	
			Chrysene	2015/11/30	<0.0085		ug/L	
			Dibenz(a,h)anthracene	2015/11/30	<0.0075		ug/L	
			Fluoranthene	2015/11/30	<0.010		ug/L	
			Fluorene	2015/11/30	<0.050		ug/L	
			Indeno(1,2,3-cd)pyrene	2015/11/30	<0.0085		ug/L	
			2-Methylnaphthalene	2015/11/30	<0.10		ug/L	
			Naphthalene	2015/11/30	<0.10		ug/L	
			Phenanthrene	2015/11/30	<0.050		ug/L	
			Perylene	2015/11/30	<0.050		ug/L	
			Pyrene	2015/11/30	<0.020		ug/L	
			Quinoline	2015/11/30	<0.20		ug/L	
8128964	LZ3	RPD	Acenaphthene	2015/11/30	NC		%	40
			Acenaphthylene	2015/11/30	NC		%	40
			Acridine	2015/11/30	NC		%	40
			Anthracene	2015/11/30	NC		%	40
			Benzo(a)anthracene	2015/11/30	NC		%	40
			Benzo(b&j)fluoranthene	2015/11/30	NC		%	40
			Benzo(k)fluoranthene	2015/11/30	NC		%	40
			Benzo(g,h,i)perylene	2015/11/30	NC		%	40
			Benzo(c)phenanthrene	2015/11/30	NC		%	40
			Benzo(a)pyrene	2015/11/30	NC		%	40
			Benzo[e]pyrene	2015/11/30	NC		%	40
			Chrysene	2015/11/30	NC		%	40
			Dibenz(a,h)anthracene	2015/11/30	NC		%	40
			Fluoranthene	2015/11/30	NC		%	40
			Fluorene	2015/11/30	NC		%	40
			Indeno(1,2,3-cd)pyrene	2015/11/30	NC		%	40
			2-Methylnaphthalene	2015/11/30	NC		%	40
			Naphthalene	2015/11/30	NC		%	40
			Phenanthrene	2015/11/30	NC		%	40

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A6102
Report Date: 2015/12/07

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Perylene	2015/11/30	NC		%	40
			Pyrene	2015/11/30	NC		%	40
			Quinoline	2015/11/30	NC		%	40
8128965	XLI	Spiked Blank	pH	2015/11/29		100	%	97 - 103
8128965	XLI	RPD	pH	2015/11/29	0.41		%	N/A
8128966	XLI	Spiked Blank	Conductivity	2015/11/29		101	%	90 - 110
8128966	XLI	Method Blank	Conductivity	2015/11/29	<1.0		uS/cm	
8128966	XLI	RPD	Conductivity	2015/11/29	0		%	20
8128968	XLI	Spiked Blank	Alkalinity (Total as CaCO3)	2015/11/30		89	%	80 - 120
8128968	XLI	Method Blank	Alkalinity (PP as CaCO3)	2015/11/30	<0.50		mg/L	
			Alkalinity (Total as CaCO3)	2015/11/30	<0.50		mg/L	
			Bicarbonate (HCO3)	2015/11/30	<0.50		mg/L	
			Carbonate (CO3)	2015/11/30	<0.50		mg/L	
			Hydroxide (OH)	2015/11/30	<0.50		mg/L	
8128968	XLI	RPD	Alkalinity (PP as CaCO3)	2015/11/30	NC		%	20
			Alkalinity (Total as CaCO3)	2015/11/30	2.1		%	20
			Bicarbonate (HCO3)	2015/11/30	2.1		%	20
			Carbonate (CO3)	2015/11/30	NC		%	20
			Hydroxide (OH)	2015/11/30	NC		%	20
8128970	XLI	Spiked Blank	pH	2015/11/30		100	%	97 - 103
8128970	XLI	RPD	pH	2015/11/30	0.19		%	N/A
8128971	XLI	Spiked Blank	Conductivity	2015/11/30		101	%	90 - 110
8128971	XLI	Method Blank	Conductivity	2015/11/30	<1.0		uS/cm	
8128971	XLI	RPD	Conductivity	2015/11/30	0.42		%	20
8129376	PC5	Matrix Spike	Dissolved Aluminum (Al)	2015/11/30		93	%	80 - 120
			Dissolved Antimony (Sb)	2015/11/30		81	%	80 - 120
			Dissolved Arsenic (As)	2015/11/30		92	%	80 - 120
			Dissolved Beryllium (Be)	2015/11/30		102	%	80 - 120
			Dissolved Chromium (Cr)	2015/11/30		93	%	80 - 120
			Dissolved Cobalt (Co)	2015/11/30		90	%	80 - 120
			Dissolved Copper (Cu)	2015/11/30		88	%	80 - 120
			Dissolved Lead (Pb)	2015/11/30		91	%	80 - 120
			Dissolved Molybdenum (Mo)	2015/11/30		105	%	80 - 120
			Dissolved Nickel (Ni)	2015/11/30		89	%	80 - 120
			Dissolved Selenium (Se)	2015/11/30		96	%	80 - 120
			Dissolved Silver (Ag)	2015/11/30		94	%	80 - 120
			Dissolved Thallium (Tl)	2015/11/30		89	%	80 - 120
			Dissolved Tin (Sn)	2015/11/30		104	%	80 - 120
			Dissolved Titanium (Ti)	2015/11/30		95	%	80 - 120
			Dissolved Uranium (U)	2015/11/30		NC	%	80 - 120
			Dissolved Vanadium (V)	2015/11/30		98	%	80 - 120
			Dissolved Zinc (Zn)	2015/11/30		80	%	80 - 120
8129376	PC5	Spiked Blank	Dissolved Aluminum (Al)	2015/11/30		99	%	80 - 120
			Dissolved Antimony (Sb)	2015/11/30		106	%	80 - 120
			Dissolved Arsenic (As)	2015/11/30		108	%	80 - 120
			Dissolved Beryllium (Be)	2015/11/30		118	%	80 - 120
			Dissolved Chromium (Cr)	2015/11/30		107	%	80 - 120
			Dissolved Cobalt (Co)	2015/11/30		104	%	80 - 120
			Dissolved Copper (Cu)	2015/11/30		104	%	80 - 120
			Dissolved Lead (Pb)	2015/11/30		106	%	80 - 120
			Dissolved Molybdenum (Mo)	2015/11/30		109	%	80 - 120
			Dissolved Nickel (Ni)	2015/11/30		103	%	80 - 120

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A6102
Report Date: 2015/12/07

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Selenium (Se)	2015/11/30		111	%	80 - 120
			Dissolved Silver (Ag)	2015/11/30		106	%	80 - 120
			Dissolved Thallium (Tl)	2015/11/30		106	%	80 - 120
			Dissolved Tin (Sn)	2015/11/30		104	%	80 - 120
			Dissolved Titanium (Ti)	2015/11/30		101	%	80 - 120
			Dissolved Uranium (U)	2015/11/30		104	%	80 - 120
			Dissolved Vanadium (V)	2015/11/30		109	%	80 - 120
			Dissolved Zinc (Zn)	2015/11/30		105	%	80 - 120
8129376	PC5	Method Blank	Dissolved Aluminum (Al)	2015/11/30	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2015/11/30	<0.00060		mg/L	
			Dissolved Arsenic (As)	2015/11/30	<0.00020		mg/L	
			Dissolved Beryllium (Be)	2015/11/30	<0.0010		mg/L	
			Dissolved Chromium (Cr)	2015/11/30	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2015/11/30	<0.00030		mg/L	
			Dissolved Copper (Cu)	2015/11/30	<0.00020		mg/L	
			Dissolved Lead (Pb)	2015/11/30	<0.00020		mg/L	
			Dissolved Molybdenum (Mo)	2015/11/30	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2015/11/30	<0.00050		mg/L	
			Dissolved Selenium (Se)	2015/11/30	<0.00020		mg/L	
			Dissolved Silver (Ag)	2015/11/30	<0.00010		mg/L	
			Dissolved Thallium (Tl)	2015/11/30	<0.00020		mg/L	
			Dissolved Tin (Sn)	2015/11/30	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2015/11/30	<0.0010		mg/L	
			Dissolved Uranium (U)	2015/11/30	<0.00010		mg/L	
			Dissolved Vanadium (V)	2015/11/30	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2015/11/30	<0.0030		mg/L	
8129376	PC5	RPD	Dissolved Aluminum (Al)	2015/11/30	NC		%	20
			Dissolved Antimony (Sb)	2015/11/30	NC		%	20
			Dissolved Arsenic (As)	2015/11/30	NC		%	20
			Dissolved Beryllium (Be)	2015/11/30	NC		%	20
			Dissolved Chromium (Cr)	2015/11/30	NC		%	20
			Dissolved Cobalt (Co)	2015/11/30	0.23		%	20
			Dissolved Copper (Cu)	2015/11/30	1.6		%	20
			Dissolved Lead (Pb)	2015/11/30	NC		%	20
			Dissolved Molybdenum (Mo)	2015/11/30	0.071		%	20
			Dissolved Nickel (Ni)	2015/11/30	7.4		%	20
			Dissolved Selenium (Se)	2015/11/30	NC		%	20
			Dissolved Silver (Ag)	2015/11/30	NC		%	20
			Dissolved Thallium (Tl)	2015/11/30	NC		%	20
			Dissolved Tin (Sn)	2015/11/30	NC		%	20
			Dissolved Titanium (Ti)	2015/11/30	NC		%	20
			Dissolved Uranium (U)	2015/11/30	2.2		%	20
			Dissolved Vanadium (V)	2015/11/30	NC		%	20
			Dissolved Zinc (Zn)	2015/11/30	NC		%	20
8130008	NW4	Matrix Spike	Dissolved Nitrite (N)	2015/12/01		102	%	80 - 120
			Dissolved Nitrate (N)	2015/12/01		NC	%	80 - 120
8130008	NW4	Spiked Blank	Dissolved Nitrite (N)	2015/12/01		100	%	80 - 120
			Dissolved Nitrate (N)	2015/12/01		102	%	80 - 120
8130008	NW4	Method Blank	Dissolved Nitrite (N)	2015/12/01	<0.010		mg/L	
			Dissolved Nitrate (N)	2015/12/01	<0.010		mg/L	
8130008	NW4	RPD	Dissolved Nitrite (N)	2015/12/01	NC		%	20

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A6102
Report Date: 2015/12/07

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Nitrate (N)	2015/12/01	1.3		%	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

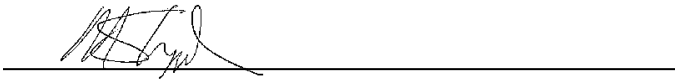
Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B5A6102
Report Date: 2015/12/07

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: BAR U RANCH
Sampler Initials: JF

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Michael Sheppard, Senior Scientific Specialist

Harry (Peng) Liang, Senior Analyst

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam

Calgary: 4000 19st St. NE, T2E 6P8. Ph: (403) 291-3077, Fax: (403) 735-2240, Toll free: (800) 386-7247
Edmonton: 9331 - 48 Street, T6B 2R4. Ph: (780) 577-7100, Fax: (780) 450-4187, Toll free: (877) 465-8889
www.maxxamanalytics.com

998

Chain of Custody A204483

Page: 1 of 1

	Invoice To:	C/O Report Address ☐
Company:	Golder Associates	
Contact:	Steven Fiddler	
Address:	16820-107 Avenue	
	Prov: Edmonton, AB T5P 4C3	
Contact #s:	Ph: 780-483-3499 / 780-984-6000	

Report To:	Same as Invoice ☒
Prov:	PC:
Ph:	Cell:

Report Distribution (E-Mail):
sfiddler@golder.com
CSH dataquality@golder.com

REGULATORY GUIDELINES:
☐ AT1
☒ CCME
☐ Regulated Drinking Water
☐ Other:

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.

PO #:
Project # / Name: 1526784, Bar U Groundwater Sampling
Site Location: Bar U Ranch
Quote #: Golder 2015
Sampled By: J. Fournier

SERVICE REQUESTED: ☐ **RUSH** (Contact lab to reserve) Date Required: ☒ REGULAR (5 to 7 Days)

See reverse for package specifics

	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	SOIL: BTEX F1-F4	Sieve (75 micron)	Regulated Metals (CCME / AT1)	Salinity 4	Assessment ICP Metals	Basic Class II Landfill	WATER: ☐VOCs	☐BTEX F1-F2	☐BTEX F1-F4	☒ Routine Water ☐ Turb ☐ F	☐ TOC ☐ DOC	Regulated Metals (CCME / AT1): Total	Dissolved	Mercury	☐ Total ☐ Dissolved	Other Analysis: PAH's	HOLD - Do not Analyze	# of Containers Submitted
1	SW15-01		W	15-11-27 1220										X		X				X		4
2	SW15-02		W	1240										X		X				X		4
3	GMW18		GW	1325										X			X			X		5
4																						
5																						
6																						
7																						
8																						
9																						
10																						
11																						
12																						

27-Nov-15 15:33
Desirae Hopkinson
B5A6102
FL5 INS-0026

Please indicate Filtered, Preserved or Both (F, P, F/P) → F/P

Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):
Julie Fournier / Julie Fournier	15-11-27	1530
Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):

Special Instructions: preserved and/or filtered & preserved where required.

# of Jars Used & Not Submitted

LAB USE ONLY

Received By:	Date:	Time:	Maxxam Job #:		
OMRAN DESOUKI	2015/11/27	15:33	Custody Seal	Temperature	Ice
Lab Comments:			Y	5/1/1	Y

Your Project #: 1526784
Site#: 1526784
Site Location: 2000, BAR U RANCH
Your C.O.C. #: M000186

Attention:Steven Fiddler

GOLDER ASSOCIATES LTD
16820-107 AVE
EDMONTON, AB
CANADA T5P 4C3

Report Date: 2015/07/23
Report #: R2002400
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B558674
Received: 2015/07/10, 18:41

Sample Matrix: Water
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	8	N/A	2015/07/14	AB SOP-00005	SM 22 2320 B m
BTEX/F1 in Water by HS GC/MS/FID	8	N/A	2015/07/14	AB SOP-00039	CCME CWS/EPA 8260C m
Cadmium - low level CCME - Dissolved	8	N/A	2015/07/15	AB WI-00065	Auto Calc
Cadmium - low level CCME (Total)	8	2015/07/12	2015/07/16	AB WI-00065	Auto Calc
Chloride by Automated Colourimetry	8	N/A	2015/07/16	AB SOP-00020	SM 22-4500-Cl G m
Conductivity @25C	8	N/A	2015/07/14	AB SOP-00005	SM 22 2510 B m
OC Pesticdes/PCB Water - Subcontract (1)	8	N/A	2015/07/22		
CCME Hydrocarbons in Water (F2; C10-C16)	8	2015/07/14	2015/07/14	AB SOP-00040 AB SOP-00037	CCME PHC-CWS m
Hardness	8	N/A	2015/07/17	AB WI-00065	Auto Calc
Elements by ICP - Dissolved	8	N/A	2015/07/15	AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICP - Total	8	2015/07/14	2015/07/15	AB SOP-00014 / AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICPMS - Dissolved	8	N/A	2015/07/14	AB SOP-00043	EPA 200.8 R5.4 m
Elements by ICPMS - Total	8	2015/07/14	2015/07/14	AB SOP-00014 / AB SOP-00043	EPA 200.8 R5.4 m
Ion Balance	8	N/A	2015/07/15	AB WI-00065	Auto Calc
Sum of cations, anions	8	N/A	2015/07/17	AB WI-00065	Auto Calc
Nitrate and Nitrite	5	N/A	2015/07/15	AB WI-00065	Auto Calc
Nitrate and Nitrite	3	N/A	2015/07/16	AB WI-00065	Auto Calc
Nitrate + Nitrite-N (calculated)	5	N/A	2015/07/15	AB WI-00065	Auto Calc
Nitrate + Nitrite-N (calculated)	3	N/A	2015/07/16	AB WI-00065	Auto Calc
Nitrogen, (Nitrite, Nitrate) by IC	5	N/A	2015/07/14	AB SOP-00023	SM 22 4110 B m
Nitrogen, (Nitrite, Nitrate) by IC	1	N/A	2015/07/15	AB SOP-00023	SM 22 4110 B m
Nitrogen, (Nitrite, Nitrate) by IC	2	N/A	2015/07/16	AB SOP-00023	SM 22 4110 B m
Benzo[a]pyrene Equivalency (2)	8	N/A	2015/07/15	AB SOP-00003	Auto Calc
PAH in Water by GC/MS	7	2015/07/14	2015/07/14	AB SOP-00037 / AB SOP-00003	EPA 8270D m
PAH in Water by GC/MS	1	2015/07/14	2015/07/15	AB SOP-00037 / AB SOP-00003	EPA 8270D m
pH @25°C (Alkalinity titrator)	8	N/A	2015/07/14	AB SOP-00005	SM 22 4500-H+B m

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Your Project #: 1526784
Site#: 1526784
Site Location: 2000, BAR U RANCH
Your C.O.C. #: M000186

Attention:Steven Fiddler

GOLDER ASSOCIATES LTD
16820-107 AVE
EDMONTON, AB
CANADA T5P 4C3

Report Date: 2015/07/23
Report #: R2002400
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B558674
Received: 2015/07/10, 18:41

Sample Matrix: Water
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Sulphate by Automated Colourimetry	8	N/A	2015/07/17	AB SOP-00018	SM 22 4500-SO4 E m
Total Dissolved Solids (Calculated)	8	N/A	2015/07/17	AB WI-00065	Auto Calc
Total Trihalomethanes Calculation	7	N/A	2015/07/15	CAL SOP-00104	Auto Calc
Total Trihalomethanes Calculation	1	N/A	2015/07/17	CAL SOP-00104	Auto Calc
VOCs in Water by HS GC/MS (Std List)	7	N/A	2015/07/15	AB SOP-00056	EPA 8260C / 5021A m
VOCs in Water by HS GC/MS (Std List)	1	N/A	2015/07/16	AB SOP-00056	EPA 8260C / 5021A m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Ontario (From Calgary)
(2) B[a]P TPE is calculated using 1/2 of the RDL for non detect results as per Alberta Environment instructions. This protocol may not apply in other jurisdictions.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Alexander Dobbie, Project Manager
Email: ADobbie@maxxam.ca
Phone# (780)577-7116

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		MQ2961	MQ2961			MQ2962	MQ2962		
Sampling Date		2015/07/09	2015/07/09			2015/07/09	2015/07/09		
COC Number		M000186	M000186			M000186	M000186		
	Units	DUP15-01	DUP15-01 Lab-Dup	RDL	QC Batch	DUP15-02	DUP15-02 Lab-Dup	RDL	QC Batch
Parameter									
Subcontract Parameter	N/A	ATTACHED	N/A	N/A	7977888	ATTACHED	N/A	N/A	7977888
Calculated Parameters									
Anion Sum	meq/L	68	N/A	N/A	7964087	0.0000	N/A	N/A	7964087
Cation Sum	meq/L	58	N/A	N/A	7964087	0.0030	N/A	N/A	7964087
Hardness (CaCO3)	mg/L	2100	N/A	0.50	7964085	<0.50	N/A	0.50	7964085
Ion Balance	N/A	0.85	N/A	0.010	7964086	NC	N/A	0.010	7964086
Dissolved Nitrate (NO3)	mg/L	0.21	N/A	0.044	7964088	<0.044	N/A	0.044	7964088
Nitrate plus Nitrite (N)	mg/L	0.047	N/A	0.020	7964089	<0.020	N/A	0.020	7964089
Dissolved Nitrite (NO2)	mg/L	<0.033	N/A	0.033	7964088	<0.033	N/A	0.033	7964088
Total Dissolved Solids	mg/L	4100	N/A	10	7964091	<10	N/A	10	7964091
Misc. Inorganics									
Conductivity	uS/cm	4500	N/A	1.0	7966649	<1.0	N/A	1.0	7966649
pH	pH	7.74	N/A	N/A	7966650	5.49	N/A	N/A	7966650
Low Level Elements									
Dissolved Cadmium (Cd)	ug/L	0.054	N/A	0.020	7964173	<0.020	N/A	0.020	7964173
Total Cadmium (Cd)	ug/L	4.8	N/A	0.020	7964167	<0.020	N/A	0.020	7964167
Anions									
Alkalinity (PP as CaCO3)	mg/L	<0.50	N/A	0.50	7966643	<0.50	N/A	0.50	7966643
Alkalinity (Total as CaCO3)	mg/L	550	N/A	0.50	7966643	<0.50	N/A	0.50	7966643
Bicarbonate (HCO3)	mg/L	670	N/A	0.50	7966643	<0.50	N/A	0.50	7966643
Carbonate (CO3)	mg/L	<0.50	N/A	0.50	7966643	<0.50	N/A	0.50	7966643
Hydroxide (OH)	mg/L	<0.50	N/A	0.50	7966643	<0.50	N/A	0.50	7966643
Dissolved Sulphate (SO4)	mg/L	2700 (1)	N/A	20	7969634	<1.0	N/A	1.0	7969634
Dissolved Chloride (Cl)	mg/L	13	N/A	1.0	7969633	<1.0	N/A	1.0	7969633
Nutrients									
Dissolved Nitrite (N)	mg/L	<0.010	<0.010	0.010	7966366	<0.010	<0.010	0.010	7966363
Dissolved Nitrate (N)	mg/L	0.047	0.045	0.010	7966366	<0.010	<0.010	0.010	7966363

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		MQ2963	MQ2963		MQ2964			MQ2965		
Sampling Date		2015/07/09	2015/07/09		2015/07/09 15:40			2015/07/09 13:00		
COC Number		M000186	M000186		M000186			M000186		
	Units	DUP15-03	DUP15-03 Lab-Dup	RDL	MW1	RDL	QC Batch	MW7	RDL	QC Batch
Parameter										
Subcontract Parameter	N/A	ATTACHED	N/A	N/A	ATTACHED	N/A	7977888	ATTACHED	N/A	7977888
Calculated Parameters										
Anion Sum	meq/L	0.0000	N/A	N/A	68	N/A	7964087	190	N/A	7964087
Cation Sum	meq/L	0.0040	N/A	N/A	58	N/A	7964087	190	N/A	7964087
Hardness (CaCO3)	mg/L	<0.50	N/A	0.50	2100	0.50	7964085	7200	0.50	7964085
Ion Balance	N/A	NC	N/A	0.010	0.86	0.010	7964086	0.98	0.010	7964086
Dissolved Nitrate (NO3)	mg/L	<0.044	N/A	0.044	0.23	0.044	7964088	37	0.089	7964088
Nitrate plus Nitrite (N)	mg/L	<0.020	N/A	0.020	0.051	0.020	7964089	8.3	0.020	7964089
Dissolved Nitrite (NO2)	mg/L	<0.033	N/A	0.033	<0.033	0.033	7964088	<0.066	0.066	7964088
Total Dissolved Solids	mg/L	<10	N/A	10	4100	10	7964091	12000	10	7964091
Misc. Inorganics										
Conductivity	uS/cm	<1.0	N/A	1.0	4500	1.0	7966649	10000	1.0	7966649
pH	pH	5.35	N/A	N/A	7.74	N/A	7966650	7.82	N/A	7966650
Low Level Elements										
Dissolved Cadmium (Cd)	ug/L	<0.020	N/A	0.020	0.038	0.020	7964173	0.074	0.020	7964173
Total Cadmium (Cd)	ug/L	<0.020	N/A	0.020	4.7	0.020	7964167	2.7	0.020	7964167
Anions										
Alkalinity (PP as CaCO3)	mg/L	<0.50	N/A	0.50	<0.50	0.50	7966643	<0.50	0.50	7966643
Alkalinity (Total as CaCO3)	mg/L	<0.50	N/A	0.50	550	0.50	7966643	530	0.50	7966643
Bicarbonate (HCO3)	mg/L	<0.50	N/A	0.50	670	0.50	7966643	640	0.50	7966643
Carbonate (CO3)	mg/L	<0.50	N/A	0.50	<0.50	0.50	7966643	<0.50	0.50	7966643
Hydroxide (OH)	mg/L	<0.50	N/A	0.50	<0.50	0.50	7966643	<0.50	0.50	7966643
Dissolved Sulphate (SO4)	mg/L	<1.0	<1.0	1.0	2700 (1)	20	7969634	8300 (1)	50	7969634
Dissolved Chloride (Cl)	mg/L	<1.0	<1.0	1.0	13	1.0	7969633	130	1.0	7969633
Nutrients										
Dissolved Nitrite (N)	mg/L	<0.010	N/A	0.010	<0.010	0.010	7966366	<0.020 (2)	0.020	7966363
Dissolved Nitrate (N)	mg/L	<0.010	N/A	0.010	0.051	0.010	7966366	8.3 (2)	0.020	7966363

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Detection limits raised due to matrix interference.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		MQ2966			MQ2967			MQ2968		
Sampling Date		2015/07/09 14:50			2015/07/09 14:30			2015/07/10 16:10		
COC Number		M000186			M000186			M000186		
	Units	MW8	RDL	QC Batch	MW9	RDL	QC Batch	MW12	RDL	QC Batch
Parameter										
Subcontract Parameter	N/A	ATTACHED	N/A	7977888	ATTACHED	N/A	7977888	ATTACHED	N/A	7977888
Calculated Parameters										
Anion Sum	meq/L	180	N/A	7964087	45	N/A	7964087	35	N/A	7964087
Cation Sum	meq/L	190	N/A	7964087	40	N/A	7964087	33	N/A	7964087
Hardness (CaCO3)	mg/L	7100	0.50	7964085	1700	0.50	7964085	1400	0.50	7964085
Ion Balance	N/A	1.0	0.010	7964086	0.88	0.010	7964086	0.94	0.010	7964086
Dissolved Nitrate (NO3)	mg/L	<0.44	0.44	7964088	0.15	0.044	7964088	0.12	0.089	7965390
Nitrate plus Nitrite (N)	mg/L	<0.020	0.020	7964089	0.034	0.020	7964089	0.027	0.020	7965391
Dissolved Nitrite (NO2)	mg/L	<0.33	0.33	7964088	<0.033	0.033	7964088	<0.066	0.066	7965390
Total Dissolved Solids	mg/L	11000	10	7964091	2500	10	7964091	2100	10	7964091
Misc. Inorganics										
Conductivity	uS/cm	9700	1.0	7966649	3100	1.0	7966649	2500	1.0	7966649
pH	pH	7.88	N/A	7966650	8.06	N/A	7966650	7.93	N/A	7966650
Low Level Elements										
Dissolved Cadmium (Cd)	ug/L	0.22	0.020	7964173	0.037	0.020	7964173	0.061	0.020	7964173
Total Cadmium (Cd)	ug/L	10	0.020	7964167	21	0.020	7964167	1.8	0.020	7964167
Anions										
Alkalinity (PP as CaCO3)	mg/L	<0.50	0.50	7966643	<0.50	0.50	7966643	<0.50	0.50	7966643
Alkalinity (Total as CaCO3)	mg/L	630	0.50	7966643	570	0.50	7966643	480	0.50	7966643
Bicarbonate (HCO3)	mg/L	770	0.50	7966643	700	0.50	7966643	590	0.50	7966643
Carbonate (CO3)	mg/L	<0.50	0.50	7966643	<0.50	0.50	7966643	<0.50	0.50	7966643
Hydroxide (OH)	mg/L	<0.50	0.50	7966643	<0.50	0.50	7966643	<0.50	0.50	7966643
Dissolved Sulphate (SO4)	mg/L	8200 (1)	50	7969634	1600 (1)	10	7969634	1200 (1)	10	7969634
Dissolved Chloride (Cl)	mg/L	9.2	1.0	7969633	27	1.0	7969633	16	1.0	7969633
Nutrients										
Dissolved Nitrite (N)	mg/L	<0.10 (2)	0.10	7966363	<0.010	0.010	7966366	<0.020 (2)	0.020	7966363
Dissolved Nitrate (N)	mg/L	<0.10 (2)	0.10	7966363	0.034	0.010	7966366	0.027 (2)	0.020	7966363

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Detection limits raised due to matrix interference.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		MQ2961	MQ2962	MQ2963	MQ2964	MQ2965	MQ2966	MQ2967		
Sampling Date		2015/07/09	2015/07/09	2015/07/09	2015/07/09 15:40	2015/07/09 13:00	2015/07/09 14:50	2015/07/09 14:30		
COC Number		M000186	M000186	M000186	M000186	M000186	M000186	M000186		
	Units	DUP15-01	DUP15-02	DUP15-03	MW1	MW7	MW8	MW9	RDL	QC Batch
Hydrocarbons										
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7965721
Surrogate Recovery (%)										
O-TERPHENYL (sur.)	%	105	100	101	100	99	100	100	N/A	7965721

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam ID		MQ2968	MQ2968		
Sampling Date		2015/07/10 16:10	2015/07/10 16:10		
COC Number		M000186	M000186		
	Units	MW12	MW12 Lab-Dup	RDL	QC Batch
Hydrocarbons					
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	0.10	7965721
Surrogate Recovery (%)					
O-TERPHENYL (sur.)	%	98	101	N/A	7965721

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

SEMIVOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		MQ2961	MQ2962	MQ2963	MQ2964	MQ2965	MQ2966		
Sampling Date		2015/07/09	2015/07/09	2015/07/09	2015/07/09 15:40	2015/07/09 13:00	2015/07/09 14:50		
COC Number		M000186	M000186	M000186	M000186	M000186	M000186		
	Units	DUP15-01	DUP15-02	DUP15-03	MW1	MW7	MW8	RDL	QC Batch
Polycyclic Aromatics									
Benzo[a]pyrene equivalency	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	7965392
Acenaphthene	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7965724
Acenaphthylene	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7965724
Acridine	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7965724
Anthracene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	7965724
Benzo(a)anthracene	ug/L	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	0.0085	7965724
Benzo(b&j)fluoranthene	ug/L	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	0.0085	7965724
Benzo(k)fluoranthene	ug/L	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	0.0085	7965724
Benzo(g,h,i)perylene	ug/L	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	0.0085	7965724
Benzo(c)phenanthrene	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7965724
Benzo(a)pyrene	ug/L	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	0.0075	7965724
Benzo[e]pyrene	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7965724
Chrysene	ug/L	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	0.0085	7965724
Dibenz(a,h)anthracene	ug/L	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	0.0075	7965724
Fluoranthene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.012	0.010	7965724
Fluorene	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7965724
Indeno(1,2,3-cd)pyrene	ug/L	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	0.0085	7965724
2-Methylnaphthalene	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7965724
Naphthalene	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7965724
Phenanthrene	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7965724
Perylene	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7965724
Pyrene	ug/L	<0.020	<0.020	<0.020	<0.020	<0.020	0.037	0.020	7965724
Quinoline	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7965724
Surrogate Recovery (%)									
D10-ANTHRACENE (sur.)	%	101	103	105	99	102	101	N/A	7965724
D12-BENZO(A)PYRENE (sur.)	%	96	100	101	91	93	89	N/A	7965724
D8-ACENAPHTHYLENE (sur.)	%	65	74	77	64	67	68	N/A	7965724
TERPHENYL-D14 (sur.)	%	115	122	120	111	115	110	N/A	7965724

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

SEMIVOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		MQ2967	MQ2968	MQ2968		
Sampling Date		2015/07/09 14:30	2015/07/10 16:10	2015/07/10 16:10		
COC Number		M000186	M000186	M000186		
	Units	MW9	MW12	MW12 Lab-Dup	RDL	QC Batch
Polycyclic Aromatics						
Benzo[a]pyrene equivalency	ug/L	<0.010	<0.010	N/A	0.010	7965392
Acenaphthene	ug/L	<0.10	<0.10	<0.10	0.10	7965724
Acenaphthylene	ug/L	<0.10	<0.10	<0.10	0.10	7965724
Acridine	ug/L	<0.20	<0.20	<0.20	0.20	7965724
Anthracene	ug/L	<0.010	<0.010	<0.010	0.010	7965724
Benzo(a)anthracene	ug/L	<0.0085	<0.0085	<0.0085	0.0085	7965724
Benzo(b&j)fluoranthene	ug/L	<0.0085	<0.0085	0.026	0.0085	7965724
Benzo(k)fluoranthene	ug/L	<0.0085	<0.0085	0.013	0.0085	7965724
Benzo(g,h,i)perylene	ug/L	<0.0085	<0.0085	0.015	0.0085	7965724
Benzo(c)phenanthrene	ug/L	<0.050	<0.050	<0.050	0.050	7965724
Benzo(a)pyrene	ug/L	<0.0075	<0.0075	0.012	0.0075	7965724
Benzo[e]pyrene	ug/L	<0.050	<0.050	<0.050	0.050	7965724
Chrysene	ug/L	<0.0085	<0.0085	0.014	0.0085	7965724
Dibenz(a,h)anthracene	ug/L	<0.0075	<0.0075	0.012	0.0075	7965724
Fluoranthene	ug/L	<0.010	0.011	0.023	0.010	7965724
Fluorene	ug/L	<0.050	<0.050	<0.050	0.050	7965724
Indeno(1,2,3-cd)pyrene	ug/L	<0.0085	<0.0085	0.013	0.0085	7965724
2-Methylnaphthalene	ug/L	<0.10	<0.10	<0.10	0.10	7965724
Naphthalene	ug/L	<0.10	<0.10	<0.10	0.10	7965724
Phenanthrene	ug/L	<0.050	0.075	0.091	0.050	7965724
Perylene	ug/L	<0.050	<0.050	<0.050	0.050	7965724
Pyrene	ug/L	<0.020	0.036	0.052	0.020	7965724
Quinoline	ug/L	<0.20	<0.20	<0.20	0.20	7965724
Surrogate Recovery (%)						
D10-ANTHRACENE (sur.)	%	101	98	102	N/A	7965724
D12-BENZO(A)PYRENE (sur.)	%	94	94	96	N/A	7965724
D8-ACENAPHTHYLENE (sur.)	%	65	64	68	N/A	7965724
TERPHENYL-D14 (sur.)	%	114	110	115	N/A	7965724

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		MQ2961		MQ2962	MQ2963		MQ2964		
Sampling Date		2015/07/09		2015/07/09	2015/07/09		2015/07/09 15:40		
COC Number		M000186		M000186	M000186		M000186		
	Units	DUP15-01	RDL	DUP15-02	DUP15-03	RDL	MW1	RDL	QC Batch
Elements									
Dissolved Aluminum (Al)	mg/L	0.0065	0.0030	0.0046	<0.0030	0.0030	0.0057	0.0030	7966206
Total Aluminum (Al)	mg/L	20	0.0030	0.0036	0.0031	0.0030	20	0.0030	7965867
Dissolved Antimony (Sb)	mg/L	<0.00060	0.00060	<0.00060	<0.00060	0.00060	<0.00060	0.00060	7966206
Total Antimony (Sb)	mg/L	0.0034	0.00060	<0.00060	<0.00060	0.00060	0.0041	0.00060	7965867
Dissolved Arsenic (As)	mg/L	0.00070	0.00020	<0.00020	<0.00020	0.00020	0.00063	0.00020	7966206
Total Arsenic (As)	mg/L	0.033	0.00020	<0.00020	<0.00020	0.00020	0.032	0.00020	7965867
Dissolved Barium (Ba)	mg/L	0.015	0.010	<0.010	<0.010	0.010	0.015	0.010	7967384
Total Barium (Ba)	mg/L	1.5	0.010	<0.010	<0.010	0.010	1.4	0.010	7965872
Dissolved Beryllium (Be)	mg/L	<0.0010	0.0010	<0.0010	<0.0010	0.0010	<0.0010	0.0010	7966206
Total Beryllium (Be)	mg/L	0.0017	0.0010	<0.0010	<0.0010	0.0010	0.0020	0.0010	7965867
Dissolved Boron (B)	mg/L	0.10	0.020	<0.020	<0.020	0.020	0.097	0.020	7967384
Total Boron (B)	mg/L	0.12	0.020	<0.020	<0.020	0.020	0.12	0.020	7965872
Dissolved Calcium (Ca)	mg/L	390	0.30	<0.30	<0.30	0.30	390	0.30	7967384
Total Calcium (Ca)	mg/L	540 (1)	1.5	<0.30	<0.30	0.30	610 (1)	1.5	7965872
Dissolved Chromium (Cr)	mg/L	<0.0010	0.0010	<0.0010	<0.0010	0.0010	<0.0010	0.0010	7966206
Total Chromium (Cr)	mg/L	0.048	0.0010	<0.0010	<0.0010	0.0010	0.047	0.0010	7965867
Dissolved Cobalt (Co)	mg/L	0.0033	0.00030	<0.00030	<0.00030	0.00030	0.0032	0.00030	7966206
Total Cobalt (Co)	mg/L	0.035	0.00030	<0.00030	<0.00030	0.00030	0.033	0.00030	7965867
Dissolved Copper (Cu)	mg/L	0.0012	0.00020	0.00028	<0.00020	0.00020	0.0012	0.00020	7966206
Total Copper (Cu)	mg/L	0.077	0.00020	0.00034	0.00029	0.00020	0.074	0.00020	7965867
Dissolved Iron (Fe)	mg/L	0.57	0.060	<0.060	<0.060	0.060	0.56	0.060	7967384
Total Iron (Fe)	mg/L	64	0.060	<0.060	<0.060	0.060	60	0.060	7965872
Dissolved Lead (Pb)	mg/L	0.00044	0.00020	0.00024 (2)	0.00025 (2)	0.00020	0.00049	0.00020	7966206
Total Lead (Pb)	mg/L	0.052	0.00020	<0.00020	<0.00020	0.00020	0.053	0.00020	7965867
Dissolved Lithium (Li)	mg/L	0.067	0.020	<0.020	<0.020	0.020	0.063	0.020	7967384
Total Lithium (Li)	mg/L	0.094	0.020	<0.020	<0.020	0.020	0.093	0.020	7965872
Dissolved Magnesium (Mg)	mg/L	260	0.20	<0.20	<0.20	0.20	270	0.20	7967384
Total Magnesium (Mg)	mg/L	300	0.20	<0.20	<0.20	0.20	300	0.20	7965872
Dissolved Manganese (Mn)	mg/L	1.9	0.0040	<0.0040	<0.0040	0.0040	1.9	0.0040	7967384
Total Manganese (Mn)	mg/L	4.2	0.0040	<0.0040	<0.0040	0.0040	4.0	0.0040	7965872
Dissolved Molybdenum (Mo)	mg/L	0.0012	0.00020	<0.00020	<0.00020	0.00020	0.0011	0.00020	7966206
Total Molybdenum (Mo)	mg/L	0.0058	0.00020	<0.00020	<0.00020	0.00020	0.0061	0.00020	7965867

RDL = Reportable Detection Limit
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Dissolved greater than total. Results are within limits of uncertainty(MU).

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		MQ2961		MQ2962	MQ2963		MQ2964		
Sampling Date		2015/07/09		2015/07/09	2015/07/09		2015/07/09 15:40		
COC Number		M000186		M000186	M000186		M000186		
	Units	DUP15-01	RDL	DUP15-02	DUP15-03	RDL	MW1	RDL	QC Batch
Dissolved Nickel (Ni)	mg/L	0.011	0.00050	<0.00050	<0.00050	0.00050	0.010	0.00050	7966206
Total Nickel (Ni)	mg/L	0.094	0.00050	<0.00050	<0.00050	0.00050	0.090	0.00050	7965867
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	<0.10	<0.10	0.10	<0.10	0.10	7967384
Total Phosphorus (P)	mg/L	2.5	0.10	0.11	<0.10	0.10	2.5	0.10	7965872
Dissolved Potassium (K)	mg/L	6.5	0.30	<0.30	<0.30	0.30	6.5	0.30	7967384
Total Potassium (K)	mg/L	12	0.30	<0.30	<0.30	0.30	11	0.30	7965872
Dissolved Selenium (Se)	mg/L	<0.00020	0.00020	<0.00020	<0.00020	0.00020	<0.00020	0.00020	7966206
Total Selenium (Se)	mg/L	0.0020	0.00020	<0.00020	<0.00020	0.00020	0.0020	0.00020	7965867
Dissolved Silicon (Si)	mg/L	4.7	0.10	<0.10	<0.10	0.10	4.7	0.10	7967384
Total Silicon (Si)	mg/L	36	0.10	<0.10	<0.10	0.10	36	0.10	7965872
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	<0.00010	<0.00010	0.00010	<0.00010	0.00010	7966206
Total Silver (Ag)	mg/L	0.00038	0.00010	<0.00010	<0.00010	0.00010	0.00030	0.00010	7965867
Dissolved Sodium (Na)	mg/L	380	0.50	<0.50	<0.50	0.50	380 (1)	0.50	7967384
Total Sodium (Na)	mg/L	380	0.50	0.72	0.50	0.50	370	0.50	7965872
Dissolved Strontium (Sr)	mg/L	4.7	0.020	<0.020	<0.020	0.020	4.6	0.020	7967384
Total Strontium (Sr)	mg/L	4.9	0.020	<0.020	<0.020	0.020	4.8	0.020	7965872
Dissolved Sulphur (S)	mg/L	840 (2)	1.0	<0.20	<0.20	0.20	910 (2)	1.0	7967384
Total Sulphur (S)	mg/L	710 (3)	1.0	<0.20	<0.20	0.20	820 (3)	1.0	7965872
Dissolved Thallium (Tl)	mg/L	<0.00020	0.00020	<0.00020	<0.00020	0.00020	<0.00020	0.00020	7966206
Total Thallium (Tl)	mg/L	0.0015	0.00020	<0.00020	<0.00020	0.00020	0.0015	0.00020	7965867
Dissolved Tin (Sn)	mg/L	<0.0010	0.0010	<0.0010	<0.0010	0.0010	<0.0010	0.0010	7966206
Total Tin (Sn)	mg/L	0.0091	0.0010	<0.0010	<0.0010	0.0010	0.0091	0.0010	7965867
Dissolved Titanium (Ti)	mg/L	<0.0010	0.0010	<0.0010	<0.0010	0.0010	<0.0010	0.0010	7966206
Total Titanium (Ti)	mg/L	0.86	0.0010	<0.0010	<0.0010	0.0010	0.89	0.0010	7965867
Dissolved Uranium (U)	mg/L	0.019	0.00010	<0.00010	<0.00010	0.00010	0.019	0.00010	7966206
Total Uranium (U)	mg/L	0.024	0.00010	<0.00010	<0.00010	0.00010	0.024	0.00010	7965867
Dissolved Vanadium (V)	mg/L	<0.0010	0.0010	<0.0010	<0.0010	0.0010	<0.0010	0.0010	7966206
Total Vanadium (V)	mg/L	0.081	0.0010	<0.0010	<0.0010	0.0010	0.077	0.0010	7965867
Dissolved Zinc (Zn)	mg/L	0.0088	0.0030	<0.0030	<0.0030	0.0030	0.0092	0.0030	7966206
Total Zinc (Zn)	mg/L	0.53	0.0030	<0.0030	<0.0030	0.0030	0.51	0.0030	7965867

RDL = Reportable Detection Limit
(1) Dissolved greater than total. Results within acceptable limits of precision.
(2) Detection limits raised due to dilution to bring analyte within the calibrated range.

Dissolved greater than total. Results within acceptable limits of precision.
(3) Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		MQ2965		MQ2966		MQ2967	MQ2967		
Sampling Date		2015/07/09 13:00		2015/07/09 14:50		2015/07/09 14:30	2015/07/09 14:30		
COC Number		M000186		M000186		M000186	M000186		
	Units	MW7	RDL	MW8	RDL	MW9	MW9 Lab-Dup	RDL	QC Batch
Elements									
Dissolved Aluminum (Al)	mg/L	0.0042	0.0030	0.0048	0.0030	0.0067	0.0084	0.0030	7966206
Total Aluminum (Al)	mg/L	34	0.0030	36	0.0030	130	N/A	0.0030	7965867
Dissolved Antimony (Sb)	mg/L	<0.00060	0.00060	<0.00060	0.00060	<0.00060	<0.00060	0.00060	7966206
Total Antimony (Sb)	mg/L	0.0017	0.00060	0.0012	0.00060	0.0012	N/A	0.00060	7965867
Dissolved Arsenic (As)	mg/L	0.0011	0.00020	0.0013	0.00020	0.0010	0.0011	0.00020	7966206
Total Arsenic (As)	mg/L	0.065	0.00020	0.045	0.00020	0.091	N/A	0.00020	7965867
Dissolved Barium (Ba)	mg/L	0.018	0.010	0.014	0.010	0.11 (1)	0.11	0.010	7967384
Total Barium (Ba)	mg/L	0.74	0.010	0.99	0.010	4.6	N/A	0.010	7965872
Dissolved Beryllium (Be)	mg/L	<0.0010	0.0010	<0.0010	0.0010	<0.0010	<0.0010	0.0010	7966206
Total Beryllium (Be)	mg/L	0.0033	0.0010	0.0039	0.0010	0.011	N/A	0.0010	7965867
Dissolved Boron (B)	mg/L	0.064	0.020	0.041	0.020	0.11	0.11	0.020	7967384
Total Boron (B)	mg/L	0.078	0.020	0.072	0.020	0.15	N/A	0.020	7965872
Dissolved Calcium (Ca)	mg/L	460	0.30	320	0.30	150	150	0.30	7967384
Total Calcium (Ca)	mg/L	800 (2)	3.0	450	0.30	760 (2)	N/A	1.5	7965872
Dissolved Chromium (Cr)	mg/L	<0.0010	0.0010	<0.0010	0.0010	<0.0010	<0.0010	0.0010	7966206
Total Chromium (Cr)	mg/L	0.077	0.0010	0.055	0.0010	0.20	N/A	0.0010	7965867
Dissolved Cobalt (Co)	mg/L	0.00088	0.00030	0.0067	0.00030	0.0054	0.0054	0.00030	7966206
Total Cobalt (Co)	mg/L	0.11	0.00030	0.035	0.00030	0.12	N/A	0.00030	7965867
Dissolved Copper (Cu)	mg/L	0.0082	0.00020	0.0043	0.00020	0.0027	0.0026	0.00020	7966206
Total Copper (Cu)	mg/L	0.090	0.00020	0.23	0.00020	0.39	N/A	0.00020	7965867
Dissolved Iron (Fe)	mg/L	0.72	0.060	0.74	0.060	0.42	0.43	0.060	7967384
Total Iron (Fe)	mg/L	130	0.060	86	0.060	260 (2)	N/A	0.30	7965872
Dissolved Lead (Pb)	mg/L	0.0016	0.00020	0.0016	0.00020	0.00081	0.00065	0.00020	7966206
Total Lead (Pb)	mg/L	0.052	0.00020	0.084	0.00020	0.22	N/A	0.00020	7965867
Dissolved Lithium (Li)	mg/L	0.12	0.020	0.068	0.020	0.046	0.049	0.020	7967384
Total Lithium (Li)	mg/L	0.17	0.020	0.11	0.020	0.21	N/A	0.020	7965872
Dissolved Magnesium (Mg)	mg/L	1500 (3)	2.0	1500 (4)	2.0	330	330	0.20	7967384

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Matrix Spike exceeds acceptance limits due to matrix interference. Reanalysis yields similar results.
(2) Detection limits raised due to dilution to bring analyte within the calibrated range.
(3) Detection limits raised due to dilution to bring analyte within the calibrated range.

Dissolved greater than total. Results within acceptable limits of precision.
(4) Detection limits raised due to dilution to bring analyte within the calibrated range.
Dissolved greater than total. Results within acceptable limits of precision.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		MQ2965		MQ2966		MQ2967	MQ2967		
Sampling Date		2015/07/09 13:00		2015/07/09 14:50		2015/07/09 14:30	2015/07/09 14:30		
COC Number		M000186		M000186		M000186	M000186		
	Units	MW7	RDL	MW8	RDL	MW9	MW9 Lab-Dup	RDL	QC Batch
Total Magnesium (Mg)	mg/L	1400 (1)	2.0	1400 (1)	2.0	480	N/A	0.20	7965872
Dissolved Manganese (Mn)	mg/L	<0.0040	0.0040	2.9	0.0040	2.2	2.2	0.0040	7967384
Total Manganese (Mn)	mg/L	6.4	0.0040	4.3	0.0040	6.6	N/A	0.0040	7965872
Dissolved Molybdenum (Mo)	mg/L	0.0016	0.00020	0.0021	0.00020	0.0023	0.0024	0.00020	7966206
Total Molybdenum (Mo)	mg/L	0.0091	0.00020	0.0069	0.00020	0.010	N/A	0.00020	7965867
Dissolved Nickel (Ni)	mg/L	0.0045	0.00050	0.026	0.00050	0.017	0.016	0.00050	7966206
Total Nickel (Ni)	mg/L	0.17	0.00050	0.13	0.00050	0.42	N/A	0.00050	7965867
Dissolved Phosphorus (P)	mg/L	0.11	0.10	0.11	0.10	<0.10	<0.10	0.10	7967384
Total Phosphorus (P)	mg/L	4.8	0.10	3.1	0.10	9.8	N/A	0.10	7965872
Dissolved Potassium (K)	mg/L	11	0.30	6.5	0.30	3.9	4.1	0.30	7967384
Total Potassium (K)	mg/L	18	0.30	13	0.30	22	N/A	0.30	7965872
Dissolved Selenium (Se)	mg/L	0.018	0.00020	0.00064	0.00020	0.00042	0.00036	0.00020	7966206
Total Selenium (Se)	mg/L	0.021	0.00020	0.015	0.00020	0.0088	N/A	0.00020	7965867
Dissolved Silicon (Si)	mg/L	3.8	0.10	4.2	0.10	5.3	5.4	0.10	7967384
Total Silicon (Si)	mg/L	53	0.10	56	0.10	160 (1)	N/A	0.50	7965872
Dissolved Silver (Ag)	mg/L	0.00046	0.00010	0.00050	0.00010	0.00027	0.00020	0.00010	7966206
Total Silver (Ag)	mg/L	0.00050	0.00010	0.00065	0.00010	0.0026	N/A	0.00010	7965867
Dissolved Sodium (Na)	mg/L	930 (2)	5.0	1000 (3)	5.0	120	130	0.50	7967384
Total Sodium (Na)	mg/L	810 (1)	5.0	870 (1)	5.0	120	N/A	0.50	7965872
Dissolved Strontium (Sr)	mg/L	11 (2)	0.20	6.9 (3)	0.20	2.2	2.2	0.020	7967384
Total Strontium (Sr)	mg/L	10 (1)	0.20	6.5 (1)	0.20	3.1	N/A	0.020	7965872
Dissolved Sulphur (S)	mg/L	2800 (3)	2.0	2800 (3)	2.0	430 (4)	440	0.20	7967384
Total Sulphur (S)	mg/L	2400 (1)	2.0	2400 (1)	2.0	420	N/A	0.20	7965872
Dissolved Thallium (Tl)	mg/L	<0.00020	0.00020	0.00022	0.00020	<0.00020	<0.00020	0.00020	7966206
Total Thallium (Tl)	mg/L	0.0021	0.00020	0.0018	0.00020	0.0045	N/A	0.00020	7965867
Dissolved Tin (Sn)	mg/L	<0.0010	0.0010	<0.0010	0.0010	<0.0010	<0.0010	0.0010	7966206
Total Tin (Sn)	mg/L	0.0033	0.0010	0.0054	0.0010	0.0058	N/A	0.0010	7965867

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Detection limits raised due to dilution to bring analyte within the calibrated range.

Dissolved greater than total. Results within acceptable limits of precision.
(3) Detection limits raised due to dilution to bring analyte within the calibrated range.
Dissolved greater than total. Results within acceptable limits of precision.
(4) Dissolved greater than total. Results within acceptable limits of precision.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		MQ2965		MQ2966		MQ2967	MQ2967		
Sampling Date		2015/07/09 13:00		2015/07/09 14:50		2015/07/09 14:30	2015/07/09 14:30		
COC Number		M000186		M000186		M000186	M000186		
	Units	**MW7**	**RDL**	**MW8**	**RDL**	**MW9**	**MW9 Lab-Dup**	**RDL**	**QC Batch**
Dissolved Titanium (Ti)	mg/L	<0.0010	0.0010	<0.0010	0.0010	<0.0010	<0.0010	0.0010	7966206
Total Titanium (Ti)	mg/L	1.3	0.0010	0.58	0.0010	0.49	N/A	0.0010	7965867
Dissolved Uranium (U)	mg/L	0.099	0.00010	0.050	0.00010	0.019	0.020	0.00010	7966206
Total Uranium (U)	mg/L	0.11	0.00010	0.057	0.00010	0.029	N/A	0.00010	7965867
Dissolved Vanadium (V)	mg/L	<0.0010	0.0010	<0.0010	0.0010	0.0023	0.0020	0.0010	7966206
Total Vanadium (V)	mg/L	0.13	0.0010	0.099	0.0010	0.34	N/A	0.0010	7965867
Dissolved Zinc (Zn)	mg/L	<0.0030	0.0030	0.023	0.0030	0.027	0.027	0.0030	7966206
Total Zinc (Zn)	mg/L	0.30	0.0030	0.61	0.0030	4.0	N/A	0.0030	7965867

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		MQ2968		
Sampling Date		2015/07/10 16:10		
COC Number		M000186		
	Units	MW12	RDL	QC Batch
Elements				
Dissolved Aluminum (Al)	mg/L	0.0085	0.0030	7966206
Total Aluminum (Al)	mg/L	29	0.0030	7965867
Dissolved Antimony (Sb)	mg/L	<0.00060	0.00060	7966206
Total Antimony (Sb)	mg/L	0.0013	0.00060	7965867
Dissolved Arsenic (As)	mg/L	0.00031	0.00020	7966206
Total Arsenic (As)	mg/L	0.055	0.00020	7965867
Dissolved Barium (Ba)	mg/L	0.079	0.010	7967384
Total Barium (Ba)	mg/L	1.0	0.010	7965872
Dissolved Beryllium (Be)	mg/L	<0.0010	0.0010	7966206
Total Beryllium (Be)	mg/L	0.0024	0.0010	7965867
Dissolved Boron (B)	mg/L	0.060	0.020	7967384
Total Boron (B)	mg/L	0.071	0.020	7965872
Dissolved Calcium (Ca)	mg/L	300	0.30	7967384
Total Calcium (Ca)	mg/L	360	0.30	7965872
Dissolved Chromium (Cr)	mg/L	<0.0010	0.0010	7966206
Total Chromium (Cr)	mg/L	0.059	0.0010	7965867
Dissolved Cobalt (Co)	mg/L	0.00037	0.00030	7966206
Total Cobalt (Co)	mg/L	0.035	0.00030	7965867
Dissolved Copper (Cu)	mg/L	0.0036	0.00020	7966206
Total Copper (Cu)	mg/L	0.095	0.00020	7965867
Dissolved Iron (Fe)	mg/L	0.25	0.060	7967384
Total Iron (Fe)	mg/L	100	0.060	7965872
Dissolved Lead (Pb)	mg/L	0.00053	0.00020	7966206
Total Lead (Pb)	mg/L	0.046	0.00020	7965867
Dissolved Lithium (Li)	mg/L	0.021	0.020	7967384
Total Lithium (Li)	mg/L	0.059	0.020	7965872
Dissolved Magnesium (Mg)	mg/L	170	0.20	7967384
Total Magnesium (Mg)	mg/L	180	0.20	7965872
Dissolved Manganese (Mn)	mg/L	0.12	0.0040	7967384
Total Manganese (Mn)	mg/L	2.3	0.0040	7965872
Dissolved Molybdenum (Mo)	mg/L	0.0016	0.00020	7966206
Total Molybdenum (Mo)	mg/L	0.016	0.00020	7965867
Dissolved Nickel (Ni)	mg/L	0.0032	0.00050	7966206
Total Nickel (Ni)	mg/L	0.11	0.00050	7965867
RDL = Reportable Detection Limit				

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		MQ2968		
Sampling Date		2015/07/10 16:10		
COC Number		M000186		
	Units	MW12	RDL	QC Batch
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	7967384
Total Phosphorus (P)	mg/L	2.2	0.10	7965872
Dissolved Potassium (K)	mg/L	11	0.30	7967384
Total Potassium (K)	mg/L	13	0.30	7965872
Dissolved Selenium (Se)	mg/L	0.00038	0.00020	7966206
Total Selenium (Se)	mg/L	0.0056	0.00020	7965867
Dissolved Silicon (Si)	mg/L	3.8	0.10	7967384
Total Silicon (Si)	mg/L	36	0.10	7965872
Dissolved Silver (Ag)	mg/L	0.00016	0.00010	7966206
Total Silver (Ag)	mg/L	0.00074	0.00010	7965867
Dissolved Sodium (Na)	mg/L	99 (1)	0.50	7967384
Total Sodium (Na)	mg/L	91	0.50	7965872
Dissolved Strontium (Sr)	mg/L	1.7	0.020	7967384
Total Strontium (Sr)	mg/L	1.7	0.020	7965872
Dissolved Sulphur (S)	mg/L	360 (1)	0.20	7967384
Total Sulphur (S)	mg/L	350	0.20	7965872
Dissolved Thallium (Tl)	mg/L	<0.00020	0.00020	7966206
Total Thallium (Tl)	mg/L	0.00063	0.00020	7965867
Dissolved Tin (Sn)	mg/L	<0.0010	0.0010	7966206
Total Tin (Sn)	mg/L	0.0014	0.0010	7965867
Dissolved Titanium (Ti)	mg/L	<0.0010	0.0010	7966206
Total Titanium (Ti)	mg/L	0.13	0.0010	7965867
Dissolved Uranium (U)	mg/L	0.021	0.00010	7966206
Total Uranium (U)	mg/L	0.026	0.00010	7965867
Dissolved Vanadium (V)	mg/L	<0.0010	0.0010	7966206
Total Vanadium (V)	mg/L	0.10	0.0010	7965867
Dissolved Zinc (Zn)	mg/L	0.0067	0.0030	7966206
Total Zinc (Zn)	mg/L	0.37	0.0030	7965867

RDL = Reportable Detection Limit
(1) Dissolved greater than total. Results within acceptable limits of precision.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		MQ2961	MQ2962	MQ2963	MQ2964	MQ2965	MQ2966	MQ2967		
Sampling Date		2015/07/09	2015/07/09	2015/07/09	2015/07/09 15:40	2015/07/09 13:00	2015/07/09 14:50	2015/07/09 14:30		
COC Number		M000186	M000186	M000186	M000186	M000186	M000186	M000186		
	Units	DUP15-01	DUP15-02	DUP15-03	MW1	MW7	MW8	MW9	RDL	QC Batch
Volatiles										
Total Trihalomethanes	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	7965393
Bromodichloromethane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
Bromoform	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
Bromomethane	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	7966429
Carbon tetrachloride	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
Chlorobenzene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
Chlorodibromomethane	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	7966429
Chloroethane	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	7966429
Chloroform	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
Chloromethane	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	7966429
1,2-dibromoethane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
1,2-dichlorobenzene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
1,3-dichlorobenzene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
1,4-dichlorobenzene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
1,1-dichloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
1,2-dichloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
1,1-dichloroethene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
cis-1,2-dichloroethene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
trans-1,2-dichloroethene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
Dichloromethane	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	7966429
1,2-dichloropropane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
cis-1,3-dichloropropene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
trans-1,3-dichloropropene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
Methyl methacrylate	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
Methyl-tert-butylether (MTBE)	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
Styrene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
1,1,1,2-tetrachloroethane	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	7966429
1,1,2,2-tetrachloroethane	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	7966429
Tetrachloroethene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
1,2,3-trichlorobenzene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	7966429
1,2,4-trichlorobenzene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	7966429
1,3,5-trichlorobenzene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
1,1,1-trichloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
1,1,2-trichloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429

RDL = Reportable Detection Limit

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		MQ2961	MQ2962	MQ2963	MQ2964	MQ2965	MQ2966	MQ2967		
Sampling Date		2015/07/09	2015/07/09	2015/07/09	2015/07/09 15:40	2015/07/09 13:00	2015/07/09 14:50	2015/07/09 14:30		
COC Number		M000186	M000186	M000186	M000186	M000186	M000186	M000186		
	Units	DUP15-01	DUP15-02	DUP15-03	MW1	MW7	MW8	MW9	RDL	QC Batch
Trichloroethene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
Trichlorofluoromethane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
1,2,4-trimethylbenzene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
1,3,5-trimethylbenzene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
Vinyl chloride	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7966429
Surrogate Recovery (%)										
1,4-Difluorobenzene (sur.)	%	99	101	101	100	101	99	102	N/A	7966429
4-Bromofluorobenzene (sur.)	%	96	96	96	98	96	96	96	N/A	7966429
D4-1,2-Dichloroethane (sur.)	%	89	90	91	96	92	92	89	N/A	7966429

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		MQ2968		
Sampling Date		2015/07/10 16:10		
COC Number		M000186		
	Units	MW12	RDL	QC Batch
Volatiles				
Total Trihalomethanes	ug/L	<2.0	2.0	7965393
Bromodichloromethane	ug/L	<0.50	0.50	7966429
Bromoform	ug/L	<0.50	0.50	7966429
Bromomethane	ug/L	<2.0	2.0	7966429
Carbon tetrachloride	ug/L	<0.50	0.50	7966429
Chlorobenzene	ug/L	<0.50	0.50	7966429
Chlorodibromomethane	ug/L	<1.0	1.0	7966429
Chloroethane	ug/L	<1.0	1.0	7966429
Chloroform	ug/L	<0.50	0.50	7966429
Chloromethane	ug/L	<2.0	2.0	7966429
1,2-dibromoethane	ug/L	<0.50	0.50	7966429
1,2-dichlorobenzene	ug/L	<0.50	0.50	7966429
1,3-dichlorobenzene	ug/L	<0.50	0.50	7966429
1,4-dichlorobenzene	ug/L	<0.50	0.50	7966429
1,1-dichloroethane	ug/L	<0.50	0.50	7966429
1,2-dichloroethane	ug/L	<0.50	0.50	7966429
1,1-dichloroethene	ug/L	<0.50	0.50	7966429
cis-1,2-dichloroethene	ug/L	<0.50	0.50	7966429
trans-1,2-dichloroethene	ug/L	<0.50	0.50	7966429
Dichloromethane	ug/L	<2.0	2.0	7966429
1,2-dichloropropane	ug/L	<0.50	0.50	7966429
cis-1,3-dichloropropene	ug/L	<0.50	0.50	7966429
trans-1,3-dichloropropene	ug/L	<0.50	0.50	7966429
Methyl methacrylate	ug/L	<0.50	0.50	7966429
Methyl-tert-butylether (MTBE)	ug/L	<0.50	0.50	7966429
Styrene	ug/L	<0.50	0.50	7966429
1,1,1,2-tetrachloroethane	ug/L	<2.0	2.0	7966429
1,1,2,2-tetrachloroethane	ug/L	<2.0	2.0	7966429
Tetrachloroethene	ug/L	<0.50	0.50	7966429
1,2,3-trichlorobenzene	ug/L	<1.0	1.0	7966429
1,2,4-trichlorobenzene	ug/L	<1.0	1.0	7966429
1,3,5-trichlorobenzene	ug/L	<0.50	0.50	7966429
1,1,1-trichloroethane	ug/L	<0.50	0.50	7966429
1,1,2-trichloroethane	ug/L	<0.50	0.50	7966429
RDL = Reportable Detection Limit				

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		MQ2968		
Sampling Date		2015/07/10 16:10		
COC Number		M000186		
	Units	**MW12**	**RDL**	**QC Batch**
Trichloroethene	ug/L	<0.50	0.50	7966429
Trichlorofluoromethane	ug/L	<0.50	0.50	7966429
1,2,4-trimethylbenzene	ug/L	<0.50	0.50	7966429
1,3,5-trimethylbenzene	ug/L	<0.50	0.50	7966429
Vinyl chloride	ug/L	<0.50	0.50	7966429
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	98	N/A	7966429
4-Bromofluorobenzene (sur.)	%	96	N/A	7966429
D4-1,2-Dichloroethane (sur.)	%	92	N/A	7966429

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		MQ2961	MQ2961	MQ2962	MQ2963	MQ2964	MQ2965	MQ2966		
Sampling Date		2015/07/09	2015/07/09	2015/07/09	2015/07/09	2015/07/09 15:40	2015/07/09 13:00	2015/07/09 14:50		
COC Number		M000186	M000186	M000186	M000186	M000186	M000186	M000186		
	Units	DUP15-01	DUP15-01 Lab-Dup	DUP15-02	DUP15-03	MW1	MW7	MW8	RDL	QC Batch
Volatiles										
Benzene	ug/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.40	7965631
Toluene	ug/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.40	7965631
Ethylbenzene	ug/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.40	7965631
m & p-Xylene	ug/L	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	0.80	7965631
o-Xylene	ug/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.40	7965631
Xylenes (Total)	ug/L	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	0.80	7965631
F1 (C6-C10) - BTEX	ug/L	<100	<100	<100	<100	<100	<100	<100	100	7965631
F1 (C6-C10)	ug/L	<100	<100	<100	<100	<100	<100	<100	100	7965631
Surrogate Recovery (%)										
1,4-Difluorobenzene (sur.)	%	121	120	122	121	120	119	119	N/A	7965631
4-Bromofluorobenzene (sur.)	%	104	104	104	103	104	105	105	N/A	7965631
D4-1,2-Dichloroethane (sur.)	%	99	99	97	97	100	97	99	N/A	7965631

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		MQ2967	MQ2968		
Sampling Date		2015/07/09 14:30	2015/07/10 16:10		
COC Number		M000186	M000186		
	Units	MW9	MW12	RDL	QC Batch
Volatiles					
Benzene	ug/L	<0.40	<0.40	0.40	7965631
Toluene	ug/L	<0.40	<0.40	0.40	7965631
Ethylbenzene	ug/L	<0.40	<0.40	0.40	7965631
m & p-Xylene	ug/L	<0.80	<0.80	0.80	7965631
o-Xylene	ug/L	<0.40	<0.40	0.40	7965631
Xylenes (Total)	ug/L	<0.80	<0.80	0.80	7965631
F1 (C6-C10) - BTEX	ug/L	<100	<100	100	7965631
F1 (C6-C10)	ug/L	<100	<100	100	7965631
Surrogate Recovery (%)					
1,4-Difluorobenzene (sur.)	%	119	119	N/A	7965631
4-Bromofluorobenzene (sur.)	%	104	105	N/A	7965631
D4-1,2-Dichloroethane (sur.)	%	97	98	N/A	7965631

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

GENERAL COMMENTS

Sample MQ2961-01 : Cation anion balance investigated data quality confirmed.

Sample MQ2964-01 : Cation anion balance investigated data quality confirmed.

Sample MQ2967-01 : Cation anion balance investigated data quality confirmed.

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
7965631	RSA	Matrix Spike [MQ2962-05]	1,4-Difluorobenzene (sur.)	2015/07/14		121	%	70 - 130
			4-Bromofluorobenzene (sur.)	2015/07/14		104	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2015/07/14		96	%	70 - 130
			Benzene	2015/07/14		101	%	70 - 130
			Toluene	2015/07/14		96	%	70 - 130
			Ethylbenzene	2015/07/14		100	%	70 - 130
			m & p-Xylene	2015/07/14		98	%	70 - 130
			o-Xylene	2015/07/14		96	%	70 - 130
			F1 (C6-C10)	2015/07/14		102	%	70 - 130
7965631	RSA	Spiked Blank	1,4-Difluorobenzene (sur.)	2015/07/14		121	%	70 - 130
			4-Bromofluorobenzene (sur.)	2015/07/14		105	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2015/07/14		96	%	70 - 130
			Benzene	2015/07/14		100	%	70 - 130
			Toluene	2015/07/14		95	%	70 - 130
			Ethylbenzene	2015/07/14		99	%	70 - 130
			m & p-Xylene	2015/07/14		97	%	70 - 130
			o-Xylene	2015/07/14		95	%	70 - 130
			F1 (C6-C10)	2015/07/14		120	%	70 - 130
7965631	RSA	Method Blank	1,4-Difluorobenzene (sur.)	2015/07/14		120	%	70 - 130
			4-Bromofluorobenzene (sur.)	2015/07/14		104	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2015/07/14		97	%	70 - 130
			Benzene	2015/07/14	<0.40		ug/L	
			Toluene	2015/07/14	<0.40		ug/L	
			Ethylbenzene	2015/07/14	<0.40		ug/L	
			m & p-Xylene	2015/07/14	<0.80		ug/L	
			o-Xylene	2015/07/14	<0.40		ug/L	
			Xylenes (Total)	2015/07/14	<0.80		ug/L	
			F1 (C6-C10) - BTEX	2015/07/14	<100		ug/L	
			F1 (C6-C10)	2015/07/14	<100		ug/L	
7965631	RSA	RPD [MQ2961-05]	Benzene	2015/07/14	NC		%	40
			Toluene	2015/07/14	NC		%	40
			Ethylbenzene	2015/07/14	NC		%	40
			m & p-Xylene	2015/07/14	NC		%	40
			o-Xylene	2015/07/14	NC		%	40
			Xylenes (Total)	2015/07/14	NC		%	40
			F1 (C6-C10) - BTEX	2015/07/14	NC		%	40
			F1 (C6-C10)	2015/07/14	NC		%	40
7965721	DO1	Matrix Spike [MQ2961-04]	O-TERPHENYL (sur.)	2015/07/14		96	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2015/07/14		96	%	50 - 130
7965721	DO1	Spiked Blank	O-TERPHENYL (sur.)	2015/07/14		105	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2015/07/14		107	%	70 - 130
7965721	DO1	Method Blank	O-TERPHENYL (sur.)	2015/07/14		101	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2015/07/14	<0.10		mg/L	
7965721	DO1	RPD [MQ2968-04]	F2 (C10-C16 Hydrocarbons)	2015/07/14	NC		%	40
7965724	NK3	Matrix Spike [MQ2962-04]	D10-ANTHRACENE (sur.)	2015/07/14		104	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2015/07/14		101	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2015/07/14		71	%	50 - 130
			TERPHENYL-D14 (sur.)	2015/07/14		119	%	50 - 130
			Acenaphthene	2015/07/14		79	%	50 - 130

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Acenaphthylene	2015/07/14		84	%	50 - 130
			Acridine	2015/07/14		98	%	50 - 130
			Anthracene	2015/07/14		97	%	50 - 130
			Benzo(a)anthracene	2015/07/14		112	%	50 - 130
			Benzo(b&j)fluoranthene	2015/07/14		100	%	50 - 130
			Benzo(k)fluoranthene	2015/07/14		102	%	50 - 130
			Benzo(g,h,i)perylene	2015/07/14		96	%	50 - 130
			Benzo(c)phenanthrene	2015/07/14		110	%	50 - 130
			Benzo(a)pyrene	2015/07/14		100	%	50 - 130
			Benzo[e]pyrene	2015/07/14		104	%	50 - 130
			Chrysene	2015/07/14		106	%	50 - 130
			Dibenz(a,h)anthracene	2015/07/14		94	%	50 - 130
			Fluoranthene	2015/07/14		112	%	50 - 130
			Fluorene	2015/07/14		85	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2015/07/14		97	%	50 - 130
			2-Methylnaphthalene	2015/07/14		77	%	50 - 130
			Naphthalene	2015/07/14		83	%	50 - 130
			Phenanthrene	2015/07/14		97	%	50 - 130
			Perylene	2015/07/14		103	%	50 - 130
			Pyrene	2015/07/14		116	%	50 - 130
			Quinoline	2015/07/14		100	%	50 - 130
7965724	NK3	Spiked Blank	D10-ANTHRACENE (sur.)	2015/07/14		101	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2015/07/14		102	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2015/07/14		72	%	50 - 130
			TERPHENYL-D14 (sur.)	2015/07/14		115	%	50 - 130
			Acenaphthene	2015/07/14		81	%	50 - 130
			Acenaphthylene	2015/07/14		87	%	50 - 130
			Acridine	2015/07/14		96	%	50 - 130
			Anthracene	2015/07/14		95	%	50 - 130
			Benzo(a)anthracene	2015/07/14		118	%	50 - 130
			Benzo(b&j)fluoranthene	2015/07/14		104	%	50 - 130
			Benzo(k)fluoranthene	2015/07/14		101	%	50 - 130
			Benzo(g,h,i)perylene	2015/07/14		103	%	50 - 130
			Benzo(c)phenanthrene	2015/07/14		110	%	50 - 130
			Benzo(a)pyrene	2015/07/14		105	%	50 - 130
			Benzo[e]pyrene	2015/07/14		109	%	50 - 130
			Chrysene	2015/07/14		109	%	50 - 130
			Dibenz(a,h)anthracene	2015/07/14		102	%	50 - 130
			Fluoranthene	2015/07/14		112	%	50 - 130
			Fluorene	2015/07/14		86	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2015/07/14		108	%	50 - 130
			2-Methylnaphthalene	2015/07/14		77	%	50 - 130
			Naphthalene	2015/07/14		82	%	50 - 130
			Phenanthrene	2015/07/14		98	%	50 - 130
			Perylene	2015/07/14		107	%	50 - 130
			Pyrene	2015/07/14		114	%	50 - 130
			Quinoline	2015/07/14		103	%	50 - 130
7965724	NK3	Method Blank	D10-ANTHRACENE (sur.)	2015/07/14		104	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2015/07/14		104	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2015/07/14		73	%	50 - 130
			TERPHENYL-D14 (sur.)	2015/07/14		119	%	50 - 130
			Acenaphthene	2015/07/14	<0.10		ug/L	

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Acenaphthylene	2015/07/14	<0.10		ug/L	
			Acridine	2015/07/14	<0.20		ug/L	
			Anthracene	2015/07/14	<0.010		ug/L	
			Benzo(a)anthracene	2015/07/14	<0.0085		ug/L	
			Benzo(b&j)fluoranthene	2015/07/14	<0.0085		ug/L	
			Benzo(k)fluoranthene	2015/07/14	<0.0085		ug/L	
			Benzo(g,h,i)perylene	2015/07/14	<0.0085		ug/L	
			Benzo(c)phenanthrene	2015/07/14	<0.050		ug/L	
			Benzo(a)pyrene	2015/07/14	<0.0075		ug/L	
			Benzo[e]pyrene	2015/07/14	<0.050		ug/L	
			Chrysene	2015/07/14	<0.0085		ug/L	
			Dibenz(a,h)anthracene	2015/07/14	<0.0075		ug/L	
			Fluoranthene	2015/07/14	<0.010		ug/L	
			Fluorene	2015/07/14	<0.050		ug/L	
			Indeno(1,2,3-cd)pyrene	2015/07/14	<0.0085		ug/L	
			2-Methylnaphthalene	2015/07/14	<0.10		ug/L	
			Naphthalene	2015/07/14	<0.10		ug/L	
			Phenanthrene	2015/07/14	<0.050		ug/L	
			Perylene	2015/07/14	<0.050		ug/L	
			Pyrene	2015/07/14	<0.020		ug/L	
			Quinoline	2015/07/14	<0.20		ug/L	
7965724	NK3	RPD [MQ2968-04]	Acenaphthene	2015/07/14	NC		%	40
			Acenaphthylene	2015/07/14	NC		%	40
			Acridine	2015/07/14	NC		%	40
			Anthracene	2015/07/14	NC		%	40
			Benzo(a)anthracene	2015/07/14	NC		%	40
			Benzo(b&j)fluoranthene	2015/07/14	NC		%	40
			Benzo(k)fluoranthene	2015/07/14	NC		%	40
			Benzo(g,h,i)perylene	2015/07/14	NC		%	40
			Benzo(c)phenanthrene	2015/07/14	NC		%	40
			Benzo(a)pyrene	2015/07/14	NC		%	40
			Benzo[e]pyrene	2015/07/14	NC		%	40
			Chrysene	2015/07/14	NC		%	40
			Dibenz(a,h)anthracene	2015/07/14	NC		%	40
			Fluoranthene	2015/07/14	NC		%	40
			Fluorene	2015/07/14	NC		%	40
			Indeno(1,2,3-cd)pyrene	2015/07/14	NC		%	40
			2-Methylnaphthalene	2015/07/14	NC		%	40
			Naphthalene	2015/07/14	NC		%	40
			Phenanthrene	2015/07/14	NC		%	40
			Perylene	2015/07/14	NC		%	40
			Pyrene	2015/07/14	NC		%	40
			Quinoline	2015/07/14	NC		%	40
7965867	HC7	Matrix Spike	Total Aluminum (Al)	2015/07/14		103	%	80 - 120
			Total Antimony (Sb)	2015/07/14		106	%	80 - 120
			Total Arsenic (As)	2015/07/14		104	%	80 - 120
			Total Beryllium (Be)	2015/07/14		102	%	80 - 120
			Total Chromium (Cr)	2015/07/14		107	%	80 - 120
			Total Cobalt (Co)	2015/07/14		109	%	80 - 120
			Total Copper (Cu)	2015/07/14		106	%	80 - 120
			Total Lead (Pb)	2015/07/14		110	%	80 - 120
			Total Molybdenum (Mo)	2015/07/14		107	%	80 - 120

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Total Nickel (Ni)	2015/07/14		107	%	80 - 120
			Total Selenium (Se)	2015/07/14		112	%	80 - 120
			Total Silver (Ag)	2015/07/14		107	%	80 - 120
			Total Thallium (Tl)	2015/07/14		110	%	80 - 120
			Total Tin (Sn)	2015/07/14		109	%	80 - 120
			Total Titanium (Ti)	2015/07/14		110	%	80 - 120
			Total Uranium (U)	2015/07/14		106	%	80 - 120
			Total Vanadium (V)	2015/07/14		109	%	80 - 120
			Total Zinc (Zn)	2015/07/14		108	%	80 - 120
7965867	HC7	Spiked Blank	Total Aluminum (Al)	2015/07/14		113	%	80 - 120
			Total Antimony (Sb)	2015/07/14		109	%	80 - 120
			Total Arsenic (As)	2015/07/14		109	%	80 - 120
			Total Beryllium (Be)	2015/07/14		107	%	80 - 120
			Total Chromium (Cr)	2015/07/14		112	%	80 - 120
			Total Cobalt (Co)	2015/07/14		113	%	80 - 120
			Total Copper (Cu)	2015/07/14		110	%	80 - 120
			Total Lead (Pb)	2015/07/14		113	%	80 - 120
			Total Molybdenum (Mo)	2015/07/14		111	%	80 - 120
			Total Nickel (Ni)	2015/07/14		112	%	80 - 120
			Total Selenium (Se)	2015/07/14		114	%	80 - 120
			Total Silver (Ag)	2015/07/14		111	%	80 - 120
			Total Thallium (Tl)	2015/07/14		113	%	80 - 120
			Total Tin (Sn)	2015/07/14		113	%	80 - 120
			Total Titanium (Ti)	2015/07/14		109	%	80 - 120
			Total Uranium (U)	2015/07/14		109	%	80 - 120
			Total Vanadium (V)	2015/07/14		112	%	80 - 120
			Total Zinc (Zn)	2015/07/14		111	%	80 - 120
7965867	HC7	Method Blank	Total Aluminum (Al)	2015/07/14	<0.0030		mg/L	
			Total Antimony (Sb)	2015/07/14	<0.00060		mg/L	
			Total Arsenic (As)	2015/07/14	<0.00020		mg/L	
			Total Beryllium (Be)	2015/07/14	<0.0010		mg/L	
			Total Chromium (Cr)	2015/07/14	<0.0010		mg/L	
			Total Cobalt (Co)	2015/07/14	<0.00030		mg/L	
			Total Copper (Cu)	2015/07/14	<0.00020		mg/L	
			Total Lead (Pb)	2015/07/14	<0.00020		mg/L	
			Total Molybdenum (Mo)	2015/07/14	<0.00020		mg/L	
			Total Nickel (Ni)	2015/07/14	<0.00050		mg/L	
			Total Selenium (Se)	2015/07/14	<0.00020		mg/L	
			Total Silver (Ag)	2015/07/14	<0.00010		mg/L	
			Total Thallium (Tl)	2015/07/14	<0.00020		mg/L	
			Total Tin (Sn)	2015/07/14	<0.0010		mg/L	
			Total Titanium (Ti)	2015/07/14	0.0011, RDL=0.0010		mg/L	
			Total Uranium (U)	2015/07/14	<0.00010		mg/L	
			Total Vanadium (V)	2015/07/14	<0.0010		mg/L	
			Total Zinc (Zn)	2015/07/14	<0.0030		mg/L	
7965867	HC7	RPD	Total Aluminum (Al)	2015/07/14	NC		%	20
			Total Antimony (Sb)	2015/07/14	NC		%	20
			Total Arsenic (As)	2015/07/14	NC		%	20
			Total Beryllium (Be)	2015/07/14	NC		%	20
			Total Chromium (Cr)	2015/07/14	NC		%	20
			Total Cobalt (Co)	2015/07/14	NC		%	20

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Total Copper (Cu)	2015/07/14	NC		%	20
			Total Lead (Pb)	2015/07/14	NC		%	20
			Total Molybdenum (Mo)	2015/07/14	NC		%	20
			Total Nickel (Ni)	2015/07/14	NC		%	20
			Total Selenium (Se)	2015/07/14	NC		%	20
			Total Silver (Ag)	2015/07/14	NC		%	20
			Total Thallium (Tl)	2015/07/14	NC		%	20
			Total Tin (Sn)	2015/07/14	NC		%	20
			Total Titanium (Ti)	2015/07/14	NC		%	20
			Total Uranium (U)	2015/07/14	NC		%	20
			Total Vanadium (V)	2015/07/14	NC		%	20
			Total Zinc (Zn)	2015/07/14	NC		%	20
7965872	SRT	Matrix Spike	Total Barium (Ba)	2015/07/15		93	%	80 - 120
			Total Boron (B)	2015/07/15		95	%	80 - 120
			Total Calcium (Ca)	2015/07/15		102	%	80 - 120
			Total Iron (Fe)	2015/07/15		99	%	80 - 120
			Total Lithium (Li)	2015/07/15		95	%	80 - 120
			Total Magnesium (Mg)	2015/07/15		96	%	80 - 120
			Total Manganese (Mn)	2015/07/15		98	%	80 - 120
			Total Phosphorus (P)	2015/07/15		99	%	80 - 120
			Total Potassium (K)	2015/07/15		94	%	80 - 120
			Total Silicon (Si)	2015/07/15		98	%	80 - 120
			Total Sodium (Na)	2015/07/15		94	%	80 - 120
			Total Strontium (Sr)	2015/07/15		96	%	80 - 120
7965872	SRT	Spiked Blank	Total Barium (Ba)	2015/07/15		94	%	80 - 120
			Total Boron (B)	2015/07/15		96	%	80 - 120
			Total Calcium (Ca)	2015/07/15		103	%	80 - 120
			Total Iron (Fe)	2015/07/15		101	%	80 - 120
			Total Lithium (Li)	2015/07/15		96	%	80 - 120
			Total Magnesium (Mg)	2015/07/15		97	%	80 - 120
			Total Manganese (Mn)	2015/07/15		99	%	80 - 120
			Total Phosphorus (P)	2015/07/15		102	%	80 - 120
			Total Potassium (K)	2015/07/15		96	%	80 - 120
			Total Silicon (Si)	2015/07/15		99	%	80 - 120
			Total Sodium (Na)	2015/07/15		94	%	80 - 120
			Total Strontium (Sr)	2015/07/15		97	%	80 - 120
7965872	SRT	Method Blank	Total Barium (Ba)	2015/07/15	<0.010		mg/L	
			Total Boron (B)	2015/07/15	<0.020		mg/L	
			Total Calcium (Ca)	2015/07/15	<0.30		mg/L	
			Total Iron (Fe)	2015/07/15	<0.060		mg/L	
			Total Lithium (Li)	2015/07/15	<0.020		mg/L	
			Total Magnesium (Mg)	2015/07/15	<0.20		mg/L	
			Total Manganese (Mn)	2015/07/15	<0.0040		mg/L	
			Total Phosphorus (P)	2015/07/15	0.16, RDL=0.10		mg/L	
			Total Potassium (K)	2015/07/15	<0.30		mg/L	
			Total Silicon (Si)	2015/07/15	<0.10		mg/L	
			Total Sodium (Na)	2015/07/15	<0.50		mg/L	
			Total Strontium (Sr)	2015/07/15	<0.020		mg/L	
			Total Sulphur (S)	2015/07/15	<0.20		mg/L	
7965872	SRT	RPD	Total Barium (Ba)	2015/07/15	NC		%	20
			Total Boron (B)	2015/07/15	NC		%	20

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Total Calcium (Ca)	2015/07/15	NC		%	20
			Total Iron (Fe)	2015/07/15	NC		%	20
			Total Lithium (Li)	2015/07/15	NC		%	20
			Total Magnesium (Mg)	2015/07/15	NC		%	20
			Total Manganese (Mn)	2015/07/15	NC		%	20
			Total Phosphorus (P)	2015/07/15	NC		%	20
			Total Potassium (K)	2015/07/15	NC		%	20
			Total Silicon (Si)	2015/07/15	NC		%	20
			Total Sodium (Na)	2015/07/15	NC		%	20
			Total Strontium (Sr)	2015/07/15	NC		%	20
			Total Sulphur (S)	2015/07/15	NC		%	20
7966206	HC7	Matrix Spike [MQ2967-03]	Dissolved Aluminum (Al)	2015/07/14		101	%	80 - 120
			Dissolved Antimony (Sb)	2015/07/14		84	%	80 - 120
			Dissolved Arsenic (As)	2015/07/14		96	%	80 - 120
			Dissolved Beryllium (Be)	2015/07/14		105	%	80 - 120
			Dissolved Chromium (Cr)	2015/07/14		98	%	80 - 120
			Dissolved Cobalt (Co)	2015/07/14		96	%	80 - 120
			Dissolved Copper (Cu)	2015/07/14		93	%	80 - 120
			Dissolved Lead (Pb)	2015/07/14		97	%	80 - 120
			Dissolved Molybdenum (Mo)	2015/07/14		108	%	80 - 120
			Dissolved Nickel (Ni)	2015/07/14		96	%	80 - 120
			Dissolved Selenium (Se)	2015/07/14		100	%	80 - 120
			Dissolved Silver (Ag)	2015/07/14		101	%	80 - 120
			Dissolved Thallium (Tl)	2015/07/14		98	%	80 - 120
			Dissolved Tin (Sn)	2015/07/14		110	%	80 - 120
			Dissolved Titanium (Ti)	2015/07/14		96	%	80 - 120
			Dissolved Uranium (U)	2015/07/14		98	%	80 - 120
			Dissolved Vanadium (V)	2015/07/14		104	%	80 - 120
			Dissolved Zinc (Zn)	2015/07/14		NC	%	80 - 120
7966206	HC7	Spiked Blank	Dissolved Aluminum (Al)	2015/07/14		106	%	80 - 120
			Dissolved Antimony (Sb)	2015/07/14		96	%	80 - 120
			Dissolved Arsenic (As)	2015/07/14		101	%	80 - 120
			Dissolved Beryllium (Be)	2015/07/14		99	%	80 - 120
			Dissolved Chromium (Cr)	2015/07/14		99	%	80 - 120
			Dissolved Cobalt (Co)	2015/07/14		99	%	80 - 120
			Dissolved Copper (Cu)	2015/07/14		101	%	80 - 120
			Dissolved Lead (Pb)	2015/07/14		103	%	80 - 120
			Dissolved Molybdenum (Mo)	2015/07/14		99	%	80 - 120
			Dissolved Nickel (Ni)	2015/07/14		98	%	80 - 120
			Dissolved Selenium (Se)	2015/07/14		104	%	80 - 120
			Dissolved Silver (Ag)	2015/07/14		100	%	80 - 120
			Dissolved Thallium (Tl)	2015/07/14		101	%	80 - 120
			Dissolved Tin (Sn)	2015/07/14		104	%	80 - 120
			Dissolved Titanium (Ti)	2015/07/14		85	%	80 - 120
			Dissolved Uranium (U)	2015/07/14		97	%	80 - 120
			Dissolved Vanadium (V)	2015/07/14		101	%	80 - 120
			Dissolved Zinc (Zn)	2015/07/14		100	%	80 - 120
7966206	HC7	Method Blank	Dissolved Aluminum (Al)	2015/07/15	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2015/07/15	<0.00060		mg/L	
			Dissolved Arsenic (As)	2015/07/15	<0.00020		mg/L	
			Dissolved Beryllium (Be)	2015/07/15	<0.0010		mg/L	

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Dissolved Chromium (Cr)	2015/07/15	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2015/07/15	<0.00030		mg/L	
			Dissolved Copper (Cu)	2015/07/15	<0.00020		mg/L	
			Dissolved Lead (Pb)	2015/07/15	<0.00020		mg/L	
			Dissolved Molybdenum (Mo)	2015/07/15	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2015/07/15	<0.00050		mg/L	
			Dissolved Selenium (Se)	2015/07/15	<0.00020		mg/L	
			Dissolved Silver (Ag)	2015/07/15	<0.00010		mg/L	
			Dissolved Thallium (Tl)	2015/07/15	<0.00020		mg/L	
			Dissolved Tin (Sn)	2015/07/15	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2015/07/15	<0.0010		mg/L	
			Dissolved Uranium (U)	2015/07/15	<0.00010		mg/L	
			Dissolved Vanadium (V)	2015/07/15	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2015/07/15	<0.0030		mg/L	
7966206	HC7	RPD [MQ2967-03]	Dissolved Aluminum (Al)	2015/07/14	NC		%	20
			Dissolved Antimony (Sb)	2015/07/14	NC		%	20
			Dissolved Arsenic (As)	2015/07/14	7.9		%	20
			Dissolved Beryllium (Be)	2015/07/14	NC		%	20
			Dissolved Chromium (Cr)	2015/07/14	NC		%	20
			Dissolved Cobalt (Co)	2015/07/14	1.3		%	20
			Dissolved Copper (Cu)	2015/07/14	2.3		%	20
			Dissolved Lead (Pb)	2015/07/14	NC		%	20
			Dissolved Molybdenum (Mo)	2015/07/14	0.81		%	20
			Dissolved Nickel (Ni)	2015/07/14	4.2		%	20
			Dissolved Selenium (Se)	2015/07/14	NC		%	20
			Dissolved Silver (Ag)	2015/07/14	NC		%	20
			Dissolved Thallium (Tl)	2015/07/14	NC		%	20
			Dissolved Tin (Sn)	2015/07/14	NC		%	20
			Dissolved Titanium (Ti)	2015/07/14	NC		%	20
			Dissolved Uranium (U)	2015/07/14	2.0		%	20
			Dissolved Vanadium (V)	2015/07/14	NC		%	20
			Dissolved Zinc (Zn)	2015/07/14	2.6		%	20
7966363	NW4	Matrix Spike [MQ2962-01]	Dissolved Nitrite (N)	2015/07/14		102	%	80 - 120
			Dissolved Nitrate (N)	2015/07/14		102	%	80 - 120
7966363	NW4	Spiked Blank	Dissolved Nitrite (N)	2015/07/14		101	%	80 - 120
			Dissolved Nitrate (N)	2015/07/14		101	%	80 - 120
7966363	NW4	Method Blank	Dissolved Nitrite (N)	2015/07/14	<0.010		mg/L	
			Dissolved Nitrate (N)	2015/07/14	<0.010		mg/L	
7966363	NW4	RPD [MQ2962-01]	Dissolved Nitrite (N)	2015/07/14	NC		%	20
			Dissolved Nitrate (N)	2015/07/14	NC		%	20
7966366	NW4	Matrix Spike [MQ2961-01]	Dissolved Nitrite (N)	2015/07/14		100	%	80 - 120
			Dissolved Nitrate (N)	2015/07/14		101	%	80 - 120
7966366	NW4	Spiked Blank	Dissolved Nitrite (N)	2015/07/14		100	%	80 - 120
			Dissolved Nitrate (N)	2015/07/14		101	%	80 - 120
7966366	NW4	Method Blank	Dissolved Nitrite (N)	2015/07/14	<0.010		mg/L	
			Dissolved Nitrate (N)	2015/07/14	<0.010		mg/L	
7966366	NW4	RPD [MQ2961-01]	Dissolved Nitrite (N)	2015/07/14	NC		%	20
			Dissolved Nitrate (N)	2015/07/14	NC		%	20
7966429	GP4	Matrix Spike	1,4-Difluorobenzene (sur.)	2015/07/14		101	%	70 - 130
			4-Bromofluorobenzene (sur.)	2015/07/14		106	%	70 - 130

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			D4-1,2-Dichloroethane (sur.)	2015/07/14		87	%	70 - 130
			Bromodichloromethane	2015/07/14		110	%	70 - 130
			Bromoform	2015/07/14		115	%	70 - 130
			Bromomethane	2015/07/14		109	%	70 - 130
			Carbon tetrachloride	2015/07/14		103	%	70 - 130
			Chlorobenzene	2015/07/14		107	%	70 - 130
			Chlorodibromomethane	2015/07/14		114	%	70 - 130
			Chloroethane	2015/07/14		98	%	70 - 130
			Chloroform	2015/07/14		107	%	70 - 130
			Chloromethane	2015/07/14		87	%	70 - 130
			1,2-dibromoethane	2015/07/14		113	%	70 - 130
			1,2-dichlorobenzene	2015/07/14		112	%	70 - 130
			1,3-dichlorobenzene	2015/07/14		107	%	70 - 130
			1,4-dichlorobenzene	2015/07/14		109	%	70 - 130
			1,1-dichloroethane	2015/07/14		101	%	70 - 130
			1,2-dichloroethane	2015/07/14		112	%	70 - 130
			1,1-dichloroethene	2015/07/14		99	%	70 - 130
			cis-1,2-dichloroethene	2015/07/14		99	%	70 - 130
			trans-1,2-dichloroethene	2015/07/14		99	%	70 - 130
			Dichloromethane	2015/07/14		99	%	70 - 130
			1,2-dichloropropane	2015/07/14		110	%	70 - 130
			cis-1,3-dichloropropene	2015/07/14		118	%	70 - 130
			trans-1,3-dichloropropene	2015/07/14		135 (1)	%	70 - 130
			Methyl methacrylate	2015/07/14		116	%	70 - 130
			Methyl-tert-butylether (MTBE)	2015/07/14		103	%	70 - 130
			Styrene	2015/07/14		109	%	70 - 130
			1,1,1,2-tetrachloroethane	2015/07/14		109	%	70 - 130
			1,1,2,2-tetrachloroethane	2015/07/14		111	%	70 - 130
			Tetrachloroethene	2015/07/14		103	%	70 - 130
			1,2,3-trichlorobenzene	2015/07/14		108	%	70 - 130
			1,2,4-trichlorobenzene	2015/07/14		110	%	70 - 130
			1,3,5-trichlorobenzene	2015/07/14		105	%	70 - 130
			1,1,1-trichloroethane	2015/07/14		102	%	70 - 130
			1,1,2-trichloroethane	2015/07/14		109	%	70 - 130
			Trichloroethene	2015/07/14		98	%	70 - 130
			Trichlorofluoromethane	2015/07/14		100	%	70 - 130
			1,2,4-trimethylbenzene	2015/07/14		107	%	70 - 130
			1,3,5-trimethylbenzene	2015/07/14		111	%	70 - 130
			Vinyl chloride	2015/07/14		72	%	70 - 130
7966429	GP4	Spiked Blank	1,4-Difluorobenzene (sur.)	2015/07/14		98	%	70 - 130
			4-Bromofluorobenzene (sur.)	2015/07/14		107	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2015/07/14		110	%	70 - 130
			Bromodichloromethane	2015/07/14		111	%	70 - 130
			Bromoform	2015/07/14		116	%	70 - 130
			Bromomethane	2015/07/14		101	%	70 - 130
			Carbon tetrachloride	2015/07/14		102	%	70 - 130
			Chlorobenzene	2015/07/14		107	%	70 - 130
			Chlorodibromomethane	2015/07/14		115	%	70 - 130
			Chloroethane	2015/07/14		97	%	70 - 130
			Chloroform	2015/07/14		106	%	70 - 130
			Chloromethane	2015/07/14		88	%	70 - 130
			1,2-dibromoethane	2015/07/14		115	%	70 - 130

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			1,2-dichlorobenzene	2015/07/14		112	%	70 - 130
			1,3-dichlorobenzene	2015/07/14		107	%	70 - 130
			1,4-dichlorobenzene	2015/07/14		109	%	70 - 130
			1,1-dichloroethane	2015/07/14		100	%	70 - 130
			1,2-dichloroethane	2015/07/14		113	%	70 - 130
			1,1-dichloroethene	2015/07/14		98	%	70 - 130
			cis-1,2-dichloroethene	2015/07/14		100	%	70 - 130
			trans-1,2-dichloroethene	2015/07/14		99	%	70 - 130
			Dichloromethane	2015/07/14		100	%	70 - 130
			1,2-dichloropropane	2015/07/14		110	%	70 - 130
			cis-1,3-dichloropropene	2015/07/14		108	%	70 - 130
			trans-1,3-dichloropropene	2015/07/14		115	%	70 - 130
			Methyl methacrylate	2015/07/14		117	%	70 - 130
			Methyl-tert-butylether (MTBE)	2015/07/14		102	%	70 - 130
			Styrene	2015/07/14		109	%	70 - 130
			1,1,1,2-tetrachloroethane	2015/07/14		110	%	70 - 130
			1,1,2,2-tetrachloroethane	2015/07/14		112	%	70 - 130
			Tetrachloroethene	2015/07/14		103	%	70 - 130
			1,2,3-trichlorobenzene	2015/07/14		107	%	70 - 130
			1,2,4-trichlorobenzene	2015/07/14		109	%	70 - 130
			1,3,5-trichlorobenzene	2015/07/14		105	%	70 - 130
			1,1,1-trichloroethane	2015/07/14		101	%	70 - 130
			1,1,2-trichloroethane	2015/07/14		110	%	70 - 130
			Trichloroethene	2015/07/14		98	%	70 - 130
			Trichlorofluoromethane	2015/07/14		99	%	70 - 130
			1,2,4-trimethylbenzene	2015/07/14		107	%	70 - 130
			1,3,5-trimethylbenzene	2015/07/14		110	%	70 - 130
			Vinyl chloride	2015/07/14		72	%	70 - 130
7966429	GP4	Method Blank	1,4-Difluorobenzene (sur.)	2015/07/14		98	%	70 - 130
			4-Bromofluorobenzene (sur.)	2015/07/14		97	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2015/07/14		89	%	70 - 130
			Bromodichloromethane	2015/07/14	<0.50		ug/L	
			Bromoform	2015/07/14	<0.50		ug/L	
			Bromomethane	2015/07/14	<2.0		ug/L	
			Carbon tetrachloride	2015/07/14	<0.50		ug/L	
			Chlorobenzene	2015/07/14	<0.50		ug/L	
			Chlorodibromomethane	2015/07/14	<1.0		ug/L	
			Chloroethane	2015/07/14	<1.0		ug/L	
			Chloroform	2015/07/14	<0.50		ug/L	
			Chloromethane	2015/07/14	<2.0		ug/L	
			1,2-dibromoethane	2015/07/14	<0.50		ug/L	
			1,2-dichlorobenzene	2015/07/14	<0.50		ug/L	
			1,3-dichlorobenzene	2015/07/14	<0.50		ug/L	
			1,4-dichlorobenzene	2015/07/14	<0.50		ug/L	
			1,1-dichloroethane	2015/07/14	<0.50		ug/L	
			1,2-dichloroethane	2015/07/14	<0.50		ug/L	
			1,1-dichloroethene	2015/07/14	<0.50		ug/L	
			cis-1,2-dichloroethene	2015/07/14	<0.50		ug/L	
			trans-1,2-dichloroethene	2015/07/14	<0.50		ug/L	
			Dichloromethane	2015/07/14	<2.0		ug/L	
			1,2-dichloropropane	2015/07/14	<0.50		ug/L	
			cis-1,3-dichloropropene	2015/07/14	<0.50		ug/L	

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			trans-1,3-dichloropropene	2015/07/14	<0.50		ug/L	
			Methyl methacrylate	2015/07/14	<0.50		ug/L	
			Methyl-tert-butylether (MTBE)	2015/07/14	<0.50		ug/L	
			Styrene	2015/07/14	<0.50		ug/L	
			1,1,1,2-tetrachloroethane	2015/07/14	<2.0		ug/L	
			1,1,2,2-tetrachloroethane	2015/07/14	<2.0		ug/L	
			Tetrachloroethene	2015/07/14	<0.50		ug/L	
			1,2,3-trichlorobenzene	2015/07/14	<1.0		ug/L	
			1,2,4-trichlorobenzene	2015/07/14	<1.0		ug/L	
			1,3,5-trichlorobenzene	2015/07/14	<0.50		ug/L	
			1,1,1-trichloroethane	2015/07/14	<0.50		ug/L	
			1,1,2-trichloroethane	2015/07/14	<0.50		ug/L	
			Trichloroethene	2015/07/14	<0.50		ug/L	
			Trichlorofluoromethane	2015/07/14	<0.50		ug/L	
			1,2,4-trimethylbenzene	2015/07/14	<0.50		ug/L	
			1,3,5-trimethylbenzene	2015/07/14	<0.50		ug/L	
			Vinyl chloride	2015/07/14	<0.50		ug/L	
7966429	GP4	RPD	Bromodichloromethane	2015/07/14	NC		%	40
			Bromoform	2015/07/14	NC		%	40
			Bromomethane	2015/07/14	NC		%	40
			Carbon tetrachloride	2015/07/14	NC		%	40
			Chlorobenzene	2015/07/14	NC		%	40
			Chlorodibromomethane	2015/07/14	NC		%	40
			Chloroethane	2015/07/14	NC		%	40
			Chloroform	2015/07/14	NC		%	40
			Chloromethane	2015/07/14	NC		%	40
			1,2-dibromoethane	2015/07/14	NC		%	40
			1,2-dichlorobenzene	2015/07/14	NC		%	40
			1,3-dichlorobenzene	2015/07/14	NC		%	40
			1,4-dichlorobenzene	2015/07/14	NC		%	40
			1,1-dichloroethane	2015/07/14	NC		%	40
			1,2-dichloroethane	2015/07/14	NC		%	40
			1,1-dichloroethene	2015/07/14	NC		%	40
			cis-1,2-dichloroethene	2015/07/14	NC		%	40
			trans-1,2-dichloroethene	2015/07/14	NC		%	40
			Dichloromethane	2015/07/14	NC		%	40
			1,2-dichloropropane	2015/07/14	NC		%	40
			cis-1,3-dichloropropene	2015/07/14	NC		%	40
			trans-1,3-dichloropropene	2015/07/14	NC		%	40
			Methyl methacrylate	2015/07/14	NC		%	40
			Methyl-tert-butylether (MTBE)	2015/07/14	NC		%	40
			Styrene	2015/07/14	NC		%	40
			1,1,1,2-tetrachloroethane	2015/07/14	NC		%	40
			1,1,2,2-tetrachloroethane	2015/07/14	NC		%	40
			Tetrachloroethene	2015/07/14	NC		%	40
			1,2,3-trichlorobenzene	2015/07/14	NC		%	40
			1,2,4-trichlorobenzene	2015/07/14	NC		%	40
			1,3,5-trichlorobenzene	2015/07/14	NC		%	40
			1,1,1-trichloroethane	2015/07/14	NC		%	40
			1,1,2-trichloroethane	2015/07/14	NC		%	40
			Trichloroethene	2015/07/14	NC		%	40
			Trichlorofluoromethane	2015/07/14	NC		%	40

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			1,2,4-trimethylbenzene	2015/07/14	NC		%	40
			1,3,5-trimethylbenzene	2015/07/14	NC		%	40
			Vinyl chloride	2015/07/14	NC		%	40
7966643	JLD	Spiked Blank	Alkalinity (Total as CaCO3)	2015/07/14		97	%	80 - 120
7966643	JLD	Method Blank	Alkalinity (PP as CaCO3)	2015/07/14	<0.50		mg/L	
			Alkalinity (Total as CaCO3)	2015/07/14	<0.50		mg/L	
			Bicarbonate (HCO3)	2015/07/14	<0.50		mg/L	
			Carbonate (CO3)	2015/07/14	<0.50		mg/L	
			Hydroxide (OH)	2015/07/14	<0.50		mg/L	
7966643	JLD	RPD	Alkalinity (PP as CaCO3)	2015/07/14	NC		%	20
			Alkalinity (Total as CaCO3)	2015/07/14	2.8		%	20
			Bicarbonate (HCO3)	2015/07/14	2.8		%	20
			Carbonate (CO3)	2015/07/14	NC		%	20
			Hydroxide (OH)	2015/07/14	NC		%	20
7966649	JLD	Spiked Blank	Conductivity	2015/07/14		101	%	90 - 110
7966649	JLD	Method Blank	Conductivity	2015/07/14	<1.0		uS/cm	
7966649	JLD	RPD	Conductivity	2015/07/14	0.56		%	20
7966650	JLD	Spiked Blank	pH	2015/07/14		100	%	97 - 103
7966650	JLD	RPD	pH	2015/07/14	0.18		%	N/A
7967384	SRT	Matrix Spike [MQ2967-03]	Dissolved Barium (Ba)	2015/07/16		55 (1)	%	80 - 120
			Dissolved Boron (B)	2015/07/16		92	%	80 - 120
			Dissolved Calcium (Ca)	2015/07/16		NC	%	80 - 120
			Dissolved Iron (Fe)	2015/07/16		91	%	80 - 120
			Dissolved Lithium (Li)	2015/07/16		92	%	80 - 120
			Dissolved Magnesium (Mg)	2015/07/16		NC	%	80 - 120
			Dissolved Manganese (Mn)	2015/07/16		NC	%	80 - 120
			Dissolved Phosphorus (P)	2015/07/16		104	%	80 - 120
			Dissolved Potassium (K)	2015/07/16		94	%	80 - 120
			Dissolved Silicon (Si)	2015/07/16		96	%	80 - 120
			Dissolved Sodium (Na)	2015/07/16		NC	%	80 - 120
			Dissolved Strontium (Sr)	2015/07/16		NC	%	80 - 120
7967384	SRT	Spiked Blank	Dissolved Barium (Ba)	2015/07/15		87	%	80 - 120
			Dissolved Boron (B)	2015/07/15		89	%	80 - 120
			Dissolved Calcium (Ca)	2015/07/15		97	%	80 - 120
			Dissolved Iron (Fe)	2015/07/15		91	%	80 - 120
			Dissolved Lithium (Li)	2015/07/15		90	%	80 - 120
			Dissolved Magnesium (Mg)	2015/07/15		91	%	80 - 120
			Dissolved Manganese (Mn)	2015/07/15		92	%	80 - 120
			Dissolved Phosphorus (P)	2015/07/15		93	%	80 - 120
			Dissolved Potassium (K)	2015/07/15		88	%	80 - 120
			Dissolved Silicon (Si)	2015/07/15		92	%	80 - 120
			Dissolved Sodium (Na)	2015/07/15		88	%	80 - 120
			Dissolved Strontium (Sr)	2015/07/15		90	%	80 - 120
7967384	SRT	Method Blank	Dissolved Barium (Ba)	2015/07/15	<0.010		mg/L	
			Dissolved Boron (B)	2015/07/15	<0.020		mg/L	
			Dissolved Calcium (Ca)	2015/07/15	<0.30		mg/L	
			Dissolved Iron (Fe)	2015/07/15	<0.060		mg/L	
			Dissolved Lithium (Li)	2015/07/15	<0.020		mg/L	
			Dissolved Magnesium (Mg)	2015/07/15	<0.20		mg/L	
			Dissolved Manganese (Mn)	2015/07/15	<0.0040		mg/L	
			Dissolved Phosphorus (P)	2015/07/15	<0.10		mg/L	

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Dissolved Potassium (K)	2015/07/15	<0.30		mg/L	
			Dissolved Silicon (Si)	2015/07/15	<0.10		mg/L	
			Dissolved Sodium (Na)	2015/07/15	<0.50		mg/L	
			Dissolved Strontium (Sr)	2015/07/15	<0.020		mg/L	
			Dissolved Sulphur (S)	2015/07/15	<0.20		mg/L	
7967384	SRT	RPD [MQ2967-03]	Dissolved Barium (Ba)	2015/07/15	2.8		%	20
			Dissolved Boron (B)	2015/07/15	1.7		%	20
			Dissolved Calcium (Ca)	2015/07/15	1.4		%	20
			Dissolved Iron (Fe)	2015/07/15	1.0		%	20
			Dissolved Lithium (Li)	2015/07/15	NC		%	20
			Dissolved Magnesium (Mg)	2015/07/15	1.7		%	20
			Dissolved Manganese (Mn)	2015/07/15	0.96		%	20
			Dissolved Phosphorus (P)	2015/07/15	NC		%	20
			Dissolved Potassium (K)	2015/07/15	3.5		%	20
			Dissolved Silicon (Si)	2015/07/15	1.7		%	20
			Dissolved Sodium (Na)	2015/07/15	2.8		%	20
			Dissolved Strontium (Sr)	2015/07/15	2.9		%	20
			Dissolved Sulphur (S)	2015/07/15	1.8		%	20
7969633	KP9	Matrix Spike [MQ2963-01]	Dissolved Chloride (Cl)	2015/07/16		108	%	80 - 120
7969633	KP9	Spiked Blank	Dissolved Chloride (Cl)	2015/07/16		106	%	80 - 120
7969633	KP9	Method Blank	Dissolved Chloride (Cl)	2015/07/16	<1.0		mg/L	
7969633	KP9	RPD [MQ2963-01]	Dissolved Chloride (Cl)	2015/07/16	NC		%	20
7969634	TN4	Matrix Spike [MQ2963-01]	Dissolved Sulphate (SO4)	2015/07/17		102	%	80 - 120
7969634	TN4	Spiked Blank	Dissolved Sulphate (SO4)	2015/07/17		107	%	80 - 120
7969634	TN4	Method Blank	Dissolved Sulphate (SO4)	2015/07/17	<1.0		mg/L	
7969634	TN4	RPD [MQ2963-01]	Dissolved Sulphate (SO4)	2015/07/17	NC		%	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B558674
Report Date: 2015/07/23

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000, BAR U RANCH
Sampler Initials: JF

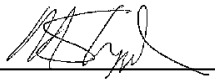
VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

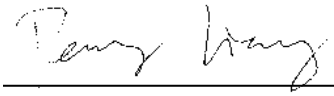
Ijeoma Okolo, Project Manager Assistant

Janet Gao, Supervisor

Letitia Prefontaine, B.Sc., Customer Service Supervisor



Michael Sheppard, Senior Scientific Specialist



Harry (Peng) Liang, Senior Analyst

Veronica Falk, Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam
A Bureau Veritas Group Company

Calgary: 4000 19th St. NE, T2E 6P8. Toll Free (800) 386-7247
Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
maxxam.ca

CHAIN OF CUSTODY RECORD

M 000186

Page 1 of 1

Invoice Information	Report Information (if differs from invoice)	Project Information	Turnaround Time (TAT) Required
Company: Golder Associates Ltd.	Company: Same as invoice	Quotation #: Golder 2015 Rates	☒ 5 - 7 Days Regular (Most analyses)
Contact Name: Steven Fiddler	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: 16820-107 Avenue Edmonton, AB T5P4C3	Address:	Project #: 1526784/2000	Rush TAT (Surcharges will be applied)
Phone: 780-483-3499/780-984-6000	Phone:	Site Location: Bar U Ranch	☐ Same Day ☐ 2 Days ☐ 1 Day ☐ 3-4 Days
Email: sfiddler@golder.com	Email:	Site #:	Date Required:
Copies: CSMdataQualityQ@golder.com	Copies:	Sampled By: J. Fournier	Rush Confirmation #:

Laboratory Use Only

	YES	NO	Cooler ID	Temp
Seal Present	✓			
Seal Intact	✓			
Cooling Media	✓			
				6 6 5
Seal Present	✓			
Seal Intact	✓			
Cooling Media	✓			
				7 5 8
Seal Present	✓			
Seal Intact	✓			
Cooling Media	✓			
				5 5 6

Depot Reception

Analysis Requested

Regulatory Criteria

☐ AT1/CCME
☐ Drinking Water
☐ Saskatchewan
☐ D50 (Drilling Waste)
☒ Other: CCME

Special Instructions

metals bottles have been Par F/P as needed for all samples.
MW8 - limited sample.
DUP15-02 ↳ limited sample.

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC ☒	BTEX F1-F2	PAH	Routine Water	Regulated Metals Tot ☒ Diss ☐	Mercury Total ☐ Dissolved ☐	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	Organic Chlorine Pesticides	HOLD - DO NOT ANALYZE
1	DUP15-01		2015/07/09		W	13	X	X	X	X	X						X	
2	DUP 15-02		↓		↓		X	X	X	X	X						X	
3	DUP 15-03		↓		↓		X	X	X	X	X						X	
4	MW 1		↓	1540	GW		X	X	X	X	X						X	
5	MW 7		↓	1300	↓		X	X	X	X	X						X	
6	MW 8		↓	1450	↓		X	X	X	X	X						X	
7	MW 9		↓	1430	↓		X	X	X	X	X						X	
8	MW 12.		2015/07/10	1610	GW	↓	X	X	X	X	X						X	
9																		
10																		

. *Please indicate Filtered, Preserved or Both (F, P, F/P)* →

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)
Julie Fournier/Julie Fournier	2015/07/10	1825	[illegible]	2015/07/10	18:41

10-Jul-15 18:41
Alexander Dobbie
B558674

353

FL5 INS-0109 JMH

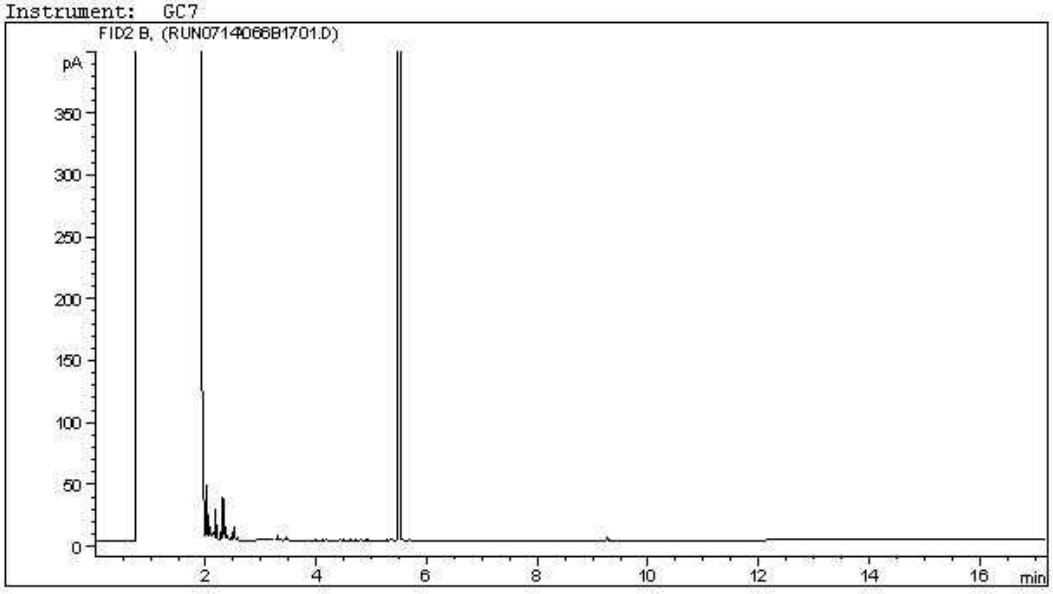
AB FCD-00331/6

Maxxam Job #: B558674
Report Date: 2015/07/23
Maxxam Sample: MQ2961

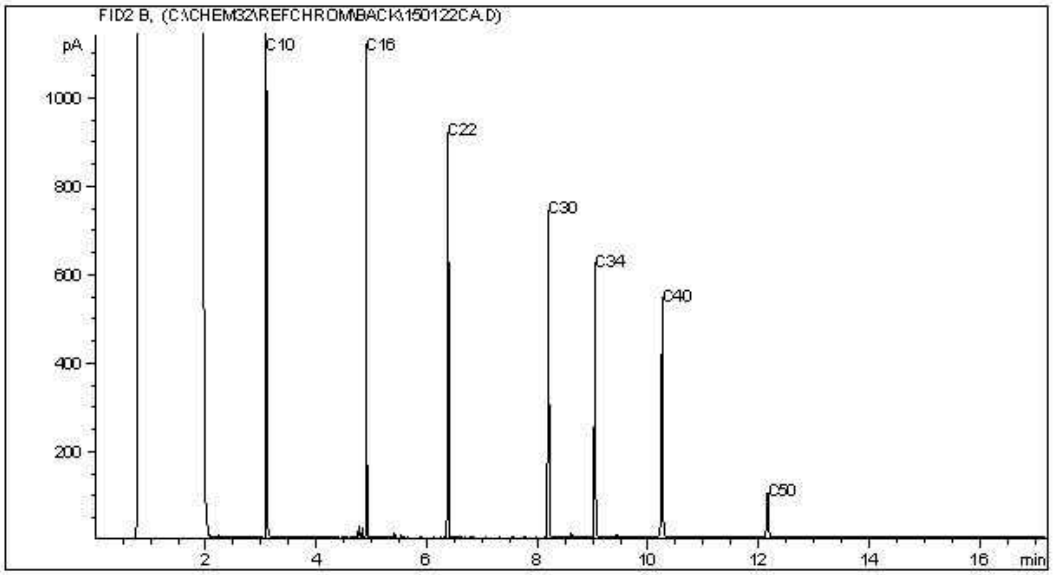
GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Reference: 2000, BAR U RANCH
Client ID: DUP15-01

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: GC7



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

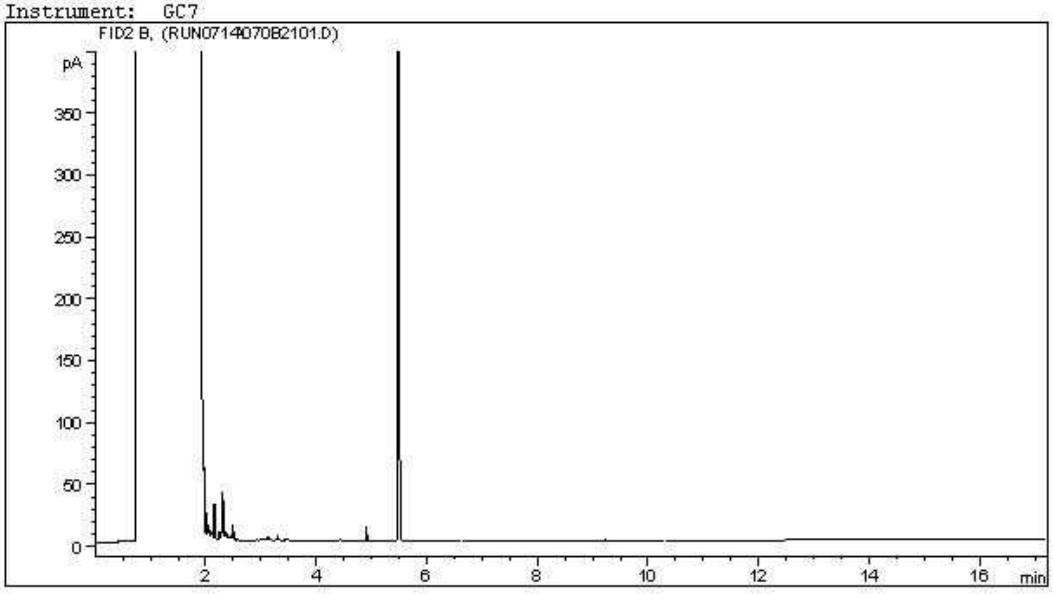
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B558674
Report Date: 2015/07/23
Maxxam Sample: MQ2962

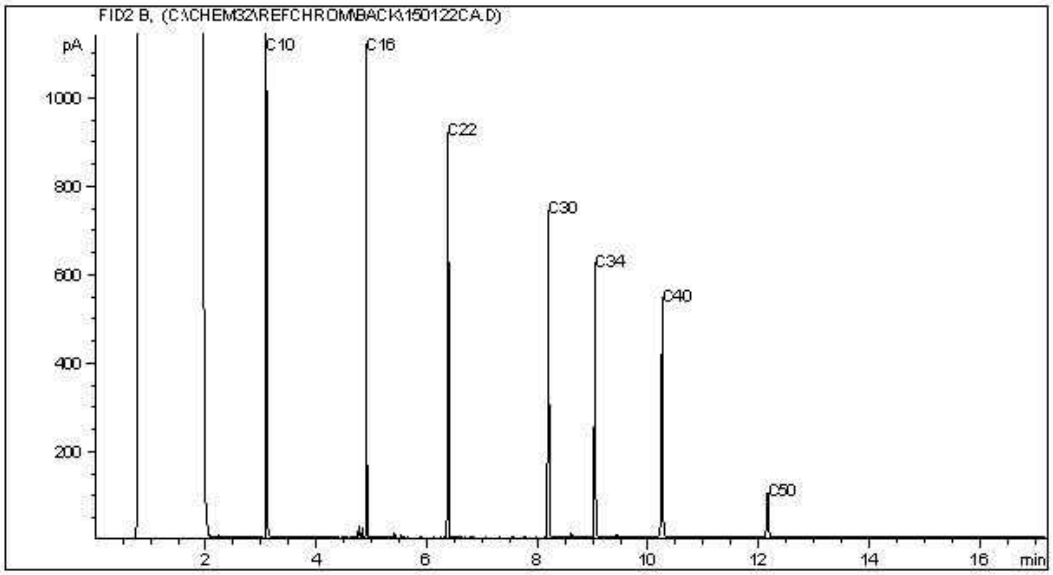
GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Reference: 2000, BAR U RANCH
Client ID: DUP15-02

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: GC7



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

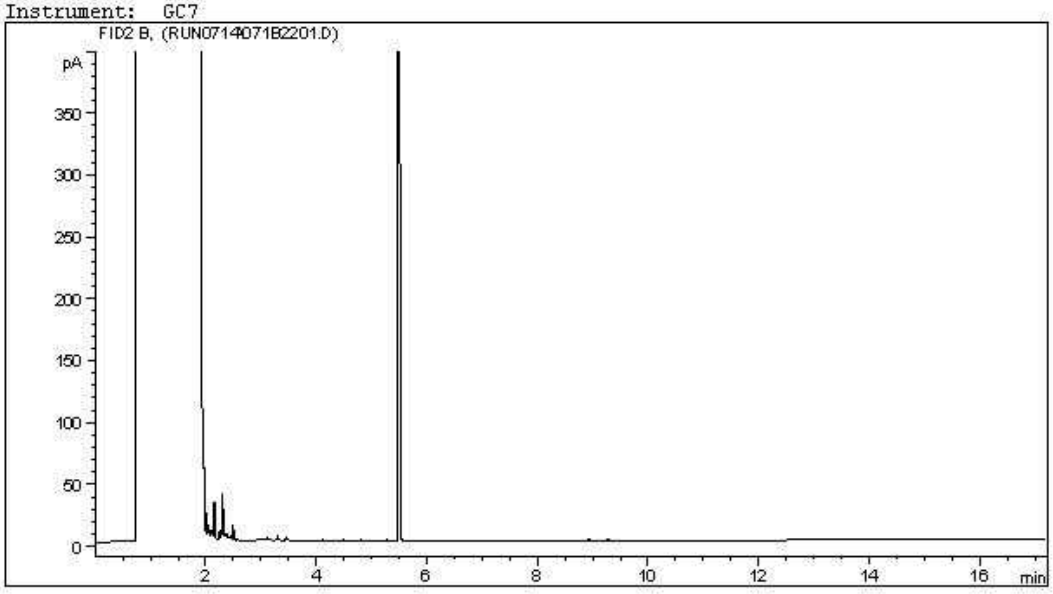
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B558674
Report Date: 2015/07/23
Maxxam Sample: MQ2963

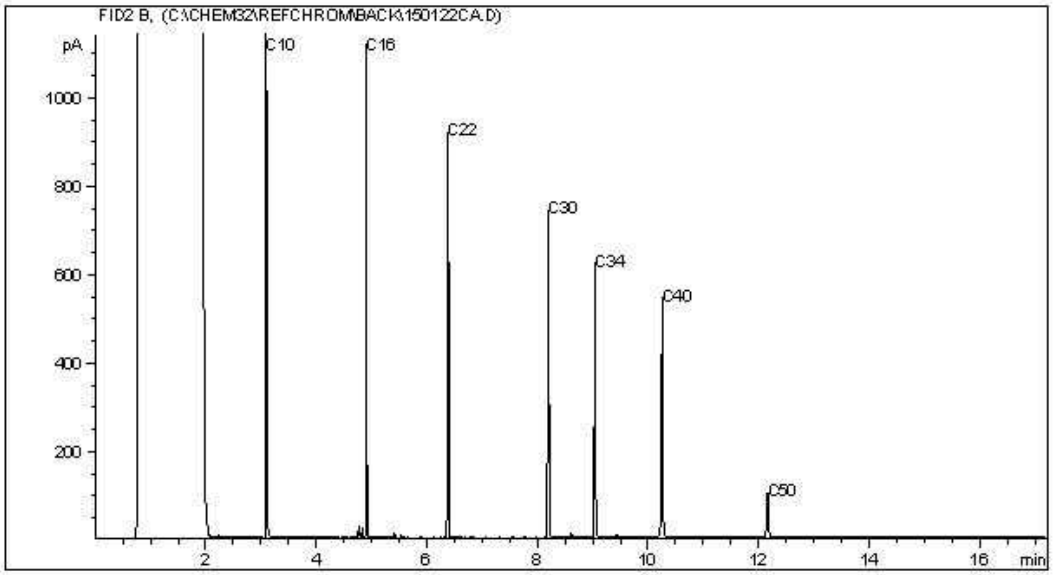
GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Reference: 2000, BAR U RANCH
Client ID: DUP15-03

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: GC7



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

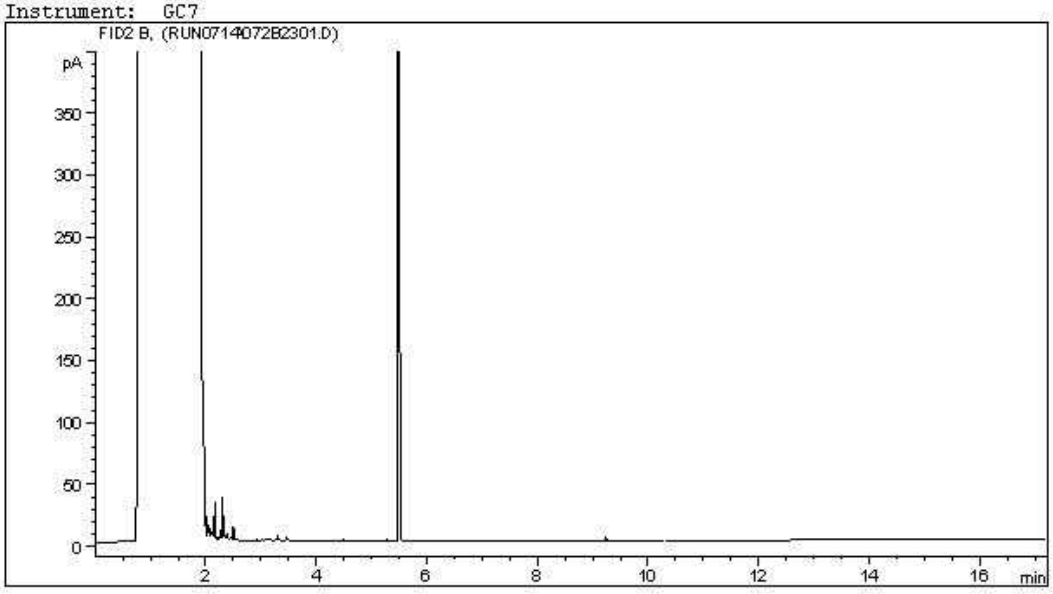
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B558674
Report Date: 2015/07/23
Maxxam Sample: MQ2964

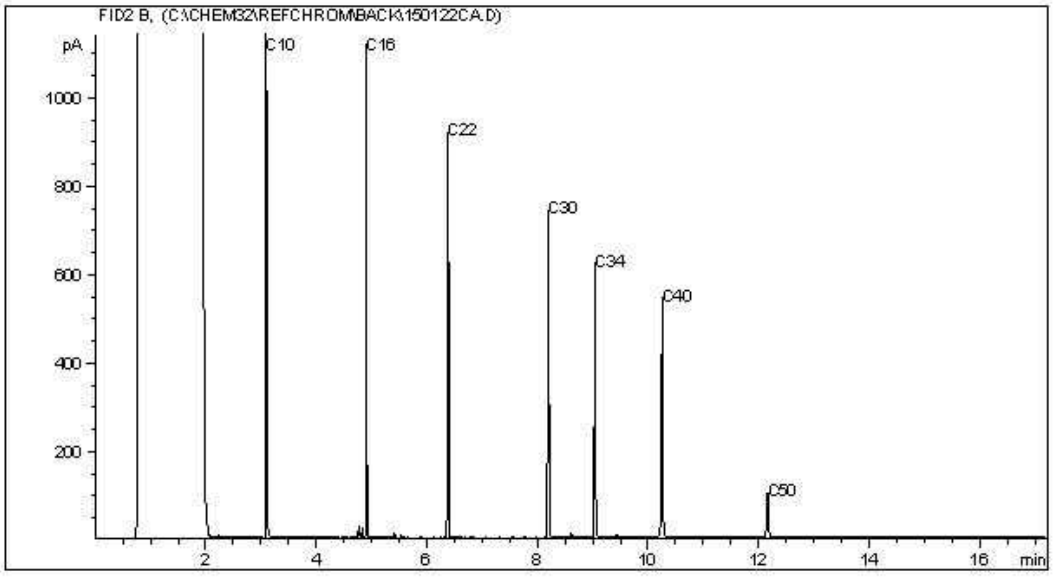
GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Reference: 2000, BAR U RANCH
Client ID: MW1

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: GC7



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

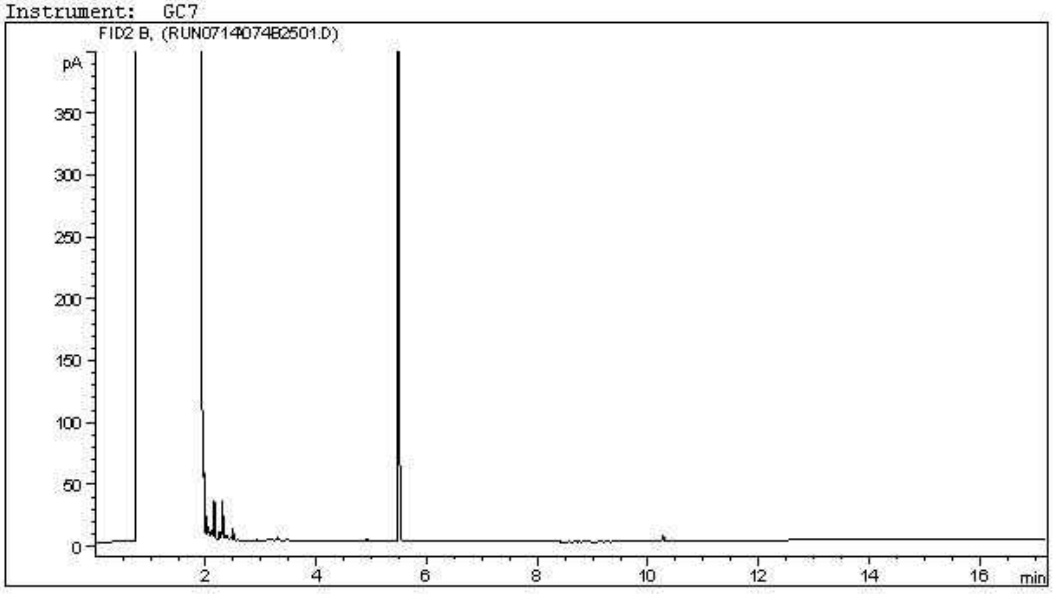
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B558674
Report Date: 2015/07/23
Maxxam Sample: MQ2965

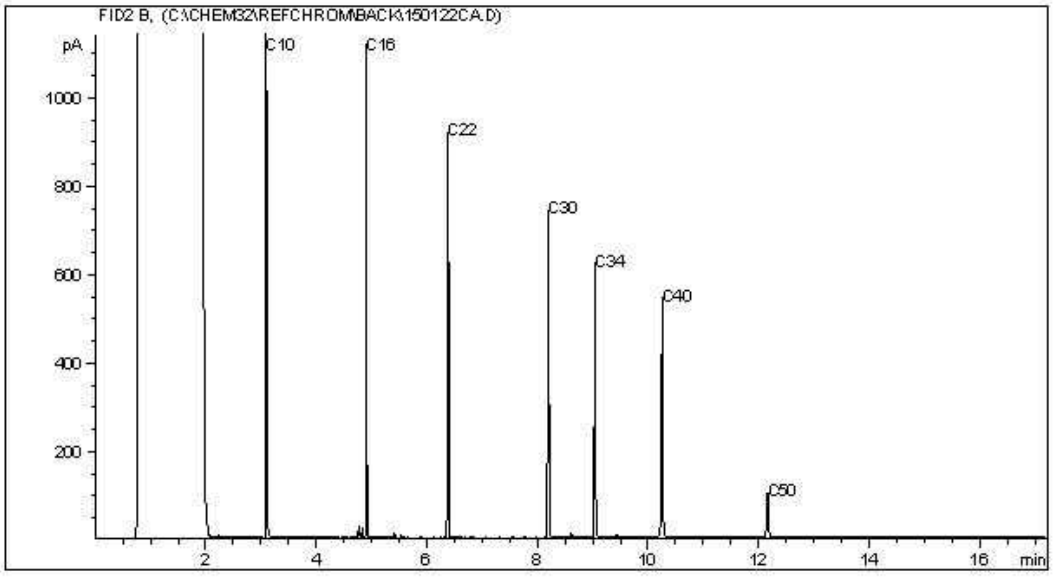
GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Reference: 2000, BAR U RANCH
Client ID: MW7

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: GC7



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

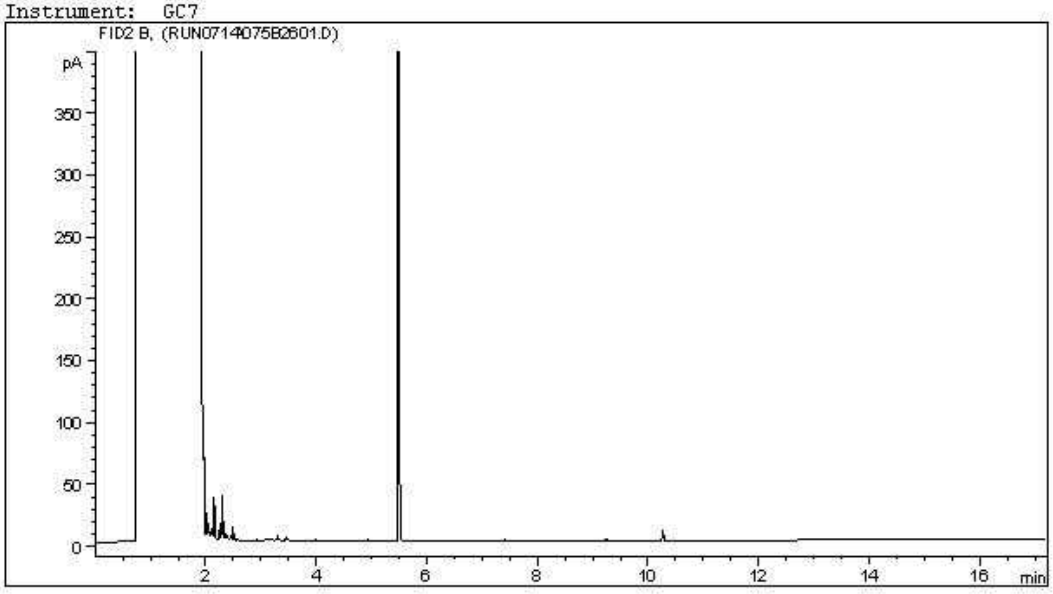
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B558674
Report Date: 2015/07/23
Maxxam Sample: MQ2966

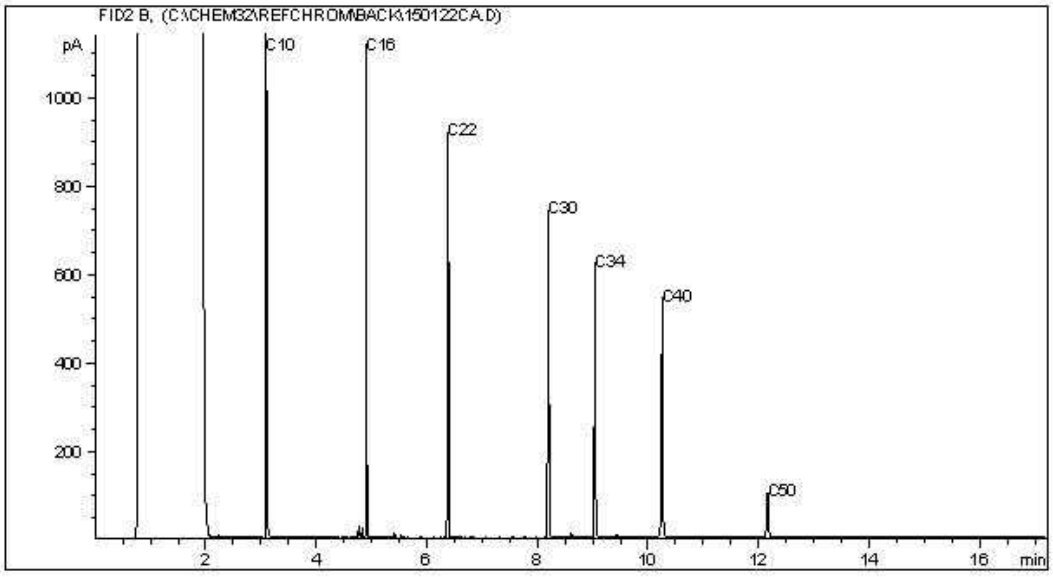
GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Reference: 2000, BAR U RANCH
Client ID: MW8

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: GC7



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

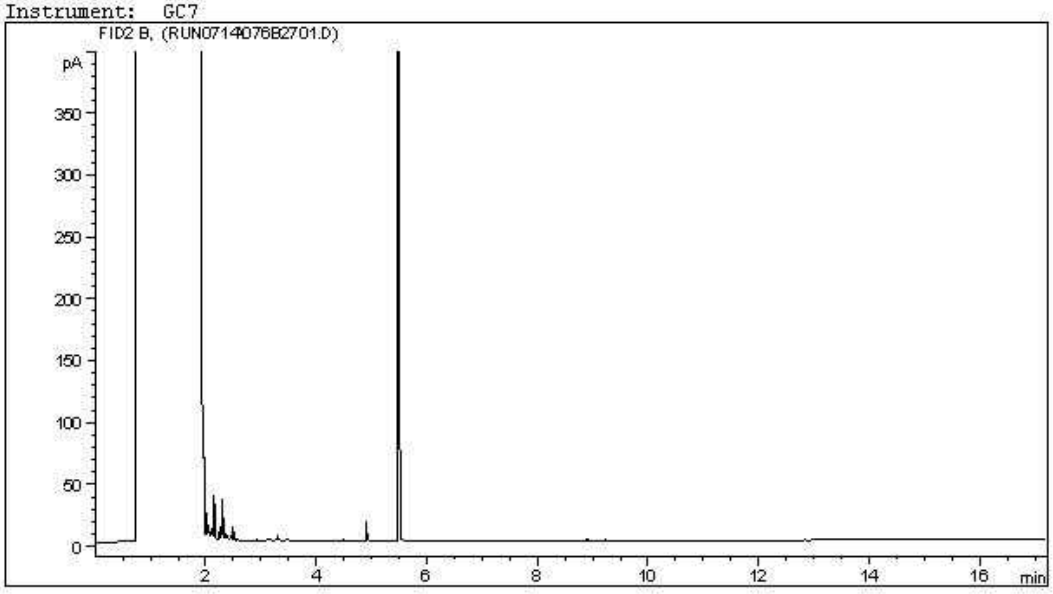
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B558674
Report Date: 2015/07/23
Maxxam Sample: MQ2967

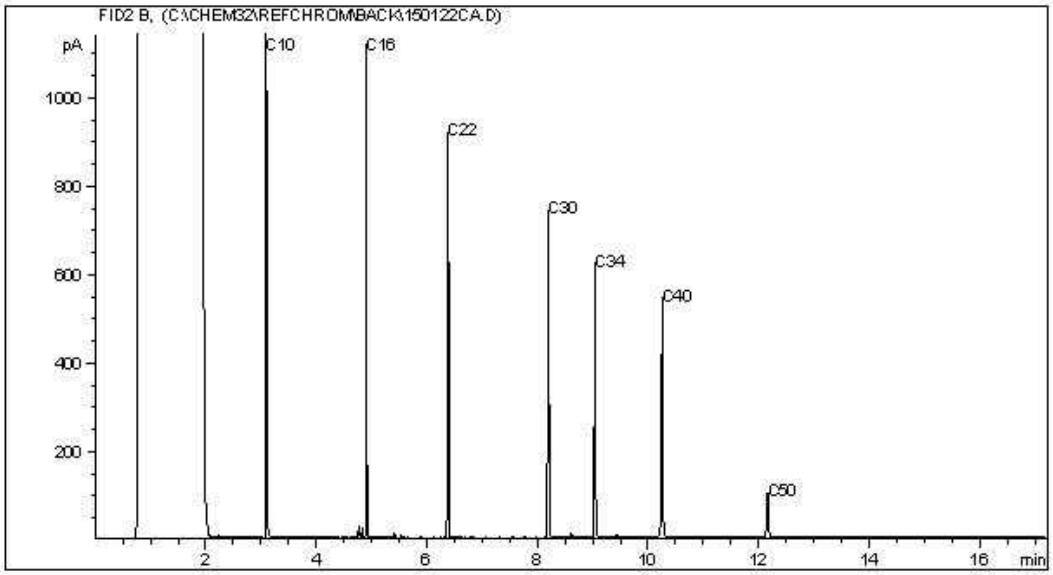
GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Reference: 2000, BAR U RANCH
Client ID: MW9

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: GC7



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

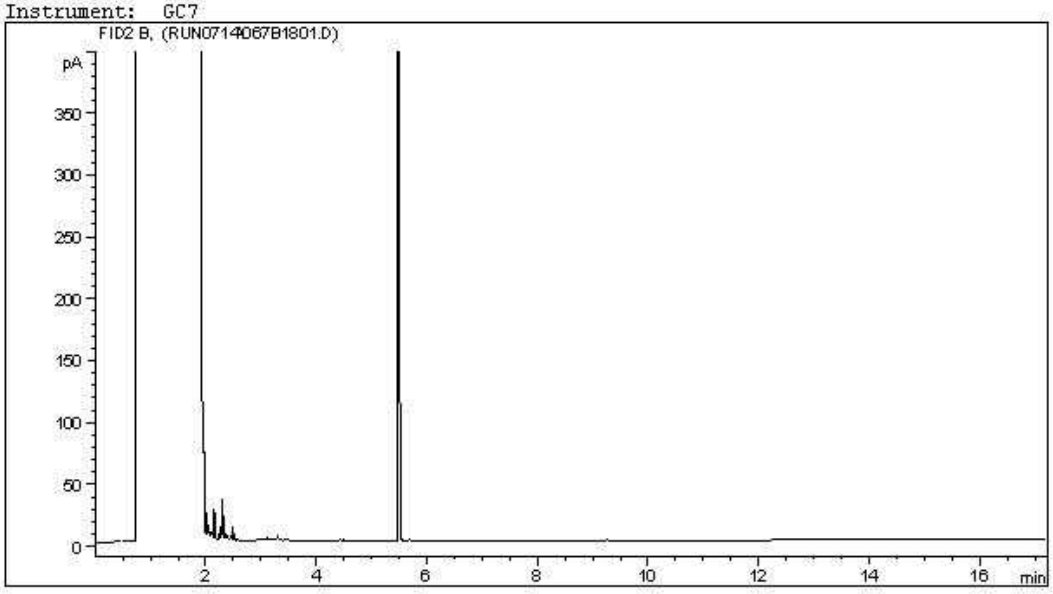
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B558674
Report Date: 2015/07/23
Maxxam Sample: MQ2968

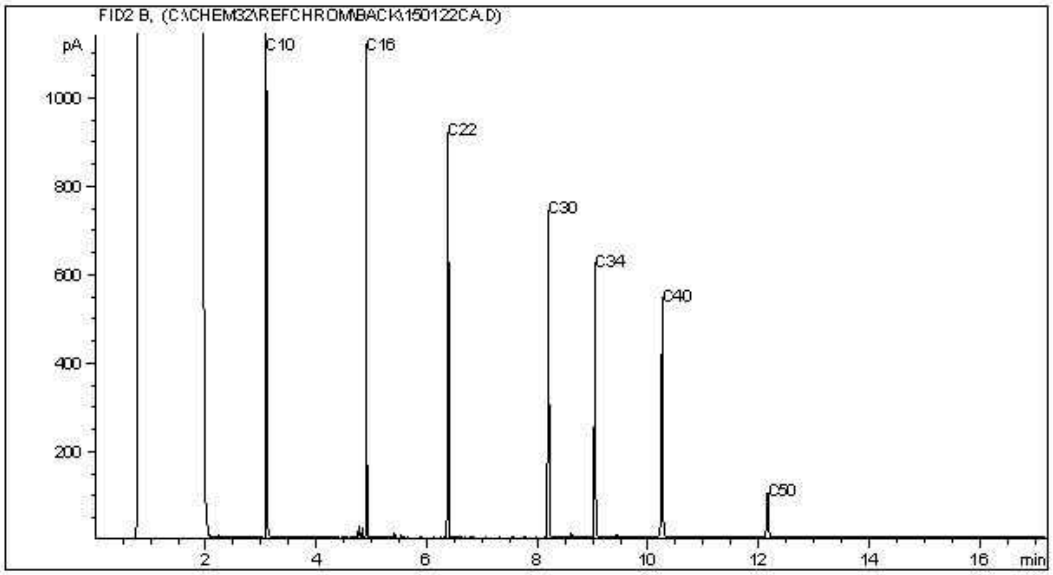
GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Reference: 2000, BAR U RANCH
Client ID: MW12

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: GC7



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

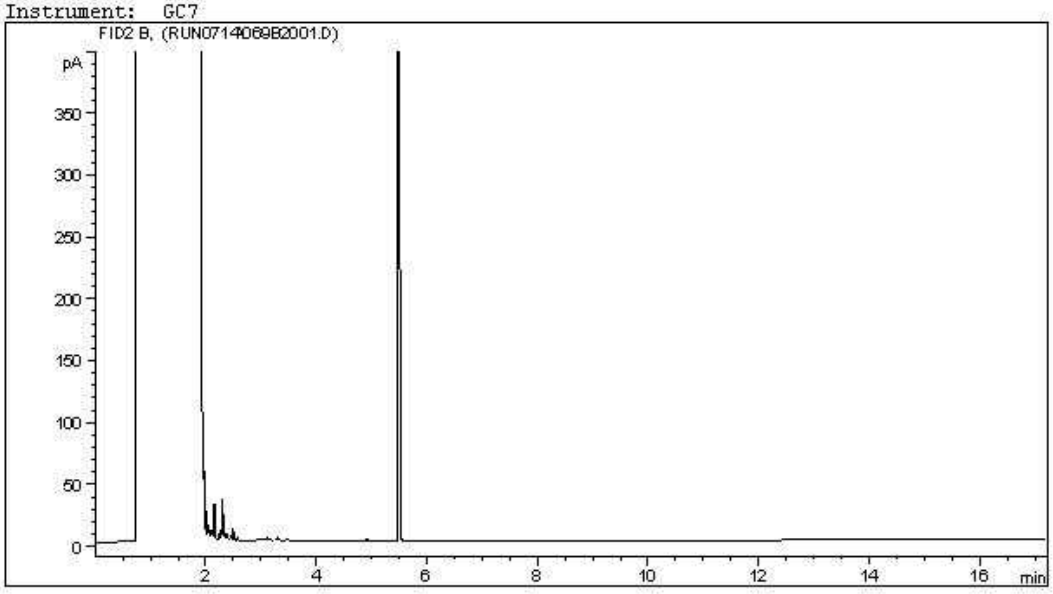
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B558674
Report Date: 2015/07/23
Maxxam Sample: MQ2968 Lab-Dup

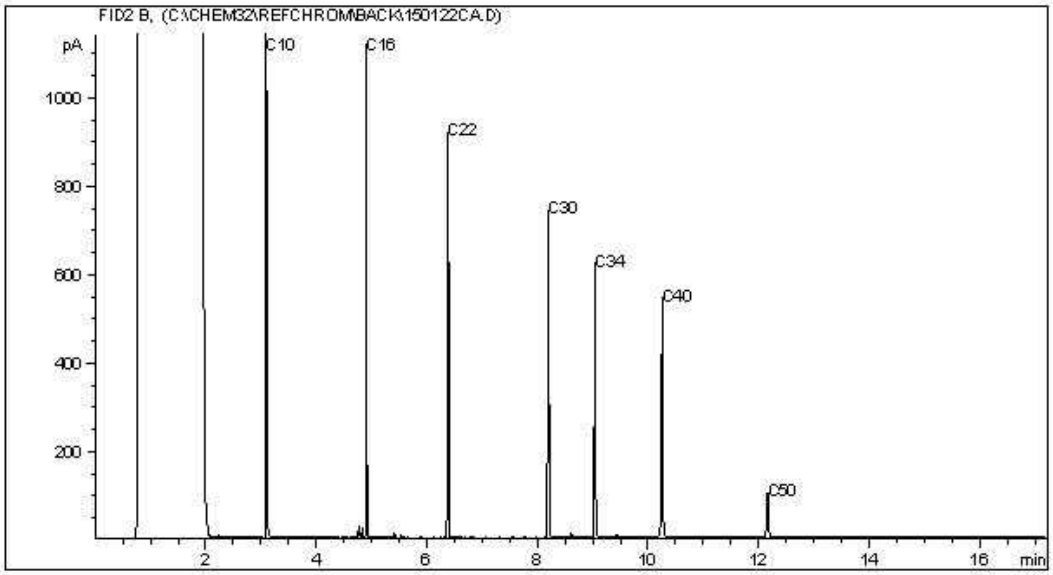
GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Reference: 2000, BAR U RANCH
Client ID: MW12

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: GC7



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Your Project #: 1526784
Site Location: 2000/ BAR U RANCH
Your C.O.C. #: M000187

Attention:Steven Fiddler

GOLDER ASSOCIATES LTD
16820-107 AVE
EDMONTON, AB
CANADA T5P 4C3

Report Date: 2015/08/04
Report #: R2008955
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B559135
Received: 2015/07/13, 17:14

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	3	N/A	2015/07/17	AB SOP-00005	SM 22 2320 B m
BTEX/F1 in Water by HS GC/MS/FID	4	N/A	2015/07/17	AB SOP-00039	CCME CWS/EPA 8260C m
Cadmium - low level CCME - Dissolved	3	N/A	2015/07/18	AB WI-00065	Auto Calc
Cadmium - low level CCME (Total)	3	2015/07/15	2015/07/18	AB WI-00065	Auto Calc
Chloride by Automated Colourimetry	2	N/A	2015/07/18	AB SOP-00020	SM 22-4500-Cl G m
Chloride by Automated Colourimetry	1	N/A	2015/07/19	AB SOP-00020	SM 22-4500-Cl G m
Conductivity @25C	3	N/A	2015/07/17	AB SOP-00005	SM 22 2510 B m
CCME Hydrocarbons in Water (F2; C10-C16)	4	2015/07/19	2015/07/19	AB SOP-00040 AB SOP-00037	CCME PHC-CWS m
Hardness	3	N/A	2015/07/20	AB WI-00065	Auto Calc
Elements by ICP - Dissolved	3	N/A	2015/07/16	AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICP - Total	3	2015/07/16	2015/07/16	AB SOP-00014 / AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICPMS - Dissolved	3	N/A	2015/07/16	AB SOP-00043	EPA 200.8 R5.4 m
Elements by ICPMS - Total	3	2015/07/16	2015/07/16	AB SOP-00014 / AB SOP-00043	EPA 200.8 R5.4 m
Ion Balance	3	N/A	2015/07/17	AB WI-00065	Auto Calc
Sum of cations, anions	3	N/A	2015/07/20	AB WI-00065	Auto Calc
Nitrate and Nitrite	2	N/A	2015/07/17	AB WI-00065	Auto Calc
Nitrate and Nitrite	1	N/A	2015/07/21	AB WI-00065	Auto Calc
Nitrate + Nitrite-N (calculated)	2	N/A	2015/07/17	AB WI-00065	Auto Calc
Nitrate + Nitrite-N (calculated)	1	N/A	2015/07/21	AB WI-00065	Auto Calc
Nitrogen, (Nitrite, Nitrate) by IC	1	N/A	2015/07/16	AB SOP-00023	SM 22 4110 B m
Nitrogen, (Nitrite, Nitrate) by IC	1	N/A	2015/07/17	AB SOP-00023	SM 22 4110 B m
Nitrogen, (Nitrite, Nitrate) by IC	1	N/A	2015/07/20	AB SOP-00023	SM 22 4110 B m
Benzo[a]pyrene Equivalency (1)	4	N/A	2015/07/21	AB SOP-00003	Auto Calc
PAH in Water by GC/MS	4	2015/07/19	2015/07/20	AB SOP-00037 / AB SOP-00003	EPA 8270D m
pH @25°C (Alkalinity titrator)	3	N/A	2015/07/17	AB SOP-00005	SM 22 4500-H+B m
Sulphate by Automated Colourimetry	2	N/A	2015/07/18	AB SOP-00018	SM 22 4500-SO4 E m
Sulphate by Automated Colourimetry	1	N/A	2015/07/19	AB SOP-00018	SM 22 4500-SO4 E m

Your Project #: 1526784
Site Location: 2000/ BAR U RANCH
Your C.O.C. #: M000187

Attention:Steven Fiddler

GOLDER ASSOCIATES LTD
16820-107 AVE
EDMONTON, AB
CANADA T5P 4C3

Report Date: 2015/08/04
Report #: R2008955
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B559135
Received: 2015/07/13, 17:14

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Total Dissolved Solids (Calculated)	3	N/A	2015/07/20	AB WI-00065	Auto Calc
Total Trihalomethanes Calculation	4	N/A	2015/07/20	CAL SOP-00104	Auto Calc
VOCs in Water by HS GC/MS (Std List)	4	N/A	2015/07/17	AB SOP-00056	EPA 8260C / 5021A m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) B[a]P TPE is calculated using 1/2 of the RDL for non detect results as per Alberta Environment instructions. This protocol may not apply in other jurisdictions.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Wendy Sears, Project manager
Email: WSears@maxxam.ca
Phone# (403)735-2277
==========
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B559135
Report Date: 2015/08/04

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000/ BAR U RANCH
Sampler Initials: JF

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		MQ5585			MQ5586			MQ5588		
Sampling Date		2015/07/13 09:45			2015/07/13 10:10			2015/07/13 10:40		
COC Number		M000187			M000187			M000187		
	Units	MW3	RDL	QC Batch	MW2	RDL	QC Batch	MW6	RDL	QC Batch
Calculated Parameters										
Anion Sum	meq/L	100	N/A	7968053	43	N/A	7968053	54	N/A	7968053
Cation Sum	meq/L	94	N/A	7968053	38	N/A	7968053	46	N/A	7968053
Hardness (CaCO3)	mg/L	3900	0.50	7968052	1400	0.50	7968052	1800	0.50	7968052
Ion Balance	N/A	0.93	0.010	7967987	0.88	0.010	7967987	0.85	0.010	7967987
Dissolved Nitrate (NO3)	mg/L	0.88	0.22	7967238	0.33	0.044	7967238	0.25	0.22	7968145
Nitrate plus Nitrite (N)	mg/L	0.20	0.020	7967239	0.075	0.020	7967239	0.057	0.020	7968146
Dissolved Nitrite (NO2)	mg/L	<0.16	0.16	7967238	<0.033	0.033	7967238	<0.16	0.16	7968145
Total Dissolved Solids	mg/L	6200	10	7967990	2500	10	7967990	3000	10	7967990
Misc. Inorganics										
Conductivity	uS/cm	6300	1.0	7969491	3200	1.0	7969491	3900	1.0	7969491
pH	pH	7.92	N/A	7969492	7.86	N/A	7969492	7.84	N/A	7969492
Low Level Elements										
Dissolved Cadmium (Cd)	ug/L	0.25	0.020	7967229	0.20	0.020	7967229	<0.020	0.020	7967229
Total Cadmium (Cd)	ug/L	1.1	0.020	7967740	1.6	0.020	7967740	5.9	0.020	7967740
Anions										
Alkalinity (PP as CaCO3)	mg/L	<0.50	0.50	7969490	<0.50	0.50	7969490	<0.50	0.50	7969490
Alkalinity (Total as CaCO3)	mg/L	620	0.50	7969490	530	0.50	7969490	880	0.50	7969490
Bicarbonate (HCO3)	mg/L	760	0.50	7969490	650	0.50	7969490	1100	0.50	7969490
Carbonate (CO3)	mg/L	<0.50	0.50	7969490	<0.50	0.50	7969490	<0.50	0.50	7969490
Hydroxide (OH)	mg/L	<0.50	0.50	7969490	<0.50	0.50	7969490	<0.50	0.50	7969490
Dissolved Sulphate (SO4)	mg/L	4200 (1)	25	7971860	1500 (1)	10	7971804	1600 (1)	10	7971804
Dissolved Chloride (Cl)	mg/L	32	1.0	7971859	11	1.0	7971787	77	1.0	7971787
Nutrients										
Dissolved Nitrite (N)	mg/L	<0.050 (2)	0.050	7970241	<0.010	0.010	7969156	<0.050 (2)	0.050	7969156
Dissolved Nitrate (N)	mg/L	0.20 (2)	0.050	7970241	0.075	0.010	7969156	0.057 (2)	0.050	7969156

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Detection limits raised due to matrix interference.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B559135
Report Date: 2015/08/04

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000/ BAR U RANCH
Sampler Initials: JF

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		MQ5585	MQ5586	MQ5587	MQ5588		
Sampling Date		2015/07/13 09:45	2015/07/13 10:10	2015/07/10 15:10	2015/07/13 10:40		
COC Number		M000187	M000187	M000187	M000187		
	Units	MW3	MW2	MW5	MW6	RDL	QC Batch
Hydrocarbons							
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	<0.10	<0.10	0.10	7969540
Surrogate Recovery (%)							
O-TERPHENYL (sur.)	%	92	92	93	93	N/A	7969540

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B559135
Report Date: 2015/08/04

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000/ BAR U RANCH
Sampler Initials: JF

SEMIVOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		MQ5585	MQ5586	MQ5587	MQ5588		
Sampling Date		2015/07/13 09:45	2015/07/13 10:10	2015/07/10 15:10	2015/07/13 10:40		
COC Number		M000187	M000187	M000187	M000187		
	Units	MW3	MW2	MW5	MW6	RDL	QC Batch
Polycyclic Aromatics							
Benzo[a]pyrene equivalency	ug/L	<0.010	<0.010	<0.010	<0.010	0.010	7968122
Acenaphthene	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	7969526
Acenaphthylene	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	7969526
Acridine	ug/L	<0.20	<0.20	<0.20	<0.20	0.20	7969526
Anthracene	ug/L	<0.010	<0.010	<0.010	<0.010	0.010	7969526
Benzo(a)anthracene	ug/L	<0.0085	<0.0085	<0.0085	<0.0085	0.0085	7969526
Benzo(b&j)fluoranthene	ug/L	<0.0085	<0.0085	<0.0085	<0.0085	0.0085	7969526
Benzo(k)fluoranthene	ug/L	<0.0085	<0.0085	<0.0085	<0.0085	0.0085	7969526
Benzo(g,h,i)perylene	ug/L	<0.0085	<0.0085	<0.0085	<0.0085	0.0085	7969526
Benzo(c)phenanthrene	ug/L	<0.050	<0.050	<0.050	<0.050	0.050	7969526
Benzo(a)pyrene	ug/L	<0.0075	<0.0075	<0.0075	<0.0075	0.0075	7969526
Benzo[e]pyrene	ug/L	<0.050	<0.050	<0.050	<0.050	0.050	7969526
Chrysene	ug/L	<0.0085	<0.0085	<0.0085	<0.0085	0.0085	7969526
Dibenz(a,h)anthracene	ug/L	<0.0075	<0.0075	<0.0075	<0.0075	0.0075	7969526
Fluoranthene	ug/L	<0.010	<0.010	<0.010	<0.010	0.010	7969526
Fluorene	ug/L	<0.050	<0.050	<0.050	<0.050	0.050	7969526
Indeno(1,2,3-cd)pyrene	ug/L	<0.0085	<0.0085	<0.0085	<0.0085	0.0085	7969526
2-Methylnaphthalene	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	7969526
Naphthalene	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	7969526
Phenanthrene	ug/L	<0.050	<0.050	<0.050	<0.050	0.050	7969526
Perylene	ug/L	<0.050	<0.050	<0.050	<0.050	0.050	7969526
Pyrene	ug/L	<0.020	<0.020	<0.020	<0.020	0.020	7969526
Quinoline	ug/L	<0.20	<0.20	<0.20	<0.20	0.20	7969526
Surrogate Recovery (%)							
D10-ANTHRACENE (sur.)	%	118	117	114	112	N/A	7969526
D12-BENZO(A)PYRENE (sur.)	%	110	112	113	112	N/A	7969526
D8-ACENAPHTHYLENE (sur.)	%	103	104	101	85	N/A	7969526
TERPHENYL-D14 (sur.)	%	118	119	117	117	N/A	7969526

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B559135
Report Date: 2015/08/04

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000/ BAR U RANCH
Sampler Initials: JF

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		MQ5585		MQ5586		MQ5588		
Sampling Date		2015/07/13 09:45		2015/07/13 10:10		2015/07/13 10:40		
COC Number		M000187		M000187		M000187		
	Units	MW3	RDL	MW2	RDL	MW6	RDL	QC Batch
Elements								
Dissolved Aluminum (Al)	mg/L	0.0039	0.0030	<0.0030	0.0030	0.0050	0.0030	7968652
Total Aluminum (Al)	mg/L	14	0.0030	6.9	0.0030	45	0.0030	7968636
Dissolved Antimony (Sb)	mg/L	<0.00060	0.00060	<0.00060	0.00060	<0.00060	0.00060	7968652
Total Antimony (Sb)	mg/L	0.00083	0.00060	0.00072	0.00060	0.0029	0.00060	7968636
Dissolved Arsenic (As)	mg/L	0.00084	0.00020	0.00059	0.00020	0.0010	0.00020	7968652
Total Arsenic (As)	mg/L	0.013	0.00020	0.011	0.00020	0.18	0.00020	7968636
Dissolved Barium (Ba)	mg/L	0.053	0.010	0.026	0.010	0.034	0.010	7969472
Total Barium (Ba)	mg/L	0.59	0.010	0.57	0.010	1.1	0.010	7968642
Dissolved Beryllium (Be)	mg/L	<0.0010	0.0010	<0.0010	0.0010	<0.0010	0.0010	7968652
Total Beryllium (Be)	mg/L	0.0010	0.0010	<0.0010	0.0010	0.0045	0.0010	7968636
Dissolved Boron (B)	mg/L	0.11	0.020	0.11	0.020	0.089	0.020	7969472
Total Boron (B)	mg/L	0.12	0.020	0.12	0.020	0.12	0.020	7968642
Dissolved Calcium (Ca)	mg/L	560 (1)	1.5	260	0.30	280	0.30	7969472
Total Calcium (Ca)	mg/L	620 (1)	1.5	310	0.30	420	0.30	7968642
Dissolved Chromium (Cr)	mg/L	<0.0010	0.0010	<0.0010	0.0010	<0.0010	0.0010	7968652
Total Chromium (Cr)	mg/L	0.019	0.0010	0.013	0.0010	0.084	0.0010	7968636
Dissolved Cobalt (Co)	mg/L	0.00058	0.00030	0.0025	0.00030	<0.00030	0.00030	7968652
Total Cobalt (Co)	mg/L	0.0095	0.00030	0.0086	0.00030	0.095	0.00030	7968636
Dissolved Copper (Cu)	mg/L	0.0037	0.00020	0.00084	0.00020	<0.00020	0.00020	7968652
Total Copper (Cu)	mg/L	0.032	0.00020	0.031	0.00020	0.22	0.00020	7968636
Dissolved Iron (Fe)	mg/L	0.54	0.060	0.33	0.060	1.8	0.060	7969472
Total Iron (Fe)	mg/L	26	0.060	22	0.060	260 (1)	0.30	7968642
Dissolved Lead (Pb)	mg/L	0.00030	0.00020	0.00030	0.00020	0.00066	0.00020	7968652
Total Lead (Pb)	mg/L	0.016	0.00020	0.012	0.00020	0.082	0.00020	7968636
Dissolved Lithium (Li)	mg/L	0.040	0.020	0.053	0.020	0.089	0.020	7969472
Total Lithium (Li)	mg/L	0.054	0.020	0.066	0.020	0.16	0.020	7968642
Dissolved Magnesium (Mg)	mg/L	620 (1)	1.0	180	0.20	260	0.20	7969472
Total Magnesium (Mg)	mg/L	670 (1)	1.0	210	0.20	320	0.20	7968642
Dissolved Manganese (Mn)	mg/L	0.15	0.0040	0.64	0.0040	0.26	0.0040	7969472
Total Manganese (Mn)	mg/L	0.63	0.0040	1.1	0.0040	2.7	0.0040	7968642
Dissolved Molybdenum (Mo)	mg/L	0.0017	0.00020	0.0011	0.00020	0.0012	0.00020	7968652
Total Molybdenum (Mo)	mg/L	0.0030	0.00020	0.0022	0.00020	0.034	0.00020	7968636
Dissolved Nickel (Ni)	mg/L	0.0080	0.00050	0.0077	0.00050	0.0014	0.00050	7968652

RDL = Reportable Detection Limit
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B559135
Report Date: 2015/08/04

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000/ BAR U RANCH
Sampler Initials: JF

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		MQ5585		MQ5586		MQ5588		
Sampling Date		2015/07/13 09:45		2015/07/13 10:10		2015/07/13 10:40		
COC Number		M000187		M000187		M000187		
	Units	MW3	RDL	MW2	RDL	MW6	RDL	QC Batch
Total Nickel (Ni)	mg/L	0.039	0.00050	0.026	0.00050	0.24	0.00050	7968636
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	<0.10	0.10	0.10	0.10	7969472
Total Phosphorus (P)	mg/L	1.1	0.10	0.70	0.10	3.5	0.10	7968642
Dissolved Potassium (K)	mg/L	19	0.30	6.1	0.30	17	0.30	7969472
Total Potassium (K)	mg/L	22	0.30	7.8	0.30	23	0.30	7968642
Dissolved Selenium (Se)	mg/L	0.00041	0.00020	0.0019	0.00020	0.020	0.00020	7968652
Total Selenium (Se)	mg/L	0.00092	0.00020	0.0046	0.00020	0.089	0.00020	7968636
Dissolved Silicon (Si)	mg/L	5.2	0.10	4.2	0.10	4.3	0.10	7969472
Total Silicon (Si)	mg/L	27	0.10	16	0.10	60	0.10	7968642
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	<0.00010	0.00010	<0.00010	0.00010	7968652
Total Silver (Ag)	mg/L	0.00027	0.00010	0.00011	0.00010	0.00094	0.00010	7968636
Dissolved Sodium (Na)	mg/L	340	0.50	220	0.50	230	0.50	7969472
Total Sodium (Na)	mg/L	370	0.50	230	0.50	240	0.50	7968642
Dissolved Strontium (Sr)	mg/L	3.1	0.020	3.1	0.020	3.4	0.020	7969472
Total Strontium (Sr)	mg/L	3.4	0.020	3.2	0.020	3.7	0.020	7968642
Dissolved Sulphur (S)	mg/L	1300 (1)	1.0	430	0.20	770 (2)	1.0	7969472
Total Sulphur (S)	mg/L	1400 (1)	1.0	460	0.20	660 (1)	1.0	7968642
Dissolved Thallium (Tl)	mg/L	<0.00020	0.00020	<0.00020	0.00020	<0.00020	0.00020	7968652
Total Thallium (Tl)	mg/L	0.00038	0.00020	0.00033	0.00020	0.0024	0.00020	7968636
Dissolved Tin (Sn)	mg/L	<0.0010	0.0010	<0.0010	0.0010	<0.0010	0.0010	7968652
Total Tin (Sn)	mg/L	0.0012	0.0010	0.0013	0.0010	0.0022	0.0010	7968636
Dissolved Titanium (Ti)	mg/L	<0.0010	0.0010	<0.0010	0.0010	<0.0010	0.0010	7968652
Total Titanium (Ti)	mg/L	0.13	0.0010	0.22	0.0010	0.33	0.0010	7968636
Dissolved Uranium (U)	mg/L	0.028	0.00010	0.023	0.00010	0.0046	0.00010	7968652
Total Uranium (U)	mg/L	0.029	0.00010	0.028	0.00010	0.011	0.00010	7968636
Dissolved Vanadium (V)	mg/L	<0.0010	0.0010	<0.0010	0.0010	0.0017	0.0010	7968652
Total Vanadium (V)	mg/L	0.036	0.0010	0.025	0.0010	0.16	0.0010	7968636
Dissolved Zinc (Zn)	mg/L	0.042	0.0030	0.020	0.0030	<0.0030	0.0030	7968652
Total Zinc (Zn)	mg/L	0.15	0.0030	0.11	0.0030	0.57	0.0030	7968636

RDL = Reportable Detection Limit
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Detection limits raised due to dilution to bring analyte within the calibrated range.
Dissolved greater than total. Results within acceptable limits of precision.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B559135
Report Date: 2015/08/04

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000/ BAR U RANCH
Sampler Initials: JF

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		MQ5585	MQ5586	MQ5587	MQ5588		
Sampling Date		2015/07/13 09:45	2015/07/13 10:10	2015/07/10 15:10	2015/07/13 10:40		
COC Number		M000187	M000187	M000187	M000187		
	Units	MW3	MW2	MW5	MW6	RDL	QC Batch
Volatiles							
Total Trihalomethanes	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	7967654
Bromodichloromethane	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
Bromoform	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
Bromomethane	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	7969871
Carbon tetrachloride	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
Chlorobenzene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
Chlorodibromomethane	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	7969871
Chloroethane	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	7969871
Chloroform	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
Chloromethane	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	7969871
1,2-dibromoethane	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
1,2-dichlorobenzene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
1,3-dichlorobenzene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
1,4-dichlorobenzene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
1,1-dichloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
1,2-dichloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
1,1-dichloroethene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
cis-1,2-dichloroethene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
trans-1,2-dichloroethene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
Dichloromethane	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	7969871
1,2-dichloropropane	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
cis-1,3-dichloropropene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
trans-1,3-dichloropropene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
Methyl methacrylate	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
Methyl-tert-butylether (MTBE)	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
Styrene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
1,1,1,2-tetrachloroethane	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	7969871
1,1,2,2-tetrachloroethane	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	7969871
Tetrachloroethene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
1,2,3-trichlorobenzene	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	7969871
1,2,4-trichlorobenzene	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	7969871
1,3,5-trichlorobenzene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
1,1,1-trichloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
1,1,2-trichloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
RDL = Reportable Detection Limit							

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B559135
Report Date: 2015/08/04

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000/ BAR U RANCH
Sampler Initials: JF

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		MQ5585	MQ5586	MQ5587	MQ5588		
Sampling Date		2015/07/13 09:45	2015/07/13 10:10	2015/07/10 15:10	2015/07/13 10:40		
COC Number		M000187	M000187	M000187	M000187		
	Units	MW3	MW2	MW5	MW6	RDL	QC Batch
Trichloroethene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
Trichlorofluoromethane	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
1,2,4-trimethylbenzene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
1,3,5-trimethylbenzene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
Vinyl chloride	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	7969871
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	99	97	97	97	N/A	7969871
4-Bromofluorobenzene (sur.)	%	96	96	96	95	N/A	7969871
D4-1,2-Dichloroethane (sur.)	%	93	95	93	95	N/A	7969871

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B559135
Report Date: 2015/08/04

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000/ BAR U RANCH
Sampler Initials: JF

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		MQ5585	MQ5586	MQ5587	MQ5588		
Sampling Date		2015/07/13 09:45	2015/07/13 10:10	2015/07/10 15:10	2015/07/13 10:40		
COC Number		M000187	M000187	M000187	M000187		
	Units	MW3	MW2	MW5	MW6	RDL	QC Batch
Volatiles							
Benzene	ug/L	<0.40	<0.40	<0.40	<0.40	0.40	7968494
Toluene	ug/L	<0.40	<0.40	<0.40	<0.40	0.40	7968494
Ethylbenzene	ug/L	<0.40	<0.40	<0.40	<0.40	0.40	7968494
m & p-Xylene	ug/L	<0.80	<0.80	<0.80	<0.80	0.80	7968494
o-Xylene	ug/L	<0.40	<0.40	<0.40	<0.40	0.40	7968494
Xylenes (Total)	ug/L	<0.80	<0.80	<0.80	<0.80	0.80	7968494
F1 (C6-C10) - BTEX	ug/L	<100	<100	<100	<100	100	7968494
F1 (C6-C10)	ug/L	<100	<100	<100	<100	100	7968494
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	108	108	108	111	N/A	7968494
4-Bromofluorobenzene (sur.)	%	87	84	86	85	N/A	7968494
D4-1,2-Dichloroethane (sur.)	%	123	118	118	121	N/A	7968494

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B559135
Report Date: 2015/08/04

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000/ BAR U RANCH
Sampler Initials: JF

GENERAL COMMENTS

OC Pesticides and PCB results are attached to this report. The reference number for these results from Maxxam Campobello is B5E0408.

Sample MQ5585-01 : Dissolved greater than total for Cd. Results are within limits of uncertainty(MU).

Sample MQ5586-01 : Cation anion balance investigated data quality confirmed.

Sample MQ5588-01 : Cation anion balance investigated data quality confirmed.

VOLATILE ORGANICS BY GC-MS (WATER) Comments

Sample MQ5587-02 VOCs in Water by HS GC/MS (Std List): Headspace was noted in sample container at the time of volatiles extraction.

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B559135
Report Date: 2015/08/04

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000/ BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
7968494	MJ0	Matrix Spike [MQ5586-02]	1,4-Difluorobenzene (sur.)	2015/07/17		105	%	70 - 130
			4-Bromofluorobenzene (sur.)	2015/07/17		86	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2015/07/17		116	%	70 - 130
			Benzene	2015/07/17		89	%	70 - 130
			Toluene	2015/07/17		88	%	70 - 130
			Ethylbenzene	2015/07/17		89	%	70 - 130
			m & p-Xylene	2015/07/17		87	%	70 - 130
			o-Xylene	2015/07/17		90	%	70 - 130
			F1 (C6-C10)	2015/07/17		87	%	70 - 130
7968494	MJ0	Spiked Blank	1,4-Difluorobenzene (sur.)	2015/07/17		106	%	70 - 130
			4-Bromofluorobenzene (sur.)	2015/07/17		87	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2015/07/17		117	%	70 - 130
			Benzene	2015/07/17		92	%	70 - 130
			Toluene	2015/07/17		92	%	70 - 130
			Ethylbenzene	2015/07/17		93	%	70 - 130
			m & p-Xylene	2015/07/17		90	%	70 - 130
			o-Xylene	2015/07/17		90	%	70 - 130
			F1 (C6-C10)	2015/07/17		101	%	70 - 130
7968494	MJ0	Method Blank	1,4-Difluorobenzene (sur.)	2015/07/17		110	%	70 - 130
			4-Bromofluorobenzene (sur.)	2015/07/17		84	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2015/07/17		124	%	70 - 130
			Benzene	2015/07/17	<0.40		ug/L	
			Toluene	2015/07/17	<0.40		ug/L	
			Ethylbenzene	2015/07/17	<0.40		ug/L	
			m & p-Xylene	2015/07/17	<0.80		ug/L	
			o-Xylene	2015/07/17	<0.40		ug/L	
			Xylenes (Total)	2015/07/17	<0.80		ug/L	
			F1 (C6-C10) - BTEX	2015/07/17	<100		ug/L	
			F1 (C6-C10)	2015/07/17	<100		ug/L	
7968494	MJ0	RPD [MQ5585-02]	Benzene	2015/07/17	NC		%	40
			Toluene	2015/07/17	NC		%	40
			Ethylbenzene	2015/07/17	NC		%	40
			m & p-Xylene	2015/07/17	NC		%	40
			o-Xylene	2015/07/17	NC		%	40
			Xylenes (Total)	2015/07/17	NC		%	40
			F1 (C6-C10) - BTEX	2015/07/17	NC		%	40
			F1 (C6-C10)	2015/07/17	NC		%	40
7968636	HC7	Matrix Spike [MQ5585-04]	Total Aluminum (Al)	2015/07/16		NC	%	80 - 120
			Total Antimony (Sb)	2015/07/16		72 (1)	%	80 - 120
			Total Arsenic (As)	2015/07/16		111	%	80 - 120
			Total Beryllium (Be)	2015/07/16		104	%	80 - 120
			Total Chromium (Cr)	2015/07/16		110	%	80 - 120
			Total Cobalt (Co)	2015/07/16		109	%	80 - 120
			Total Copper (Cu)	2015/07/16		NC	%	80 - 120
			Total Lead (Pb)	2015/07/16		104	%	80 - 120
			Total Molybdenum (Mo)	2015/07/16		107	%	80 - 120
			Total Nickel (Ni)	2015/07/16		NC	%	80 - 120
			Total Selenium (Se)	2015/07/16		102	%	80 - 120
			Total Silver (Ag)	2015/07/16		110	%	80 - 120
			Total Thallium (Tl)	2015/07/16		104	%	80 - 120

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B559135
Report Date: 2015/08/04

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000/ BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Total Tin (Sn)	2015/07/16		105	%	80 - 120
			Total Titanium (Ti)	2015/07/16		NC	%	80 - 120
			Total Uranium (U)	2015/07/16		NC	%	80 - 120
			Total Vanadium (V)	2015/07/16		NC	%	80 - 120
			Total Zinc (Zn)	2015/07/16		NC	%	80 - 120
7968636	HC7	Spiked Blank	Total Aluminum (Al)	2015/07/16		107	%	80 - 120
			Total Antimony (Sb)	2015/07/16		103	%	80 - 120
			Total Arsenic (As)	2015/07/16		102	%	80 - 120
			Total Beryllium (Be)	2015/07/16		104	%	80 - 120
			Total Chromium (Cr)	2015/07/16		104	%	80 - 120
			Total Cobalt (Co)	2015/07/16		106	%	80 - 120
			Total Copper (Cu)	2015/07/16		121 (1)	%	80 - 120
			Total Lead (Pb)	2015/07/16		107	%	80 - 120
			Total Molybdenum (Mo)	2015/07/16		104	%	80 - 120
			Total Nickel (Ni)	2015/07/16		103	%	80 - 120
			Total Selenium (Se)	2015/07/16		107	%	80 - 120
			Total Silver (Ag)	2015/07/16		102	%	80 - 120
			Total Thallium (Tl)	2015/07/16		103	%	80 - 120
			Total Tin (Sn)	2015/07/16		105	%	80 - 120
			Total Titanium (Ti)	2015/07/16		108	%	80 - 120
			Total Uranium (U)	2015/07/16		103	%	80 - 120
			Total Vanadium (V)	2015/07/16		108	%	80 - 120
			Total Zinc (Zn)	2015/07/16		101	%	80 - 120
7968636	HC7	Method Blank	Total Aluminum (Al)	2015/07/16	<0.0030		mg/L	
			Total Antimony (Sb)	2015/07/16	<0.00060		mg/L	
			Total Arsenic (As)	2015/07/16	<0.00020		mg/L	
			Total Beryllium (Be)	2015/07/16	<0.0010		mg/L	
			Total Chromium (Cr)	2015/07/16	<0.0010		mg/L	
			Total Cobalt (Co)	2015/07/16	<0.00030		mg/L	
			Total Copper (Cu)	2015/07/16	<0.00020		mg/L	
			Total Lead (Pb)	2015/07/16	<0.00020		mg/L	
			Total Molybdenum (Mo)	2015/07/16	<0.00020		mg/L	
			Total Nickel (Ni)	2015/07/16	<0.00050		mg/L	
			Total Selenium (Se)	2015/07/16	<0.00020		mg/L	
			Total Silver (Ag)	2015/07/16	<0.00010		mg/L	
			Total Thallium (Tl)	2015/07/16	<0.00020		mg/L	
			Total Tin (Sn)	2015/07/16	<0.0010		mg/L	
			Total Titanium (Ti)	2015/07/16	<0.0010		mg/L	
			Total Uranium (U)	2015/07/16	<0.00010		mg/L	
			Total Vanadium (V)	2015/07/16	<0.0010		mg/L	
			Total Zinc (Zn)	2015/07/16	<0.0030		mg/L	
7968636	HC7	RPD [MQ5586-04]	Total Aluminum (Al)	2015/07/16	0.99		%	20
			Total Antimony (Sb)	2015/07/16	NC		%	20
			Total Arsenic (As)	2015/07/16	0.056		%	20
			Total Beryllium (Be)	2015/07/16	NC		%	20
			Total Chromium (Cr)	2015/07/16	3.1		%	20
			Total Cobalt (Co)	2015/07/16	5.6		%	20
			Total Copper (Cu)	2015/07/16	0.33		%	20
			Total Lead (Pb)	2015/07/16	6.5		%	20
			Total Molybdenum (Mo)	2015/07/16	0.94		%	20
			Total Nickel (Ni)	2015/07/16	0.66		%	20
			Total Selenium (Se)	2015/07/16	7.2		%	20

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B559135
Report Date: 2015/08/04

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000/ BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Total Silver (Ag)	2015/07/16	NC		%	20
			Total Thallium (Tl)	2015/07/16	NC		%	20
			Total Tin (Sn)	2015/07/16	NC		%	20
			Total Titanium (Ti)	2015/07/16	0.060		%	20
			Total Uranium (U)	2015/07/16	0.0071		%	20
			Total Vanadium (V)	2015/07/16	3.1		%	20
			Total Zinc (Zn)	2015/07/16	0.67		%	20
7968642	MAP	Matrix Spike [MQ5588-04]	Total Barium (Ba)	2015/07/16		NC	%	80 - 120
			Total Boron (B)	2015/07/16		86	%	80 - 120
			Total Calcium (Ca)	2015/07/16		NC	%	80 - 120
			Total Iron (Fe)	2015/07/16		NC	%	80 - 120
			Total Lithium (Li)	2015/07/16		89	%	80 - 120
			Total Magnesium (Mg)	2015/07/16		NC	%	80 - 120
			Total Manganese (Mn)	2015/07/16		NC	%	80 - 120
			Total Phosphorus (P)	2015/07/16		95	%	80 - 120
			Total Potassium (K)	2015/07/16		NC	%	80 - 120
			Total Silicon (Si)	2015/07/16		NC	%	80 - 120
			Total Sodium (Na)	2015/07/16		NC	%	80 - 120
			Total Strontium (Sr)	2015/07/16		NC	%	80 - 120
7968642	MAP	Spiked Blank	Total Barium (Ba)	2015/07/16		88	%	80 - 120
			Total Boron (B)	2015/07/16		89	%	80 - 120
			Total Calcium (Ca)	2015/07/16		99	%	80 - 120
			Total Iron (Fe)	2015/07/16		95	%	80 - 120
			Total Lithium (Li)	2015/07/16		89	%	80 - 120
			Total Magnesium (Mg)	2015/07/16		93	%	80 - 120
			Total Manganese (Mn)	2015/07/16		93	%	80 - 120
			Total Phosphorus (P)	2015/07/16		98	%	80 - 120
			Total Potassium (K)	2015/07/16		88	%	80 - 120
			Total Silicon (Si)	2015/07/16		95	%	80 - 120
			Total Sodium (Na)	2015/07/16		87	%	80 - 120
			Total Strontium (Sr)	2015/07/16		91	%	80 - 120
7968642	MAP	Method Blank	Total Barium (Ba)	2015/07/16	<0.010		mg/L	
			Total Boron (B)	2015/07/16	<0.020		mg/L	
			Total Calcium (Ca)	2015/07/16	<0.30		mg/L	
			Total Iron (Fe)	2015/07/16	<0.060		mg/L	
			Total Lithium (Li)	2015/07/16	<0.020		mg/L	
			Total Magnesium (Mg)	2015/07/16	<0.20		mg/L	
			Total Manganese (Mn)	2015/07/16	<0.0040		mg/L	
			Total Phosphorus (P)	2015/07/16	0.10, RDL=0.10		mg/L	
			Total Potassium (K)	2015/07/16	<0.30		mg/L	
			Total Silicon (Si)	2015/07/16	<0.10		mg/L	
			Total Sodium (Na)	2015/07/16	<0.50		mg/L	
			Total Strontium (Sr)	2015/07/16	<0.020		mg/L	
			Total Sulphur (S)	2015/07/16	<0.20		mg/L	
7968642	MAP	RPD [MQ5586-04]	Total Barium (Ba)	2015/07/16	2.6		%	20
			Total Boron (B)	2015/07/16	5.3		%	20
			Total Calcium (Ca)	2015/07/16	1.6		%	20
			Total Iron (Fe)	2015/07/16	2.1		%	20
			Total Lithium (Li)	2015/07/16	NC		%	20
			Total Magnesium (Mg)	2015/07/16	1.9		%	20

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B559135
Report Date: 2015/08/04

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000/ BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Total Manganese (Mn)	2015/07/16	1.9		%	20
			Total Phosphorus (P)	2015/07/16	17		%	20
			Total Potassium (K)	2015/07/16	2.1		%	20
			Total Silicon (Si)	2015/07/16	1.0		%	20
			Total Sodium (Na)	2015/07/16	2.3		%	20
			Total Strontium (Sr)	2015/07/16	2.3		%	20
			Total Sulphur (S)	2015/07/16	2.0		%	20
7968652	HC7	Matrix Spike	Dissolved Aluminum (Al)	2015/07/16		93	%	80 - 120
			Dissolved Antimony (Sb)	2015/07/16		84	%	80 - 120
			Dissolved Arsenic (As)	2015/07/16		87	%	80 - 120
			Dissolved Beryllium (Be)	2015/07/16		107	%	80 - 120
			Dissolved Chromium (Cr)	2015/07/16		94	%	80 - 120
			Dissolved Cobalt (Co)	2015/07/16		92	%	80 - 120
			Dissolved Copper (Cu)	2015/07/16		92	%	80 - 120
			Dissolved Lead (Pb)	2015/07/16		95	%	80 - 120
			Dissolved Molybdenum (Mo)	2015/07/16		98	%	80 - 120
			Dissolved Nickel (Ni)	2015/07/16		92	%	80 - 120
			Dissolved Selenium (Se)	2015/07/16		98	%	80 - 120
			Dissolved Silver (Ag)	2015/07/16		95	%	80 - 120
			Dissolved Thallium (Tl)	2015/07/16		96	%	80 - 120
			Dissolved Tin (Sn)	2015/07/16		96	%	80 - 120
			Dissolved Titanium (Ti)	2015/07/16		96	%	80 - 120
			Dissolved Uranium (U)	2015/07/16		95	%	80 - 120
			Dissolved Vanadium (V)	2015/07/16		97	%	80 - 120
			Dissolved Zinc (Zn)	2015/07/16		99	%	80 - 120
7968652	HC7	Spiked Blank	Dissolved Aluminum (Al)	2015/07/16		97	%	80 - 120
			Dissolved Antimony (Sb)	2015/07/16		92	%	80 - 120
			Dissolved Arsenic (As)	2015/07/16		96	%	80 - 120
			Dissolved Beryllium (Be)	2015/07/16		104	%	80 - 120
			Dissolved Chromium (Cr)	2015/07/16		96	%	80 - 120
			Dissolved Cobalt (Co)	2015/07/16		96	%	80 - 120
			Dissolved Copper (Cu)	2015/07/16		96	%	80 - 120
			Dissolved Lead (Pb)	2015/07/16		99	%	80 - 120
			Dissolved Molybdenum (Mo)	2015/07/16		97	%	80 - 120
			Dissolved Nickel (Ni)	2015/07/16		100	%	80 - 120
			Dissolved Selenium (Se)	2015/07/16		100	%	80 - 120
			Dissolved Silver (Ag)	2015/07/16		96	%	80 - 120
			Dissolved Thallium (Tl)	2015/07/16		96	%	80 - 120
			Dissolved Tin (Sn)	2015/07/16		97	%	80 - 120
			Dissolved Titanium (Ti)	2015/07/16		100	%	80 - 120
			Dissolved Uranium (U)	2015/07/16		95	%	80 - 120
			Dissolved Vanadium (V)	2015/07/16		101	%	80 - 120
			Dissolved Zinc (Zn)	2015/07/16		100	%	80 - 120
7968652	HC7	Method Blank	Dissolved Aluminum (Al)	2015/07/16	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2015/07/16	<0.00060		mg/L	
			Dissolved Arsenic (As)	2015/07/16	<0.00020		mg/L	
			Dissolved Beryllium (Be)	2015/07/16	<0.0010		mg/L	
			Dissolved Chromium (Cr)	2015/07/16	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2015/07/16	<0.00030		mg/L	
			Dissolved Copper (Cu)	2015/07/16	<0.00020		mg/L	
			Dissolved Lead (Pb)	2015/07/16	<0.00020		mg/L	
			Dissolved Molybdenum (Mo)	2015/07/16	<0.00020		mg/L	

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B559135
Report Date: 2015/08/04

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000/ BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Dissolved Nickel (Ni)	2015/07/16	<0.00050		mg/L	
			Dissolved Selenium (Se)	2015/07/16	<0.00020		mg/L	
			Dissolved Silver (Ag)	2015/07/16	<0.00010		mg/L	
			Dissolved Thallium (Tl)	2015/07/16	<0.00020		mg/L	
			Dissolved Tin (Sn)	2015/07/16	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2015/07/16	<0.0010		mg/L	
			Dissolved Uranium (U)	2015/07/16	<0.00010		mg/L	
			Dissolved Vanadium (V)	2015/07/16	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2015/07/16	<0.0030		mg/L	
7968652	HC7	RPD	Dissolved Aluminum (Al)	2015/07/16	NC		%	20
			Dissolved Antimony (Sb)	2015/07/16	NC		%	20
			Dissolved Arsenic (As)	2015/07/16	NC		%	20
			Dissolved Beryllium (Be)	2015/07/16	NC		%	20
			Dissolved Chromium (Cr)	2015/07/16	NC		%	20
			Dissolved Cobalt (Co)	2015/07/16	NC		%	20
			Dissolved Copper (Cu)	2015/07/16	NC		%	20
			Dissolved Lead (Pb)	2015/07/16	NC		%	20
			Dissolved Molybdenum (Mo)	2015/07/16	NC		%	20
			Dissolved Nickel (Ni)	2015/07/16	NC		%	20
			Dissolved Selenium (Se)	2015/07/16	4.1		%	20
			Dissolved Silver (Ag)	2015/07/16	NC		%	20
			Dissolved Thallium (Tl)	2015/07/16	NC		%	20
			Dissolved Tin (Sn)	2015/07/16	NC		%	20
			Dissolved Titanium (Ti)	2015/07/16	NC		%	20
			Dissolved Uranium (U)	2015/07/16	1.9		%	20
			Dissolved Vanadium (V)	2015/07/16	NC		%	20
			Dissolved Zinc (Zn)	2015/07/16	0.45		%	20
7969156	NW4	Matrix Spike [MQ5586-06]	Dissolved Nitrite (N)	2015/07/17		101	%	80 - 120
			Dissolved Nitrate (N)	2015/07/17		102	%	80 - 120
7969156	NW4	Spiked Blank	Dissolved Nitrite (N)	2015/07/16		99	%	80 - 120
			Dissolved Nitrate (N)	2015/07/16		100	%	80 - 120
7969156	NW4	Method Blank	Dissolved Nitrite (N)	2015/07/16	<0.010		mg/L	
			Dissolved Nitrate (N)	2015/07/16	<0.010		mg/L	
7969156	NW4	RPD [MQ5586-06]	Dissolved Nitrite (N)	2015/07/17	NC		%	20
			Dissolved Nitrate (N)	2015/07/17	0.94		%	20
7969472	MAP	Matrix Spike	Dissolved Barium (Ba)	2015/07/16		92	%	80 - 120
			Dissolved Boron (B)	2015/07/16		95	%	80 - 120
			Dissolved Calcium (Ca)	2015/07/16		NC	%	80 - 120
			Dissolved Iron (Fe)	2015/07/16		98	%	80 - 120
			Dissolved Lithium (Li)	2015/07/16		92	%	80 - 120
			Dissolved Magnesium (Mg)	2015/07/16		96	%	80 - 120
			Dissolved Manganese (Mn)	2015/07/16		99	%	80 - 120
			Dissolved Phosphorus (P)	2015/07/16		106	%	80 - 120
			Dissolved Potassium (K)	2015/07/16		95	%	80 - 120
			Dissolved Silicon (Si)	2015/07/16		101	%	80 - 120
			Dissolved Sodium (Na)	2015/07/16		NC	%	80 - 120
			Dissolved Strontium (Sr)	2015/07/16		93	%	80 - 120
7969472	MAP	Spiked Blank	Dissolved Barium (Ba)	2015/07/16		84	%	80 - 120
			Dissolved Boron (B)	2015/07/16		85	%	80 - 120
			Dissolved Calcium (Ca)	2015/07/16		97	%	80 - 120
			Dissolved Iron (Fe)	2015/07/16		91	%	80 - 120

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B559135
Report Date: 2015/08/04

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000/ BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Dissolved Lithium (Li)	2015/07/16		86	%	80 - 120
			Dissolved Magnesium (Mg)	2015/07/16		90	%	80 - 120
			Dissolved Manganese (Mn)	2015/07/16		92	%	80 - 120
			Dissolved Phosphorus (P)	2015/07/16		94	%	80 - 120
			Dissolved Potassium (K)	2015/07/16		85	%	80 - 120
			Dissolved Silicon (Si)	2015/07/16		91	%	80 - 120
			Dissolved Sodium (Na)	2015/07/16		84	%	80 - 120
			Dissolved Strontium (Sr)	2015/07/16		87	%	80 - 120
7969472	MAP	Method Blank	Dissolved Barium (Ba)	2015/07/16	<0.010		mg/L	
			Dissolved Boron (B)	2015/07/16	<0.020		mg/L	
			Dissolved Calcium (Ca)	2015/07/16	<0.30		mg/L	
			Dissolved Iron (Fe)	2015/07/16	<0.060		mg/L	
			Dissolved Lithium (Li)	2015/07/16	<0.020		mg/L	
			Dissolved Magnesium (Mg)	2015/07/16	<0.20		mg/L	
			Dissolved Manganese (Mn)	2015/07/16	<0.0040		mg/L	
			Dissolved Phosphorus (P)	2015/07/16	<0.10		mg/L	
			Dissolved Potassium (K)	2015/07/16	<0.30		mg/L	
			Dissolved Silicon (Si)	2015/07/16	<0.10		mg/L	
			Dissolved Sodium (Na)	2015/07/16	<0.50		mg/L	
			Dissolved Strontium (Sr)	2015/07/16	<0.020		mg/L	
			Dissolved Sulphur (S)	2015/07/16	<0.20		mg/L	
7969472	MAP	RPD	Dissolved Barium (Ba)	2015/07/16	0.52		%	20
			Dissolved Boron (B)	2015/07/16	1.2		%	20
			Dissolved Calcium (Ca)	2015/07/16	0.17		%	20
			Dissolved Iron (Fe)	2015/07/16	NC		%	20
			Dissolved Lithium (Li)	2015/07/16	NC		%	20
			Dissolved Magnesium (Mg)	2015/07/16	0.54		%	20
			Dissolved Manganese (Mn)	2015/07/16	NC		%	20
			Dissolved Phosphorus (P)	2015/07/16	NC		%	20
			Dissolved Potassium (K)	2015/07/16	1.6		%	20
			Dissolved Silicon (Si)	2015/07/16	0.51		%	20
			Dissolved Sodium (Na)	2015/07/16	0.72		%	20
			Dissolved Strontium (Sr)	2015/07/16	0.42		%	20
			Dissolved Sulphur (S)	2015/07/16	1.0		%	20
7969490	JLD	Spiked Blank	Alkalinity (Total as CaCO3)	2015/07/17		94	%	80 - 120
7969490	JLD	Method Blank	Alkalinity (PP as CaCO3)	2015/07/17	<0.50		mg/L	
			Alkalinity (Total as CaCO3)	2015/07/17	<0.50		mg/L	
			Bicarbonate (HCO3)	2015/07/17	<0.50		mg/L	
			Carbonate (CO3)	2015/07/17	<0.50		mg/L	
			Hydroxide (OH)	2015/07/17	<0.50		mg/L	
7969490	JLD	RPD	Alkalinity (PP as CaCO3)	2015/07/17	NC		%	20
			Alkalinity (Total as CaCO3)	2015/07/17	0.64		%	20
			Bicarbonate (HCO3)	2015/07/17	3.3		%	20
			Carbonate (CO3)	2015/07/17	NC		%	20
			Hydroxide (OH)	2015/07/17	NC		%	20
7969491	JLD	Spiked Blank	Conductivity	2015/07/17		102	%	90 - 110
7969491	JLD	Method Blank	Conductivity	2015/07/17	<1.0		uS/cm	
7969491	JLD	RPD	Conductivity	2015/07/17	0.31		%	20
7969492	JLD	Spiked Blank	pH	2015/07/17		100	%	97 - 103
7969492	JLD	RPD	pH	2015/07/17	2.1		%	N/A
7969526	VP4	Matrix Spike	D10-ANTHRACENE (sur.)	2015/07/20		116	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2015/07/20		116	%	50 - 130

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B559135
Report Date: 2015/08/04

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000/ BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			D8-ACENAPHTHYLENE (sur.)	2015/07/20		104	%	50 - 130
			TERPHENYL-D14 (sur.)	2015/07/20		118	%	50 - 130
			Acenaphthene	2015/07/20		89	%	50 - 130
			Acenaphthylene	2015/07/20		98	%	50 - 130
			Acridine	2015/07/20		106	%	50 - 130
			Anthracene	2015/07/20		101	%	50 - 130
			Benzo(a)anthracene	2015/07/20		116	%	50 - 130
			Benzo(b&j)fluoranthene	2015/07/20		103	%	50 - 130
			Benzo(k)fluoranthene	2015/07/20		94	%	50 - 130
			Benzo(g,h,i)perylene	2015/07/20		101	%	50 - 130
			Benzo(c)phenanthrene	2015/07/20		108	%	50 - 130
			Benzo(a)pyrene	2015/07/20		104	%	50 - 130
			Benzo[e]pyrene	2015/07/20		106	%	50 - 130
			Chrysene	2015/07/20		103	%	50 - 130
			Dibenz(a,h)anthracene	2015/07/20		102	%	50 - 130
			Fluoranthene	2015/07/20		111	%	50 - 130
			Fluorene	2015/07/20		102	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2015/07/20		104	%	50 - 130
			2-Methylnaphthalene	2015/07/20		77	%	50 - 130
			Naphthalene	2015/07/20		83	%	50 - 130
			Phenanthrene	2015/07/20		101	%	50 - 130
			Perylene	2015/07/20		105	%	50 - 130
			Pyrene	2015/07/20		112	%	50 - 130
			Quinoline	2015/07/20		91	%	50 - 130
7969526	VP4	Spiked Blank	D10-ANTHRACENE (sur.)	2015/07/20		114	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2015/07/20		117	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2015/07/20		101	%	50 - 130
			TERPHENYL-D14 (sur.)	2015/07/20		117	%	50 - 130
			Acenaphthene	2015/07/20		93	%	50 - 130
			Acenaphthylene	2015/07/20		103	%	50 - 130
			Acridine	2015/07/20		109	%	50 - 130
			Anthracene	2015/07/20		102	%	50 - 130
			Benzo(a)anthracene	2015/07/20		120	%	50 - 130
			Benzo(b&j)fluoranthene	2015/07/20		111	%	50 - 130
			Benzo(k)fluoranthene	2015/07/20		98	%	50 - 130
			Benzo(g,h,i)perylene	2015/07/20		108	%	50 - 130
			Benzo(c)phenanthrene	2015/07/20		111	%	50 - 130
			Benzo(a)pyrene	2015/07/20		108	%	50 - 130
			Benzo[e]pyrene	2015/07/20		113	%	50 - 130
			Chrysene	2015/07/20		109	%	50 - 130
			Dibenz(a,h)anthracene	2015/07/20		109	%	50 - 130
			Fluoranthene	2015/07/20		114	%	50 - 130
			Fluorene	2015/07/20		103	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2015/07/20		112	%	50 - 130
			2-Methylnaphthalene	2015/07/20		81	%	50 - 130
			Naphthalene	2015/07/20		88	%	50 - 130
			Phenanthrene	2015/07/20		103	%	50 - 130
			Perylene	2015/07/20		112	%	50 - 130
			Pyrene	2015/07/20		113	%	50 - 130
			Quinoline	2015/07/20		97	%	50 - 130
7969526	VP4	Method Blank	D10-ANTHRACENE (sur.)	2015/07/20		114	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2015/07/20		115	%	50 - 130

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B559135
Report Date: 2015/08/04

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000/ BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			D8-ACENAPHTHYLENE (sur.)	2015/07/20		98	%	50 - 130
			TERPHENYL-D14 (sur.)	2015/07/20		118	%	50 - 130
			Acenaphthene	2015/07/20	<0.10		ug/L	
			Acenaphthylene	2015/07/20	<0.10		ug/L	
			Acridine	2015/07/20	<0.20		ug/L	
			Anthracene	2015/07/20	<0.010		ug/L	
			Benzo(a)anthracene	2015/07/20	<0.0085		ug/L	
			Benzo(b&j)fluoranthene	2015/07/20	<0.0085		ug/L	
			Benzo(k)fluoranthene	2015/07/20	<0.0085		ug/L	
			Benzo(g,h,i)perylene	2015/07/20	<0.0085		ug/L	
			Benzo(c)phenanthrene	2015/07/20	<0.050		ug/L	
			Benzo(a)pyrene	2015/07/20	<0.0075		ug/L	
			Benzo[e]pyrene	2015/07/20	<0.050		ug/L	
			Chrysene	2015/07/20	<0.0085		ug/L	
			Dibenz(a,h)anthracene	2015/07/20	<0.0075		ug/L	
			Fluoranthene	2015/07/20	<0.010		ug/L	
			Fluorene	2015/07/20	<0.050		ug/L	
			Indeno(1,2,3-cd)pyrene	2015/07/20	<0.0085		ug/L	
			2-Methylnaphthalene	2015/07/20	<0.10		ug/L	
			Naphthalene	2015/07/20	<0.10		ug/L	
			Phenanthrene	2015/07/20	<0.050		ug/L	
			Perylene	2015/07/20	<0.050		ug/L	
			Pyrene	2015/07/20	<0.020		ug/L	
			Quinoline	2015/07/20	<0.20		ug/L	
7969526	VP4	RPD	Acenaphthene	2015/07/20	NC		%	40
			Acenaphthylene	2015/07/20	NC		%	40
			Acridine	2015/07/20	NC		%	40
			Anthracene	2015/07/20	NC		%	40
			Benzo(a)anthracene	2015/07/20	NC		%	40
			Benzo(b&j)fluoranthene	2015/07/20	NC		%	40
			Benzo(k)fluoranthene	2015/07/20	NC		%	40
			Benzo(g,h,i)perylene	2015/07/20	NC		%	40
			Benzo(c)phenanthrene	2015/07/20	NC		%	40
			Benzo(a)pyrene	2015/07/20	NC		%	40
			Benzo[e]pyrene	2015/07/20	NC		%	40
			Chrysene	2015/07/20	NC		%	40
			Dibenz(a,h)anthracene	2015/07/20	NC		%	40
			Fluoranthene	2015/07/20	NC		%	40
			Fluorene	2015/07/20	NC		%	40
			Indeno(1,2,3-cd)pyrene	2015/07/20	NC		%	40
			2-Methylnaphthalene	2015/07/20	NC		%	40
			Naphthalene	2015/07/20	NC		%	40
			Phenanthrene	2015/07/20	NC		%	40
			Perylene	2015/07/20	NC		%	40
			Pyrene	2015/07/20	NC		%	40
			Quinoline	2015/07/20	NC		%	40
7969540	MHF	Matrix Spike [MQ5585-01]	O-TERPHENYL (sur.)	2015/07/19		90	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2015/07/19		91	%	50 - 130
7969540	MHF	Spiked Blank	O-TERPHENYL (sur.)	2015/07/19		91	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2015/07/19		104	%	70 - 130
7969540	MHF	Method Blank	O-TERPHENYL (sur.)	2015/07/19		93	%	50 - 130

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B559135
Report Date: 2015/08/04

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000/ BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			F2 (C10-C16 Hydrocarbons)	2015/07/19	<0.10		mg/L	
7969540	MHF	RPD	F2 (C10-C16 Hydrocarbons)	2015/07/19	NC		%	40
7969871	SLZ	Matrix Spike [MQ5586-02]	1,4-Difluorobenzene (sur.)	2015/07/17		100	%	70 - 130
			4-Bromofluorobenzene (sur.)	2015/07/17		107	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2015/07/17		111	%	70 - 130
			Bromodichloromethane	2015/07/17		104	%	70 - 130
			Bromoform	2015/07/17		99	%	70 - 130
			Bromomethane	2015/07/17		103	%	70 - 130
			Carbon tetrachloride	2015/07/17		97	%	70 - 130
			Chlorobenzene	2015/07/17		97	%	70 - 130
			Chlorodibromomethane	2015/07/17		101	%	70 - 130
			Chloroethane	2015/07/17		98	%	70 - 130
			Chloroform	2015/07/17		102	%	70 - 130
			Chloromethane	2015/07/17		92	%	70 - 130
			1,2-dibromoethane	2015/07/17		102	%	70 - 130
			1,2-dichlorobenzene	2015/07/17		105	%	70 - 130
			1,3-dichlorobenzene	2015/07/17		101	%	70 - 130
			1,4-dichlorobenzene	2015/07/17		103	%	70 - 130
			1,1-dichloroethane	2015/07/17		98	%	70 - 130
			1,2-dichloroethane	2015/07/17		107	%	70 - 130
			1,1-dichloroethene	2015/07/17		95	%	70 - 130
			cis-1,2-dichloroethene	2015/07/17		94	%	70 - 130
			trans-1,2-dichloroethene	2015/07/17		96	%	70 - 130
			Dichloromethane	2015/07/17		95	%	70 - 130
			1,2-dichloropropane	2015/07/17		106	%	70 - 130
			cis-1,3-dichloropropene	2015/07/17		104	%	70 - 130
			trans-1,3-dichloropropene	2015/07/17		113	%	70 - 130
			Methyl methacrylate	2015/07/17		109	%	70 - 130
			Methyl-tert-butylether (MTBE)	2015/07/17		96	%	70 - 130
			Styrene	2015/07/17		98	%	70 - 130
			1,1,1,2-tetrachloroethane	2015/07/17		98	%	70 - 130
			1,1,2,2-tetrachloroethane	2015/07/17		101	%	70 - 130
			Tetrachloroethene	2015/07/17		93	%	70 - 130
			1,2,3-trichlorobenzene	2015/07/17		103	%	70 - 130
			1,2,4-trichlorobenzene	2015/07/17		103	%	70 - 130
			1,3,5-trichlorobenzene	2015/07/17		99	%	70 - 130
			1,1,1-trichloroethane	2015/07/17		96	%	70 - 130
			1,1,2-trichloroethane	2015/07/17		101	%	70 - 130
			Trichloroethene	2015/07/17		92	%	70 - 130
			Trichlorofluoromethane	2015/07/17		98	%	70 - 130
			1,2,4-trimethylbenzene	2015/07/17		103	%	70 - 130
			1,3,5-trimethylbenzene	2015/07/17		106	%	70 - 130
			Vinyl chloride	2015/07/17		76	%	70 - 130
7969871	SLZ	Spiked Blank	1,4-Difluorobenzene (sur.)	2015/07/17		101	%	70 - 130
			4-Bromofluorobenzene (sur.)	2015/07/17		106	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2015/07/17		93	%	70 - 130
			Bromodichloromethane	2015/07/17		104	%	70 - 130
			Bromoform	2015/07/17		100	%	70 - 130
			Bromomethane	2015/07/17		100	%	70 - 130
			Carbon tetrachloride	2015/07/17		98	%	70 - 130
			Chlorobenzene	2015/07/17		96	%	70 - 130

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B559135
Report Date: 2015/08/04

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000/ BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Chlorodibromomethane	2015/07/17		102	%	70 - 130
			Chloroethane	2015/07/17		99	%	70 - 130
			Chloroform	2015/07/17		101	%	70 - 130
			Chloromethane	2015/07/17		91	%	70 - 130
			1,2-dibromoethane	2015/07/17		101	%	70 - 130
			1,2-dichlorobenzene	2015/07/17		103	%	70 - 130
			1,3-dichlorobenzene	2015/07/17		101	%	70 - 130
			1,4-dichlorobenzene	2015/07/17		101	%	70 - 130
			1,1-dichloroethane	2015/07/17		98	%	70 - 130
			1,2-dichloroethane	2015/07/17		107	%	70 - 130
			1,1-dichloroethene	2015/07/17		96	%	70 - 130
			cis-1,2-dichloroethene	2015/07/17		94	%	70 - 130
			trans-1,2-dichloroethene	2015/07/17		96	%	70 - 130
			Dichloromethane	2015/07/17		94	%	70 - 130
			1,2-dichloropropane	2015/07/17		105	%	70 - 130
			cis-1,3-dichloropropene	2015/07/17		101	%	70 - 130
			trans-1,3-dichloropropene	2015/07/17		107	%	70 - 130
			Methyl methacrylate	2015/07/17		108	%	70 - 130
			Methyl-tert-butylether (MTBE)	2015/07/17		96	%	70 - 130
			Styrene	2015/07/17		99	%	70 - 130
			1,1,1,2-tetrachloroethane	2015/07/17		99	%	70 - 130
			1,1,2,2-tetrachloroethane	2015/07/17		100	%	70 - 130
			Tetrachloroethene	2015/07/17		94	%	70 - 130
			1,2,3-trichlorobenzene	2015/07/17		98	%	70 - 130
			1,2,4-trichlorobenzene	2015/07/17		100	%	70 - 130
			1,3,5-trichlorobenzene	2015/07/17		96	%	70 - 130
			1,1,1-trichloroethane	2015/07/17		97	%	70 - 130
			1,1,2-trichloroethane	2015/07/17		100	%	70 - 130
			Trichloroethene	2015/07/17		92	%	70 - 130
			Trichlorofluoromethane	2015/07/17		98	%	70 - 130
			1,2,4-trimethylbenzene	2015/07/17		101	%	70 - 130
			1,3,5-trimethylbenzene	2015/07/17		105	%	70 - 130
			Vinyl chloride	2015/07/17		82	%	70 - 130
7969871	SLZ	Method Blank	1,4-Difluorobenzene (sur.)	2015/07/17		100	%	70 - 130
			4-Bromofluorobenzene (sur.)	2015/07/17		95	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2015/07/17		91	%	70 - 130
			Bromodichloromethane	2015/07/17	<0.50		ug/L	
			Bromoform	2015/07/17	<0.50		ug/L	
			Bromomethane	2015/07/17	<2.0		ug/L	
			Carbon tetrachloride	2015/07/17	<0.50		ug/L	
			Chlorobenzene	2015/07/17	<0.50		ug/L	
			Chlorodibromomethane	2015/07/17	<1.0		ug/L	
			Chloroethane	2015/07/17	<1.0		ug/L	
			Chloroform	2015/07/17	<0.50		ug/L	
			Chloromethane	2015/07/17	<2.0		ug/L	
			1,2-dibromoethane	2015/07/17	<0.50		ug/L	
			1,2-dichlorobenzene	2015/07/17	<0.50		ug/L	
			1,3-dichlorobenzene	2015/07/17	<0.50		ug/L	
			1,4-dichlorobenzene	2015/07/17	<0.50		ug/L	
			1,1-dichloroethane	2015/07/17	<0.50		ug/L	
			1,2-dichloroethane	2015/07/17	<0.50		ug/L	
			1,1-dichloroethene	2015/07/17	<0.50		ug/L	

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B559135
Report Date: 2015/08/04

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000/ BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			cis-1,2-dichloroethene	2015/07/17	<0.50		ug/L	
			trans-1,2-dichloroethene	2015/07/17	<0.50		ug/L	
			Dichloromethane	2015/07/17	<2.0		ug/L	
			1,2-dichloropropane	2015/07/17	<0.50		ug/L	
			cis-1,3-dichloropropene	2015/07/17	<0.50		ug/L	
			trans-1,3-dichloropropene	2015/07/17	<0.50		ug/L	
			Methyl methacrylate	2015/07/17	<0.50		ug/L	
			Methyl-tert-butylether (MTBE)	2015/07/17	<0.50		ug/L	
			Styrene	2015/07/17	<0.50		ug/L	
			1,1,1,2-tetrachloroethane	2015/07/17	<2.0		ug/L	
			1,1,2,2-tetrachloroethane	2015/07/17	<2.0		ug/L	
			Tetrachloroethene	2015/07/17	<0.50		ug/L	
			1,2,3-trichlorobenzene	2015/07/17	<1.0		ug/L	
			1,2,4-trichlorobenzene	2015/07/17	<1.0		ug/L	
			1,3,5-trichlorobenzene	2015/07/17	<0.50		ug/L	
			1,1,1-trichloroethane	2015/07/17	<0.50		ug/L	
			1,1,2-trichloroethane	2015/07/17	<0.50		ug/L	
			Trichloroethene	2015/07/17	<0.50		ug/L	
			Trichlorofluoromethane	2015/07/17	<0.50		ug/L	
			1,2,4-trimethylbenzene	2015/07/17	<0.50		ug/L	
			1,3,5-trimethylbenzene	2015/07/17	<0.50		ug/L	
			Vinyl chloride	2015/07/17	<0.50		ug/L	
7969871	SLZ	RPD [MQ5585-02]	Bromodichloromethane	2015/07/17	NC		%	40
			Bromoform	2015/07/17	NC		%	40
			Bromomethane	2015/07/17	NC		%	40
			Carbon tetrachloride	2015/07/17	NC		%	40
			Chlorobenzene	2015/07/17	NC		%	40
			Chlorodibromomethane	2015/07/17	NC		%	40
			Chloroethane	2015/07/17	NC		%	40
			Chloroform	2015/07/17	NC		%	40
			Chloromethane	2015/07/17	NC		%	40
			1,2-dibromoethane	2015/07/17	NC		%	40
			1,2-dichlorobenzene	2015/07/17	NC		%	40
			1,3-dichlorobenzene	2015/07/17	NC		%	40
			1,4-dichlorobenzene	2015/07/17	NC		%	40
			1,1-dichloroethane	2015/07/17	NC		%	40
			1,2-dichloroethane	2015/07/17	NC		%	40
			1,1-dichloroethene	2015/07/17	NC		%	40
			cis-1,2-dichloroethene	2015/07/17	NC		%	40
			trans-1,2-dichloroethene	2015/07/17	NC		%	40
			Dichloromethane	2015/07/17	NC		%	40
			1,2-dichloropropane	2015/07/17	NC		%	40
			cis-1,3-dichloropropene	2015/07/17	NC		%	40
			trans-1,3-dichloropropene	2015/07/17	NC		%	40
			Methyl methacrylate	2015/07/17	NC		%	40
			Methyl-tert-butylether (MTBE)	2015/07/17	NC		%	40
			Styrene	2015/07/17	NC		%	40
			1,1,1,2-tetrachloroethane	2015/07/17	NC		%	40
			1,1,2,2-tetrachloroethane	2015/07/17	NC		%	40
			Tetrachloroethene	2015/07/17	NC		%	40
			1,2,3-trichlorobenzene	2015/07/17	NC		%	40
			1,2,4-trichlorobenzene	2015/07/17	NC		%	40

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B559135
Report Date: 2015/08/04

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000/ BAR U RANCH
Sampler Initials: JF

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			1,3,5-trichlorobenzene	2015/07/17	NC		%	40
			1,1,1-trichloroethane	2015/07/17	NC		%	40
			1,1,2-trichloroethane	2015/07/17	NC		%	40
			Trichloroethene	2015/07/17	NC		%	40
			Trichlorofluoromethane	2015/07/17	NC		%	40
			1,2,4-trimethylbenzene	2015/07/17	NC		%	40
			1,3,5-trimethylbenzene	2015/07/17	NC		%	40
			Vinyl chloride	2015/07/17	NC		%	40
7970241	NW4	Matrix Spike [MQ5585-06]	Dissolved Nitrite (N)	2015/07/20		100	%	80 - 120
			Dissolved Nitrate (N)	2015/07/20		100	%	80 - 120
7970241	NW4	Spiked Blank	Dissolved Nitrite (N)	2015/07/17		100	%	80 - 120
			Dissolved Nitrate (N)	2015/07/17		100	%	80 - 120
7970241	NW4	Method Blank	Dissolved Nitrite (N)	2015/07/17	<0.010		mg/L	
			Dissolved Nitrate (N)	2015/07/17	<0.010		mg/L	
7970241	NW4	RPD [MQ5585-06]	Dissolved Nitrite (N)	2015/07/20	NC		%	20
			Dissolved Nitrate (N)	2015/07/20	NC		%	20
7971787	KP9	Matrix Spike	Dissolved Chloride (Cl)	2015/07/18		NC	%	80 - 120
7971787	KP9	Spiked Blank	Dissolved Chloride (Cl)	2015/07/18		103	%	80 - 120
7971787	KP9	Method Blank	Dissolved Chloride (Cl)	2015/07/18	<1.0		mg/L	
7971787	KP9	RPD	Dissolved Chloride (Cl)	2015/07/18	0.45		%	20
7971804	KP9	Matrix Spike	Dissolved Sulphate (SO4)	2015/07/18		108	%	80 - 120
7971804	KP9	Spiked Blank	Dissolved Sulphate (SO4)	2015/07/18		106	%	80 - 120
7971804	KP9	Method Blank	Dissolved Sulphate (SO4)	2015/07/18	<1.0		mg/L	
7971804	KP9	RPD	Dissolved Sulphate (SO4)	2015/07/18	5.7		%	20
7971859	KP9	Matrix Spike	Dissolved Chloride (Cl)	2015/07/19		107	%	80 - 120
7971859	KP9	Spiked Blank	Dissolved Chloride (Cl)	2015/07/19		105	%	80 - 120
7971859	KP9	Method Blank	Dissolved Chloride (Cl)	2015/07/19	<1.0		mg/L	
7971859	KP9	RPD	Dissolved Chloride (Cl)	2015/07/19	NC		%	20
7971860	KP9	Matrix Spike	Dissolved Sulphate (SO4)	2015/07/19		NC	%	80 - 120
7971860	KP9	Spiked Blank	Dissolved Sulphate (SO4)	2015/07/19		105	%	80 - 120
7971860	KP9	Method Blank	Dissolved Sulphate (SO4)	2015/07/19	<1.0		mg/L	
7971860	KP9	RPD	Dissolved Sulphate (SO4)	2015/07/19	2.7		%	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B559135
Report Date: 2015/08/04

GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Location: 2000/ BAR U RANCH
Sampler Initials: JF

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Janet Gao, Supervisor

Luba Shymushovska, Organics – Senior Analyst

Harry (Peng) Liang, Senior Analyst

Veronica Falk, Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

398

Maxxam
A Bureau Veritas Group Company

Calgary: 4000 19th St. NE, T2E 6P8. Toll Free (800) 386-7247
Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
maxxam.ca

CHAIN OF CUSTODY RECORD M 000187 Page 1 of 1

Invoice Information	Report Information (if differs from invoice)	Project Information	Turnaround Time (TAT) Required
Company: Golder Associates	Company: same as invoice	Quotation #: Golder 2015 Rates	☒ 5 - 7 Days Regular (Most analyses)
Contact Name: Steven Fiddler	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: 16820 - 107 Avenue Edmonton, AB T5P 4C3	Address:	Project #: 1526784.0000	Rush TAT (Surcharges will be applied)
Phone: 780-483-3499/780-984-6000	Phone:	Site Location: Bar U Ranch	☐ Same Day ☐ 2 Days ☐ 1 Day ☐ 3-4 Days
Email: ~~sfiddler~~ sfiddler@golder.com	Email: CSMdataquality@golder.com	Site #:	Date Required:
Copies: julie_fournier@golder.com	Copies:	Sampled By: JFournier	Rush Confirmation #:

Laboratory Use Only

	YES	NO	Cooler ID	Temp		
Seal Present	✓					
Seal Intact	✓					
Cooling Media	✓					
	YES	NO	Cooler ID	Temp		
Seal Present	✓					
Seal Intact	✓					
Cooling Media	✓					
	YES	NO	Cooler ID	Temp		
Seal Present						
Seal Intact						
Cooling Media						

Depot Reception: 1 2 1 / 5 5 6

Analysis Requested

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC ☒	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals Tot ☒ Diss ☒	Mercury Total ☐ Dissolved ☐	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	PAH	organochlorine pesticides	HOLD - DO NOT ANALYZE
1	MW3		2015-07-13	9:45	GW	12	X	X		X	X						X	X	
2	MW2		"	10:10	GW	13	X	X		X	X						X	X	
3	MW5		" 07-10	15:10	GW	2	X	X									X		
4	MW6		2015-07-13	10:40	GW	13	X	X		X	X						X	X	
5																			
6																			
7																			
8																			
9																			
10																			

Please indicate Filtered, Preserved or Both (F, P, F/P) → FP

Regulatory Criteria

- ☐ AT1/CCME
- ☐ Drinking Water
- ☐ Saskatchewan
- ☐ D50 (Drilling Waste)
- ☒ Other: CCME

Special Instructions

- limited sample.
- very limited sample!
- all metals have been filtered and/or preserved, as needed.
- *contact PM for order of analysis for MW2.

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)
Julie Fournier Julie Fournier	2015/07/13	17:05	M3 freight Purgel NATHEE BLANQUICET	2015/07/13	17:14

13-Jul-15 17:14
Alexander Dobbie
B559135

FL5, INS-0056

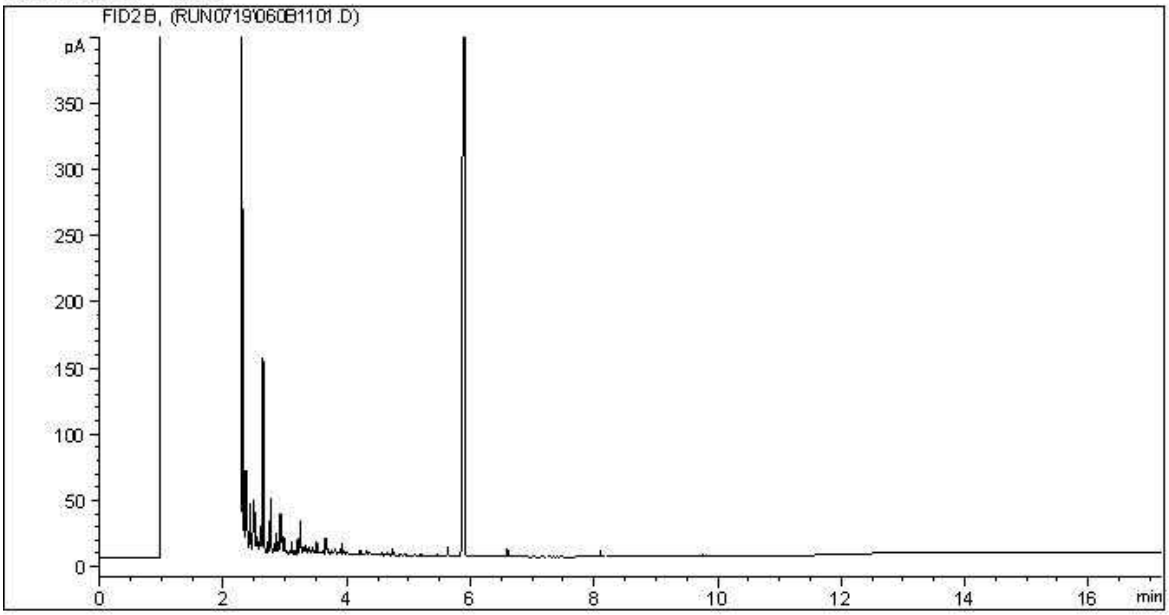
AB FCD-00331/6

Maxxam Job #: B559135
Report Date: 2015/08/04
Maxxam Sample: MQ5585

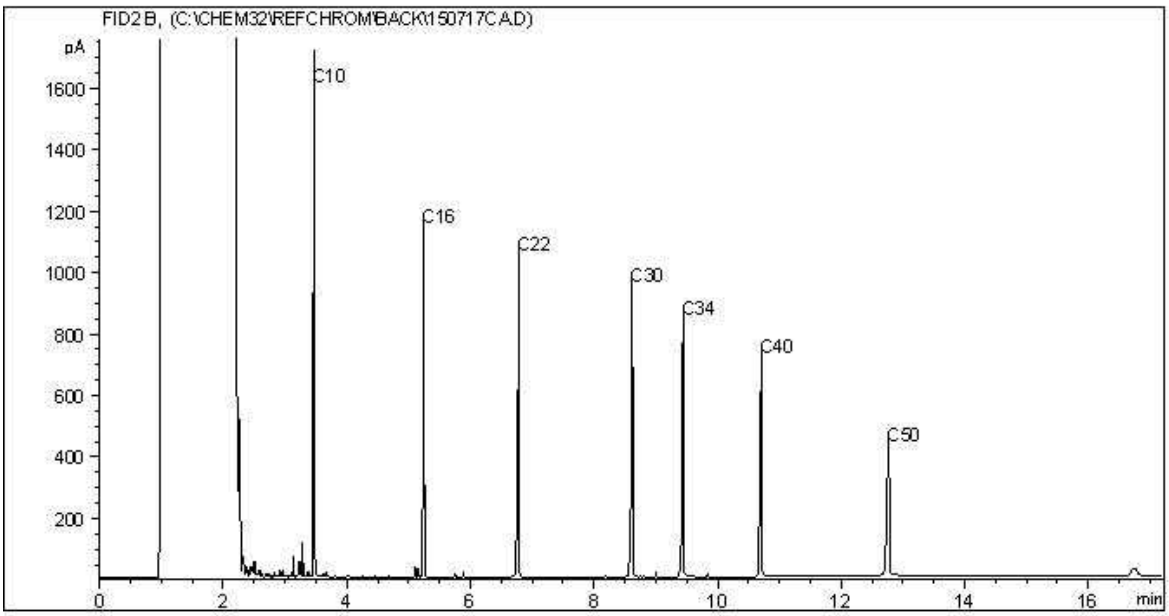
GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Reference: 2000/ BAR U RANCH
Client ID: MW3

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: GC12



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

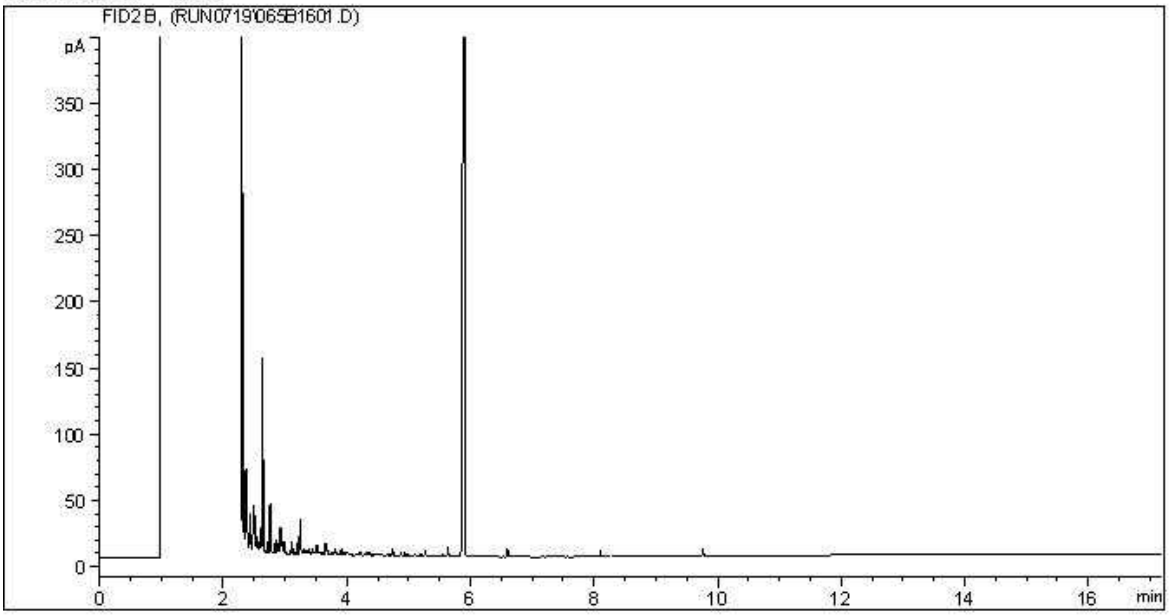
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B559135
Report Date: 2015/08/04
Maxxam Sample: MQ5586

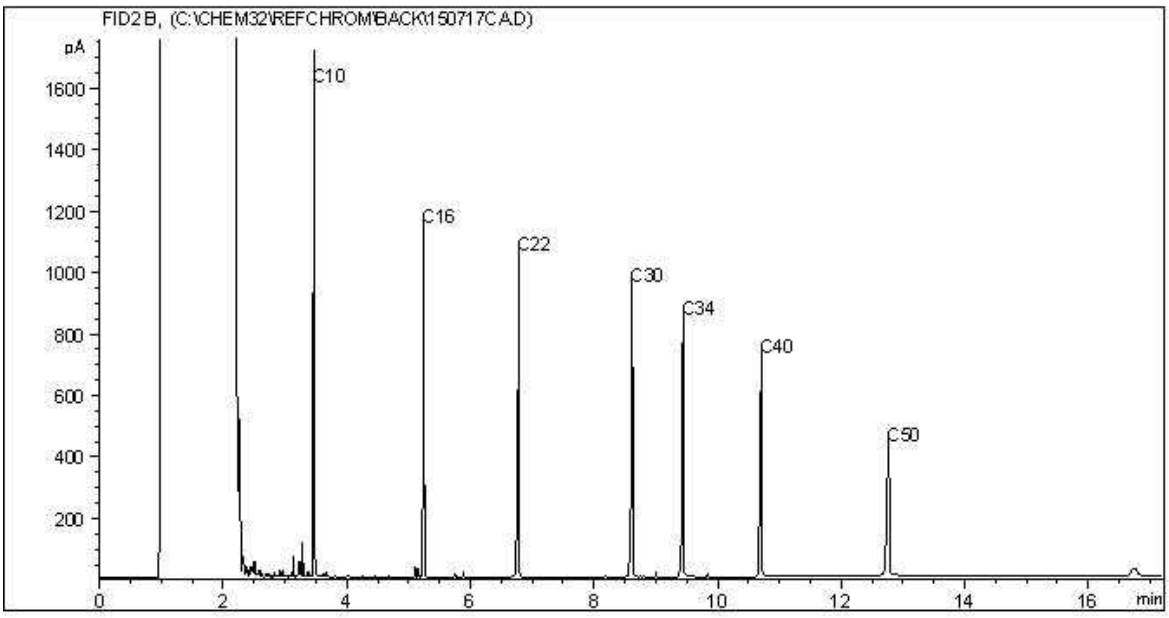
GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Reference: 2000/ BAR U RANCH
Client ID: MW2

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: GC12



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

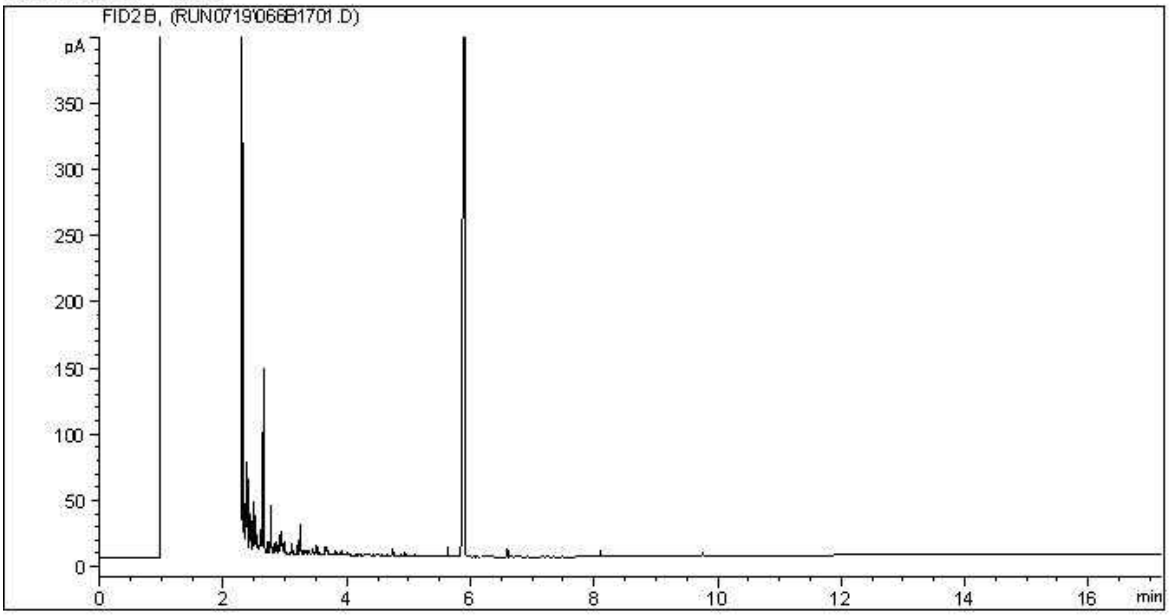
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B559135
Report Date: 2015/08/04
Maxxam Sample: MQ5587

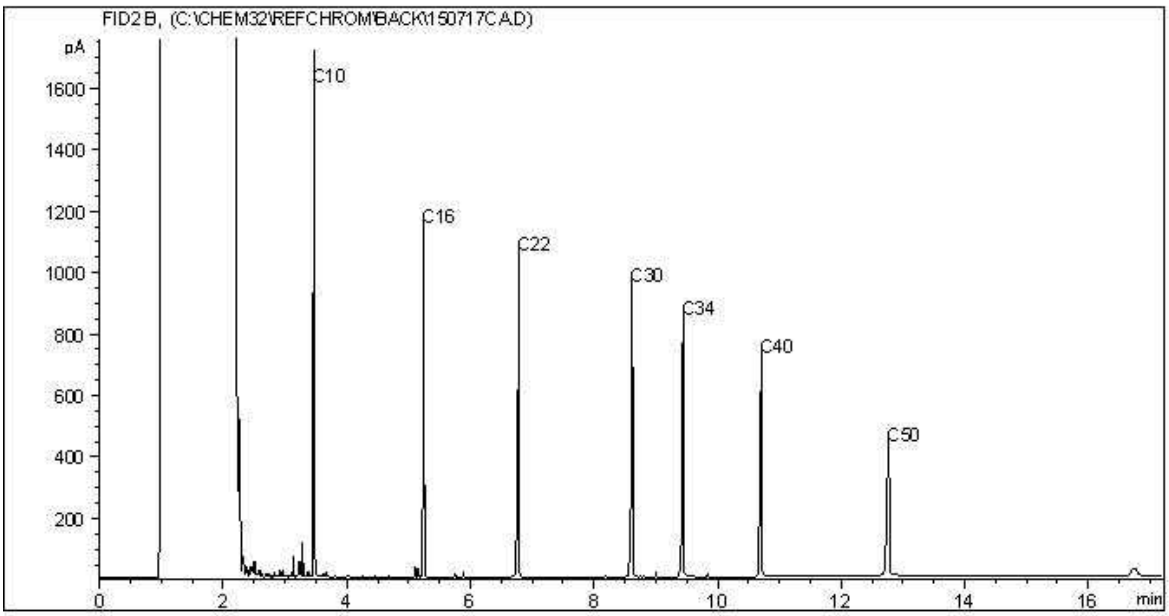
GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Reference: 2000/ BAR U RANCH
Client ID: MW5

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: GC12



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

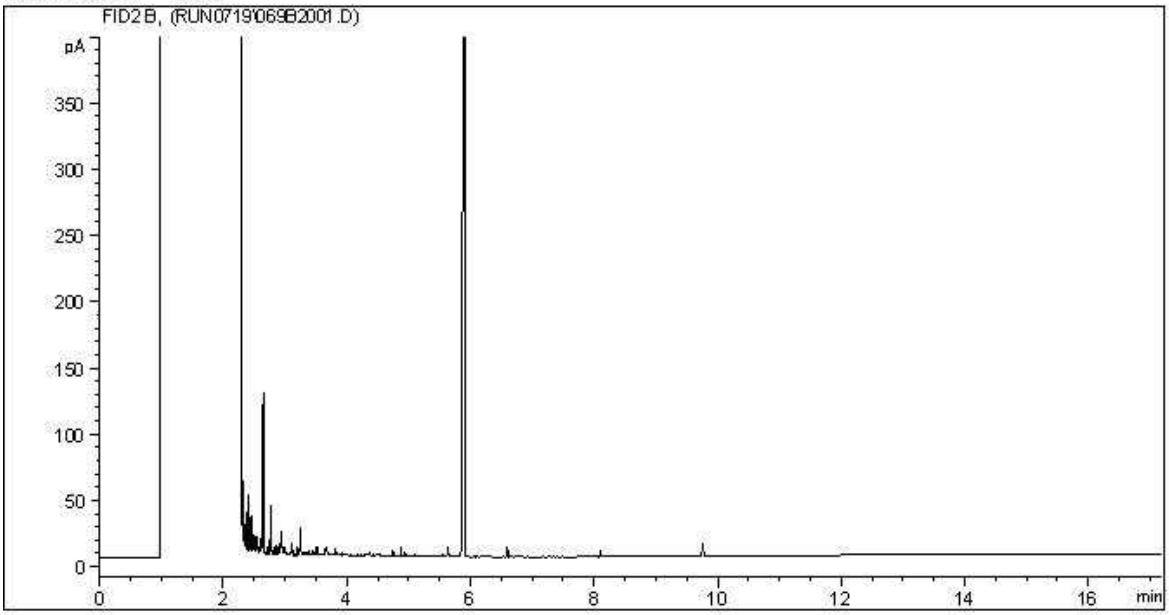
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B559135
Report Date: 2015/08/04
Maxxam Sample: MQ5588

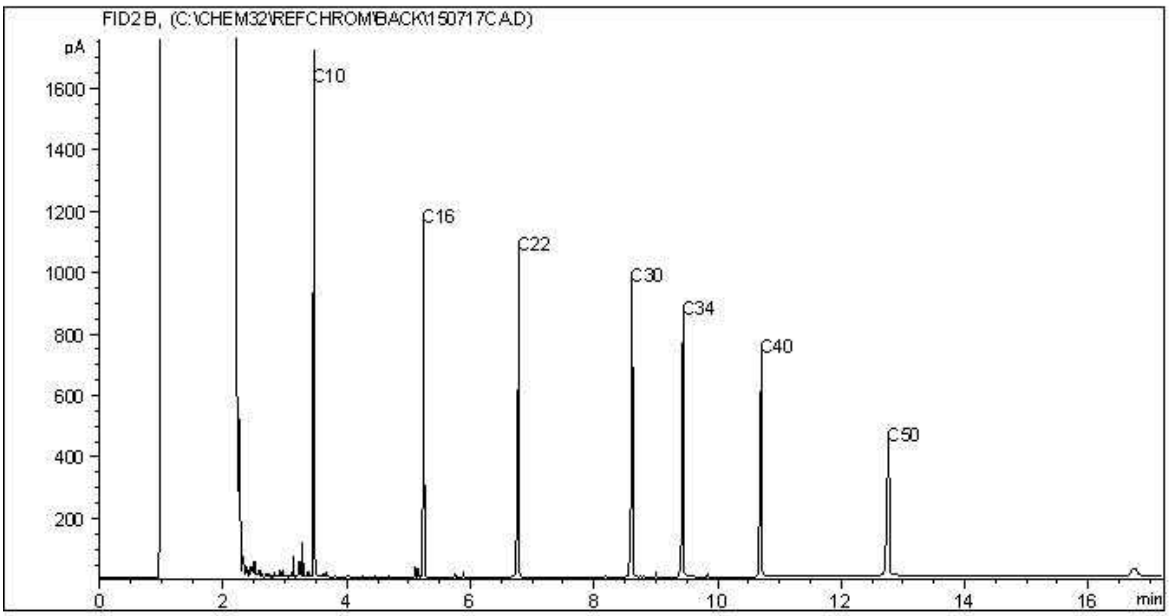
GOLDER ASSOCIATES LTD
Client Project #: 1526784
Site Reference: 2000/ BAR U RANCH
Client ID: MW6

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: GC12



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

APPENDIX D

Historical Soil Analytical Results

Table 1 – Soil Samples Submitted for Analysis						
BTEX, F1-F4	**VOCs**	**PAHs**	**Metals**	**Phenols**	**Glycols**	**Pesticides & Herbicides**
Background						
			TP1			
Waste Dump 1						
SS1, SS2, TP2-2, TP3-1, TP4-1, TP5-1, TP6-1, TP30-1, TP31-1		SS1, TP2-2, TP4-1, TP6-1	SS1, SS2, SS3, TP2-2, TP2-3, TP3-1, TP4-1, TP5-1, TP6-1, TP7-1, TP30-11, TP31-12, MW1-2, MW2-1, MW3-1	SS1, TP2-2, TP4-1, TP6-1	SS1, TP2-2, TP4-1, TP6-1	SS1, TP2-2, TP4-1, TP6-1
Waste Dump 2						
TP11-2, TP12-4, TP13-1, TP14-4, TP15-4, TP16-1, TP18-1	TP11-2, TP12-4, TP16-1	TP11-2, TP12-4, TP14-3, TP16-1	TP11-2, TP12-4, TP13-1, TP14-4, TP15-4, TP15-1, TP18-1, MW4 20'	TP11-2, TP12-4, TP14-3, TP16-1	TP11-2, TP12 4, TP14-3, TP16-1	TP11-2, TP12-4, TP14-3, TP16-1

1 - Soil sample TP30-1 is a duplicate of soil sample SS2

2 - Soil sample TP31-1 is a duplicate of soil sample TP3-1

Table 2: Soil Analytical Results - Petroleum Hydrocarbons Constituents											
Location	**Sample Depth (m)**	**Date**	**ISV[1] (ppm)**	**Benzene**	**Toluene**	**Ethyl-benzene**	**Xylenes (o, m & p)**	**F1 (C_6-C_{10})**	**F2 (>C_{10}-C_{16})**	**F3 (>C_{16}-C_{34})**	**F4 (>C_{34})**
Waste Dump 1											
SS1	Surface	6-Oct-04	nm	< 0.04	< 0.10	< 0.10	< 0.1	< 10	< 10	110	80
SS2	Surface	6-Oct-04	nm	< 0.04	< 0.10	< 0.10	< 0.1	< 10	< 10	540	930
TP30-1[2]	Surface	6-Oct-04	nm	< 0.04	< 0.10	< 0.10	< 0.1	< 10	< 10	210	300
TP2-2	1.0	6-Oct-04	6.2	< 0.04	< 0.10	< 0.10	< 0.1	< 10	39	410	110
TP3-1	0.3	6-Oct-04	1.1	< 0.04	< 0.10	< 0.10	< 0.1	< 10	< 10	28	59
TP31-1[3]	0.3	6-Oct-04	1.1	< 0.04	< 0.10	< 0.10	< 0.1	< 10	< 10	32	47
TP4-1	0.3	6-Oct-04	2.8	< 0.04	< 0.10	< 0.10	< 0.1	< 10	< 10	240	86
TP5-1	0.3	6-Oct-04	2.9	< 0.04	< 0.10	< 0.10	< 0.1	< 10	< 10	260	690
TP6-1	0.4	6-Oct-04	4.2	< 0.04	< 0.10	< 0.10	< 0.1	< 10	< 10	200	660
Waste Dump 2											
TP11-2	0.8	5-Oct-04	15.1	< 0.04	< 0.10	< 0.10	< 0.1	< 10	< 10	360	140
TP12-4	1.8	5-Oct-04	1.4	< 0.04	< 0.10	< 0.10	< 0.1	< 10	< 10	130	61
TP13-1	0.3	5-Oct-04	0.9	< 0.04	< 0.10	< 0.10	< 0.1	< 10	< 10	350	150
TP14-4	2.2	5-Oct-04	2.4	< 0.04	< 0.10	< 0.10	< 0.1	< 10	< 10	54	29
TP15-4	2.3	5-Oct-04	0.3	< 0.04	< 0.10	< 0.10	< 0.1	< 10	< 10	47	15
TP16-1	0.2	5-Oct-04	0.2	< 0.04	< 0.10	< 0.10	< 0.1	< 10	< 10	64	< 10
TP18-1	0.3	5-Oct-04	0.2	< 0.04	< 0.10	< 0.10	< 0.1	< 10	< 10	53	< 10
Referenced Criteria											
CCME (2003) Soil Quality Guidelines[4]	**Agricultural**			**0.05**	**0.1**	**0.1**	**0.1**	**-**	**-**	**-**	**-**
CCME (2001) Canada Wide Standards[5] for Fine-Grained Soil[6]	**Protection of Potable Groundwater**			**-**	**-**	**-**	**-**	**180**	**250**	**-**	**-**
	Eco Soil Contact			**-**	**-**	**-**	**-**	**260**	**900**	**800**	**5600**

Notes:

All results expressed in mg/kg or µg/g (ppm) < - below laboratory method detection limit

- ' = no guideline established

1 - Ionizable soil vapour measured with MiniRae 2000 Photoionization Detector (PID)

2 - Soil sample TP30-1 is a duplicate of soil sample SS2

3 - Soil sample TP31-1 is a duplicate of soil sample TP3-1

4 – Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines Soil Quality Guidelines (1991, Updated 1997, 1999, 2002 and 2003)

5 - CCME, 2001. *Canada-Wide Standards for Petroleum Hydrocarbons (PHC) for Soil* in Fine-Grained Soil for Agricultural Land Use

6 - Fine-grained soil defined as having a median grain size (D50) <75 microns

Table 3: Soil Analytical Results – Volatile Organic Compounds (VOCs)				
Paramters	**Sample Number**			**CCME 2003 SQG[2]**
	TP11-2	**TP12-4**	**TP16-1**	**Agricultural**
Depth (mbg)	**0.8**	**1.8**	**0.2**	
Date	**5-Oct-04**	**5-Oct-04**	**5-Oct-04**	
ISV[1] (ppm)	**15.1**	**1.4**	**0.2**	
1,1,1-Trichloroethane	< 0.10	< 0.10	< 0.10	0.1
1,1,2,2-Tetrachloroethane	< 0.10	< 0.10	< 0.10	0.1
1,1,2-Trichloroethane	< 0.10	< 0.10	< 0.10	0.1
1,1-Dichloroethane	< 0.10	< 0.10	< 0.10	0.1
1,1-Dichloroethene	< 0.10	< 0.10	< 0.10	0.1
1,2-Dichlorobenzene	< 0.10	< 0.10	< 0.10	0.1
1,2-Dichloroethane	< 0.10	< 0.10	< 0.10	0.1
1,2-Dichloropropane	< 0.10	< 0.10	< 0.10	0.1
1,3-Dichlorobenzene	< 0.10	< 0.10	< 0.10	0.1
1,4-Dichlorobenzene	< 0.10	< 0.10	< 0.10	0.1
Bromodichloromethane	< 0.10	< 0.10	< 0.10	0.05
Bromoform	< 0.10	< 0.10	< 0.10	-
Bromomethane	< 0.20	< 0.20	< 0.20	-
Carbon Tetrachloride	< 0.10	< 0.10	< 0.10	0.1
Chlorobenzene	< 0.10	< 0.10	< 0.10	0.1
Chloroform	< 0.10	< 0.10	< 0.10	0.1
Chloromethane	< 0.20	< 0.20	< 0.20	-
cis 1,2-Dichloroethene	< 0.10	< 0.10	< 0.10	0.1
cis 1,3-Dichloropropene	< 0.10	< 0.10	< 0.10	0.1
Dibromochloromethane	< 0.10	< 0.10	< 0.10	-
Dichloromethane	< 0.10	< 0.10	< 0.10	0.1
Ethylbenzene	< 0.10	< 0.10	< 0.10	0.1
Ethylene Dibromide	< 0.10	< 0.10	< 0.10	-
Methyl t-butyl ether	< 0.10	< 0.10	< 0.10	-
Styrene	< 0.10	< 0.10	< 0.10	0.1
Tetrachloroethene (PCE)	< 0.10	< 0.10	< 0.10	0.1
Toluene	< 0.10	< 0.10	< 0.10	0.1
trans 1,2-Dichloroethene	< 0.10	< 0.10	< 0.10	0.1
trans 1,3-Dichloropropene	< 0.10	< 0.10	< 0.10	0.1
Trichloroethene (TCE)	< 0.10	< 0.10	< 0.10	0.1
Trichlorofluoromethane	< 0.10	< 0.10	< 0.10	-
Vinyl Chloride	< 0.10	< 0.10	< 0.10	-
Xylenes (o, m & p)	< 0.1	< 0.1	< 0.1	0.1

Notes:

All results expressed in mg/kg or µg/g (ppm) < - below laboratory method detection limit

- ' = no guideline established

1 - Ionizable soil vapour measured with MiniRae 2000 Photoionization Detector (PID)

2 – Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines Soil Quality Guidelines (1991, Updated 1997, 1999, 2002 and 2003)

Table 4: Soil Analytical Results – Polycyclic Aromatic Hydrocarbons (PAHs)

Parameter	Sample Number								CCME 2003 SQG[1]
	Waste Dump 1				Waste Dump 2				
	SS1	TP2-2	TP4-1	TP6-1	TP11-2	TP12-4	TP14-3	TP16-1	
Depth (mbg)	Surface	1.0	0.3	0.4	0.8	1.8	1.8	0.2	Agricultural
Date	6-Oct-04	6-Oct-04	6-Oct-04	6-Oct-04	5-Oct-04	5-Oct-04	5-Oct-04	5-Oct-04	
1-Methylnaphthalene	<0.5	0.1	<0.5	<0.5	<2.0	<0.1	<0.1	<0.1	-
2-Methylnaphthalene	<0.5	0.2	<0.5	<0.5	<2.0	<0.1	<0.1	<0.1	-
Acenaphthene	<0.5	<0.1	<0.5	<0.5	<2.0	<0.1	<0.1	<0.1	-
Acenaphthylene	<0.5	0.1	<0.5	<0.5	<2.0	<0.1	<0.1	<0.1	-
Anthracene	<0.5	<0.1	<0.5	<0.5	<2.0	<0.1	<0.1	<0.1	-
Benzo(a)anthracene	<0.5	0.1	<0.5	<0.5	<2.0	<0.1	<0.1	<0.1	1
Benzo(a)pyrene	<0.5	0.1	<0.5	<0.5	<2.0	<0.1	<0.1	<0.1	0.1
Benzo(b)fluoranthene	<0.5	0.1	<0.5	<0.5	<2.0	<0.1	<0.1	<0.1	0.1
Benzo(ghi)perylene	<0.5	<0.1	<0.5	<0.5	<2.0	<0.1	<0.1	<0.1	0.1
Benzo(k)fluoranthene	<0.5	<0.1	<0.5	<0.5	<2.0	<0.1	<0.1	<0.1	0.1
Chrysene	<0.5	0.1	<0.5	<0.5	<2.0	<0.1	<0.1	<0.1	-
Dibenzo(a,h)anthracene	<0.5	<0.1	<0.5	<0.5	<2.0	<0.1	<0.1	<0.1	0.1
Fluoranthene	<0.5	0.3	<0.5	<0.5	<2.0	<0.1	<0.1	<0.1	-
Fluorene	<0.5	<0.1	<0.5	<0.5	<2.0	<0.1	<0.1	<0.1	-
Indeno(1,2,3-cd)pyrene	<0.5	<0.1	<0.5	<0.5	<2.0	<0.1	<0.1	<0.1	0.1
Naphthalene	<0.5	**0.4**	<0.5	<0.5	<2.0	<0.1	<0.1	<0.1	0.1
Phenanthrene	<0.5	**0.2**	<0.5	<0.5	<2.0	<0.1	<0.1	<0.1	0.1
Pyrene	<0.5	**0.2**	<0.5	<0.5	<2.0	<0.1	<0.1	<0.1	0.1

Notes:

All results expressed in mg/kg or µg/g (ppm) < - below laboratory method detection limit

- ' = no guideline established

1 – Canadian Council of Ministers of the Environment "Canadian Environmental Quality Guidelines - Soil Quality Guidelines" (1991, Updated 1997, 1999, 2002 and 2003)

BOLD - Exceeds Agricultural criteria

Table 5 - Soil Analytical Results - Metals

Parameters	Sample Number									CCME 2003 SQG[1]
	Background	Waste Dump 1								
	TP1-1	SS1	SS2	TP30-1[2]	SS3	TP2-2	TP2-3	TP3-1	TP31-1[3]	
Depth (mbg)	0.3	Surface	Surface	Surface	Surface	1	1.7	0.3	0.3	Agricultural
Date	5-Oct-04	6-Oct-04	6-Oct-04	6-Oct-04	4-Nov-04	6-Oct-04	6-Oct-04	6-Oct-04	6-Oct-04	
Aluminum	13100	13200	13400	14500	12500	17800	15900	15500	13500	-
Antimony	0.4	1.8	1.7	2.5	0.2	1	<0.2	3.8	1.8	20
Arsenic	6.4	9.4	10.8	9	6	7	7.2	6.9	6.5	12
Barium	342	383	282	285	322	638	296	505	479	750
Beryllium	0.8	0.7	0.8	0.8	0.7	1.1	0.8	0.8	0.8	4
Bismuth	<2.3	4	5	<2.3	<0.2	2.9	<2.3	<2.3	3.4	-
Boron	na	na	na	na	na	na	na	na	na	2
Cadmium	<0.5	**2.2**	**3.6**	**3.6**	0.7	**4.7**	0.7	1.1	0.9	1.4
Calcium	70200	30400	27300	24800	21200	11700	4470	33300	24300	-
Chromium (tota	17	21	21	22	16	19	22	20	16	64
Cobalt	7	8	9	8	7	8	9	9	8	40
Copper	19	60	**90**	49	21	**98**	19	38	36	63
Iron	18300	29600	34600	29300	19200	29200	23800	25600	25300	-
Lead	11	**173**	**175**	**180**	30	**411**	14	**210**	**150**	70
Lithium	na	na	na	na	na	na	na	na	na	-
Magnesium	6320	7200	7170	6880	7130	4620	5470	5810	4960	-
Manganese	232	431	686	711	406	799	370	408	376	-
Mercury	<0.05	0.06	0.32	0.43	0.05	0.54	<0.05	<0.05	0.05	6.6
Molybdenum	<3	4	<3	<3	<3	<3	<3	**6**	<3	5
Nickel	22	26	29	27	23	24	27	26	28	50
Phosphorus	514	2880	2230	2040	1090	2970	742	1790	1910	-
Potassium	1270	2250	2220	2190	2570	2330	1410	2110	2060	-
Selenium	0.52	0.59	0.75	0.69	0.7	0.97	0.61	0.54	0.52	1
Silver	<1	<1	<1	<1	<1	<1	<1	<1	<1	20
Sodium	42.1	331	337	335	138	607	333	221	225	-
Strontium	71	108	94.2	91.5	64.7	163	63.7	127	121	-
Sulphur	na	na	na	na	na	na	na	na	na	500
Tellurium	<0.16	<0.16	<0.16	<0.16	<0.5	<0.16	<0.16	<0.16	<0.16	-
Thallium	<1	<1	<1	<1	<1	<1	<1	<1	<1	1
Tin	<1.8	<1.8	<1.8	<1.8	<10	<1.8	<1.8	<1.8	<1.8	5
Titanium	<5	5	6	6	<5	9	9	<5	7	-
Uranium	0.46	1.17	1.39	1.33	0.93	2.56	1.12	0.59	0.58	-
Vanadium	31	24	24	29	27	27	35	28	26	130
Zinc	69	**837**	**1220**	**1240**	186	**2110**	118	**442**	**558**	200
Zirconium	na	na	na	na	na	na	na	na	na	-

Notes:

All results expressed in mg/kg or µg/g (ppm)

- ' = no guideline established

< - below laboratory method detection limit

1 – Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines Soil Quality Guidelines (1991, Updated 1997, 1999, 2002 and 2003)

2 - Soil sample TP30-1 is a duplicate of soil sample SS2

3 - Soil sample TP31-1 is a duplicate of soil sample TP3-1

BOLD Exceeds Agricultural criteria

Table 5 (continued) - Soil Analytical Results - Metals										
Parameters	Sample Number									CCME 2003 SQG[1]
	Waste Dump 1							Waste Dump 2		
	TP4-1	TP5-1	TP6-1	TP7-1	MW1-2	MW2-1	MW3-1	TP11-2	TP12-4	
Depth (mbg)	0.3	0.3	0.3	0.4	2.8	0.5	0.5	0.8	1.8	Agricultural
Date	6-Oct-04	6-Oct-04	6-Oct-04	6-Oct-04	7-Oct-04	8-Oct-04	8-Oct-04	5-Oct-04	5-Oct-04	
Aluminum	14500	10200	13900	12400	10200	11300	17800	11700	15800	-
Antimony	5.1	0.9	1.7	0.6	< 2.0	<0.5	<0.5	0.5	0.8	20
Arsenic	8.1	5.9	7	7.3	4	6	9	4.5	7.5	12
Barium	676	286	498	353	204	317	466	273	385	750
Beryllium	0.8	0.5	0.8	0.7	0.4	<10	<10	0.5	0.7	4
Bismuth	6	13.5	4.6	4.6	< 10	<5.0	<5.0	<2.3	<2.3	-
Boron	na	na	na	na	< 20	na	na	na	na	2
Cadmium	**1.6**	0.9	1.4	0.9	0.2	0.54	0.78	0.6	0.8	1.4
Calcium	17800	36500	27700	34200	39600	51800	25600	30100	39300	-
Chromium (to	20	18	31	16	12.3	16.1	24.8	16	22	64
Cobalt	8	8	7	8	5.4	8.4	11.9	5	7	40
Copper	51	32	48	21	18.2	17.8	26.7	25	31	63
Iron	28400	84800	21800	23500	23900	17500	28800	18600	20900	-
Lead	**287**	68	**189**	29	15.1	11	18	19	35	70
Lithium	na	na	na	na	11.6	9.8	14.3	na	na	-
Magnesium	4050	6850	4440	8260	11700	10000	9510	6810	8490	-
Manganese	416	586	372	336	332	497	633	271	352	-
Mercury	0.06	0.2	<0.05	0.05	< 0.05	<0.05	0.06	<0.05	<0.05	6.6
Molybdenum	<3	**56**	<3	<3	1.4	0.7	1.2	<3	<3	5
Nickel	25	31	23	22	22.9	25.8	37.1	21	22	50
Phosphorus	2490	2740	3190	957	653	605	940	2850	1070	-
Potassium	2700	3020	2900	1830	1310	1270	3040	4300	2560	-
Selenium	0.69	0.28	0.55	0.7	**1.6**	<0.5	<0.5	0.51	0.42	1
Silver	<1	<1	<1	<1	< 1.0	0.15	0.25	<1	<1	20
Sodium	656	195	542	216	409	<100	190	175	289	-
Strontium	149	67.4	113	81	73	107	84.5	57.9	85.7	-
Sulphur	na	na	na	na	398	na	na	na	na	500
Tellurium	<0.16	<0.16	<0.16	<0.16	< 5.0	<5.0	<5.0	<0.16	<0.16	-
Thallium	<1	<1	<1	<1	< 1.00	<1	<1	na	na	1
Tin	<1.8	<1.8	<1.8	<1.8	< 2.0	6.3	**14.1**	<1.8	<1.8	5
Titanium	8	<5	8	<5	26.9	27	34	74	76	-
Uranium	0.82	0.51	0.65	0.94	< 2	1	1.5	0.43	0.68	-
Vanadium	25	19	23	29	26.6	27	44	31	37	130
Zinc	**532**	**233**	**532**	**242**	43.6	68.4	131	159	**291**	200
Zirconium	na	na	na	na	1.7	1.5	5.7	na	na	-

Notes:

All results expressed in mg/kg or µg/g (ppm)

- ' = no guideline established

< - below laboratory method detection limit na - not analyzed

1 – Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines Soil Quality Guidelines (1991, Updated 1997, 1999, 2002 and 2003)

BOLD Exceeds Agricultural criteria

Table 5 (continued) - Soil Analytical Results - Metals							
Parameters	Sample Number						CCME 2003 SQG[1]
	Waste Dump 2						
	TP13-1	TP14-4	TP15-4	TP16-1	TP18-1	MW4 20'	
Depth (mbg)	0.3	2.2	2.3	0.2	0.3	6	Agricultural
Date	5-Oct-04	5-Oct-04	5-Oct-04	5-Oct-04	5-Oct-04	7-Oct-04	
Aluminum	6600	15800	16100	11400	12900	12400	-
Antimony	0.2	0.5	0.6	0.3	0.5	< 0.5	20
Arsenic	1.9	6.1	6.1	6.9	6.8	8	12
Barium	233	348	359	414	365	375	750
Beryllium	0.3	0.8	0.8	0.6	0.7	< 10	4
Bismuth	<2.3	2.9	<2.3	<2.3	8	< 5.0	-
Boron	na	na	na	na	na	na	2
Cadmium	<0.5	<0.5	<0.5	<0.5	<0.5	< 0.50	1.4
Calcium	21900	52800	54200	27900	36800	35400	-
Chromium (to	10	19	19	16	17	19.9	64
Cobalt	4	7	6	10	8	7.7	40
Copper	24	20	20	23	22	22	63
Iron	9020	19800	19800	20800	20800	22100	-
Lead	8	13	12	13	14	13	70
Lithium	na	na	na	na	na	12.4	-
Magnesium	4920	9400	9260	7390	8560	9390	-
Manganese	289	262	259	601	357	349	-
Mercury	0.06	<0.05	<0.05	0.07	0.06	0.06	6.6
Molybdenum	<3	<3	<3	<3	<3	1	5
Nickel	11	23	22	25	22	23.5	50
Phosphorus	3680	687	690	523	548	599	-
Potassium	3800	1220	1280	2370	2560	1680	-
Selenium	0.67	0.37	0.34	0.54	0.38	0.9	1
Silver	<1	<1	<1	<1	<1	0.35	20
Sodium	104	80.5	101	268	228	516	-
Strontium	69.3	74.7	76	72.4	70.2	90.9	-
Sulphur	na	na	na	na	na	na	500
Tellurium	<0.16	<0.16	<0.16	<0.16	<0.16	< 5.0	-
Thallium	na	na	na	na	na	< 1	1
Tin	<1.8	<1.8	<1.8	<1.8	<1.8	**10.8**	5
Titanium	73	50	48	59	60	33	-
Uranium	0.72	0.64	0.62	0.73	0.85	1.2	-
Vanadium	18	38	38	27	30	31	130
Zinc	172	95	74	94	78	89.7	200
Zirconium	na	na	na	na	na	1.9	-

Notes:

All results expressed in mg/kg or µg/g (ppm)

- ' = no guideline established

< - below laboratory method detection limit na - not analyzed

1 – Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines Soil Quality Guidelines (1991, Updated 1997, 1999, 2002 and 2003)

BOLD Exceeds Agricultural criteria

Table 6: Soil Analytical Results – Phenols

Parameter	Sample Number								CCME 2003 SQG[1]
	Waste Dump 1				Waste Dump 2				
	SS1	TP2-2	TP4-1	TP6-1	TP11-2	TP12-4	TP14-3	TP16-1	
Depth (mbg)	Surface	1.0	0.3	0.4	0.8	1.8	1.8	0.2	Agriculture
Date	6-Oct-04	6-Oct-04	6-Oct-04	6-Oct-04	5-Oct-04	5-Oct-04	5-Oct-04	5-Oct-04	
2,3,4-Trichlorophenol	na	na	na	na	na	na	<0.1	na	0.05
2,3,5,6-Tetrachlorophenol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	0.05
2,3,5-Trichlorophenol	na	na	na	na	na	na	<0.1	na	0.05
2,3,6-Trichlorophenol	na	na	na	na	na	na	<0.1	na	0.05
2,3-dichlorophenol	na	na	na	na	na	na	<0.1	na	0.05
2,4,5-Trichlorophenol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	0.05
2,4,6-Trichlorophenol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	0.05
2,4-dichlorophenol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	0.05
2,4-Dimethylphenol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	0.1
2,4-Dinitrophenol	<1.0	<0.2	<1.0	<1.0	<0.2	<0.2	<0.2	<0.2	0.1
2,5-dichlorophenol	na	na	na	na	na	na	<0.1	na	0.05
2,6-dichlorophenol	na	na	na	na	na	na	<0.1	na	0.05
2-Chlorophenol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	0.05
2-Methyl-4,6-Dinitrophenol	<2.5	<0.5	<2.5	<2.5	<0.5	<0.5	<0.5	<0.5	0.1
2-Nitrophenol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	0.1
3,4,5-Trichlorophenol	na	na	na	na	na	na	<0.1	na	0.05
3,4-dichlorophenol	na	na	na	na	na	na	<0.1	na	0.05
3,5-dichlorophenol	na	na	na	na	na	na	<0.1	na	0.05
4-Chloro-3-Methylphenol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	-
4-Nitrophenol	<2.5	<0.5	<2.5	<2.5	<0.5	<0.5	<0.5	<0.5	0.1
m-Cresol & p-Cresol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	0.1
o-Cresol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	0.1
Pentachlorophenol	<2.0	<0.4	<2.0	<2.0	<0.4	<0.4	<0.2	<0.4	7.6
Phenol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	na	<0.1	3.8
Tetrachlorophenol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	0.05

Notes:

All results expressed in mg/kg or µg/g (ppm)

- ' = no guideline established na - not analyzed

< - below laboratory method detection limit

1 – Canadian Council of Ministers of the Environment "Canadian Environmental Quality Guidelines - Soil Quality Guidelines" (1991, Updated 1997, 1999, 2002 and 2003)

Table 7: Soil Analytical Results – Glycols

Parameter	Sample Number								CCME 2003 SQG[1]
	Waste Dump 1				Waste Dump 2				
	SS1	TP2-2	TP4-1	TP6-1	TP11-2	TP12-4	TP14-3	TP16-1	
Depth (mbg)	Surface	1.0	0.3	0.4	0.8	1.8	1.8	0.2	Agriculture
Date	6-Oct-04	6-Oct-04	6-Oct-04	6-Oct-04	5-Oct-04	5-Oct-04	5-Oct-04	5-Oct-04	
Propylene Glycol	<10	<10	<10	<10	<10	<10	<10	<10	-
Ethylene Glycol	<10	<10	<10	<10	<10	<10	<10	<10	960
Diethylene Glycol	<10	<10	<10	<10	<10	<10	<10	<10	-
Total Glycol	<10	<10	<10	<10	<10	<10	<10	<10	-

Notes:

All units expressed in µg/g dry weight unless otherwise noted.

- ' = no guideline established

< - below laboratory method detection limit

1 – Canadian Council of Ministers of the Environment "Canadian Environmental Quality Guidelines - Soil Quality Guidelines" (1991, Updated 1997, 1999, 2002 and 2003)

Table 8 – Soil Analytical Results – Pesticides									
Parameter	Sample Number								CCME SQG[1]
	Waste Dump 1				Waste Dump 2				
	SS1	TP2-2	TP1-4	TP6-1	TP11-2	TP12-4	TP14-3	TP16-1	
Depth (mbg)	Surface	1.0	0.3	0.4	0.8	1.8	1.8	0.2	Agricultural
Date	6-Oct-04	6-Oct-04	6-Oct-04	6-Oct-04	5-Oct-04	5-Oct-04	5-Oct-04	5-Oct-04	
Organochlorine Pesticides									
2,4'-DDT	0.013	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.7
4,4'-DDD	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	-
4,4'-DDE	0.021	<0.002	0.004	0.010	<0.002	<0.002	<0.002	<0.002	-
4,4'-DDT	0.067	<0.004	0.008	0.021	<0.004	<0.004	<0.004	<0.004	0.7
Aldrin	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-
Alpha Chlordane	<0.002	0.010	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-
Alpha-BHC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-
Beta-BHC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-
Delta-BHC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-
Dieldrin	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-
Endosulfan I	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	-
Endosulfan II	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	-
Endosulfan Sulphate	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	-
Endrin	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	-
Endrin Aldehyde	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-
Endrin Ketone	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	-
Gamma-BHC (Lindane)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.01
Gamma-Chlordane	<0.002	0.133	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-
Heptachlor	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-
Heptachlor Epoxide	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-
Methoxychlor	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	-
Mirex	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	-
Total PCB'S	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.5
Toxaphene	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	-
Organophosphorus Pesticides									
Azinphosmethyl	<1.25	<1.25	<1.25	<1.25	<1.25	<1.25	<1.25	<1.25	-
Chlorpyriphos	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-
Demeton	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-
Diazinon	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-
Dichlorvos	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-
Dimethoate	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-
Ethion	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-
Ethyl Parathion	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-
Fenchlorphos	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-
Fenthion	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-
Fonofos	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-
Malathion	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-
Methyl Parathion	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-
Metolachlor	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	-
Mevinphos	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-
Phosmet	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-
Terbufos	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-
Thimet	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-

All results expressed in mg/kg or µg/g (ppm) < - below laboratory method detection limit

- ' = no guideline established

1 – Canadian Council of Ministers of the Environment "Canadian Environmental Quality Guidelines - Soil Quality Guidelines" (1991, Updated 1997, 1999, 2002 & 2003)

Table 9 – Soil Analytical Results – Herbicides									
Parameter	Sample Number								CCME SQG[1]
	Waste Dump 1				Waste Dump 2				
	SS1	TP2-2	TP1-4	TP6-1	TP11-2	TP12-4	TP14-3	TP16-1	Agricultural
Depth (mbg)	Surface	1.0	0.3	0.4	0.8	1.8	1.8	0.2	
Date	6-Oct-04	6-Oct-04	6-Oct-04	6-Oct-04	5-Oct-04	5-Oct-04	5-Oct-04	5-Oct-04	
2,4-Dichlorophenoxyacetic acid	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-
2,4,5-TP (Silvex)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-
2,4,5-Trichlorophenoxyacetic acid	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-
Dicamba	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-
Mecoprop or 2-(2-methyl-4-chlorophenoxy) proprionic	<50	<50	<50	<50	<50	<50	<50	<50	-
2-Methyl-4-chlorophenoxy acetic acid	<50	<50	<50	<50	<50	<50	<50	<50	-
Dichlorprop	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-
Dinoseb	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-
2,4-dichlorophenoxybutyric acid	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-

All results expressed in mg/kg or µg/g (ppm) < - below laboratory method detection limit
- ' = no guideline established

1 – Canadian Council of Ministers of the Environment "Canadian Environmental Quality Guidelines - Soil Quality Guidelines" (1991, Updated 1997, 1999, 2002 & 2003)

TABLE 3
SOIL PHYSICAL CHARACTERIZATION RESULTS

Location	**MW7**	**MW8**	**MW8**	**MW10**	**MW10**	**MW12**	**MW13**	**MW13**
Depth (m)	**4.5-5**	**1.5-2**	**5-5.5**	**1.5-2**	**4.5-5**	**1.5-2**	**2.5-3**	**4-4.5**
Date	**2006-10-11**	**2006-10-11**	**2006-10-11**	**2006-10-11**	**2006-10-11**	**2006-10-11**	**2006-10-11**	**2006-10-11**
Total Organic Carbon (g/g)	0.006	-	-	-	0.008	0.011	0.013	0.013
Bulk Density (g/cm^3)[a]	-	1.17	1.21	1.14	-	-	1.14	1.25
Particle Size								
%Sand	-	28	25	23	-	-	44	46
%Silt	-	39	42	40	-	-	33	31
%Clay	-	33	33	37	-	-	23	23
Texture	-	Clay loam	Clay loam	Clay loam	-	-	Loam	Loam

a - disturbed sample bulk density

TABLE 4 (Page 1 of 2)
RESULTS OF SOIL ANALYSES - VOLATILE AND EXTRACTABLE HYDROCARBONS
(mg/kg unless noted otherwise)

	Background		Waste Midden 1							
Location	**MW7**	**MW10**	**SS1**	**SS2**	**SS2 (duplicate)**	**TP2-2**	**TP3-1**	**TP3-1 (duplicate)**	**TP4-1**	
Sample Date	**2006-10-11**	**2006-10-11**	**2004-06-10**	**2004-06-10**	**2004-06-10**	**2004-06-10**	**2004-06-10**	**2004-06-10**	**2004-06-10**	**GUIDELINES[a]**
Depth (m)	**4.5 - 5**	**4.5-5**	**Surface**	**Surface**	**Surface**	**1**	**0.3**	**0.3**	**0.3**	
Benzene	<0.005	<0.005	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.0068
Toluene	<0.01	<0.01	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.08
Ethylbenzene	<0.01	<0.01	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.018
Xylenes (Total)	<0.01	<0.01	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	2.4
F1 (C6-C10)	<5	<5	<10	<10	<10	<10	<10	<10	<10	180
F2 (>C10-C16)	<5	<5	<10	<10	<10	39	<10	<10	<10	250
F3 (>C16-C34)	<5	<5	110	540	210	410	28	32	240	800
F4 (>C34)	<5	<5	80	930	300	110	59	47	86	5600

	Waste Midden 1								
Location	**TP5-1**	**TP6-1**	**MW8**	**MW8**	**MW13**	**MW13**	**SS06-1[b]**	**TH06-9**	
Sample Date	**2004-06-10**	**2004-06-10**	**2006-10-11**	**2006-10-11**	**2006-10-11**	**2006-10-11**	**2006-10-11**	**2006-11-03**	**GUIDELINES[a]**
Depth (m)	**0.3**	**0.4**	**3-3.5**	**4.5-5**	**1.5-2**	**3.5-4**	**0-0.3**	**0-0.6**	
Benzene	<0.04	<0.04	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0068
Toluene	<0.10	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.08
Ethylbenzene	<0.10	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.018
Xylenes (Total)	<0.10	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	2.4
F1 (C6-C10)	<10	<10	<5	<5	<5	<5	<5	<5	180
F2 (>C10-C16)	<10	<10	<5	<5	<5	<5	<5	<5	250
F3 (>C16-C34)	260	200	8	<5	21	<5	97	380	800
F4 (>C34)	690	660	11	<5	20	<5	140	170	5600

a - CCME (2006) Environmental Quality Guidelines (BTEX) and CCME (2001) Canada-Wide Standard for Petroleum Hydrocarons in Soil (F1-F4); agricultural land use, fine soils
b - identified as SS1 on laboratory certificates
c - identified as SS2 on laboratory certificates
2004 samples collected by Jacques Whitford; 2006 samples collected by Meridian

TABLE 4 (Page 2 of 2)
RESULTS OF SOIL ANALYSES - VOLATILE AND EXTRACTABLE HYDROCARBONS
(mg/kg unless noted otherwise)

Sample ID	Waste Midden 2						
	TP11-2	TP12-4	TP13-1	TP14-4	TP15-4	TP16-1	
Sample Date	2004-05-10	2004-05-10	2004-05-10	2004-05-10	2004-05-10	2004-05-10	GUIDELINES[a]
Depth (m)	0.8	1.8	0.3	2.2	2.3	0.2	
Benzene	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.0068
Toluene	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.08
Ethylbenzene	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.018
Xylenes (Total)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	2.4
F1 (C6-C10)	<10	<10	<10	<10	<10	<10	180
F2 (>C10-C16)	<10	<10	<10	<10	<10	<10	250
F3 (>C16-C34)	360	130	350	54	47	64	800
F4 (>C34)	140	61	150	29	15	<10	5600

Sample ID	Waste Midden 2						
	TP18-1	MW11	MW11	MW12	MW12	SS06-2[c]	
Sample Date	2004-05-10	2006-10-11	2006-10-11	2006-10-11	2006-10-11	2006-10-11	GUIDELINES[a]
Depth (m)	0.3	1.5-2	2.5-3	0.5-1	2.5-3	0-0.3	
Benzene	<0.04	<0.005	<0.005	<0.005	<0.005	<0.005	0.0068
Toluene	<0.10	0.01	<0.01	<0.01	<0.01	<0.01	0.08
Ethylbenzene	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	0.018
Xylenes (Total)	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	2.4
F1 (C6-C10)	<10	<5	<5	<5	6	<5	180
F2 (>C10-C16)	<10	<5	<5	<5	43	<5	250
F3 (>C16-C34)	53	16	44	<5	110	100	800
F4 (>C34)	<10	15	43	<5	31	74	5600

a - CCME (2006) Environmental Quality Guidelines (BTEX) and CCME (2001) Canada-Wide Standard for Petroleum Hydrocarons in Soil (F1-F4); agricultural land use, fine soils
b - identified as SS1 on laboratory certificates
c - identified as SS2 on laboratory certificates
2004 samples collected by Jacques Whitford; 2006 samples collected by Meridian

TABLE 5 (Page 1 of 2)
RESULTS OF SOIL ANALYSES - VOLATILE ORGANIC COMPOUNDS (VOCs)
(mg/kg unless noted otherwise)

Sample ID	**TP11-2**	**TP12-4**	**TP16-1**	**MW8**	**MW11**	**GUIDELINES**	
Depth (m)	**0.8**	**1.8**	**0.2**	**3-3.5**	**2.5-3**		
Sample Date	**2004-05-10**	**2004-05-10**	**2004-05-10**	**2006-10-11**	**2006-10-11**	**CCME[a]**	**AENV[c]**
1,1,1-Trichloroethane	<0.10	<0.10	<0.10	<0.01	<0.01	0.1[b]	ns
1,1,2,2-Tetrachloroethane	<0.10	<0.10	<0.10	<0.2	<0.2	0.1[b]	ns
1,1,2-Trichloroethane	<0.10	<0.10	<0.10	<0.02	<0.02	0.1[b]	ns
1,2,3-Trichloropropane	-	-	-	<0.05	<0.05	0.1[b]	ns
1,1-Dichloroethane	<0.10	<0.10	<0.10	<0.01	<0.01	0.1[b]	ns
1,1-Dichloroethene	<0.10	<0.10	<0.10	<0.01	<0.01	0.1[b]	0.037
1,2-Dichlorobenzene	<0.10	<0.10	<0.10	<0.01	<0.01	0.1[b]	0.0055
1,2-Dichloroethane	<0.10	<0.10	<0.10	<0.02	<0.02	0.1[b]	0.0062
1,2-Dichloropropane	<0.10	<0.10	<0.10	<0.02	<0.02	0.1[b]	ns
1,3-Dichlorobenzene	<0.10	<0.10	<0.10	<0.01	<0.01	0.1[b]	ns
1,4-Dichlorobenzene	<0.10	<0.10	<0.10	<0.01	<0.01	0.1[b]	0.012
2-Butanone (MEK)	-	-	-	<10	<10	ns	ns
2-Chloroethylvinylether	-	-	-	<0.1	<0.1	ns	ns
2-Hexanone	-	-	-	<0.1	<0.1	ns	ns
4-Methyl-2-Pentanone (MIBK)	-	-	-	<0.1	<0.1	ns	ns
Acetone	-	-	-	<5	<5	ns	ns
Acrolein	-	-	-	<1	<1	ns	ns
Acrylonitrile	-	-	-	<1	<1	ns	ns
Benzene	-	-	-	<0.01	<0.01	0.068	0.011
Bromodichloromethane	<0.10	<0.10	<0.10	<0.01	<0.01	0.1[b]	ns
Bromoform	<0.10	<0.10	<0.10	<0.03	<0.03	ns	ns
Bromomethane	<0.20	<0.20	<0.20	<0.1	<0.1	ns	ns
Carbon Disulphide	na	na	na	<0.01	<0.01	ns	ns
Carbon Tetrachloride	<0.10	<0.10	<0.10	<0.01	<0.01	0.1[b]	0.013
Chlorobenzene	<0.10	<0.10	<0.10	<0.01	<0.01	0.1[b]	0.0064
Chloroform	<0.10	<0.10	<0.10	<0.01	<0.01	0.1[b]	0.0029
Chloromethane	<0.20	<0.20	<0.20	<0.1	<0.1	ns	ns
Chloroethane	na	na	na	<0.1	<0.1	0.1[b]	ns

a - CCME (2006) Environmental Quality Guidelines - agricultural land use, fine soils
b - 1991 guideline, not derived using current risk-based methods
c - AENV (2006) Draft Alberta Tier 1 Guidelines for Soil and Groundwater agricultural, fine soils (draft for public review; provided for reference only)
ns - not specified

2004 samples collected by Jacques Whitford; 2006 samples collected by Meridian

TABLE 5 (Page 2 of 2)
RESULTS OF SOIL ANALYSES - VOLATILE ORGANIC COMPOUNDS (VOCs)
(mg/kg unless noted otherwise)

Sample ID	**TP11-2**	**TP12-4**	**TP16-1**	**MW8**	**MW11**	**GUIDELINES**	
Depth (m)	**0.8**	**1.8**	**0.2**	**3-3.5**	**2.5-3**		
Sample Date	**2004-05-10**	**2004-05-10**	**2004-05-10**	**2006-10-11**	**2006-10-11**	**CCME[a]**	**AENV[c]**
cis 1,2-Dichloroethene	<0.10	<0.10	<0.10	<0.01	<0.01	0.1[b]	ns
cis 1,3-Dichloropropene	<0.10	<0.10	<0.10	<0.01	<0.01	0.1[b]	ns
cis-1,4-Dichloro-2-butene	-	-	-	<0.1	<0.1	0.1[b]	ns
Dibromochloromethane	<0.10	<0.10	<0.10	<0.03	<0.03	0.1[b]	0.22
Dibromomethane	-	-	-	<0.03	<0.03	0.1[b]	ns
Dichlorodifluoromethane	-	-	-	<0.03	<0.03	0.1[b]	ns
Dichloromethane	<0.10	<0.10	<0.10	<0.01	<0.01	0.1[b]	0.052
Ethanol	-	-	-	<40	<40	ns	ns
Ethylbenzene	<0.10	<0.10	<0.10	<0.01	<0.01	0.018	0.027
Ethylene Dibromide	<0.10	<0.10	<0.10	<0.01	<0.01	ns	ns
Ethyl Methacrylate	-	-	-	<0.1	<0.1	ns	ns
Iodomethane	-	-	-	<0.01	<0.01	ns	ns
Methyl t-butyl ether	<0.10	<0.10	<0.10	-	-	ns	ns
Styrene	<0.10	<0.10	<0.10	<0.01	<0.01	0.1[b]	0.68
Tetrachloroethene (PCE)	<0.10	<0.10	<0.10	<0.01	<0.01	0.1	0.19
Toluene	<0.10	<0.10	<0.10	<0.01	<0.01	0.08	0.13
trans 1,2 - Dichlorothene	<0.10	<0.10	<0.10	<0.01	<0.01	0.1[b]	ns
trans 1,3-Dichloropropene	<0.10	<0.10	<0.10	<0.01	<0.01	ns	ns
Trichloroethylene (TCE)	<0.10	<0.10	<0.10	<0.01	<0.01	0.01	0.013
Trichlorofluoromethane	<0.10	<0.10	<0.10	<0.01	<0.01	ns	ns
Vinyl Chloride	<0.10	<0.10	<0.10	<0.02	<0.02	ns	ns
Xylenes (m+p)	-	-	-	<0.01	<0.01	ns	ns
o-Xylene	-	-	-	<0.01	<0.01	ns	ns
Xylenes (total)	<0.1	<0.1	<0.1	<0.02	<0.02	2.4	3.6

a - CCME (2006) Environmental Quality Guidelines - agricultural land use, fine soils
b - 1991 guideline, not derived using current risk-based methods
c - AENV (2006) Draft Alberta Tier 1 Guidelines for Soil and Groundwater agricultural, fine soils (draft for public review; provided for reference only)
ns - not specified

2004 samples collected by Jacques Whitford; 2006 samples collected by Meridian

TABLE 6 (Page 1 of 2)
RESULTS OF SOIL ANALYSES - POLYCYCLIC AROMATIC HYDROCARBONS
(mg/kg unless noted otherwise)

	Waste Midden 1							GUIDELINES	
Location	**SS1**	**TP2-2**	**TP4-1**	**TP6-1**	**MW8**	**MW8**	**TH06-10**		
Depth (m)	**Surface**	**1**	**0.3**	**0.4**	**3-3.5**	**4-4.5**	**0-0.6**	**CCME[a]**	**AENV[c]**
Sample Date	**2004-06-10**	**2004-06-10**	**2004-06-10**	**2004-06-10**	**2006-10-11**	**2006-10-11**	**2006-11-03**		
Naphthalene	<0.5	**0.4**	<0.5	<2.0	<0.01	<0.01	<0.01	0.1	0.026
Acenaphthylene	<0.5	0.1	<0.5	<2.0	<0.01	<0.01	<0.01	ns	ns
Acenaphthene	<0.5	<0.1	<0.5	<2.0	<0.01	<0.01	<0.01	ns	0.55
Fluorene	<0.5	<0.1	<0.5	<2.0	<0.01	<0.01	<0.01	ns	0.45
Phenanthrene	<0.5	**0.2**	<0.5	<2.0	<0.01	<0.01	0.06	0.1[b]	ns
Anthracene	<0.5	<0.1	<0.5	<2.0	<0.01	<0.01	<0.01	ns	0.0055
Fluoranthene	<0.5	**0.3**	<0.5	<2.0	<0.01	<0.01	**0.07**	ns	0.038
Pyrene	<0.5	**0.2**	<0.5	<2.0	<0.01	<0.01	**0.07**	0.1[b]	0.033
Benzo(c)phenanthrene	-	-	-	-	<0.01	<0.01	<0.01	ns	ns
Benzo(a)anthracene	<0.5	0.1	<0.5	<2.0	<0.01	<0.01	0.06	0.1[b]	ns
Chrysene	<0.5	0.1	<0.5	<2.0	<0.01	<0.01	0.04	ns	ns
7,12-Dimethylbenz(a)anthracene	-	-	-	-	<0.01	<0.01	<0.01	ns	ns
Benzo(b)fluoranthene	<0.5	0.1	<0.5	<2.0	<0.01	<0.01	0.07	0.1[b]	ns
Benzo(j)fluoranthene	-	-	-	-	<0.01	<0.01	0.01	ns	ns
Benzo(k)fluoranthene	<0.5	<0.1	<0.5	<2.0	<0.01	<0.01	0.02	0.1[b]	ns
Benzo(a)pyrene	<0.5	0.1	<0.5	<2.0	<0.01	<0.01	0.07	0.1	ns
3-Methylcholanthrene	-	-	-	-	<0.01	<0.01	<0.01	ns	ns
Indeno(1,2,3-cd)pyrene	<0.5	<0.1	<0.5	<2.0	<0.01	<0.01	0.06	0.1[b]	ns
Dibenzo(a,h)anthracene	<0.5	<0.1	<0.5	<2.0	<0.01	<0.01	<0.01	0.1[b]	ns
Benzo(ghi)perylene	<0.5	<0.1	<0.5	<2.0	<0.01	<0.01	0.05	0.1[b]	ns
Dibenzo(a,h/a,i/a,l)pyrene	-	-	-	-	<0.01	<0.01	<0.01	ns	ns
2-Methylnaphthalene	<0.5	0.2	<0.5	<2.0	-	-	0.01	ns	ns
1-Methylnaphthalene	<0.5	0.1	<0.5	<2.0	-	-	<0.01	ns	ns
Carcinogenic PAH as B(a)P	-	**0.12[d]**	-	-	<0.03	<0.03	**0.1**	ns	0.069

a - CCME (2006) Environmental Quality Guidelines - agricultural land use, fine soils
b - 1991 guideline, not derived using current risk-based methods
c - AENV (2006) Draft Alberta Tier 1 Guidelines for Soil and Groundwater - agricultural, fine soils (draft for public review; provided for reference only)
d - calculated from reported PAH concentrations; not all carcinogenic PAH analyzed
ns - not specified
2004 samples collected by Jacques Whitford; 2006 samples collected by Meridian
BOLD - exceeds guideline

TABLE 6 (Page 2 of 2)
RESULTS OF SOIL ANALYSES - POLYCYCLIC AROMATIC HYDROCARBONS
(mg/kg unless noted otherwise)

	Waste Midden 2						GUIDELINES	
Location	**TP11-2**	**TP12-4**	**TP14-3**	**TP16-1**	**MW11**	**TH06-7**		
Depth (m)	**0.8**	**1.8**	**1.8**	**0.2**	**1.5-2**	**0-0.6**	**CCME[a]**	**AENV[c]**
Sample Date	**2004-05-10**	**2004-05-10**	**2004-05-10**	**2004-05-10**	**2006-10-11**	**2006-11-03**		
Naphthalene	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	0.1	0.026
Acenaphthylene	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	ns	ns
Acenaphthene	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	ns	0.55
Fluorene	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	ns	0.45
Phenanthrene	<0.1	<0.1	<0.1	<0.1	<0.01	0.03	0.1[b]	ns
Anthracene	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	ns	0.0055
Fluoranthene	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	ns	0.038
Pyrene	<0.1	<0.1	<0.1	<0.1	<0.01	0.01	0.1[b]	0.033
Benzo(c)phenanthrene	-	-	-	-	<0.01	<0.01	ns	ns
Benzo(a)anthracene	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	0.1[b]	ns
Chrysene	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	ns	ns
7,12-Dimethylbenz(a)anthracene	-	-	-	-	<0.01	<0.01	ns	ns
Benzo(b)fluoranthene	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	0.1[b]	ns
Benzo(j)fluoranthene	-	-	-	-	<0.01	<0.01	ns	ns
Benzo(k)fluoranthene	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	0.1[b]	ns
Benzo(a)pyrene	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	0.1	ns
3-Methylcholanthrene	-	-	-	-	<0.01	<0.01	ns	ns
Indeno(1,2,3-cd)pyrene	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	0.1[b]	ns
Dibenzo(a,h)anthracene	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	0.1[b]	ns
Benzo(ghi)perylene	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	0.1[b]	ns
Dibenzo(a,h/a,i/a,l)pyrene	-	-	-	-	<0.01	<0.01	ns	ns
2-Methylnaphthalene	<0.1	<0.1	<0.1	<0.1	-	0.03	ns	ns
1-Methylnaphthalene	<0.1	<0.1	<0.1	<0.1	-	0.03	ns	ns
Carcinogenic PAH as B(a)P	-	-	-	-	<0.03	<0.03	ns	0.069

a - CCME (2006) Environmental Quality Guidelines - agricultural land use, fine soils
b - 1991 guideline, not derived using current risk-based methods
c - AENV (2006) Draft Alberta Tier 1 Guidelines for Soil and Groundwater - agricultural, fine soils (draft for public review; provided for reference only)
d - calculated from reported PAH concentrations; not all carcinogenic PAH analyzed
ns - not specified
2004 samples collected by Jacques Whitford; 2006 samples collected by Meridian
BOLD - exceeds guideline

TABLE 7
RESULTS OF SOIL ANALYSES - SALINITY PARAMETERS
(mg/L unless noted otherwise)

	BACKGROUND	WASTE MIDDEN 1			WASTE MIDDEN 2		
Sample ID	**MW7**	**MW8**	**MW13**	**SS06-1[b]**	**MW11**	**SS06-2[c]**	
Depth (m)	**1.5-2**	**1.5-2**	**1.5-2**	**0-0.3**	**1.5-2**	**0-0.3**	**GUIDELINES[a]**
Sample Date	**2006-10-11**	**2006-10-11**	**2006-10-11**	**2006-10-11**	**2006-10-11**	**2006-10-11**	
Saturation (%)	60.0	40.0	37.3	57.9	66.7	50.0	-
pH (pH units)	8.0	**8.2**	7.7	7.9	7.7	7.6	6 to 8
Conductivity (dS/m)	**5.74**	1.10	1.37	**6.82**	**2.33**	**3.92**	2
Sodium Adsorption Ratio (unitless)	3.1	2.3	1.0	3.7	0.7	2.1	5
Chloride	40	30	<20	370	110	70	-
Calcium	322	22	116	387	212	324	-
Potassium	12	2	5	358	14	30	-
Magnesium	552	47	69	461	90	304	-
Sodium	396	84	58	461	51	222	-
Sulphate	4450	347	700	3830	74	2530	-

a - CCME (2006) Environmental Quality Guidelines, agricultural soils
b - identified as SS1 on laboratory certificates
c - identified as SS2 on laboratory certificates
BOLD - value exceeds guideline

TABLE 8 (Page 1 of 5)
RESULTS OF SOIL ANALYSES - METALS
(mg/kg unless noted otherwise)

Sample ID	Background					Waste Midden 1					GUIDELINES[a]
	TP1-1	MW7	MW7	MW10	MW10	SS1	SS2	TP30-1	SS3	TP2-2	
Depth (m)	0.3	2-2.5	5.5-6	1.5-2	4.5-5	Surface	Surface	Surface	Surface	1	
Sample Date	2004-05-10	2006-10-11	2006-10-11	2006-10-11	2006-10-11	2004-06-10	2004-06-10	2004-06-10	2004-04-11	2004-06-10	
Aluminum	13100	-	-	-	-	13200	13400	14500	12500	17800	-
Antimony	0.4	<0.2	<0.2	<0.2	<0.2	1.8	1.7	2.5	0.2	1	20
Arsenic	6.4	8.2	7.9	8.8	9.3	9.4	10.8	9	6	7	12
Barium	342	359	423	410	403	383	282	285	322	638	750
Berylium	0.8	<1	<1	<1	<1	0.7	0.8	0.8	0.7	1.1	4
Bismuth	<2.3	-	-	-	-	4	5	<2.3	<0.2	2.9	-
Boron	-	-	-	-	-	-	-	-	-	-	-
Cadmium	<0.5	0.5	0.6	0.7	0.5	**2.2**	**3.6**	**3.6**	0.7	**4.7**	1.4
Calcium	70200	-	-	-	-	30400	27300	24800	21200	1170	-
Chromium (total)	17	18	20.5	26.8	20	21	21	22	16	19	64
Cobalt	7	10	8	10	10	8	9	8	7	8	40
Copper	19	24	21	26	30	60	**90**	49	21	**98**	63
Iron	18300	-	-	-	-	29600	34600	29300	19200	29200	-
Lead	11	13	12	16	15	**173**	**175**	**180**	30	**411**	70
Lithium	-	-	-	-	-	-	-	-	-	-	-
Magnesium	6320	-	-	-	-	7200	7170	6880	7130	4620	-
Manganese	232	-	-	-	-	431	686	711	406	799	-
Mercury	<0.05	0.05	<0.05	0.05	0.05	0.06	0.32	0.43	0.05	0.54	6.6
Molydbenum	<3	<1	<1	<1	<1	4	<3	<3	<3	<3	5
Nickel	22	29	26	35	32	26	29	27	23	24	50
Phosphorus	514	-	-	-	-	2880	2230	2040	1090	2970	-
Potassium	1270	-	-	-	-	2250	2220	2190	2570	2330	-
Selenium	0.52	0.3	0.6	<0.2	0.3	0.59	0.75	0.69	0.7	0.97	1
Silver	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	20
Sodium	42.1	-	-	-	-	331	337	335	138	607	-
Strontium	71	-	-	-	-	108	94.2	91.5	64.7	163	-
Sulphur	-	-	-	-	-	-	-	-	-	-	-
Tellurium	<0.16	-	-	-	-	<0.16	<0.16	<0.16	<0.5	<0.16	-
Thallium	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1
Tin	<1.8	<5	<5	<5	<5	<1.8	<1.8	<1.8	<10	<1.8	5
Titanium	<5	-	-	-	-	5	6	6	<5	9	-
Uranium	0.46	<2	<2	<2	<2	1.17	1.39	1.33	0.93	2.56	23[b]
Vanadium	31	30	30	36	30	24	24	29	27	27	130
Zinc	69	90	90	110	100	**837**	**1220**	**1240**	186	**2110**	200
Zirconium	-	-	-	-	-	-	-	-	-	-	-

a - CCME (2006) Environmental Quality Guidelines, agricultural land use
b - draft guideline
c - identified as SS1 on laboratory certificate
d - identified as SS2 on laboratory certificate
2004 samples collected by Jacques Whitford; 2006 samples collected by Meridian

TABLE 8 (Page 2 of 5)
RESULTS OF SOIL ANALYSES - METALS
(mg/kg unless noted otherwise)

Sample ID	Waste Midden 1										
	TP2-3	TP3-1	TP3-1 (dup)	TP4-1	TP5-1	TP6-1	TP7-1	MW1-2	MW2-1	MW3-1	GUIDELINES[a]
Depth (m)	1.7	0.3	0.3	0.3	0.3	0.3	0.4	2.8	0.5	0.5	
Sample Date	2004-06-10	2004-06-10	2004-06-10	2004-06-10	2004-06-10	2004-06-10	2004-06-10	2004-07-10	2004-08-10	2004-08-10	
Aluminum	15900	15500	13500	14500	10200	13900	12400	10200	11300	17800	-
Antimony	<0.2	3.8	1.8	2.1	0.9	1.7	0.6	<2.0	<0.5	<0.5	20
Arsenic	7.2	6.9	6.5	8.1	5	7	7.3	4	6	9	12
Barium	296	505	479	676	286	48	353	204	317	466	750
Berylium	0.8	**38**	0.8	0.8	0.5	0.8	0.7	0.4	<10	<10	4
Bismuth	<2.3	<2.3	3.4	6	13.5	4.6	4.6	<10	<5.0	<5.0	-
Boron	-	-	-	-	-	-	-	<20	-	-	-
Cadmium	0.7	1.1	0.9	**1.6**	0.9	1.4	0.9	0.2	0.54	0.78	1.4
Calcium	4470	33300	24300	17800	36500	27700	34200	39600	51800	25600	-
Chromium (total)	22	20	16	20	18	31	16	12.3	16.1	24.8	64
Cobalt	9	9	8	8	8	7	8	5.4	8.4	11.9	40
Copper	19	38	36	51	32	48	21	18.2	17.8	26.7	63
Iron	23800	25600	25300	28400	84800	21800	23500	23900	17500	28800	-
Lead	14	**210**	**150**	**287**	68	**189**	29	15.1	11	18	70
Lithium	-	-	-	-	-	-	-	11.6	9.8	14.3	-
Magnesium	5470	5810	4960	4050	6850	4440	8260	11700	10000	9510	-
Manganese	370	408	376	416	58	372	226	332	497	633	-
Mercury	<0.05	<0.05	0.05	0.06	0.2	<0.05	0.05	<0.05	<0.05	0.06	6.6
Molydbenum	<3	**6**	<3	<3	**56**	<3	<3	1.4	0.7	1.2	5
Nickel	27	26	28	25	31	23	22	22.9	25.8	37.1	50
Phosphorus	742	1790	1910	2490	3740	3190	957	653	605	940	-
Potassium	1410	2110	2060	2700	3020	2900	1830	1310	1270	3040	-
Selenium	0.61	0.54	0.52	0.69	0.28	0.55	0.7	**1.6**	<0.5	<0.5	1
Silver	<1	<1	<1	<1	<1	<1	<1	<1	0.15	0.25	20
Sodium	333	221	225	656	195	542	216	409	<100	190	-
Strontium	63.7	127	121	149	67.4	113	81	73	107	84.5	-
Sulphur	-	-	-	-	-	-	-	398	-	-	-
Tellurium	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<5.0	<5.0	<0.16	-
Thallium	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1
Tin	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	<2.0	**6.3**	**14.1**	5
Titanium	9	<5	7	8	<5	8	<5	26.9	27	34	-
Uranium	1.12	0.59	0.58	0.82	0.51	0.65	0.94	<2	1	1.5	23[b]
Vanadium	35	28	26	25	19	23	29	26.6	27	44	130
Zinc	118	**442**	**558**	**532**	**233**	**532**	**242**	43.6	68.4	131	200
Zirconium	-	-	-	-	-	-	-	1.7	1.5	5.7	-

a - CCME (2006) Environmental Quality Guidelines, agricultural land use
b - draft guideline
c - identified as SS1 on laboratory certificate
d - identified as SS2 on laboratory certificate
2004 samples collected by Jacques Whitford; 2006 samples collected by Meridian

TABLE 8 (Page 3 of 5)
RESULTS OF SOIL ANALYSES - METALS
(mg/kg unless noted otherwise)

Sample ID	Waste Midden 1								
	MW8	MW8	SS06-1[c]	TH06-2	TH06-3	TH06-8	TH06-9	TH06-10	GUIDELINES[a]
Depth (m)	3-3.5	5-5.5	Surface	0.9-1.2	0-0.3	0-0.3	0-0.6	0.3-0.6	
Sample Date	2006-10-11	2006-10-11	2006-10-11	2006-11-03	2006-11-03	2006-11-03	2006-11-03	2006-11-03	
Aluminum	-	-	-	-	-	-	-	-	-
Antimony	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	20
Arsenic	8.1	6.8	10	7.5	6.8	6.8	7.8	7.4	12
Barium	306	417	382	377	370	346	375	372	750
Berylium	<1	<1	<1	1	<1	1	<1	<1	4
Bismuth	-	-	-	-	-	-	-	-	-
Boron	-	-	-	-	-	-	-	-	-
Cadmium	0.6	0.6	0.6	0.5	0.6	0.7	0.8	0.9	1.4
Calcium	-	-	-	-	-	-	-	-	-
Chromium (total)	18.9	16.5	19.1	24.7	17.8	23.5	19.5	25.3	64
Cobalt	9	7	9	10	8	9	8	9	40
Copper	23	22	52	25	21	26	25	70	63
Iron	-	-	-	-	-	-	-	-	-
Lead	14	13	19	14	14	15	29	**196**	70
Lithium	-	-	-	-	-	-	-	-	-
Magnesium	-	-	-	-	-	-	-	-	-
Manganese	-	-	-	-	-	-	-	-	-
Mercury	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	6.6
Molydbenum	<1	<1	<1	<1	<1	<1	<1	<1	5
Nickel	27	25	28	33	26	29	26	29	50
Phosphorus	-	-	-	-	-	-	-	-	-
Potassium	-	-	-	-	-	-	-	-	-
Selenium	0.4	0.5	0.6	0.3	0.6	0.8	0.9	0.6	1
Silver	<1	<1	<1	<1	<1	<1	<1	<1	20
Sodium	-	-	-	-	-	-	-	-	-
Strontium	-	-	-	-	-	-	-	-	-
Sulphur	-	-	-	-	-	-	-	700	-
Tellurium	-	-	-	-	-	-	-	-	-
Thallium	<1	<1	<1	<1	<1	<1	<1	<1	1
Tin	<5	<5	<5	<5	<5	<5	<5	<5	5
Titanium	-	-	-	-	-	-	-	-	-
Uranium	<2	<2	<2	<2	<2	<2	<2	<2	23[b]
Vanadium	33	26	32	44	31	41	33	40	130
Zinc	100	90	**310**	80	90	130	190	**250**	200
Zirconium	-	-	-	-	-	-	-	-	-

a - CCME (2006) Environmental Quality Guidelines, agricultural land use
b - draft guideline
c - identified as SS1 on laboratory certificate
d - identified as SS2 on laboratory certificate
2004 samples collected by Jacques Whitford; 2006 samples collected by Meridian

TABLE 8 (Page 4 of 5)
RESULTS OF SOIL ANALYSES - METALS
(mg/kg unless noted otherwise)

Sample ID	Waste Midden 2											GUIDELINES[a]
	TP11-2	TP12-4	TP13-1	TP14-4	TP15-4	TP16-1	TP18-1	MW4	MW11	MW11	MW12	
Depth (m)	0.8	1.8	0.3	2.2	2.3	0.2	0.3	6	1.5-2	2.5-3	0.5-1	
Sample Date	2004-05-10	2004-05-10	2004-05-10	2004-05-10	2004-05-10	2004-05-10	2004-05-10	2004-07-10	2006-10-11	2006-10-11	2006-10-11	
Aluminum	11700	15800	6600	15800	16100	11400	12900	12400	-	-	-	-
Antimony	0.5	0.8	0.2	0.5	0.6	0.3	0.5	<0.5	<0.2	<0.2	<0.2	20
Arsenic	4.5	7.5	1.9	6.1	6.1	6.9	6.8	8	8.1	8.2	8.2	12
Barium	273	385	233	348	359	414	365	375	450	365	439	750
Berylium	0.5	0.7	0.3	0.8	0.8	0.6	0.7	<10	<1	<1	<1	4
Bismuth	<2.3	<2.3	<2.3	2.9	<2.3	<2.3	8	<5.0	-	-	-	-
Boron	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	0.6	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	0.6	0.7	1.4
Calcium	30100	39300	21900	52800	54200	27900	36800	35400	-	-	-	-
Chromium (total)	16	22	10	19	19	16	17	19.9	24.1	22.4	22.3	64
Cobalt	5	7	4	7	6	10	8	7.7	10	10	10	40
Copper	25	31	24	20	20	23	22	22	30	24	31	63
Iron	1800	20900	9020	19800	19800	20800	20800	22100	-	-	-	-
Lead	19	35	8	13	12	13	14	13	17	12	21	70
Lithium	-	-	-	-	-	-	-	12.4	-	-	-	-
Magnesium	6810	8490	4920	9400	9260	7390	8560	9390	-	-	-	-
Manganese	271	352	289	262	259	601	357	349	-	-	-	-
Mercury	<0.05	<0.05	0.06	<0.05	<0.05	0.07	0.06	0.06	<0.05	<0.05	<0.05	6.6
Molydbenum	<3	<3	<3	<3	<3	<3	<3	1	<1	1	<1	5
Nickel	21	22	11	23	22	25	22	23.5	34	32	32	50
Phosphorus	2850	1070	3680	687	690	523	548	599	-	-	-	-
Potassium	4300	2560	300	1220	1280	2370	2560	1680	-	-	-	-
Selenium	0.51	0.42	0.67	0.37	0.34	0.54	0.38	0.9	0.3	0.6	0.5	1
Silver	<1	<1	<1	<1	<1	<1	<1	0.35	<1	<1	<1	20
Sodium	175	289	104	80.8	101	268	228	516	-	-	-	-
Strontium	57.9	85.7	69.3	74.7	76	72.4	70.2	90.9	-	-	-	-
Sulphur	-	-	-	-	-	-	-	-	-	-	-	-
Tellurium	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	-	-	-	-
Thallium	-	-	-	-	-	-	-	-	<1	<1	<1	1
Tin	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	**10.8**	<5	<5	<5	5
Titanium	74	76	73	50	48	59	60	33	-	-	-	-
Uranium	0.43	0.68	0.72	0.64	0.62	0.73	0.85	1.2	<2	<2	<2	23[b]
Vanadium	31	37	18	38	38	27	30	31	42	41	40	130
Zinc	159	**291**	172	95	74	94	78	89.7	120	130	**300**	200
Zirconium	-	-	-	-	-	-	-	1.9	-	-	-	-

a - CCME (2006) Environmental Quality Guidelines, agricultural land us
b - draft guideline
c - identified as SS1 on laboratory certificat
d - identified as SS2 on laboratory certificat
2004 samples collected by Jacques Whitford; 2006 samples collected by Meridia

TABLE 8 (Page 5 of 5)
RESULTS OF SOIL ANALYSES - METALS
(mg/kg unless noted otherwise)

Sample ID	Waste Midden 2										
	MW12	SS06-2[d]	SS06-2[d]	TH06-4	TH06-5	TH06-1	TH06-11	TH06-6	TH06-10	TH06-5	GUIDELINES[a]
Depth (m)	2.5-3	0-0.3	duplicate	0-0.3	0.9-1.2	0.9-1.2	0-0.3	0-0.6	0-0.6	0-0.6	
Sample Date	2006-10-11	2006-10-11	2006-10-11	2006-11-03	2006-11-03	2006-11-03	2006-11-03	2006-11-03	2006-11-03	2006-11-03	
Aluminum	-	-	-	-		-	-	-	-		-
Antimony	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	20
Arsenic	**16.2**	8.5	8.7	7.5	6.6	6.8	7.3	**13.6**	7.4	7.2	12
Barium	355	460	466	359	313	400	324	384	342	321	750
Berylium	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	4
Bismuth	-	-	-	-		-	-	-	-		-
Boron	-	-	-	-		-	-	-	-		-
Cadmium	0.6	1.1	0.7	0.5	0.6	0.5	0.8	<0.5	1.4	0.6	1.4
Calcium	-	-	-	-		-	-	-	-		-
Chromium (total)	18.6	21.6	24.3	17.3	20.2	18.1	21.3	23.8	23.8	20.4	64
Cobalt	9	10	10	8	9	9	9	9	9	9	40
Copper	26	28	32	22	26	22	29	37	51	24	63
Iron	-	-	-	-		-	-	-	-		-
Lead	15	37	19	13	12	12	13	23	50	13	70
Lithium	-	-	-	-		-	-	-	-		-
Magnesium	-	-	-	-		-	-	-	-		-
Manganese	-	-	-	-		-	-	-	-		-
Mercury	0.07	<0.05	0.09	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.05	6.6
Molydbenum	**6**	<1	<1	<1	1	<1	<1	<1	1	<1	5
Nickel	35	30	34	25	30	27	30	30	30	29	50
Phosphorus	-	-	-	-		-	-	-	-		-
Potassium	-	-	-	-		-	-	-	-		-
Selenium	**2**	0.7	0.3	0.6	0.8	0.5	0.9	0.5	0.4	**1.1**	1
Silver	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	20
Sodium	-	-	-	-		-	-	-	-		-
Strontium	-	-	-	-		-	-	-	-		-
Sulphur	-	-	-	500	500	-	-	1000	-	700	-
Tellurium	-	-	-	-		-	-	-	-		-
Thallium	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1
Tin	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	5
Titanium	-	-	-	-		-	-	-	-		-
Uranium	2	2	<2	<2	<2	<2	<2	<2	<2	<2	23[b]
Vanadium	37	37	39	28	36	31	38	27	39	37	130
Zinc	130	**270**	**220**	90	110	80	120	160	**400**	140	200
Zirconium	-	-	-	-		-	-	-	-		-

a - CCME (2006) Environmental Quality Guidelines, agricultural land us
b - draft guideline
c - identified as SS1 on laboratory certificat
d - identified as SS2 on laboratory certificat
2004 samples collected by Jacques Whitford; 2006 samples collected by Meridia

TABLE 9
RESULTS OF SOIL ANALYSES - GLYCOLS
(mg/kg unless noted otherwise)

Sample ID	Waste Midden 1					Waste Midden 2					GUIDELINES	
	SS1	TP2-2	TP4-1	TP6-1	MW8	TP11-1	TP12-4	TP14-3	TP16-1	MW11		
Depth (m)	Surface	1.0	0.3	0.4	4-4.5	0.8	1.8	1.8	0.2	1.5-2	CCME[a]	AENVb
Sample Date	2004-06-10	2004-06-10	2004-06-10	2004-06-10	2006-10-11	2004-05-10	2004-05-10	2004-05-10	2004-05-10	2006-10-11		
Propylene Glycol	<10	<10	<10	<10	<50	<10	<10	<10	<10	<50	-	-
Ethylene Glycol	<10	<10	<10	<10	<50	<10	<10	<10	<10	<50	960	15
Diethylene Glycol	<10	<10	<10	<10	<50	<10	<10	<10	<10	<50	-	-
Triethylene Glycol					<50					<50		
Total Glycol	<10	<10	<10	<10		<10	<10	<10	<10		-	-

a - CCME (2006) Environmental Quality Guidelines - agricultural land use, fine soils
b - AENV (2006) Draft Alberta Tier 1 Guidelines for Soil and Groundwater - agricultural, fine soils (draft for public review; provided for reference only)
2004 samples collected by Jacques Whitford; 2006 samples collected by Meridian

TABLE 10
RESULTS OF SOIL ANALYSES - PHENOLS
(mg/kg unless noted otherwise)

Sample ID	Waste Midden 1				Waste Midden 2				GUIDELINES
	SS1	TP2-2	TP4-1	TP6-1	TP11-1	TP12-4	TP14-3	TP16-1	
Depth (m)	Surface	1.0	0.3	0.4	0.8	1.8	1.8	0.2	
Sample Date	2004-06-10	2004-06-10	2004-06-10	2004-06-10	2004-05-10	2004-05-10	2004-05-10	2004-05-10	CCME[a]
2,3,4- Trichlorophenol	na	na	na	na	na	na	<0.1	na	0.05[b]
2,3,5,6- Tetrachlorophenol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	0.05[b]
2,3,5- Trichlorophenol	na	na	na	na	na	na	<0.1	na	0.05[b]
2,3,6- Trichlorophenol	na	na	na	na	na	na	<0.1	na	0.05[b]
2,3- Dichlorophenol	na	na	na	na	na	na	<0.1	na	0.05[b]
2,4,5- Trichlorphenol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	0.05[b]
2,4,6- Trichlorphenol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	0.05[b]
2,4- dichlorophenol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	0.05[b]
2,4- Dimethylphenol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	0.1[b]
2,4- Dinitrophenol	<1.0	<0.2	<1.0	<1.0	<0.2	<0.2	<0.2	<0.2	0.1[b]
2,5-Dichlorophenol	na	na	na	na	na	na	<0.1	na	0.05[b]
2,6- Dichlorophenol	na	na	na	na	na	na	<0.1	na	0.05[b]
2- Chlorophenol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	0.05[b]
2-Methyl-4,6-Dinitrophenol	<2.5	<0.5	<2.5	<2.5	<0.5	<0.5	<0.5	<0.5	0.1[b]
2-Nitrophenol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	0.1[b]
3,4,5-Trichlorophenol	na	na	na	na	na	na	<0.1	na	0.05[b]
3,4-dichlorophenol	na	na	na	na	na	na	<0.1	na	0.05[b]
3,5-dichlorophenol	na	na	na	na	na	na	<0.1	na	0.05[b]
4-Chloro-3-Methylphenol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	0.05[b]
4-Nitrophenol	<2.5	<0.5	<2.5	<2.5	<0.5	<0.5	<0.5	<0.5	0.1[b]
m-Cresol & p-Cresol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	0.1[b]
o-Cresol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	0.1[b]
Pentachlorophenol	<2.0	<0.4	<0.2	<0.2	<0.4	<0.4	<0.2	<0.4	7.6
Phenol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	na	<0.1	3.8
Tetrachlorophenol	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	0.05[b]

a - CCME (2006) Environmental Quality Guidelines - agricultural land use, fine soils
b - 1991 guideline, not derived using current risk-based methods
2004 samples collected by Jacques Whitford; 2006 samples collected by Meridian

TABLE 11 (Page 1 of 2)
RESULTS OF SOIL ANALYSES - ORGANOCHLORINE PESTICIDES
(mg/kg unless noted otherwise)

	Waste Midden 1						GUIDELINES	
Sample ID	**SS1-JWL**	**TP2-2**	**TP4-1**	**TP6-1**	**MW8**	**SS06-1[d]**		
Depth (m)	**Surface**	**1.0**	**0.3**	**0.4**	**2-2.5**	**Surface**		
Sample Date	**2004-06-10**	**2004-06-10**	**2004-06-10**	**2004-06-10**	**2006-10-11**	**2006-10-11**	**CCME[a]**	**AENV[b]**
2,4'-DDT	0.013	<0.004	<0.004	<0.004			0.7[c]	0.015[c]
4,4'-DDD	<0.004	<0.004	<0.004	<0.004	<0.005	<0.005	0.7[c]	0.015[c]
4,4'-DDE	**0.021**	<0.002	0.004	0.010	<0.005	<0.005	0.7[c]	0.015[c]
4,4'-DDT	**0.067**	<0.004	0.008	**0.021**	<0.005	<0.005	0.7[c]	0.015[c]
Aldrin	<0.002	<0.002	<0.002	<0.002	<0.005	<0.005	-	1.4
Alpha-BHC	<0.002	<0.002	<0.002	<0.002	<0.005	<0.005	-	-
Beta-BHC	<0.002	<0.002	<0.002	<0.002	<0.005	<0.005	-	-
Chlordane, cis- (alpha)	<0.002	0.0010	<0.002	<0.002	<0.005	<0.005	-	-
Chlordane, trans- (gamma)	<0.002	0.133	<0.002	<0.002	<0.005	<0.005	-	-
Delta-BHC	<0.002	<0.002	<0.002	<0.002			-	-
Dieldrin	<0.002	<0.002	<0.002	<0.002	<0.005	<0.005	-	0.14
Endosulfan I	<0.004	<0.004	<0.004	<0.004	<0.005	<0.005	-	0.0085
Endosulfan II	<0.004	<0.004	<0.004	<0.004	<0.005	<0.005	-	-
Endosulfan Sulphate	<0.004	<0.004	<0.004	<0.004			-	-
Endrin	<0.004	<0.004	<0.004	<0.004	<0.005	<0.005	-	0.59
Endrin Aldehyde	<0.010	<0.010	<0.010	<0.010			-	-
Endrin Ketone	<0.004	<0.004	<0.004	<0.004			-	-
Heptachlor	<0.002	<0.002	<0.002	<0.002	<0.005	<0.005		-
Heptachlor Epoxide	<0.002	<0.002	<0.002	<0.002			-	0.0096
Lindane (Gamma-BHC)	<0.002	<0.002	<0.002	<0.002	<0.005	<0.005	0.01	0.00027
Methoxychlor	<0.040	<0.040	<0.040	<0.040	<0.005	<0.005	-	1400
Mirex	<0.004	<0.004	<0.004	<0.004	<0.005	<0.005	-	-
Nonachlor					<0.005	<0.005	-	-
Oxychlordane					<0.005	<0.005	-	-
Quintozine (PCNB)					<0.005	0.11	-	-
Total PCBs	<0.05	<0.05	<0.05	<0.05			0.5	0.0044
Toxaphene	<0.3	<0.3	<0.3	<0.3			-	0.79

a - CCME (2006) Environmental Quality Guidelines - agricultural land use, fine soils
b - AENV (2006) Draft Alberta Tier 1 Guidelines for Soil and Groundwater - agricultural, fine soils (draft for public review; provided for reference only)
c - guideline for total DDT and metabolites'
d - identified as SS1 on laboratory certificate
e - identified as SS2 on laboratory certificate
2004 samples collected by Jacques Whitford; 2006 samples collected by Meridian

TABLE 11 (Page 2 of 2)
RESULTS OF SOIL ANALYSES - ORGANOCHLORINE PESTICIDES
(mg/kg unless noted otherwise)

	Waste Midden 2					GUIDELINES	
Sample ID	**TP11-1**	**TP12-4**	**TP14-3**	**TP16-1**	**SS06-2[e]**		
Depth (m)	**0.8**	**1.8**	**1.8**	**0.2**	**Surface**	**CCME[a]**	**AENV[b]**
Sample Date	**2004-05-10**	**2004-05-10**	**2004-05-10**	**2004-05-10**	**2006-10-11**		
2,4'-DDT	<0.004	<0.004	<0.004	<0.004		0.7[c]	0.015[c]
4,4'-DDD	<0.004	<0.004	<0.004	<0.004	<0.005	0.7[c]	0.015[c]
4,4'-DDE	<0.002	<0.002	<0.002	<0.002	<0.005	0.7[c]	0.015[c]
4,4'-DDT	<0.004	<0.004	<0.004	<0.004	<0.005	0.7[c]	0.015[c]
Aldrin	<0.002	<0.002	<0.002	<0.002	<0.005	-	1.4
Alpha-BHC	<0.002	<0.002	<0.002	<0.002	<0.005	-	-
Beta-BHC	<0.002	<0.002	<0.002	<0.002	<0.005	-	-
Chlordane, cis- (alpha)	<0.002	<0.002	<0.002	<0.002	<0.005	-	-
Chlordane, trans- (gamma)	<0.002	<0.002	<0.002	<0.002	<0.005	-	-
Delta-BHC	<0.002	<0.002	<0.002	<0.002		-	-
Dieldrin	<0.002	<0.002	<0.002	<0.002	<0.005	-	0.14
Endosulfan I	<0.004	<0.004	<0.004	<0.004	<0.005	-	0.0085
Endosulfan II	<0.004	<0.004	<0.004	<0.004	<0.005	-	-
Endosulfan Sulphate	<0.004	<0.004	<0.004	<0.004		-	-
Endrin	<0.004	<0.004	<0.004	<0.004	<0.005	-	0.59
Endrin Aldehyde	<0.010	<0.010	<0.010	<0.010		-	-
Endrin Ketone	<0.004	<0.004	<0.004	<0.004		-	-
Heptachlor	<0.002	<0.002	<0.002	<0.002	<0.005		-
Heptachlor Epoxide	<0.002	<0.002	<0.002	<0.002		-	0.0096
Lindane (Gamma-BHC)	<0.002	<0.002	<0.002	<0.002	<0.005	0.01	0.00027
Methoxychlor	<0.040	<0.040	<0.040	<0.040	<0.005	-	1400
Mirex	<0.004	<0.004	<0.004	<0.004	<0.005	-	-
Nonachlor					<0.005	-	-
Oxychlordane					<0.005	-	-
Quintozine (PCNB)					<0.005	-	-
Total PCBs	<0.05	<0.05	<0.05	<0.05		0.5	0.0044
Toxaphene	<0.3	<0.3	<0.3	<0.3		-	0.79

a - CCME (2006) Environmental Quality Guidelines - agricultural land use, fine soils
b - AENV (2006) Draft Alberta Tier 1 Guidelines for Soil and Groundwater - agricultural, fine soils (draft for public review; provided for reference only)
c - guideline for total DDT and metabolites'
d - identified as SS1 on laboratory certificate
e - identified as SS2 on laboratory certificate
2004 samples collected by Jacques Whitford; 2006 samples collected by Meridian

TABLE 12
RESULTS OF SOIL ANALYSES - ORGANOPHOSPHORUS PESTICIDES
mg/kg unless noted otherwise

	Waste Midden 1				Waste Midden 2				GUIDELINES	
Sample ID	**SS1**	**TP2-2**	**TP4-1**	**TP6-1**	**TP11-1**	**TP12-4**	**TP14-3**	**TP16-1**		
Depth (m)	**Surface**	**1.0**	**0.3**	**0.4**	**0.8**	**1.8**	**1.8**	**0.2**	**CCME[a]**	**AENV[b]**
Sample Date	**2004-06-10**	**2004-06-10**	**2004-06-10**	**2004-06-10**	**2004-05-10**	**2004-05-10**	**2004-05-10**	**2004-05-10**		
Azinphosmethyl	<1.25	<1.25	<1.25	<1.25	<1.25	<1.25	<1.25	<1.25	-	0.098
Chlorpyriphos	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-	0.00046
Demeton	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-	-
Diazinon	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-	0.53
Dichlorvos	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-	-
Dimethoate	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-	0.0028
Ethion	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-	-
Ethyl Parathion	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-	-
Fenchchlorphos	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-	-
Fenthion	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-	-
Fonofos	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-	-
Malathion	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-	0.2
Methyl Parathion	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-	-
Metolachlor	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	-	0.048
Mevinphos	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-	-
Phosmet	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-	-
Terbufos	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-	0.019
Thimet	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-	-

a - CCME (2006) Environmental Quality Guidelines - agricultural land use, fine soils
b - AENV (2006) Draft Alberta Tier 1 Guidelines for Soil and Groundwater - agricultural, fine soils (draft for public review; provided for reference only)
2004 samples collected by Jacques Whitford; 2006 samples collected by Meridian

TABLE 13
RESULTS OF SOIL ANALYSES - HERBICIDES
(mg/kg unless noted otherwise)

Sample ID	Waste Midden 1				Waste Midden 2				GUIDELINES	
	SS1-JWL	TP2-2	TP4-1	TP6-1	TP11-1	TP12-4	TP14-3	TP16-1		
Depth (m)	Surface	1.0	0.3	0.4	0.8	1.8	1.8	0.2		
Sample Date	2004-06-10	2004-06-10	2004-06-10	2004-06-10	2004-05-10	2004-05-10	2004-05-10	2004-05-10	CCME[a]	AENV[b]
2,4-Dichlorophenoxyacetic acid (2,4-D)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	0.0041
2,4,5-TO (Silvex)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	-
2,4,5-Trichlorophenoxyacetic acid	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	-
Dicamba	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	0.0000061
Mecoprop or 2-(2-methyl-4-chlorophenoxy) proprionic	<50	<50	<50	<50	<50	<50	<50	<50	-	-
2-Methyl-4-chlorophenoxy acetic acid (MCPA)	<50	<50	<50	<50	<50	<50	<50	<50	-	0.000026
Dichlorprop	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	-
Dinoseb	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	0.0034
2,4-dichlorophenoxybutyric acid	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	-

a - CCME (2006) Environmental Quality Guidelines - agricultural land use, fine soils
b - AENV (2006) Draft Alberta Tier 1 Guidelines for Soil and Groundwater - agricultural, fine soils (draft for public review; provided for reference only)
2004 samples collected by Jacques Whitford; 2006 samples collected by Meridian

APPENDIX E

Laboratory Quality Assurance/Quality Control

GOLDER DATA QUALITY REVIEW CHECKLIST

Site Location: Bar U

Sampling Date: November 20, 2015

Golder Project Number: 1526784

Laboratory: Maxxam

Lab Submission Number: B5A3973

Was the Cooler Received at the lab under a sealed and intact custody seal?	Yes
Was proper chain of custody of the samples documented and kept?	Yes
Were sample temperatures acceptable when they reached lab?:	Yes
Were all samples analyzed and extracted within hold times?:	Yes
Has lab warranted all tests were in statistical control in CoA?:	Yes
Was sufficient sample provided for the requested analysis?	Yes
Has lab warranted all samples were analyzed with limited headspace present?:	Yes

Are All Laboratory QC Within Acceptance Criteria (Yes, No, Not Applicable)?

	Yes	No	NA	Comments
Surrogate Recovery	X			All laboratory QC results are within
Method Blank Concentration	X			acceptance criteria, please see QA/QC
Laboratory Duplicate RPD	X			appendix.
Matrix Spike Recovery	X			
Blank Spike Recovery	X			

Are All Field QC Samples Within Alert Limits (Yes, No, Not Applicable)?

	Yes	No	NA	Comments
Field Blank Concentration			X	No field QC samples were collected.
Trip Blank Concentration			X	
Field Duplicate RPD			X	

Is data considered reliable (Yes/No/Suspect)?: Yes

If answer is "No" or "Suspect", describe and provide rationale:

Data Reviewed by (Print): Anita Colbert

Data Reviewed by (Signature): Anita Colbert

Date: December 1, 2015

Summary of Quality Control Sample Results

Laboratory Submission Number	Sample Matrix	Laboratory Sample ID Affected	Test Affected	Data Quality Issue	Comments
B5A3973	**Soil**	**NR5277**	**Total Uranium**	Matrix spike sample recovery outside acceptance range of 75-125% for total uranium for batch 8123301.	For multi-parameter tests, 10% of parameters can fall outside of the acceptance range. Under these circumstances, the total uranium data reported can be considered reliable.
B5A3973	**Soil**	**NR5277**	**Leachable Boron and Leachable Uranium**	Matrix spike sample recovery outside acceptance range of 75-125% for leachable boron and leachable uranium for batch 8123669.	For multi-parameter tests, 10% of parameters can fall outside of the acceptance range. Under these circumstances, the leachable boron and leachable uranium data reported can be considered reliable.

GOLDER DATA QUALITY REVIEW CHECKLIST

Site Location: Bar U

Sampling Date: November 27, 2015

Golder Project Number: 1526784

Laboratory: Maxxam Calgary

Lab Submission Number: B5A6102

Was the Cooler Received at the lab under a sealed and intact custody seal?	Yes
Was proper chain of custody of the samples documented and kept?	Yes
Were sample temperatures acceptable when they reached lab?:	Yes
Were all samples analyzed and extracted within hold times?:	Yes
Has lab warranted all tests were in statistical control in CoA?:	Yes
Was sufficient sample provided for the requested analysis?	Yes
Has lab warranted all samples were analyzed with limited headspace present?:	Yes

Are All Laboratory QC Within Acceptance Criteria (Yes, No, Not Applicable)?

	Yes	No	NA	Comments
Surrogate Recovery	X			All laboratory QC results are within
Method Blank Concentration		X		acceptance criteria, please see QA/QC
Laboratory Duplicate RPD	X			appendix.
Matrix Spike Recovery		X		
Blank Spike Recovery	X			

Are All Field QC Samples Within Alert Limits (Yes, No, Not Applicable)?

	Yes	No	NA	Comments
Field Blank Concentration			X	No field QC samples were collected.
Trip Blank Concentration			X	
Field Duplicate RPD			X	

Is data considered reliable (Yes/No/Suspect)?: Yes

If answer is "No" or "Suspect", describe and provide rationale:

Data Reviewed by (Print): Jenny Musijowski

Data Reviewed by (Signature): 

Date: January 25, 2016

Summary of Quality Control Sample Results

Laboratory Submission Number	Sample Matrix	Laboratory Sample ID Affected	Test Affected	Data Quality Issue	Comments
B5A6102	**Water**	**Matrix Spike**	**D12-BENZO(A)PYRENE and TERPHENYL-D14**	Matrix Spike sample recovery outside acceptance range of 50-130% for D12-BENZO(A)PYRENE and TERPHENYL-D14 for batch 8128964.	The sample in question was from another sample from the worksheet and not a sample associated with this job. The sample failure is only associated with the sample which was spiked and therefore has no material effect on these results. All remaining laboratory QC are within acceptance criteria and the data is considered to be reliable.
B5A6102	**Water**	**Method Blank**	**TERPHENYL-D14**	Method blank sample recovery outside acceptance range of 50-130% for TERPHENYL-D14 for batch 8128964.	The sample in question was from another sample from the worksheet and not a sample associated with this job. The sample failure is only associated with the sample which was spiked and therefore has no material effect on these results. All remaining laboratory QC are within acceptance criteria and the data is considered to be reliable.
B5A6102	**Water**	**NS8665, NS8666 and NS8667**	**TERPHENYL-D14**	TERPHENYL-D14 surrogate recovery percentage outside acceptance range of 50 - 130% for batch 8128964.	1 of 3 surrogates can fall outside of the acceptance range. Under these circumstances, the TERPHENYL-D14 (sur.) data reported can be considered reliable.

GOLDER DATA QUALITY REVIEW CHECKLIST

Site Location: Bar U Ranch, AB

Sampling Date: July 9 and 10, 2015

Golder Project Number: 15-26784

Laboratory: Maxxam - Edmonton

Lab Submission Number: B558674 (B5D7961-SC)

Was the Cooler Received at the lab under a sealed and intact custody seal?	Yes
Was proper chain of custody of the samples documented and kept?	Yes
Were sample temperatures acceptable when they reached lab?:	Yes
Were all samples analyzed and extracted within hold times?:	Yes
Has lab warranted all tests were in statistical control in CoA?:	Yes
Was sufficient sample provided for the requested analysis?	Yes
Has lab warranted all samples were analyzed with limited headspace present?:	Yes

Are All Laboratory QC Within Acceptance Criteria (Yes, No, Not Applicable)?

	Yes	No	NA	Comments
Surrogate Recovery	X			Matrix spike sample recovery below acceptance
Method Blank Concentration	X			criteria for dissolved barium. All remaining
Laboratory Duplicate RPD	X			laboratory QC results are within
Matrix Spike Recovery		X		acceptance criteria, please see QA/QC
Blank Spike Recovery	X			appendix.

Are All Field QC Samples Within Alert Limits (Yes, No, Not Applicable)?

	Yes	No	NA	Comments
Field Blank Concentration	X			All field QC samples are within
Trip Blank Concentration	X			alert limits.
Field Duplicate RPD	X			

Is data considered reliable (Yes/No/Suspect)?: Yes

If answer is "No" or "Suspect", describe and provide rationale:

Data Reviewed by (Print): Lori Lemke

Data Reviewed by (Signature): Lori Lemke

Date: August 5, 2015

Relative Percent Difference Calculations - Water

Sample Location Sample Collection Date Laboratory Sample ID	Units	Alert Limit	RDL	5X RDL	Are the results >5X RDL	MW1 July 9, 2015 MQ2964	DUP15-01 July 9, 2015 MQ2961	RPD
Hydrocarbons								
Benzene	mg/L	>30%	0.40	2	no	<0.40	<0.40	n/c
Toluene	mg/L	>30%	0.40	2	no	<0.40	<0.40	n/c
Ethylbenzene	mg/L	>30%	0.40	2	no	<0.40	<0.40	n/c
m & p-Xylene	mg/L	>30%	0.80	4	no	<0.80	<0.80	n/c
o-Xylene	mg/L	>30%	0.40	2	no	<0.40	<0.40	n/c
Xylenes (Total)	mg/L	>30%	0.80	4	no	<0.80	<0.80	n/c
F1 (C_6-C_{10}) - BTEX	mg/L	>30%	100	500	no	<100	<100	n/c
(C6-C10)	mg/L	>30%	100	500	no	<100	<100	n/c
F2 (C_{10}-C_{16})	mg/L	>30%	0.10	0.5	no	<0.10	<0.10	n/c
Metals								
Dissolved Aluminum (Al)	mg/L	>25%	0.0030	0.015	no	0.0065	0.0057	n/c
Total Aluminum (Al)	mg/L	>25%	0.0030	0.015	yes	20	20	0
Dissolved Antimony (Sb)	mg/L	>25%	0.00060	0.003	no	<0.00060	<0.00060	n/c
Total Antimony (Sb)	mg/L	>25%	0.00060	0.003	yes	0.0034	0.0041	19
Dissolved Arsenic (As)	mg/L	>25%	0.00020	0.001	no	0.0007	0.00063	n/c
Total Arsenic (As)	mg/L	>25%	0.00020	0.001	yes	0.033	0.032	3
Dissolved Barium (Ba)	mg/L	>25%	0.010	0.05	no	0.015	0.015	n/c
Total Barium (Ba)	mg/L	>25%	0.010	0.05	yes	1.5	1.4	7
Dissolved Beryllium (Be)	mg/L	>25%	0.0010	0.005	no	<0.0010	<0.0010	n/c
Total Beryllium (Be)	mg/L	>25%	0.0010	0.005	no	0.0017	0.002	n/c
Dissolved Boron (B)	mg/L	>25%	0.020	0.1	no	0.10	0.097	n/c
Total Boron (B)	mg/L	>25%	0.020	0.1	yes	0.12	0.12	0
Dissolved Cadmium (Cd)	mg/L	>25%	0.020	0.1	no	0.054	0.038	n/c
Total Cadmium (Cd)	mg/L	>25%	0.020	0.1	yes	4.8	4.7	2
Dissolved Calcium (Ca)	mg/L	>25%	0.30	1.5	yes	390	390	0
Total Calcium (Ca)	mg/L	>25%	1.5	7.5	yes	540	610	12
Dissolved Chromium (Cr)	mg/L	>25%	0.0010	0.005	no	<0.0010	<0.0010	n/c
Total Chromium (Cr)	mg/L	>25%	0.0010	0.005	yes	0.048	0.047	2
Dissolved Cobalt (Co)	mg/L	>25%	0.00030	0.0015	yes	0.0033	0.0032	3
Total Cobalt (Co)	mg/L	>25%	0.00030	0.0015	yes	0.035	0.033	6
Dissolved Copper (Cu)	mg/L	>25%	0.00020	0.001	yes	0.0012	0.0012	0
Total Copper (Cu)	mg/L	>25%	0.00020	0.001	yes	0.077	0.074	4
Dissolved Iron (Fe)	mg/L	>25%	0.060	0.3	yes	0.57	0.56	2
Total Iron (Fe)	mg/L	>25%	0.060	0.3	yes	64	60	6
Dissolved Lead (Pb)	mg/L	>25%	0.00020	0.001	no	0.00044	0.00049	n/c
Total Lead (Pb)	mg/L	>25%	0.00020	0.001	yes	0.052	0.053	2
Dissolved Lithium (Li)	mg/L	>25%	0.020	0.1	no	0.067	0.063	n/c
Total Lithium (Li)	mg/L	>25%	0.020	0.1	no	0.094	0.093	n/c
Dissolved Magnesium (Mg)	mg/L	>25%	0.20	1	yes	260	270	4
Total Magnesium (Mg)	mg/L	>25%	0.20	1	yes	300	300	0
Dissolved Manganese (Mn)	mg/L	>25%	0.0040	0.02	yes	1.9	1.9	0
Total Manganese (Mn)	mg/L	>25%	0.0040	0.02	yes	4.2	4.0	5
Dissolved Molybdenum (Mo)	mg/L	>25%	0.00020	0.001	yes	0.0012	0.0011	9
Total Molybdenum (Mo)	mg/L	>25%	0.00020	0.001	yes	0.0058	0.0061	5
Dissolved Nickel (Ni)	mg/L	>25%	0.00050	0.0025	yes	0.011	0.010	10
Total Nickel (Ni)	mg/L	>25%	0.00050	0.0025	yes	0.094	0.090	4
Dissolved Phosphorus (P)	mg/L	>25%	0.10	0.5	no	<0.10	<0.10	n/c
Total Phosphorus (P)	mg/L	>25%	0.10	0.5	yes	2.5	2.5	0
Dissolved Potassium (K)	mg/L	>25%	0.30	1.5	yes	6.5	6.5	0
Total Potassium (K)	mg/L	>25%	0.30	1.5	yes	12	11	9
Dissolved Selenium (Se)	mg/L	>25%	0.00020	0.001	no	<0.00020	<0.00020	n/c
Total Selenium (Se)	mg/L	>25%	0.00020	0.001	yes	0.0020	0.0020	0
Dissolved Silicon (Si)	mg/L	>25%	0.10	0.5	yes	4.7	4.7	0
Total Silicon (Si)	mg/L	>25%	0.10	0.5	yes	36	36	0
Dissolved Silver (Ag)	mg/L	>25%	0.00010	0.0005	no	<0.00010	<0.00010	n/c
Total Silver (Ag)	mg/L	>25%	0.00010	0.0005	no	0.00038	0.00030	n/c
Dissolved Sodium (Na)	mg/L	>25%	0.50	2.5	yes	380	380	0
Total Sodium (Na)	mg/L	>25%	0.50	2.5	yes	380	370	3
Dissolved Strontium (Sr)	mg/L	>25%	0.020	0.1	yes	4.7	4.6	2
Total Strontium (Sr)	mg/L	>25%	0.020	0.1	yes	4.9	4.8	2
Dissolved Sulphur (S)	mg/L	>25%	1.0	5	yes	840	910	8
Total Sulphur (S)	mg/L	>25%	1.0	5	yes	710	820	14
Dissolved Thallium (Tl)	mg/L	>25%	0.00020	0.001	no	<0.00020	<0.00020	n/c
Total Thallium (Tl)	mg/L	>25%	0.00020	0.001	yes	0.0015	0.0015	0
Dissolved Tin (Sn)	mg/L	>25%	0.0010	0.005	no	<0.0010	<0.0010	n/c
Total Tin (Sn)	mg/L	>25%	0.0010	0.005	yes	0.0091	0.0091	0
Dissolved Titanium (Ti)	mg/L	>25%	0.0010	0.005	no	<0.0010	<0.0010	n/c
Total Titanium (Ti)	mg/L	>25%	0.0010	0.005	yes	0.86	0.89	3
Dissolved Uranium (U)	mg/L	>25%	0.00010	0.0005	yes	0.019	0.019	0
Total Uranium (U)	mg/L	>25%	0.00010	0.0005	yes	0.024	0.024	0
Dissolved Vanadium (V)	mg/L	>25%	0.0010	0.005	no	<0.0010	<0.0010	n/c
Total Vanadium (V)	mg/L	>25%	0.0010	0.005	yes	0.081	0.077	5
Dissolved Zinc (Zn)	mg/L	>25%	0.0030	0.015	no	0.0088	0.0092	n/c
Total Zinc (Zn)	mg/L	>25%	0.0030	0.015	yes	0.53	0.51	4

Relative Percent Difference Calculations - Water

Sample Location Sample Collection Date Laboratory Sample ID	Units	Alert Limit	RDL	5X RDL	Are the results >5X RDL	MW1 July 9, 2015 MQ2964	DUP15-01 July 9, 2015 MQ2961	RPD
Volatile Organics								
Total Trihalomethanes	ug/L	>30%	2.0	10	no	<2.0	<2.0	n/c
Bromodichloromethane	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
Bromoform	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
Bromomethane	ug/L	>30%	2.0	10	no	<2.0	<2.0	n/c
Carbon Tetrachloride	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
Chlorobenzene	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
Chlorodibromomethane	ug/L	>30%	1.0	5	no	<1.0	<1.0	n/c
Chloroethane	ug/L	>30%	1.0	5	no	<1.0	<1.0	n/c
Chloroform	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
Chloromethane	ug/L	>30%	2.0	10	no	<2.0	<2.0	n/c
1,2-dibromoethane	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
1,2-dichlorobenzene	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
1,3-dichlorobenzene	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
1,4-dichlorobenzene	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
1,1-dichloroethane	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
1,2-dichloroethane	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
1,1-dichloroethene	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
cis-1,2-dichloroethene	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
trans-1,2-dichloroethene	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
Dichloromethane	ug/L	>30%	2.0	10	no	<2.0	<2.0	n/c
1,2-dichloropropane	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
cis-1,3-dichloropropene	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
trans-1,3-dichloropropene	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
Methyl methacrylate	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
Methyl-tert-butylether (MTBE)	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
Styrene	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
1,1,1,2-tetrachloroethane	ug/L	>30%	2.0	10	no	<2.0	<2.0	n/c
1,1,2,2-tetrachloroethane	ug/L	>30%	2.0	10	no	<2.0	<2.0	n/c
Tetrachloroethene	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
1,2,3-trichlorobenzene	ug/L	>30%	1.0	5	no	<1.0	<1.0	n/c
1,2,4-trichlorobenzene	ug/L	>30%	1.0	5	no	<1.0	<1.0	n/c
1,3,5-trichlorobenzene	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
1,1,1-trichloroethane	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
1,1,2-trichloroethane	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
Trichloroethene	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
Trichlorofluoromethane	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
1,2,4-trimethylbenzene	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
1,3,5-trimethylbenzene	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
Vinyl chloride	ug/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
Polycyclic Aromatics								
Acenaphthene	mg/L	>30%	0.10	0.5	no	<0.10	<0.10	n/c
Acenaphthylene	mg/L	>30%	0.10	0.5	no	<0.10	<0.10	n/c
Acridine	mg/L	>30%	0.20	1	no	<0.20	<0.20	n/c
Anthracene	mg/L	>30%	0.010	0.05	no	<0.010	<0.010	n/c
Benzo(a)anthracene	mg/L	>30%	0.0085	0.0425	no	<0.0085	<0.0085	n/c
Benzo(b&j)fluoranthene	mg/L	>30%	0.0085	0.0425	no	<0.0085	<0.0085	n/c
Benzo(k)fluoranthene	mg/L	>30%	0.0085	0.0425	no	<0.0085	<0.0085	n/c
Benzo(g,h,i)perylene	mg/L	>30%	0.0085	0.0425	no	<0.0085	<0.0085	n/c
Benzo(c)phenanthrene	mg/L	>30%	0.050	0.25	no	<0.050	<0.050	n/c
Benzo(a)pyrene	mg/L	>30%	0.0075	0.0375	no	<0.0075	<0.0075	n/c
Benzo[e]pyrene	mg/L	>30%	0.050	0.25	no	<0.050	<0.050	n/c
Chrysene	mg/L	>30%	0.0085	0.0425	no	<0.0085	<0.0085	n/c
Dibenz(a,h)anthracene	mg/L	>30%	0.0075	0.0375	no	<0.0075	<0.0075	n/c
Fluoranthene	mg/L	>30%	0.010	0.05	no	<0.010	<0.010	n/c
Fluorene	mg/L	>30%	0.050	0.25	no	<0.050	<0.050	n/c
Indeno(1,2,3-cd)pyrene	mg/L	>30%	0.0085	0.0425	no	<0.0085	<0.0085	n/c
2-Methylnaphthalene	mg/L	>30%	0.10	0.5	no	<0.10	<0.10	n/c
Naphthalene	mg/L	>30%	0.10	0.5	no	<0.10	<0.10	n/c
Phenanthrene	mg/L	>30%	0.050	0.25	no	<0.050	<0.050	n/c
Perylene	mg/L	>30%	0.050	0.25	no	<0.050	<0.050	n/c
Pyrene	mg/L	>30%	0.020	0.1	no	<0.020	<0.020	n/c
Quinoline	mg/L	>30%	0.20	1	no	<0.20	<0.20	n/c
Calculated Parameters								
Anion Sum	meq/L	>30%	N/A	0	yes	68	68	0
Cation Sum	meq/L	>30%	N/A	0	yes	58	58	0
hardness (CaCO3)	mg/L	>30%	0.50	2.5	yes	2100	2100	0
Ion Balance	N/A	>30%	0.010	0.05	yes	0.86	0.85	1
Dissloved Nitrate (NO3)	mg/L	>30%	0.044	0.22	no	0.23	0.21	n/c
Nitrate plus Nitrite (N)	mg/L	>30%	0.020	0.1	no	0.051	0.047	n/c
Dissolved Nitrite (NO2)	mg/L	>30%	0.033	0.165	no	<0.033	<0.033	n/c
Total Dissolved Solids	mg/L	>30%	10	50	yes	4100	4100	0
Micsellaneous Organics								
Conductivity	uS/cm	>30%	1.0	5	yes	4500	4500	0
pH	pH	>30%	N/A	0	yes	7.74	7.74	0

Relative Percent Difference Calculations - Water

Sample Location Sample Collection Date Laboratory Sample ID	Units	Alert Limit	RDL	5X RDL	Are the results >5X RDL	MW1 July 9, 2015 MQ2964	DUP15-01 July 9, 2015 MQ2961	RPD
Anions								
Alkalinity (PP as CaCO3)	mg/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
Alkalinity (Total as CaCO3)	mg/L	>30%	0.50	2.5	yes	550	550	0
Bicarbonate (HCO3)	mg/L	>30%	0.50	2.5	yes	670	670	0
Carbonate (CO3)	mg/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
Hydroxide (OH)	mg/L	>30%	0.50	2.5	no	<0.50	<0.50	n/c
Dissolved Sulphate (SO4)	mg/L	>30%	20	100	yes	2700	2700	0
Dissolved Chloride (Cl)	mg/L	>30%	1.0	5	yes	13	13	0
Nutrients								
Dissolved Nitrite (N)	mg/L	>25%	0.010	0.05	no	<0.010	<0.010	n/c
Dissolved Nitrate (N)	mg/L	>25%	0.010	0.05	no	0.051	0.047	n/c
Calculated Parameters								
Aldrin + Dieldrin	ug/L	>25%	0.0005	0.0025	no	<0.005	<0.005	n/c
Chlordane (Total)	ug/L	>25%	0.0005	0.0025	no	<0.005	<0.005	n/c
DDT+ Metabolites	ug/L	>25%	0.0005	0.0025	no	<0.005	<0.005	n/c
Heptachlor + Heptachlor epoxide	ug/L	>25%	0.0005	0.0025	no	<0.005	<0.005	n/c
o,p-DDD + p,p-DDD	ug/L	>25%	0.0005	0.0025	no	<0.005	<0.005	n/c
o,p-DDE + p,p-DDE	ug/L	>25%	0.0005	0.0025	no	<0.005	<0.005	n/c
o,p-DDT + p,p-DDT	ug/L	>25%	0.0005	0.0025	no	<0.005	<0.005	n/c
Total Endosulfan	ug/L	>25%	0.0005	0.0025	no	<0.005	<0.005	n/c
Total PCB	ug/L	>25%	0.0005	0.0025	no	<0.05	<0.05	n/c
Pesticides & Herbicides								
Aldrin	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
Dieldrin	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
a-Chlordane	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
g-Chlordane	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
o,p-DDD	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
p,p-DDD	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
o,p-DDE	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
p,p-DDE	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
o,p-DDT	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
p,p-DDT	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
Lindane	ug/L	>25%	0.003	0.015	no	<0.003	<0.003	n/c
Endosulfan I (alpha)	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
Endosulfan II	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
Endrin	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
Heptachlor	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
Heptachlor epoxide	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
Hexachlorobenzene	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
Methoxychlor	ug/L	>25%	0.01	0.05	no	<0.01	<0.01	n/c
Aroclor 1016	ug/L	>25%	0.05	0.25	no	<0.05	<0.05	n/c
Aroclor 1221	ug/L	>25%	0.05	0.25	no	<0.05	<0.05	n/c
Aroclor 1232	ug/L	>25%	0.05	0.25	no	<0.05	<0.05	n/c
Aroclor 1242	ug/L	>25%	0.05	0.25	no	<0.05	<0.05	n/c
Aroclor 1248	ug/L	>25%	0.05	0.25	no	<0.05	<0.05	n/c
Aroclor 1254	ug/L	>25%	0.05	0.25	no	<0.05	<0.05	n/c
Aroclor 1260	ug/L	>25%	0.05	0.25	no	<0.05	<0.05	n/c
alpha-BHC	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
beta-BHC	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
delta-BHC	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
Endosulfan sulfate	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
Endrin aldehyde	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
Endrin ketone	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
Mirex	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
Octachlorostyrene	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
Oxychlordane	ug/L	>25%	0.005	0.025	no	<0.005	<0.005	n/c
Toxaphene	ug/L	>25%	0.2	1	no	<0.2	<0.2	n/c

Relative Percent Difference Calculations - Field Blank, Trip Blank

Sample Collection Date / Laboratory Sample ID	Units	RDL	Field Blank July 9, 2015 MQ2962	Alert Limit	Do the results exceed the Alert Limit?	Trip Blank July 9, 2015 MQ2963	Alert Limit	Do the results exceed the Alert Limit?
Hydrocarbons								
Benzene	mg/L	0.40	<0.40	>5X RDL	no	<0.40	>5X RDL	no
Toluene	mg/L	0.40	<0.40	>5X RDL	no	<0.40	>5X RDL	no
Ethylbenzene	mg/L	0.40	<0.40	>5X RDL	no	<0.40	>5X RDL	no
m & p-Xylene	mg/L	0.80	<0.80	>5X RDL	no	<0.80	>5X RDL	no
o-Xylene	mg/L	0.40	<0.40	>5X RDL	no	<0.40	>5X RDL	no
Xylenes (Total)	mg/L	0.80	<0.80	>5X RDL	no	<0.80	>5X RDL	no
F1 (C_6-C_{10}) - BTEX	mg/L	100	<100	>5X RDL	no	<100	>5X RDL	no
(C6-C10)	mg/L	100	<100	>5X RDL	no	<100	>5X RDL	no
F2 (C_{10}-C_{16})	mg/L	0.10	<0.10	>5X RDL	no	<0.10	>5X RDL	no
Metals								
Dissolved Aluminum (Al)	mg/L	0.0030	0.0046	>5X RDL	no	<0.0030	>5X RDL	no
Total Aluminum (Al)	mg/L	0.0030	0.0036	>5X RDL	no	0.0031	>5X RDL	no
Dissolved Antimony (Sb)	mg/L	0.00060	<0.00060	>5X RDL	no	<0.00060	>5X RDL	no
Total Antimony (Sb)	mg/L	0.00060	<0.00060	>5X RDL	no	<0.00060	>5X RDL	no
Dissolved Arsenic (As)	mg/L	0.00020	<0.00020	>5X RDL	no	<0.00020	>5X RDL	no
Total Arsenic (As)	mg/L	0.00020	<0.00020	>5X RDL	no	<0.00020	>5X RDL	no
Dissolved Barium (Ba)	mg/L	0.010	<0.010	>5X RDL	no	<0.010	>5X RDL	no
Total Barium (Ba)	mg/L	0.010	<0.010	>5X RDL	no	<0.010	>5X RDL	no
Dissolved Beryllium (Be)	mg/L	0.0010	<0.0010	>5X RDL	no	<0.0010	>5X RDL	no
Total Beryllium (Be)	mg/L	0.0010	<0.0010	>5X RDL	no	<0.0010	>5X RDL	no
Dissolved Boron (B)	mg/L	0.020	<0.020	>5X RDL	no	<0.020	>5X RDL	no
Total Boron (B)	mg/L	0.020	<0.020	>5X RDL	no	<0.020	>5X RDL	no
Dissolved Cadmium (Cd)	mg/L	0.020	<0.020	>5X RDL	no	<0.020	>5X RDL	no
Total Cadmium (Cd)	mg/L	0.020	<0.020	>5X RDL	no	<0.020	>5X RDL	no
Dissolved Calcium (Ca)	mg/L	0.30	<0.30	>5X RDL	no	<0.30	>5X RDL	no
Total Calcium (Ca)	mg/L	1.5	<0.30	>5X RDL	no	<0.30	>5X RDL	no
Dissolved Chromium (Cr)	mg/L	0.0010	<0.0010	>5X RDL	no	<0.0010	>5X RDL	no
Total Chromium (Cr)	mg/L	0.0010	<0.0010	>5X RDL	no	<0.0010	>5X RDL	no
Dissolved Cobalt (Co)	mg/L	0.00030	<0.00030	>5X RDL	no	<0.00030	>5X RDL	no
Total Cobalt (Co)	mg/L	0.00030	<0.00030	>5X RDL	no	<0.00030	>5X RDL	no
Dissolved Copper (Cu)	mg/L	0.00020	0.00028	>5X RDL	no	<0.00020	>5X RDL	no
Total Copper (Cu)	mg/L	0.00020	0.00034	>5X RDL	no	0.00029	>5X RDL	no
Dissolved Iron (Fe)	mg/L	0.060	<0.060	>5X RDL	no	<0.060	>5X RDL	no
Total Iron (Fe)	mg/L	0.060	<0.060	>5X RDL	no	<0.060	>5X RDL	no
Dissolved Lead (Pb)	mg/L	0.00020	0.00024	>5X RDL	no	0.00025	>5X RDL	no
Total Lead (Pb)	mg/L	0.00020	<0.00020	>5X RDL	no	<0.00020	>5X RDL	no
Dissolved Lithium (Li)	mg/L	0.020	<0.020	>5X RDL	no	<0.020	>5X RDL	no
Total Lithium (Li)	mg/L	0.020	<0.020	>5X RDL	no	<0.020	>5X RDL	no
Dissolved Magnesium (Mg)	mg/L	0.20	<0.20	>5X RDL	no	<0.20	>5X RDL	no
Total Magnesium (Mg)	mg/L	0.20	<0.20	>5X RDL	no	<0.20	>5X RDL	no
Dissolved Manganese (Mn)	mg/L	0.0040	<0.0040	>5X RDL	no	<0.0040	>5X RDL	no
Total Manganese (Mn)	mg/L	0.0040	<0.0040	>5X RDL	no	<0.0040	>5X RDL	no
Dissolved Molybdenum (Mo)	mg/L	0.00020	<0.00020	>5X RDL	no	<0.00020	>5X RDL	no
Total Molybdenum (Mo)	mg/L	0.00020	<0.00020	>5X RDL	no	<0.00020	>5X RDL	no
Dissolved Nickel (Ni)	mg/L	0.00050	<0.00050	>5X RDL	no	<0.00050	>5X RDL	no
Total Nickel (Ni)	mg/L	0.00050	<0.00050	>5X RDL	no	<0.00050	>5X RDL	no
Dissolved Phosphorus (P)	mg/L	0.10	<0.10	>5X RDL	no	<0.10	>5X RDL	no
Total Phosphorus (P)	mg/L	0.10	0.11	>5X RDL	no	<0.10	>5X RDL	no
Dissolved Potassium (K)	mg/L	0.30	<0.30	>5X RDL	no	<0.30	>5X RDL	no
Total Potassium (K)	mg/L	0.30	<0.30	>5X RDL	no	<0.30	>5X RDL	no
Dissolved Selenium (Se)	mg/L	0.00020	<0.00020	>5X RDL	no	<0.00020	>5X RDL	no
Total Selenium (Se)	mg/L	0.00020	<0.00020	>5X RDL	no	<0.00020	>5X RDL	no
Dissolved Silicon (Si)	mg/L	0.10	<0.10	>5X RDL	no	<0.10	>5X RDL	no
Total Silicon (Si)	mg/L	0.10	<0.10	>5X RDL	no	<0.10	>5X RDL	no
Dissolved Silver (Ag)	mg/L	0.00010	<0.00010	>5X RDL	no	<0.00010	>5X RDL	no
Total Silver (Ag)	mg/L	0.00010	<0.00010	>5X RDL	no	<0.00010	>5X RDL	no
Dissolved Sodium (Na)	mg/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
Total Sodium (Na)	mg/L	0.50	0.72	>5X RDL	no	0.50	>5X RDL	no
Dissolved Strontium (Sr)	mg/L	0.020	<0.020	>5X RDL	no	<0.020	>5X RDL	no
Total Strontium (Sr)	mg/L	0.020	<0.020	>5X RDL	no	<0.020	>5X RDL	no
Dissolved Sulphur (S)	mg/L	1.0	<0.20	>5X RDL	no	<0.20	>5X RDL	no
Total Sulphur (S)	mg/L	1.0	<0.20	>5X RDL	no	<0.20	>5X RDL	no
Dissolved Thallium (Tl)	mg/L	0.00020	<0.00020	>5X RDL	no	<0.00020	>5X RDL	no
Total Thallium (Tl)	mg/L	0.00020	<0.00020	>5X RDL	no	<0.00020	>5X RDL	no
Dissolved Tin (Sn)	mg/L	0.0010	<0.0010	>5X RDL	no	<0.0010	>5X RDL	no
Total Tin (Sn)	mg/L	0.0010	<0.0010	>5X RDL	no	<0.0010	>5X RDL	no
Dissolved Titanium (Ti)	mg/L	0.0010	<0.0010	>5X RDL	no	<0.0010	>5X RDL	no
Total Titanium (Ti)	mg/L	0.0010	<0.0010	>5X RDL	no	<0.0010	>5X RDL	no
Dissolved Uranium (U)	mg/L	0.00010	<0.00010	>5X RDL	no	<0.00010	>5X RDL	no
Total Uranium (U)	mg/L	0.00010	<0.00010	>5X RDL	no	<0.00010	>5X RDL	no
Dissolved Vanadium (V)	mg/L	0.0010	<0.0010	>5X RDL	no	<0.0010	>5X RDL	no
Total Vanadium (V)	mg/L	0.0010	<0.0010	>5X RDL	no	<0.0010	>5X RDL	no
Dissolved Zinc (Zn)	mg/L	0.0030	<0.0030	>5X RDL	no	<0.0030	>5X RDL	no
Total Zinc (Zn)	mg/L	0.0030	<0.0030	>5X RDL	no	<0.0030	>5X RDL	no
Volatile Organics								
Total Trihalomethanes	ug/L	2.0	<2.0	>5X RDL	no	<2.0	>5X RDL	no
Bromodichloromethane	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
Bromoform	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
Bromomethane	ug/L	2.0	<2.0	>5X RDL	no	<2.0	>5X RDL	no
Carbon Tetrachloride	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
Chlorobenzene	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
Chlorodibromomethane	ug/L	1.0	<1.0	>5X RDL	no	<1.0	>5X RDL	no
Chloroethane	ug/L	1.0	<1.0	>5X RDL	no	<1.0	>5X RDL	no
Chloroform	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
Chloromethane	ug/L	2.0	<2.0	>5X RDL	no	<2.0	>5X RDL	no
1,2-dibromoethane	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
1,2-dichlorobenzene	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
1,3-dichlorobenzene	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
1,4-dichlorobenzene	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
1,1-dichloroethane	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
1,2-dichloroethane	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
1,1-dichloroethene	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
cis-1,2-dichloroethene	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
trans-1,2-dichloroethene	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
Dichloromethane	ug/L	2.0	<2.0	>5X RDL	no	<2.0	>5X RDL	no
1,2-dichloropropane	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
cis-1,3-dichloropropene	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
trans-1,3-dichloropropene	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
Methyl methacrylate	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
Methyl-tert-butylether (MTBE)	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
Styrene	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
1,1,1,2-tetrachloroethane	ug/L	2.0	<2.0	>5X RDL	no	<2.0	>5X RDL	no
1,1,2,2-tetrachloroethane	ug/L	2.0	<2.0	>5X RDL	no	<2.0	>5X RDL	no
Tetrachloroethene	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
1,2,3-trichlorobenzene	ug/L	1.0	<1.0	>5X RDL	no	<1.0	>5X RDL	no
1,2,4-trichlorobenzene	ug/L	1.0	<1.0	>5X RDL	no	<1.0	>5X RDL	no
1,3,5-trichlorobenzene	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
1,1,1-trichloroethane	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
1,1,2-trichloroethane	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
Trichloroethene	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
Trichlorofluoromethane	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
1,2,4-trimethylbenzene	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
1,3,5-trimethylbenzene	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
Vinyl chloride	ug/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no

Relative Percent Difference Calculations - Field Blank, Trip Blank

Sample Collection Date / Laboratory Sample ID	Units	RDL	Field Blank July 9, 2015 MQ2962	Alert Limit	Do the results exceed the Alert Limit?	Trip Blank July 9, 2015 MQ2963	Alert Limit	Do the results exceed the Alert Limit?
Polycyclic Aromatics								
Acenaphthene	mg/L	0.10	<0.10	>5X RDL	no	<0.10	>5X RDL	no
Acenaphthylene	mg/L	0.10	<0.10	>5X RDL	no	<0.10	>5X RDL	no
Acridine	mg/L	0.20	<0.20	>5X RDL	no	<0.20	>5X RDL	no
Anthracene	mg/L	0.010	<0.010	>5X RDL	no	<0.010	>5X RDL	no
Benzo(a)anthracene	mg/L	0.0085	<0.0085	>5X RDL	no	<0.0085	>5X RDL	no
Benzo(b&j)fluoranthene	mg/L	0.0085	<0.0085	>5X RDL	no	<0.0085	>5X RDL	no
Benzo(k)fluoranthene	mg/L	0.0085	<0.0085	>5X RDL	no	<0.0085	>5X RDL	no
Benzo(g,h,i)perylene	mg/L	0.0085	<0.0085	>5X RDL	no	<0.0085	>5X RDL	no
Benzo(c)phenanthrene	mg/L	0.050	<0.050	>5X RDL	no	<0.050	>5X RDL	no
Benzo(a)pyrene	mg/L	0.0075	<0.0075	>5X RDL	no	<0.0075	>5X RDL	no
Benzo[e]pyrene	mg/L	0.050	<0.050	>5X RDL	no	<0.050	>5X RDL	no
Chrysene	mg/L	0.0085	<0.0085	>5X RDL	no	<0.0085	>5X RDL	no
Dibenz(a,h)anthracene	mg/L	0.0075	<0.0075	>5X RDL	no	<0.0075	>5X RDL	no
Fluoranthene	mg/L	0.010	<0.010	>5X RDL	no	<0.010	>5X RDL	no
Fluorene	mg/L	0.050	<0.050	>5X RDL	no	<0.050	>5X RDL	no
Indeno(1,2,3-cd)pyrene	mg/L	0.0085	<0.0085	>5X RDL	no	<0.0085	>5X RDL	no
2-Methylnaphthalene	mg/L	0.10	<0.10	>5X RDL	no	<0.10	>5X RDL	no
Naphthalene	mg/L	0.10	<0.10	>5X RDL	no	<0.10	>5X RDL	no
Phenanthrene	mg/L	0.050	<0.050	>5X RDL	no	<0.050	>5X RDL	no
Perylene	mg/L	0.050	<0.050	>5X RDL	no	<0.050	>5X RDL	no
Pyrene	mg/L	0.020	<0.020	>5X RDL	no	<0.020	>5X RDL	no
Quinoline	mg/L	0.20	<0.20	>5X RDL	no	<0.20	>5X RDL	no
Calculated Parameters								
Anion Sum	meq/L	N/A	0.0000	>5X RDL	#VALUE!	0.0000	>5X RDL	#VALUE!
Cation Sum	meq/L	N/A	0.0030	>5X RDL	#VALUE!	0.0040	>5X RDL	#VALUE!
hardness (CaCO3)	mg/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
Ion Balance	N/A	0.010	NC	>5X RDL	no	NC	>5X RDL	no
Dissloved Nitrate (NO3)	mg/L	0.044	<0.044	>5X RDL	no	<0.044	>5X RDL	no
Nitrate plus Nitrite (N)	mg/L	0.020	<0.020	>5X RDL	no	<0.020	>5X RDL	no
Dissolved Nitrite (NO2)	mg/L	0.033	<0.033	>5X RDL	no	<0.033	>5X RDL	no
Total Dissolved Solids	mg/L	10	<10	>5X RDL	no	<10	>5X RDL	no
Micsellaneous Organics								
Conductivity	uS/cm	1.0	<1.0	>5X RDL	no	<1.0	>5X RDL	no
pH	pH	N/A	5.49	>5X RDL	#VALUE!	5.35	>5X RDL	#VALUE!
Anions								
Alkalinity (PP as CaCO3)	mg/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
Alkalinity (Total as CaCO3)	mg/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
Bicarbonate (HCO3)	mg/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
Carbonate (CO3)	mg/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
Hydroxide (OH)	mg/L	0.50	<0.50	>5X RDL	no	<0.50	>5X RDL	no
Dissolved Sulphate (SO4)	mg/L	20	<1.0	>5X RDL	no	<1.0	>5X RDL	no
Dissolved Chloride (Cl)	mg/L	1.0	<1.0	>5X RDL	no	<1.0	>5X RDL	no
Nutrients								
Dissolved Nitrite (N)	mg/L	0.010	<0.010	>5X RDL	no	<0.010	>5X RDL	no
Dissolved Nitrate (N)	mg/L	0.010	<0.010	>5X RDL	no	<0.010	>5X RDL	no
Calculated Parameters								
Aldrin + Dieldrin	ug/L	0.0005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
Chlordane (Total)	ug/L	0.0005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
DDT+ Metabolites	ug/L	0.0005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
Heptachlor + Heptachlor epoxide	ug/L	0.0005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
o,p-DDD + p,p-DDD	ug/L	0.0005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
o,p-DDE + p,p-DDE	ug/L	0.0005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
o,p-DDT + p,p-DDT	ug/L	0.0005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
Total Endosulfan	ug/L	0.0005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
Total PCB	ug/L	0.0005	<0.05	>5X RDL	no	<0.05	>5X RDL	no
Pesticides & Herbicides								
Aldrin	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
Dieldrin	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
a-Chlordane	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
g-Chlordane	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
o,p-DDD	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
p,p-DDD	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
o,p-DDE	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
p,p-DDE	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
o,p-DDT	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
p,p-DDT	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
Lindane	ug/L	0.003	<0.003	>5X RDL	no	<0.003	>5X RDL	no
Endosulfan I (alpha)	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
Endosulfan II	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
Endrin	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
Heptachlor	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
Heptachlor epoxide	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
Hexachlorobenzene	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
Methoxychlor	ug/L	0.01	<0.01	>5X RDL	no	<0.01	>5X RDL	no
Aroclor 1016	ug/L	0.05	<0.05	>5X RDL	no	<0.05	>5X RDL	no
Aroclor 1221	ug/L	0.05	<0.05	>5X RDL	no	<0.05	>5X RDL	no
Aroclor 1232	ug/L	0.05	<0.05	>5X RDL	no	<0.05	>5X RDL	no
Aroclor 1242	ug/L	0.05	<0.05	>5X RDL	no	<0.05	>5X RDL	no
Aroclor 1248	ug/L	0.05	<0.05	>5X RDL	no	<0.05	>5X RDL	no
Aroclor 1254	ug/L	0.05	<0.05	>5X RDL	no	<0.05	>5X RDL	no
Aroclor 1260	ug/L	0.05	<0.05	>5X RDL	no	<0.05	>5X RDL	no
alpha-BHC	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
beta-BHC	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
delta-BHC	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
Endosulfan sulfate	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
Endrin aldehyde	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
Endrin ketone	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
Mirex	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
Octachlorostyrene	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
Oxychlordane	ug/L	0.005	<0.005	>5X RDL	no	<0.005	>5X RDL	no
Toxaphene	ug/L	0.2	<0.2	>5X RDL	no	<0.2	>5X RDL	no

Summary of Quality Control Sample Results

Laboratory Submission Number	Sample Matrix	Laboratory Sample ID Affected	Test Affected	Data Quality Issue	Comments
B558674 (B5D7961-SC)	**Water**	**Matrix Spike - MQ2967**	**Dissolved Barium (Ba)**	Matrix spike sample recovery below acceptance criteria	This may cause a low bias for the sample associated with the matrix spike. However, since the results were well below the regulatory guideline there is no material effect on the interpretation of this data. Under these circumstances, the dissolved barium data reported can be considered reliable.
B558674 (B5D7961-SC)	**Water**	**Matrix Spike**	**trans-1,3-dichloropropene**	Matrix spike sample recovery outside acceptance range for trans-1,3-dichloropropene.	For multi-parameter tests, 10% of parameters can fall outside of the acceptance range. Under these circumstances, the trans-1,3-dichloropropene data reported can be considered reliable.
B558674 (B5D7961-SC)	**Water**	**MQ2964, MQ2968**	**Dissolved Sodium (Na) and Dissolved Sulphur (S)**	Dissolved greater than total.	This may increase the uncertainty associated with these results. However, the results are within acceptable limits of precision of the method. Under these circumstances, the dissolved sodium, and dissolved sulphur data reported can be considered reliable.
B558674 (B5D7961-SC)	**Water**	**MQ2965, MQ2966**	**Dissolved Magnesium (Mg), Dissolved Sodium (Na), Dissolved Strontium (Sr) and Dissolved Sulphur (S)**	Dissolved greater than total.	This may increase the uncertainty associated with these results. However, the results are within acceptable limits of precision of the method. Under these circumstances, the dissolved magnesium, dissolved sodium, dissolved strontium, and dissolved sulphur data reported can be considered reliable.
B558674 (B5D7961-SC)	**Water**	**MQ2961, MQ2967**	**Dissolved Sulphur (S)**	Dissolved greater than total.	This may increase the uncertainty associated with these results. However, the results are within acceptable limits of precision of the method. Under these circumstances, the dissolved sulphur data reported can be considered reliable.
B558674 (B5D7961-SC)	**Water**	**MQ2962 and MQ2963**	**Dissolved Lead (Pb)**	Dissolved greater than total.	This may increase the uncertainty associated with these results. However, the results are within limits of uncertainty(MU). Under these circumstances, the dissolved lead data reported can be considered reliable.

GOLDER DATA QUALITY REVIEW CHECKLIST

Site Location: Bar U Ranch, AB

Sampling Date: July 10 and 13, 2015

Golder Project Number: 15-26784

Laboratory: Maxxam - Calgary

Lab Submission Number: B559135 (B5E0408 - SC)

Was the Cooler Received at the lab under a sealed and intact custody seal?	Yes
Was proper chain of custody of the samples documented and kept?	Yes
Were sample temperatures acceptable when they reached lab?:	Yes
Were all samples analyzed and extracted within hold times?:	Yes
Has lab warranted all tests were in statistical control in CoA?:	Yes
Was sufficient sample provided for the requested analysis?	Yes
Has lab warranted all samples were analyzed with limited headspace present?:	No

Are All Laboratory QC Within Acceptance Criteria (Yes, No, Not Applicable)?

	Yes	No	NA	Comments
Surrogate Recovery		X		Matrix spike and surrogate outside of
Method Blank Concentration	X			acceptance criteria. All remaining
Laboratory Duplicate RPD	X			laboratory QC results are within
Matrix Spike Recovery		X		acceptance criteria, please see QA/QC
Blank Spike Recovery	X			appendix.

Are All Field QC Samples Within Alert Limits (Yes, No, Not Applicable)?

	Yes	No	NA	Comments
Field Blank Concentration			X	No field QC samples were collected.
Trip Blank Concentration			X	
Field Duplicate RPD			X	

Is data considered reliable (Yes/No/Suspect)?: Suspect

If answer is "No" or "Suspect", describe and provide rationale:

Please see QA/QC section.

Data Reviewed by (Print): Lori Lemke

Data Reviewed by (Signature): Lori Lemke

Date: August 5, 2015

Summary of Quality Control Sample Results

Laboratory Submission Number	Sample Matrix	Laboratory Sample ID Affected	Test Affected	Data Quality Issue	Comments
B559135 (B5E0408 - SC)	**Water**	**Spiked Blank**	**Total Copper (Cu)**	Spiked blank sample recovery outside acceptance range for total copper (Cu).	For multi-parameter tests, 10% of parameters can fall outside of the acceptance range. Under these circumstances, the total copper (Cu) data reported can be considered reliable.
B559135 (B5E0408 - SC)	**Water**	**Matrix Spike [MQ5585-04]**	**Total Antimony (Sb)**	Matrix spike sample recovery outside acceptance range for total antimony (Sb).	For multi-parameter tests, 10% of parameters can fall outside of the acceptance range. Under these circumstances, the total antimony (Sb) data reported can be considered reliable.
B559135 (B5E0408 - SC)	**Water**	**MQ5587**	**Volatiles**	Headspace was noted in sample container at the time of volatiles extraction.	This deviation may represent a low bias for this parameter in this sample. Thus, this volatile data for this sample should be considered suspect.
B559135 (B5E0408 - SC)	**Water**	**MQ5585**	**Cadmium (Cd)**	Dissolved greater than total.	This may increase the uncertainty associated with these results. However, the results are within limits of uncertainty(MU). Under these circumstances, the cadmium (Cd) data reported can be considered reliable.
B559135 (B5E0408 - SC)	**Water**	**MQ5588**	**Dissolved Sulphur (S)**	Dissolved greater than total.	This may increase the uncertainty associated with these results. However, the results are within acceptable limits of precision of the method. Under these circumstances, the dissolved sulphur (S) data reported can be considered reliable.
B559135 (B5E0408 - SC)	**Water**	**Matrix Spike**	**Pesticide Surrogate**	Decachlorobiphenyl surrogate recovery outside the acceptance criteria.	Results may be biased high for these parameters, however, since the results for associated with this surrogate are all below detection limit there is no material effect on the interpretation of this data. Under these circumstances, the pesticide data reported can be considered reliable.
B559135 (B5E0408 - SC)	**Water**	**Matrix Spike**	**Endosulfan sulfate and Methoxychlor**	Matrix Spike sample recovery outside acceptance range for endosulfan sulfate and methoxychlor.	Results may be biased high for these parameters, however, since the results for associated with these parameters are all below detection limit there is no material effect on the interpretation of this data. Under these circumstances, the endosulfan sulfate and methoxychlor data reported can be considered reliable.

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

For more information, visit golder.com

Africa	+ 27 11 254 4800
Asia	+ 86 21 6258 5522
Australasia	+ 61 3 8862 3500
Europe	+ 44 1628 851851
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

solutions@golder.com
www.golder.com

Golder Associates Ltd.
16820 107 Avenue
Edmonton, Alberta, T5P 4C3
Canada
T: +1 (780) 483 3499

Golder Associates