



TETRA TECH EBA

**2015 Groundwater and Soil Vapour Monitoring Program
202 Main Street, Barons, Alberta
Alberta Municipal Affairs Site #9557**



PRESENTED TO
Village of Barons

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EXECUTIVE SUMMARY

FOREWORD

Tetra Tech EBA Inc. (Tetra Tech EBA), was retained by the Village of Barons (Barons) to conduct the 2015 groundwater monitoring program (GWMP) and a subsurface soil vapour monitoring program (SVMP) for a property located at 202 Main Street in Barons, Alberta.

The scope of work is based on previous environmental site assessments (ESAs) conducted at the site by Tetra Tech EBA which identified concentrations of petroleum hydrocarbons (PHCs) in the soil, groundwater, and soil vapour greater than the referenced Alberta Environment and Sustainable Resource Development (ESRD) 2014 Alberta Tier 1 and Tier 2 Soil and Groundwater Remediation Guidelines (Tier 1 / Tier 2 Guidelines), and more specifically, in excess of the Tier 2 Vapour Inhalation (VI) Guidelines.

The objective of the GWMP is to monitor subsurface conditions (PHC concentrations), and to obtain additional data to evaluate the success of natural attenuation at reducing PHC concentrations, as stated in the risk management plan (RMP) prepared for the site. The RMP identifies the compliance groundwater monitoring wells on the site as: 08MW02, 08MW07, 09MW10, 09MW13, and 09MW19.

The objective of the SVMP is to augment existing soil vapour data (July 2014) with seasonal PHC concentrations (April and October) to develop a seasonal understanding of risk associated with PHC vapours. The 2014 soil vapour data indicated that there may be a risk of exposure of benzene to occupants of the adjacent residence with an earthen basement, however, there are no apparent risks to the on-site or surrounding commercial receptors. Tetra Tech EBA contacted the property owner at the residence to the east in 2015 to gain access to assess the indoor air quality, however, access was not permitted.

DISCUSSION AND CONCLUSIONS

Groundwater

In 2015, concentrations of benzene, ethylbenzene and PHC fraction F2 were detected greater than the Tier 1 Guidelines in the groundwater at 08MW02 and 09MW13. Concentrations of these parameters at these two monitoring wells also exceeded the referenced guidelines in 2008 and 2009, respectively. However, the concentrations measured in 2014 and 2015 have decreased and xylenes and/or PHC fraction F1 are no longer greater than the referenced guidelines.

Benzene concentrations were greater than the referenced guideline at 08MW07 in April 2015 and at 09MW10 in April and October. Similar to 08MW02 and 09MW13, concentrations of benzene exceeded the referenced guideline in 2008 and 2009, respectively. The benzene concentration decreased at 08MW07 compared to values measured in 2008, and the concentration at 09MW10 in 2015 is similar to the 2009 value. The natural attenuation of PHC concentrations at the site is likely attributed to the underground storage tank and source removal that was completed in 2013.

Routine groundwater parameters were analyzed to assist in determining the potential for the natural attenuation of PHCs at the site. Concentrations of total dissolved solids (TDS), sodium, sulphate, chloride, nitrate, nitrite, dissolved manganese and dissolved iron greater than the referenced guidelines were measured in one or more monitoring wells in 2015. The concentrations of these parameters, excluding chloride, may reflect natural groundwater composition attributed to the dissolution of soluble salts within the till beneath the site. Generally, the measured concentrations of routine parameters in 2015 were similar to those measured in 2014.

The degradation of hydrocarbons occurs under both aerobic and anaerobic conditions; aerobic breakdown occurring more rapidly. The significance of the reduction-oxidation (redox) condition is, therefore, that under aerobic (oxic) conditions, many PHCs are expected to attenuate much faster than under anoxic conditions. Therefore, if inferred oxic conditions prevail at the edge of the dissolved hydrocarbon plume, the migration of hydrocarbons may stabilize or decrease.

Reviewing the measured concentrations of redox sensitive elements (e.g., nitrate, dissolved manganese, dissolved iron, and sulphate), the inferred redox conditions appear stable and under suboxic conditions. The suboxic conditions suggests that subsurface conditions are suitable, but not optimal for the continued attenuation of PHCs.

Soil Vapour

As presented in the Alberta 2014 Tier 2 Guidelines, the concentration of potential contaminants of concern (PCOCs) in soil vapour samples may be used to evaluate the risk to indoor and outdoor receptors via inhalation of vapours originating in the subsurface.

The Health Canada Preliminary Quantitative Risk Assessment (PQRA) Guidance was applied to calculate an indoor air inhalation screening concentration for each PCOC identified for the site. The British Columbia Ministry of Environment (BC MoE) attenuation coefficient, as per BC MoE Technical Guidance Document 4 “*Vapour Investigation and Remediation*”, was applied to calculate a soil vapour screening level. The BC MoE guidance contains an attenuation factor applicable to earthen basements which the Tier 2 Guidelines does not provide.

The concentrations of one or more benzene and the $>C_8-C_{10}$ aromatic sub-fraction exceeded the applied guidelines from each of the four vapour wells (14VW01, 14VW02, 14VW03, and 14VW04). Following application of the appropriate BC MoE attenuation coefficient the benzene concentration in each of the four vapour wells still exceeded the calculated soil vapour screening level concentration.

The measured benzene and $>C_8-C_{10}$ aromatic sub-fraction concentrations in April and October 2015 were generally similar or less than those measured in July 2014. The lower concentrations measured in April and October 2015 are likely related with lower ambient air temperatures also observed during these months. As higher concentrations were measured in July 2014, including the $>C_{10}-C_{12}$ aromatic sub-fraction exceeding the calculated soil vapour screening level, seasonal variation is expected to correlate with the weather.

Similar to 2014, the 2015 results indicate that there is a risk of exposure to PHCs via inhalation of indoor air at the nearby residence with an earthen basement/crawl space. No risk of exposure via inhalation of indoor air was identified to receptors in surrounding commercial buildings which have concrete floors or basements

RECOMMENDATIONS

Based on the 2015 GWMP and SVMP, Tetra Tech EBA recommends the following.

- The Village of Barons should facilitate access to the adjacent residential property for the sampling of indoor air at the earliest convenience. If the results of the indoor air samples indicate a risk to occupants, appropriate measures to minimize risk should be implemented (i.e., exhaust fans for vapour extraction).
- Annual groundwater monitoring and sampling of the current monitoring well network and analytical parameters should be continued to monitor PHC concentrations.
- The suboxic conditions at the site should be improved to oxic with an in situ injection of an oxygen releasing compound to enhance the natural attenuation of PHC compounds.
- The RMP should also be updated to address the risk of exposure to PHC-impacted vapours at the proximal residence with an earthen basement/crawl space.

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LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Village Of Barons and their agents. Tetra Tech EBA Inc. (Tetra Tech EBA) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Village Of Barons, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in Tetra Tech EBA's Services Agreement. Tetra Tech EBA's General Conditions are provided in Appendix A of this report.

1.0 INTRODUCTION

1.1 General

Tetra Tech EBA Inc. (Tetra Tech EBA), was retained by the Village of Barons (Barons) to conduct the 2015 groundwater monitoring program (GWMP) and a subsurface soil vapour monitoring program (SVMP) for a property located at 202 Main Street in Barons, Alberta; herein after referred to as the site (Figure 1). The site is included within the Alberta Municipal Affairs Tank Site Remediation Program (AMA Program), Site Number: 9557.

The scope of work is based on previous environmental site assessments (ESAs) conducted at the site by Tetra Tech EBA which identified concentrations of petroleum hydrocarbons (PHCs) in the soil, groundwater, and soil vapour greater than the referenced Alberta Environment and Sustainable Resource Development (ESRD¹) 2014 Alberta Tier 1 and Tier 2 Soil and Groundwater Remediation Guidelines (Tier 1 / Tier 2 Guidelines), and more specifically, in excess of the Tier 2 Vapour Inhalation (VI) Guidelines.

Details of the previous ESAs completed by Tetra Tech EBA are presented in the following documents:

- Phase II and Phase III Environmental Site Assessment. 202 Main Street. Lot 1 and Lot 2, Block 7, Plan 2605X. Barons, Alberta. File No. L22101182.001, October 2009.
- Additional Phase III Environmental Site Assessment. 202 Main Street. Lot 1 and Lot 2, Block 7, Plan 2605X Barons, Alberta. File No. L22101182.002, December 2011.
- Risk Management Plan. Alberta Municipal Affairs Site 9557. 202 Main Street Barons, Alberta. File No. L22101490.01, May 23, 2012.
- Underground Storage Tank Removal and Monitoring. 202 Main Street. Barons, Alberta. Alberta Municipal Affairs Site #9557. File No. L22003112-01, October 2013.
- Groundwater and Soil Vapour Monitoring Program. 202 Main Street, Barons, Alberta. Alberta Municipal Affairs Site #9557. File No. ENVIND03354-01, October 2014.

The objective of the GWMP is to monitor subsurface conditions (PHC concentrations), and to obtain additional data to evaluate the success of natural attenuation at reducing PHC concentrations, as stated in the risk management plan (RMP) prepared for the site. The RMP identifies the compliance groundwater monitoring wells on the site as: 08MW02, 08MW07, 09MW10, 09MW13, and 09MW19, however, monitoring well 09MW19 has been destroyed.

The objective of the SVMP is to augment existing soil vapour data (July 2014) with seasonal PHC concentrations (April and October) to develop a seasonal understanding of risk associated with PHC vapours. The 2014 soil vapour data indicates there may be a risk of exposure of benzene to occupants of the adjacent residence with an earthen basement, however, there are no apparent risks to the on-site or surrounding commercial receptors. Tetra Tech EBA contacted the property owner at the residence to the east in 2015 to gain access to assess the indoor air quality, however, access was not permitted.

Additionally, the SVMP will support the RMP for the site and will also ensure that Barons is providing adequate due diligence with respect to any potential health risks to occupants at the site and the adjacent property from potential exposure to soil vapours. Tetra Tech EBA notes that the RMP has not yet been approved by AEP.

¹ Currently Alberta Environment and Parks (AEP).

1.2 Authorization

Ms. Laurie Beck, of the Village of Barons, provided written authorization to Tetra Tech EBA to proceed with the present study via a signed Services Agreement dated June 25, 2015.

1.3 Scope of Work

To meet the objectives stated in Section 1.1, the scope of work for the GWMP and SVMP included the following tasks:

- Task 1 – Groundwater monitoring and sampling.
- Task 2 – Soil vapour sampling.
- Task 3 – Data evaluation and reporting including an updated Record of Site Condition Form (RSCF).

1.3.1 Task 1 – Groundwater Monitoring and Sampling

- Measured groundwater levels in the four compliance groundwater monitoring wells previously installed at the site and observed monitoring well integrity.
- Measured combustible vapour concentrations (CVCs) in the headspace of each monitoring well.
- Purged each well of approximately three standing well volumes of water or until the well was practically dry, allowed the water level in the well to recover and collected groundwater samples from each well.
- Submitted four groundwater samples for laboratory analysis of the following parameters: benzene, toluene, ethylbenzene, and xylenes (BTEX), PHC fractions F1 and F2, dissolved iron and manganese, and routine parameters.

1.3.2 Task 2 – Soil Vapour Sampling

- Collected soil vapour samples from the soil vapour wells installed at the site and submitted soil vapour samples to Maxxam Analytics (Maxxam) for laboratory analysis for the following parameters: BTEX and aliphatic and aromatic hydrocarbon sub-fractions.

1.3.3 Task 3 – Data Evaluation and Reporting

- Prepared this report discussing the field observations and analytical results and compared the results to the 2014 Tier 1 Guidelines, Health Canada Preliminary Quantitative Risk Assessment (PQRA) Guidance, and ESRD 2014 human toxicity reference values for inhalation exposure thresholds.

1.4 Qualifications of Assessors

Mr. Jamie LaMontagne, EP, conducted the groundwater monitoring and sampling and the soil vapour sampling. Mr. LaMontagne is an environmental technologist with Tetra Tech EBA's Environment Practice and has over 15 years of experience in the environmental industry.

Mr. Jaymes Going, B.Sc., EP, acted as the project manager, assisted with the interpretation of the data, and wrote this report. Mr. Going is an environmental scientist with Tetra Tech EBA's Environment Practice and has over 7 years of experience in the environment industry.

Ms. Kristy Gabelhouse, B.Sc., R.P.Bio., P.Biol., conducted the intermediate review of this report. Ms. Gabelhouse is a risk assessor with Tetra Tech EBA's Environment Practice and has 8 years of experience in the environment industry.

Mr. Matthew Horrigan, B.Sc., is a Senior Scientist in the Human Health and Ecological Risk Assessment group at Tetra Tech in the United States. Mr. Horrigan was the Senior Technical Advisor for the soil vapour portion of the project. He has 20 years of professional experience in environmental consulting, specializing in human health risk assessment and risk-based remediation.

Mr. Henri Carriere, P.Eng., M.N.R.M., conducted the final review of the report. Mr. Carriere is a Senior Environmental Engineer with Tetra Tech EBA in the Environmental Practice in Calgary, Alberta. Mr. Carriere has over 20 years of experience in the environment industry.

2.0 METHODS

This section describes the methods applied by Tetra Tech EBA during the GWMP and the SVMP.

2.1 Project Safety

A pre-job hazard assessment and safe work form were completed prior to the initiation of the fieldwork and applicable safe work procedures were reviewed. The safe work form was reviewed on site by the Tetra Tech EBA representatives.

2.2 Groundwater Monitoring, Sampling, and Analytical Testing

Tetra Tech EBA personnel monitored groundwater on April 23 and October 7, 2015. Groundwater sampling was completed on April 24 and October 8, 2015. Liquid levels were measured using a Heron[™] electronic interface probe at all accessible groundwater monitoring wells (08MW02, 08MW07, 09MW10, and 09MW13). Monitoring wells were screened for headspace CVCs using a RKI Eagle hydrocarbon surveyor. CVC measurements on April 23 ranged from 80 ppm (08MW07 and 09MW13) to 100 ppm (08MW02) and on October 7 ranged from 5 ppm (08MW02) to 85 ppm (08MW07).

Prior to sampling, groundwater wells were purged of approximately three standing well volumes of water, or until the well was practically dry, and allowed to recover to near static levels prior to collecting the samples. Groundwater samples were collected using dedicated disposable bailers, stored in laboratory-supplied bottles, appropriately preserved/filtered, and stored on ice in a cooler. The samples were transported to Maxxam in Calgary, Alberta under chain-of-custody (COC) for analysis of BTEX, PHC fractions F1 and F2, dissolved iron and manganese, and routine groundwater parameters.

Tetra Tech EBA's standard procedures for purging, sampling, preserving, and transporting groundwater samples were followed to avoid cross-contamination and to ensure sample quality was maintained. Groundwater monitoring and sampling was conducted in accordance with Tetra Tech EBA work method (WM4203).

Table 1 summarizes groundwater monitoring well completion details and the 2015 field monitoring results. Groundwater monitoring well locations are presented on Figure 2.

2.3 Soil Vapour Well Installation and Sampling

In 2014, the soil vapour wells were constructed and installed approximately 0.5 m above the perceived water table using a sampling port and valve attached to a 25 mm solid PVC pipe and a 50 mm slotted PVC vapour intake screen with a length of 300 mm at the base of the well. 14VW01 to 14VW03 were completed to

1.6 m below grade (mbg) and 14VW04 was completed to 1.1 mbg. Silica sand was placed from the base of the borehole to approximately 0.2 m above the slotted interval of the standpipe within the borehole annulus. The annulus of each monitoring well, above the screened section, was sealed with bentonite clay to ground level and a flush mount casing was seated in concrete to protect the well.

Tetra Tech EBA personnel conducted the soil vapour sampling on April 23 and October 8, 2015. During each sampling event, the soil vapour wells were purged of approximately 1.0 L of air prior to sample collection. Soil vapour samples were collected using 1.4 L Summa™ canisters equipped with non-linear flow regulators set to collect the sample over a period of 60 minutes. The Summa™ canisters were submitted to Maxxam in Mississauga, Ontario under COC for analysis of BTEX and aliphatic and aromatic hydrocarbon sub-fractions.

2.4 Regulatory Framework

2.4.1 Groundwater Regulatory Guidelines

Based on the surrounding land use and the desired end land use for the site, soil and groundwater analytical results were compared to Tier 1 Guidelines for residential land use, fine-grained soils. The Tier 1 Guidelines approach is based on the assumption that all exposure pathways and receptors relevant to a particular land use are present and operative. Such receptors include the domestic use aquifer (DUA), freshwater aquatic life (FAL), direct soil contact (ecological and human), off-site migration, and vapour inhalation.

2.4.2 Soil Vapour Regulatory Guidelines

2.4.2.1 Comparative Guidelines Following ESRD 2014 Guidance

As presented in the Alberta 2014 Tier 2 Guidelines, the concentration of Potential Contaminants of Concern (PCOCs) in soil vapour samples may be used to evaluate the risk to indoor and outdoor receptors via inhalation of vapours originating in the subsurface.

The Tier 2 Guidelines include human toxicity reference values (TRVs) for inhalation. For non-carcinogens, the inhalation TRV represents the concentration of the chemical of concern considered unlikely to cause adverse human health effects after a lifetime of continuous exposure, referred to as the tolerable concentration (TC). For carcinogens, the inhalation TRV is referred to as the inhalation unit risk (IUR), and can be used to determine a risk-specific concentration (RSC). To ensure that the incremental lifetime cancer risk of an individual does not exceed 1 in 100,000 (1×10^{-5}) after a lifetime of continuous exposure, the RSC is calculated (as per Health Canada, 2012, PQRA Guidance) as follows:

$$\text{RSC} = 1 \times 10^{-5} / \text{IUR}$$

The assumption of continuous exposure, expressed as an exposure term (ET) of 1, is considered appropriate for residential exposure (Tier 2 Guidelines). The ET is used to determine appropriate indoor screening levels for ambient air in buildings as indicated below (as per Health Canada, 2012, PQRA Guidance):

$$\text{Indoor Screening Level} = (\text{TC or RSC}) / \text{ET}$$

As permitted under the Tier 2 Guidelines, subsurface soil vapour concentrations may be used to assess the potential for health risks via inhalation by applying an attenuation coefficient [dilution factor (DF)] to account for the dilution of vapours as they migrate from the subsurface into the building and mixing with indoor air. However, the DF used in the models to assess the transport of hydrocarbon vapours into a building assumes that the structure has a solid foundation, such as a concrete floor slab or basement. In the cases where the physical structures are more sensitive than assumed under the Tier 1 and Tier 2 Guidelines development, such as the

presence of an earthen floor basement, the Tier 2 Guidelines do not offer an attenuation coefficient and calculation of site specific DFs is required.

At this site, where the proximal residence has an earthen basement, the calculation of site-specific DFs would require extensive field and laboratory testing of numerous geotechnical soil properties, which was beyond the scope of this project. Alternatively, the use of “typical” default soil properties could be employed in the calculations, however; it is considered that the number of default parameters required would be too extensive to assume that the calculated DF would be representative of true conditions.

In consideration of the above coupled with the presence of soil having PHC concentrations in excess of the Tier 1 Guidelines within 3 m of the residence (and soil with benzene concentrations in excess of the Tier 1 vapour inhalation guideline within 5 m), Tetra Tech EBA suggests that the soil vapour concentrations measured in the vapour wells may provide a reasonable approximation of the vapours actually entering the building envelope. As such Tetra Tech EBA compared the soil vapour data to the TC or RSC in the case of carcinogenic compounds.

2.4.2.2 Comparative Guidelines Following BC MoE 2010 Guidance

As stated above, the ESRD models do not offer an attenuation coefficient to account for the dilution of vapours as they migrate from the subsurface into a building with an earthen basement and mixing with indoor air. However, British Columbia Ministry of Environment (BC MoE) Guidance (Technical Guidance Document 4 “*Vapour Investigation and Remediation*” September 2010) permits the conservative application of an attenuation coefficient of 0.1 (DF of 10) to soil vapour data collected within 5 m of an unlined crawl space, earthen basement or wooden basement. In order to support the assumption that the TC or RSC adequately represents the risk to receptors, the BC MoE DF for earthen basements was also applied. The TC, IUR, and ET are the same in models from both provinces.

For non-carcinogens, ESRD 2014 and BC MoE 2010 apply a soil allocation factor (SAF) in the development of the soil remediation guidelines. The SAF represents the relative proportion of the TRV that may be apportioned to impacts in soil and allows for the remaining incremental exposure to be reserved for other media (e.g. food, air, water and consumer products). ESRD also use the SAF in deriving the groundwater guidelines, again reserving some incremental exposure to be allocated to other media. To maintain an equivalent level of protection, the SAF was also applied in the development of the soil vapour screening levels. Tetra Tech EBA advises that the SAF was not applied to the carcinogenic indoor screening levels since the air within the building reflects the contributions of all other media to the inhalation pathway.

Based on the above, the soil vapour screening levels were determined as follows:

$$\text{Soil Vapour Screening Level (non-carcinogen)} = \text{TC} \times \text{SAF} \times \text{DF} / \text{ET}$$

$$\text{Soil Vapour Screening Level (carcinogen)} = \text{RSC} \times \text{DF} / \text{ET}$$

The following table (Table A) presents the calculated soil vapour screening levels for residential land use.

Table A: Soil Vapour Screening Levels

Compound	TC (mg/m ³)	IUR (mg/m ³) ⁻¹	RSC (mg/m ³)	ET (residential)	Indoor Screening Level (mg/m ³)	SAF	DF	Soil Vapour Screening Levels (mg/m ³)
Benzene	-	0.0033	0.0030	1	0.003	-	10	0.03
Toluene	3.8	-	-	1	3.8	0.5	10	19.0
Ethylbenzene	1.0	-	-	1	1.0	0.5	10	5.0
Xylenes (total)	0.18	-	-	1	0.18	0.5	10	0.9
F1								
>C6-C10 Aliphatic	18.4	-	-	1	18.4	0.5	10	92.0
>C8-C10 Aliphatic	1.0	-	-	1	1.0	0.5	10	5.0
>C8-C10 Aromatic	0.2	-	-	1	0.2	0.5	10	1.0
F2								
>C10-C12 Aliphatic	1.0	-	-	1	1.0	0.5	10	5.0
>C12-C16 Aliphatic	1.0	-	-	1	1.0	0.5	10	5.0
>C10-C12 Aromatic	0.2	-	-	1	0.2	0.5	10	1.0
>C12-C16 Aromatic	0.2	-	-	1	0.2	0.5	10	1.0

- = no value or not applicable

TC = tolerable concentration (Table A7 ESRD 2014)

IUR – inhalation unit risk (Table A7 ESRD 2014)

RSC = risk specific concentration

ET = exposure term (Table A1 ESRD 2014)

SAF = soil allocation factor (Table A9 ESRD 2014)

DF = dilution factor (British Columbia Ministry of Environment, Technical Guidance on Contaminated Sites 4; Vapour Investigation and Remediation, Version 1, September 2010)

3.0 RESULTS

3.1 Groundwater Levels

Groundwater levels on April 23, 2015 ranged from 1.73 mbg at 08MW07 to 1.92 mbg at 08MW02. Groundwater levels on October 8, 2015 ranged from 2.41 mbg at 09MW13 to 2.84 mbg at 08MW02. Based on the calculated relative groundwater elevations, the apparent local groundwater flow direction was to the northwest at a gradient of 0.004 m/m in April 2015 (Figure 3), and to the north at a gradient of 0.00024 m/m in October 2015 (Figure 4).

Monitoring well completion details and the 2015 field monitoring results are summarized in Table 1. Figures 3 and 4 present the site plans showing groundwater elevations in April 2015 and October 2015, respectively.

3.2 Groundwater Chemical Quality

In 2015, parameters measured greater than the referenced Tier 1 Guidelines include benzene, ethylbenzene, PHC fraction F2, nitrate, nitrite, total dissolved solids (TDS), chloride, sodium, sulphate, and dissolved iron and dissolved manganese and are discussed below.

- Concentrations of benzene were greater than the referenced guideline (0.005 mg/L) at all monitoring wells in April and October, with the exception of 08MW07 in October which was less than the laboratory detection limit. Concentrations ranged from 0.0069 mg/L at 08MW07 (April) to 0.22 mg/L at 09MW13 (October).
- Concentrations of ethylbenzene were greater than the referenced guideline (0.0024 mg/L) at 08MW02 and 09MW13 in April and October. Concentrations ranged from 0.0040 mg/L at 08MW02 (April) to 0.16 mg/L at 09MW13 (October).
- Concentrations of PHC fraction F2 were greater than the referenced guideline (1.1 mg/L) at 08MW02 and 09MW13 in April and October. Concentrations ranged from 1.5 mg/L at 09MW13 (April) to 26 mg/L at 08MW02 (April).
- Nitrate concentrations were greater than the referenced guideline (3 mg/L) at 08MW07, 09MW10 and 09MW13, ranging from 3.0 mg/L to 48 mg/L. Nitrite concentrations were greater than the referenced guideline (0.06 mg/L) at 09MW10 and 09MW13, ranging from 1.3 mg/L to 2.4 mg/L.
- TDS concentrations were greater than the referenced guideline (500 mg/L) at all locations sampled, ranging from 1,900 mg/L at 08MW02 (April) to 8,300 mg/L at 08MW07 (October).
- Chloride concentrations were greater than or equal to the referenced guideline (120 mg/L) at 08MW07 (October) and 09MW13 (April and October).
- Sodium and sulphate concentrations were greater than the referenced guideline (200 mg/L and 500 mg/L, respectively) at all locations sampled.
- Dissolved manganese concentrations were greater than the referenced guideline (0.05 mg/L) in the groundwater at all locations sampled, ranging from 0.22 mg/L to 3.5 mg/L. Concentrations of dissolved iron were greater than the referenced guideline at all monitoring wells in October, and at 08MW02 and 09MW13 in April, ranging from 0.35 mg/L to 8.7 mg/L.

Laboratory analytical results, including methods of analyses, are attached in Appendix B. A summary of the 2014 and 2015 groundwater analytical results are provided in Table 2. Historic (2008, 2009, and 2011) groundwater analytical results are summarized in Table 3 and historic groundwater wells and boreholes are identified on Figure 2. Historic soil analytical results are attached as Appendix C.

3.3 Soil Vapour Results

The 2015 concentrations of BTEX and PHC aliphatic and aromatic sub-fractions were within the applicable standards with the exception of benzene and the >C₈-C₁₀ aromatic sub-fraction.

Concentrations of benzene exceeded the RSC in each of the four vapour wells (14VW01 to 14VW04). The >C₈-C₁₀ aromatic sub-fraction exceeded the TC in three of the vapour wells, two of which are installed close to the adjacent residence (14VW01 and 14VW03). Following application of the BC MoE attenuation coefficient, the benzene concentration in each of the four vapour wells still exceeded the calculated soil vapour screening level concentration.

Laboratory analytical results, including methods of analyses, are attached in Appendix B. Table 4 presents the soil vapour analytical data in comparison to the TC (or RSC) derived from ESRD guidance and the soil vapour screening levels calculated using the BC MoE DF for residential and commercial land use.

4.0 DISCUSSION AND CONCLUSIONS

4.1 Groundwater

In 2015, concentrations of benzene, ethylbenzene and PHC fraction F2 were detected greater than the Tier 1 Guidelines in the groundwater at 08MW02 and 09MW13. Concentrations of these parameters at these two monitoring wells also exceeded the referenced guidelines in 2008 and 2009, respectively. However, the concentrations measured in 2014 and 2015 have decreased and xylenes and/or PHC fraction F1 are no longer greater than the referenced guidelines.

Benzene concentrations were greater than the referenced guideline at 08MW07 in April 2015 and at 09MW10 in April and October. Similar to 08MW02 and 09MW13, concentrations of benzene exceeded the referenced guideline in 2008 and 2009, respectively. The benzene concentration decreased at 08MW07 compared to values measured in 2008, and the concentration at 09MW10 in 2015 is similar to the 2009 value. The natural attenuation of PHC concentrations at the site is likely attributed to the underground storage tank and source removal that was completed in 2013.

Routine groundwater parameters were analyzed to assist in determining the potential for the natural attenuation of PHCs at the site. Concentrations of TDS, sodium, sulphate, chloride, nitrate, nitrite, dissolved manganese and dissolved iron greater than the referenced guidelines were measured in one or more monitoring wells in 2015. The concentrations of these parameters, excluding chloride, may reflect natural groundwater composition attributed to the dissolution of soluble salts within the till beneath the site. Generally, the measured concentrations of routine parameters in 2015 were similar to those measured in 2014.

Groundwater analytical results were also evaluated for reduction-oxidation (redox) conditions to comment on the shallow groundwater's natural attenuation capacity.

The degradation of hydrocarbons occurs under both aerobic and anaerobic conditions; aerobic breakdown occurring more rapidly. The significance of the redox condition is, therefore, that under aerobic (oxic) conditions, many PHCs are expected to attenuate much faster than under anoxic conditions. Therefore, if inferred oxic conditions prevail at the edge of the dissolved hydrocarbon plume, the migration of hydrocarbons may stabilize or decrease.

The three simplified redox levels in groundwater are summarized below:

- **Oxic Zone:** Nitrate concentrations are typically stable, but dissolved iron and manganese are not present in appreciable concentrations.
- **Suboxic Zone:** Nitrate concentrations are less than 1 mg-N/L; dissolved manganese is present in concentrations greater than 0.1 mg/L without an accompanying dissolved iron increase.
- **Anoxic Zone:** Nitrate has been reduced; dissolved iron and dissolved manganese occur in concentrations typically greater than 0.1 mg/L; sulphate reduction is occurring, based on observations made during sampling and/or sulphate concentrations are considerably less than background values.

Reviewing the measured concentrations of redox sensitive elements (e.g., nitrate, dissolved manganese, dissolved iron, and sulphate), the inferred redox conditions appear stable and under suboxic conditions. The suboxic conditions suggests that subsurface conditions are suitable, but not optimal for the continued attenuation of PHCs.

4.2 Soil Vapour

As presented in the Alberta 2014 Tier 2 Guidelines, the concentration of PCOCs in soil vapour samples may be used to evaluate the risk to indoor and outdoor receptors via inhalation of vapours originating in the subsurface.

The Health Canada, 2012 PQRA Guidance was applied to calculate an indoor air inhalation screening concentration for each PCOC. The BC MoE attenuation coefficient, as per BC MoE Technical Guidance Document 4 “*Vapour Investigation and Remediation*”, was applied to further calculate a soil vapour screening level. The BC MoE guidance contains an attenuation factor applicable to earthen basements which the Tier 2 Guidelines does not provide.

The concentrations of one or more of benzene and the >C₈-C₁₀ aromatic sub-fraction exceeded the applied guidelines from each of the four vapour wells (14VW01, 14VW02, 14VW03, and 14VW04) in 2015. Following application of the BC MoE attenuation coefficient, the benzene concentration in each of the four vapour wells still exceeded the calculated soil vapour screening level concentration.

The measured benzene and >C₈-C₁₀ aromatic sub-fraction concentrations in April and October 2015 were generally similar or less than those measured in July 2014. The lower concentrations measured in April and October are likely related with lower ambient air temperatures also observed during these months. As higher concentrations were measured in July 2014, including the >C₁₀-C₁₂ aromatic sub-fraction exceeding the calculated soil vapour screening level, seasonal variation is expected to correlate with the weather.

Similar to 2014, the results indicate that there is a risk of exposure to PHCs via inhalation of indoor air at the nearby residence with an earthen basement/crawl space. No risk of exposure via inhalation of indoor air was identified to receptors in surrounding commercial buildings which have concrete floors or basements (Table 4).

5.0 RECOMMENDATIONS

Based on the 2015 GWMP and SVMP, Tetra Tech EBA recommends the following.

- The Village of Barons should facilitate access to the adjacent residential property for the sampling of indoor air at the earliest convenience. If the results of the indoor air samples indicate a risk to occupants, appropriate measures to minimize risk should be implemented (i.e., exhaust fans for vapour extraction).
- Annual groundwater monitoring and sampling of the current monitoring well network and analytical parameters should be continued to maintain and audit of PHC concentrations.
- The suboxic conditions at the site should be improved to oxic with an in situ injection of an oxygen releasing compound to enhance the natural attenuation of PHC compounds.
- The RMP should also be updated to address the risk of exposure to PHC-impacted vapours at the proximal residence with an earthen basement/crawl space.

An updated copy of the RSCF is included in Appendix D.

6.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech EBA Inc.



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PERMIT TO PRACTICE
TETRA TECH EBA INC.

Signature 

Date February 10, 2016

PERMIT NUMBER: P245

The Association of Professional Engineers
and Geoscientists of Alberta

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TABLES

Table 1	Monitoring Well Completion Details and 2015 Field Monitoring Results
Table 2	2014 and 2015 Groundwater Analytical Results
Table 3	Historic Groundwater Analytical Results
Table 4	2014 and 2015 Soil Vapour Analytical Results

Table 1: Monitoring Well Completion Details and 2015 Field Monitoring Results

Monitoring Well I.D.	Date of Installation	Elevation ¹ (m)	Monitoring Well Depth (mbg) ²	Screen Interval (mbg)	Screened In	Depth to Groundwater (mBTOC) ³	Depth to Groundwater (mbg)	Groundwater Elevation (m)	Combustible Vapour Concentrations ⁴	Depth to Groundwater (mBTOC) ³	Depth to Groundwater (mbg)	Groundwater Elevation (m)	Combustible Vapour Concentrations ⁴
						April 23, 2015				October 7, 2015			
08MW02	17-Nov-08	99.33	5.2	2.2 to 5.2	Clay and bedrock	1.92	1.92	97.41	100 ppm	2.84	2.84	96.50	5 ppm
08MW07	17-Nov-08	99.13	6.1	1.6 to 6.1	Clay and bedrock	1.68	1.73	97.45	80 ppm	2.57	2.62	96.56	85 ppm
09MW10	12-Mar-09	99.29	6.1	3.1 to 6.1	Clay and bedrock	1.86	1.86	97.43	90 ppm	2.76	2.76	96.53	80 ppm
09MW13	12-Mar-09	98.86	6.1	3.1 to 6.1	Clay and bedrock	1.51	1.56	97.35	80 ppm	2.36	2.41	96.50	75 ppm

Notes:

Benchmark: Top bolt of fire hydrant located on the northwest corner of Main Street and Alberta Avenue.

¹ Elevation of top of pipe casing.

² Meters below grade.

³ Meters below top of pipe casing.

⁴ Combustible vapour concentrations measured in parts per million using a RKI Eagle Hydrocarbon Surveyor.

Table 2: 2014 and 2015 Groundwater Analytical Results

Parameter	Unit	Tier 1 Guideline ¹	08MW02			08MW07			09MW10			09MW13		
			7/18/2014	4/23/2015	10/8/2015	7/18/2014	4/23/2015	10/8/2015	7/18/2014	4/23/2015	10/8/2015	7/18/2014	4/23/2015	10/8/2015
Hydrocarbons														
Benzene	mg/L	0.005	0.042	0.12	0.18	0.0038	0.0069	<0.0004	0.11	0.15	0.12	0.15	0.22	0.17
Toluene	mg/L	0.024	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Ethylbenzene	mg/L	0.0024	0.0020	0.0040	0.0049	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	0.02	0.016	0.16
Xylene Total	mg/L	0.3	0.0014	0.0026	<0.0008	<0.0008	<0.0008	<0.0008	0.0032	0.01	0.011	0.017	0.019	0.2
F1 (C6-C10) - BTEX	mg/L	2.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.16	0.12	<0.1	0.59	0.26	0.62
F2 (C10-C16 Hydrocarbons)	mg/L	1.1	1.4	26	3.9	0.33	0.13	<0.1	<0.1	0.21	0.23	14	1.5	18
Nutrients														
Nitrate (as N)	mg/L	3	0.21	0.22	<0.01	2.6	4.7	48	0.78	0.48	3.0	1.6	0.18	3.4
Nitrite (as N)	mg/L	0.06	0.034	0.043	<0.01	0.20	0.31	0.054	3.3	2.4	2.2	2.3	2.4	1.3
Calculated Nitrogen	mg/L	NG	0.24	0.27	<0.02	2.8	5.0	48	4.1	2.9	5.2	3.9	2.6	4.7
Calculated Nitrate (as NO3)	mg/L	NG	0.92	0.99	<0.044	12	21	210	3.5	2.1	13	7.2	0.81	15
Calculated Nitrite (as NO2)	mg/L	NG	0.11	0.14	<0.033	0.66	1	0.18	11	7.9	7.4	7.5	7.9	4.4
Routine														
Alkalinity (Carbonate as CaCO3)	mg/L	NG	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
pH	pH Units	6.5-8.5	7.59	7.86	7.35	7.71	7.9	7.67	7.63	7.89	7.44	7.56	7.83	7.31
Hardness as CaCO3	mg/L	NG	1,000	2,700	3,600	1,700	5,000	9,300	2,100	6,900	6,400	2,400	8,200	7,700
Electrical Conductivity (EC)	uS/cm	NG	2,200	2,700	3,600	4,700	5,000	9,300	6,600	6,900	6,400	7,700	8,200	7,700
Total Dissolved Solids (TDS)	mg/L	500	1,600	1,900	2,900	4,000	4,200	8,300	5,700	5,800	5,500	7,000	7,200	6,800
Chloride (Cl) (Filtered)	mg/L	120	24	27	20	51	56	120	86	87	90	130	130	120
Alkalinity (total as CaCO3)	mg/L	NG	680	760	870	770	790	610	990	970	960	1,200	1,100	1,100
Bicarbonate	mg/L	NG	820	930	1,100	940	960	750	1,200	1,200	1,200	1,400	1,400	1,400
Calcium (Filtered)	mg/L	NG	180	170	280	300	290	420	340	320	370	380	330	390
Carbonate	mg/L	NG	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hydroxide	mg/L	NG	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Magnesium (Filtered)	mg/L	NG	130	150	250	230	240	380	290	260	290	360	310	390
Alkalinity (pp as CaCO3)	mg/L	NG	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	-
Potassium (Filtered)	mg/L	NG	3.9	3.7	5.5	6.8	6.2	11	8.2	7.6	9.3	9.1	8.2	11
Sodium (Filtered)	mg/L	200	190	210	340	600	700	1,600	1,000	1,100	1,000	1,300	1,300	1,300
Sulphate (SO4) (Filtered)	mg/L	500	680	820	1,500	2,300	2400	5,100	3,400	3,400	3,100	4,100	4,300	4,000
Metals														
Iron (Filtered)	mg/L	0.3	1.3	3.6	8.7	<0.06	<0.06	0.41	<0.06	<0.06	0.35	1.1	2.9	2.4
Manganese (Filtered)	mg/L	0.05	1.7	2.1	3.5	1.6	1.5	0.22	0.81	0.88	1.1	1.3	1.3	1.6
Inorganics														
Anion Sum	meq/L	NG	28	33	49	66	68	130	93	94	88	110	120	110
Cation Sum	meq/L	NG	29	31	50	60	65	120	86	84	88	100	100	110
Ionic Balance	N/A	NG	1	0.93	1	0.92	0.96	1	0.93	0.9	1	0.91	0.86	0.98

Notes:

¹ Alberta Environment and Sustainable Resource Development (ESRD). 2014. Alberta Tier 1 Soil and Groundwater Remediation Guidelines. Land and Forestry Policy Branch, Policy Division. 195 pp. References guidelines are for fine-grained soils under residential/parkland land use.

NG - No guideline.

< = less than laboratory reportable detection limit.

BOLD AND SHADED - Exceeds Guideline.

Table 3: Historic Groundwater Analytical Results

Parameter	Detection Limits	Units	Tier 1 Guidelines ¹	28-Nov-08					26-Mar-09			31-Mar-11			
				08MW01	08MW02	08MW06	08MW07	08MW08	09MW10	09MW13	09MW19	11MW01	11MW02	11MW03	11MW03 Duplicate
Petroleum Hydrocarbons															
Benzene	0.0009	mg/L	0.005	5.5	1.6	1.2	0.056	<0.0009	0.13	0.7	0.23	<0.0009	<0.0009	<0.0009	<0.0009
Toluene	0.0009	mg/L	0.024	0.0005	0.0017	0.0022	<0.0009	<0.0009	0.0007	0.0013	0.0007	<0.0009	<0.0009	<0.0009	<0.0009
Ethylbenzene	0.0009	mg/L	0.0024	0.47	0.4	0.35	<0.0009	<0.0009	0.0004	0.28	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009
Xylenes	0.002	mg/L	0.3	0.5	0.5	0.52	0.014	<0.002	0.027	0.37	0.0017	<0.002	<0.002	<0.002	<0.002
F1 (C ₆ to C ₁₀)	0.2	mg/L	2.2	<0.2	1	2	0.5	<0.2	0.3	3.9	<0.2	<0.2	<0.2	<0.2	<0.2
F2 (C ₁₀ to C ₁₆)	0.1	mg/L	1.1	6.4	8.2	31.9	0.7	<0.1	0.2	28.4	<0.1	<0.1	<0.1	<0.1	<0.1
Metals															
Lead (Pb)	0.001	mg/L	0.01	0.0059	<0.001	<0.001	0.0002	<0.001	<0.001	<0.001	<0.001	--	--	--	--

Notes:¹ Alberta Environment and Sustainable Resource Development (ESRD). 2014. Alberta Tier 1 Soil and Groundwater Remediation Guidelines. Land and Forestry Policy Branch, Policy

Division. 195 pp. References guidelines are for fine-grained surface and subsoil under residential/parkland land use

< = less than laboratory reportable detection limit.

`-- = Not analyzed.

BOLD AND SHADED - Exceeds Guideline.

Table 4: 2014 and 2015 Soil Vapour Analytical Results

Parameters	Sample Location	14VW01			14VW02			14VW03			14VW04			TC ¹ (ug/m ³)	RSC (ug/m ³)	Residential Soil Vapour Screening Level Concentration ² (ug/m ³)	Commercial Soil Vapour Screening Level Concentration ² (ug/m ³)
	Lab ID	WT9268	AEJ790	BDY016	WT9269	AEJ791	BDY017	WT9270	AEJ792	BDY018	WT9271	AEJ793	BDY019				
	Date	7/18/2014	4/23/2015	10/8/2015	7/18/2014	4/23/2015	10/8/2015	7/18/2014	4/23/2015	10/8/2015	7/18/2014	4/23/2015	10/8/2015				
Volatile Organics																	
Benzene		535	316	273	238	52.6	79.8	639	176	184	205	149	197	NG	3	30	1,103
Toluene		3.5	1.8	4.1	2.3	<1.6	<1.6	6.6	1.7	1.6	<1.6	<1.6	1.7	3,800	NG	19,000	691,664
Ethylbenzene		<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	1,000	NG	5,000	182,017
Xylenes (total)		5.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	180	NG	900	32,763
F1 Petroleum Hydrocarbons																	
>C6-C8 Aliphatic		27.4	5.9	<5.0	11.5	<5.0	8.5	31.0	6.8	<5.0	9.0	154.0	20.2	18,400	NG	92,000	3,349,108
>C8-C10 Aliphatic		81.4	<5.0	<5.0	10.8	<5.0	<5.0	12.0	<5.0	<5.0	<5.0	80.3	<5.0	1,000	NG	5,000	182,017
>C8-C10 Aromatic		442	341	192	387	97.9	79.6	732	297	215	145	224	179	200	NG	1,000	36,403
F2 Petroleum Hydrocarbons																	
>C10-C12 Aliphatic		98.8	14.4	5.7	34.4	7.1	5.0	45.9	19.9	11.1	5.4	16.6	5.8	1,000	NG	5,000	182,017
>C12-C16 Aliphatic		9.8	19.7	<5.0	13.3	9.2	8.3	35.5	7.0	8.9	<5.0	<5.0	7.2	1,000	NG	5,000	182,017
>C10-C12 Aromatic		264	39.2	46.3	149	40.1	193	268	52.6	143	18.2	29.1	45.8	200	NG	1,000	36,403
>C12-C16 Aromatic		10.2	<5.0	<5.0	10.2	<5.0	<5.0	7.0	<5.0	<5.0	<5.0	<5.0	<5.0	200	NG	1,000	36,403

Notes:¹ = Alberta Tier 2 Soil and Groundwater Remediation Guidelines - tolerable concentration (TC) from Table C-7 Human Toxicity Reference Values.² = Alberta Tier 2 Soil and Groundwater Remediation Guidelines - Calculated screening levels for indoor air inhalation employing Health Canada Preliminary Quantitative Risk Assessment Guidance and BC MoE attenuation coefficient for an earthen basement (residential exposure term = 1 with a dilution factor of 10, commercial exposure term = 0.2747 with a dilution factor of 100).

mL/min = millilitres per minute.

< = less than laboratory reportable detection limit.

NG = no guideline.

All results in ug/m³.

TC = tolerable concentration.

RSC = risk specific concentration calculated.

442 Measured concentration exceeds residential TC or RSC.**535** Measured concentration exceeds residential soil vapour screening level.

Sample Duration (min) - 60

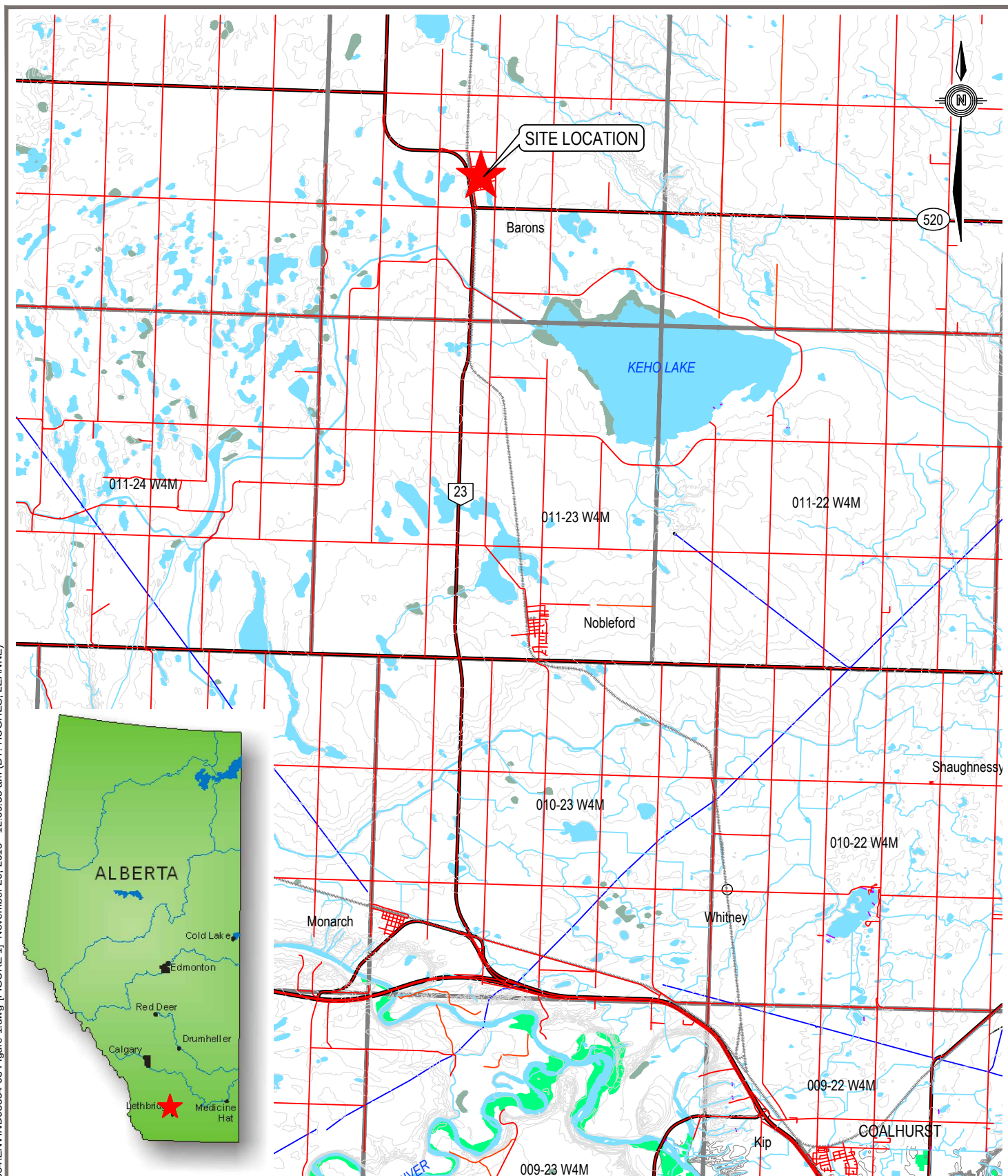
Sample Flow Rate (mL/min) - 23

Sample Volume (litres) - 1.4

FIGURES

Figure 1	Site Location Plan
Figure 2	Site Plan Showing Borehole, Monitoring Well and Soil Vapour Well Locations
Figure 3	Site Plan Showing Groundwater Elevations (April 23, 2015)
Figure 4	Site Plan Showing Groundwater Elevations (October 7, 2015)

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NOTES
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CLIENT

Village of Barons



TETRA TECH EBA

2015 GROUNDWATER AND SOIL VAPOUR
MONITORING PROGRAM, 202 MAIN STREET
BARONS, ALBERTA, AMA SITE 9557

SITE LOCATION PLAN

PROJECT NO.
ENVIND03354-03

DWN
LCH

CKD
BC

REV
0

OFFICE
LETHBRIDGE

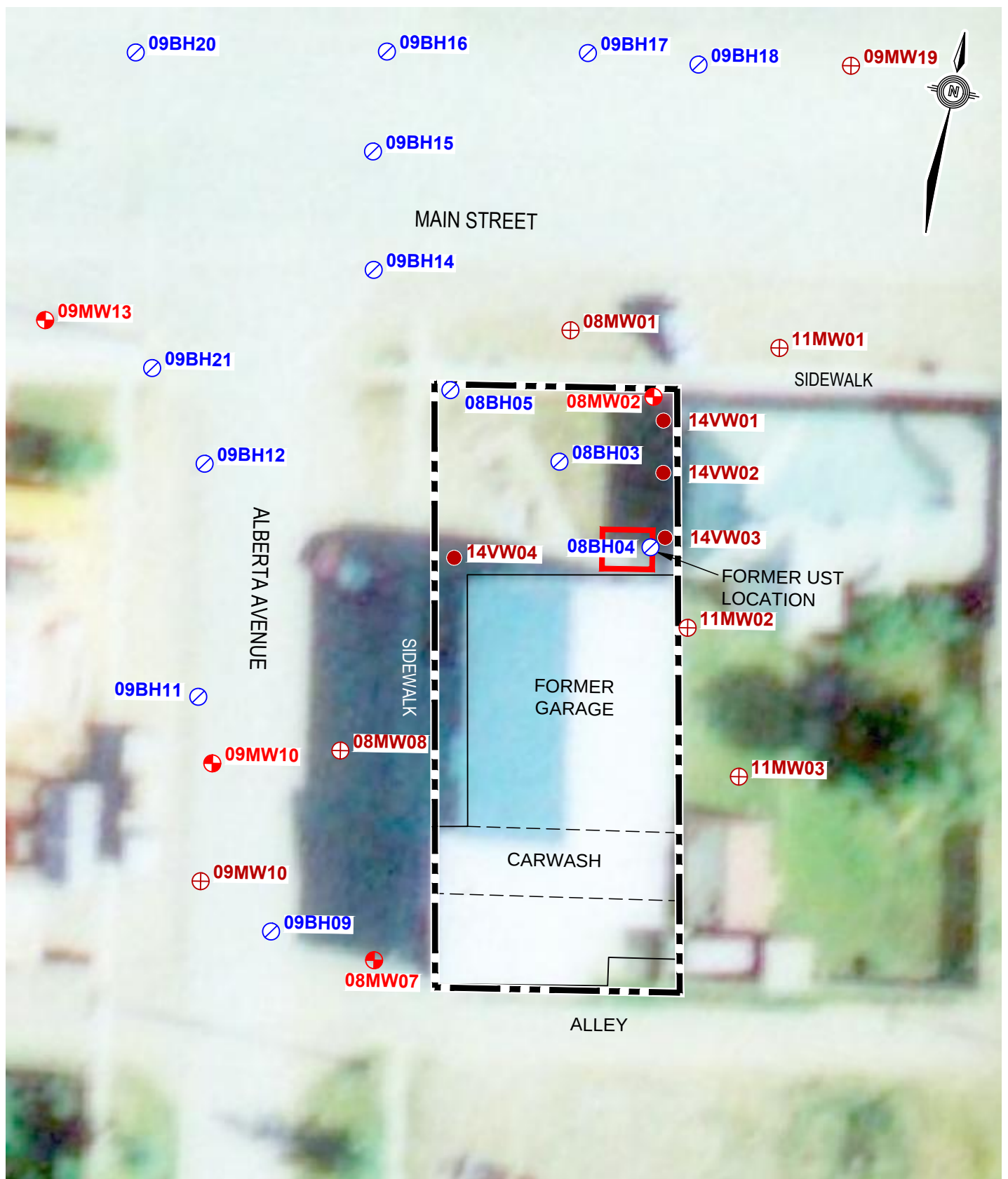
DATE
November 2015

Figure 1

0 8 km

Scale: 1:150,000 @ 8.5"x11"

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LEGEND

- SITE BOUNDARY
- ⊕ COMPLIANCE MONITORING WELL
- SOIL VAPOUR WELL
- ⊕ HISTORIC MONITORING WELL
- HISTORIC BOREHOLE

0 10 m

Scale: 1:250 @ 8.5"x11"

CLIENT

Village of Barons

TETRA TECH EBA

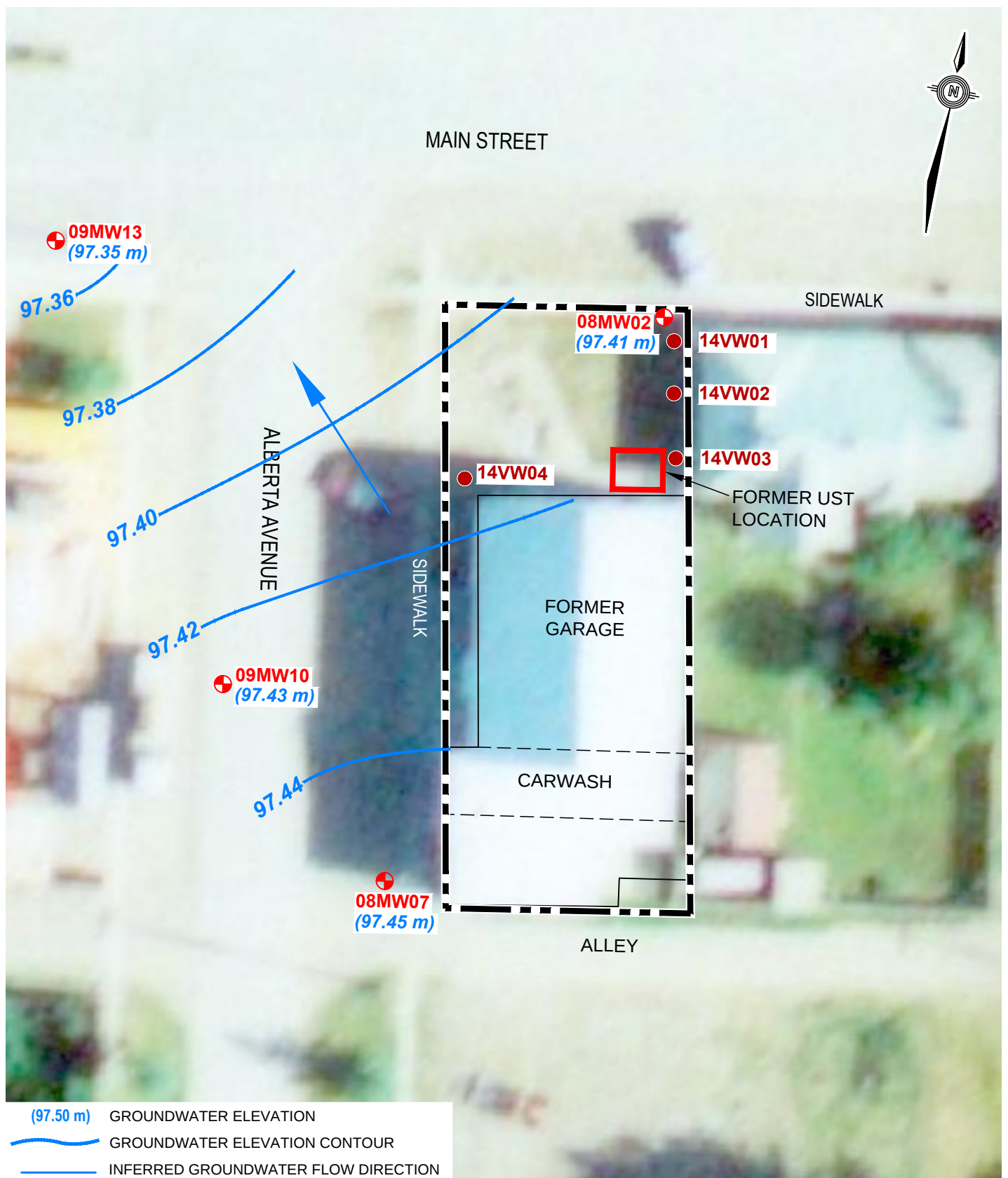
2015 GROUNDWATER AND SOIL VAPOUR MONITORING PROGRAM, 202 MAIN STREET BARONS, ALBERTA, AMA SITE 9557

SITE PLAN SHOWING BOREHOLE, MONITORING WELL AND SOIL VAPOUR WELL LOCATIONS

PROJECT NO. ENVIND03354-03	DWN LCH	CKD BC	REV 0
OFFICE LETHBRIDGE	DATE February 2016		

Figure 2

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(97.50 m) GROUNDWATER ELEVATION
 GROUNDWATER ELEVATION CONTOUR
 INFERRED GROUNDWATER FLOW DIRECTION

- LEGEND**
- SITE BOUNDARY
 - ⊕ COMPLIANCE MONITORING WELL
 - SOIL VAPOUR WELL

0 10 m
 Scale: 1:250 @ 8.5"x11"

CLIENT

Village of Barons



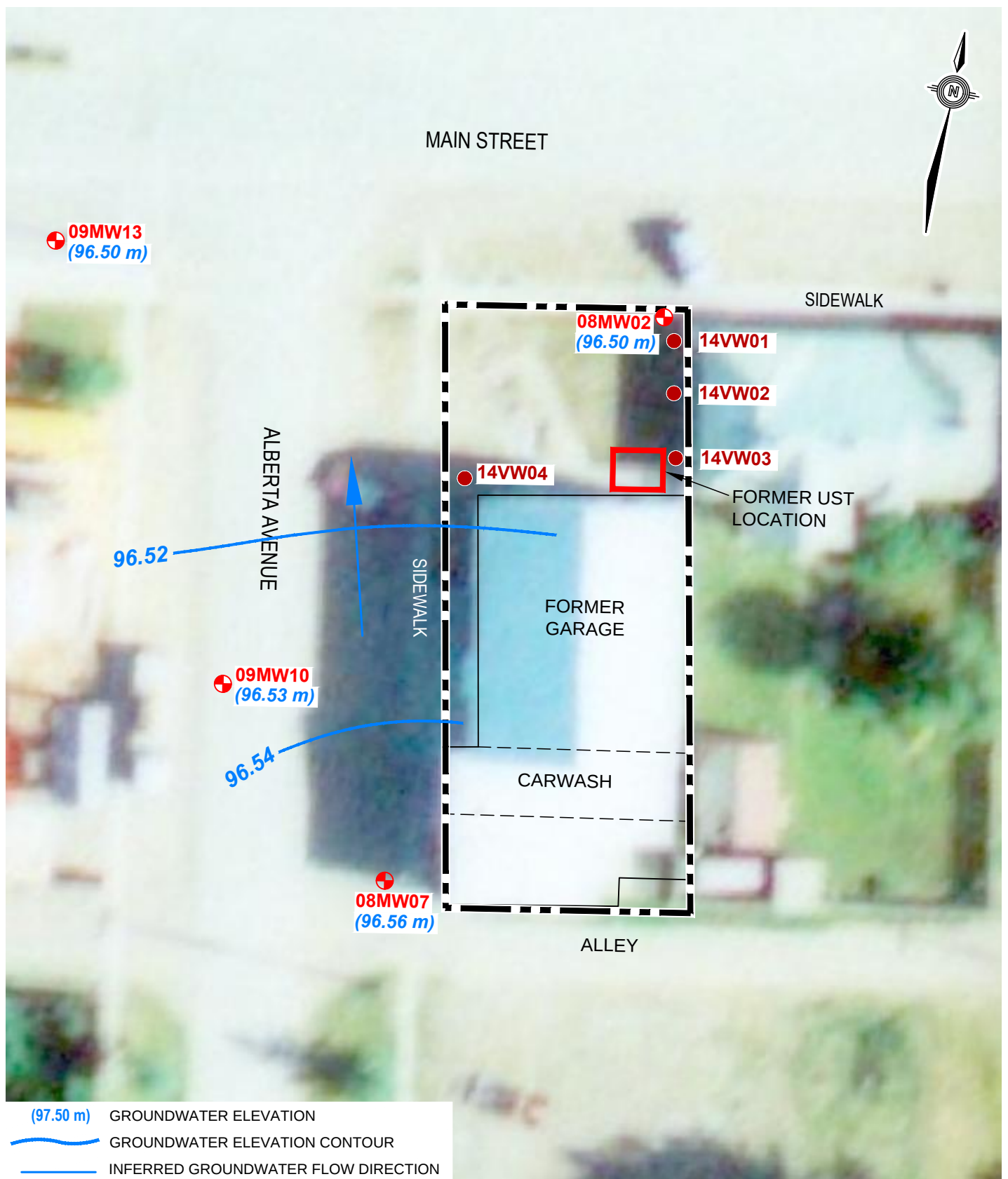
**2015 GROUNDWATER AND SOIL VAPOUR
 MONITORING PROGRAM, 202 MAIN STREET
 BARONS, ALBERTA, AMA SITE 9557**

**SITE PLAN SHOWING
 GROUNDWATER ELEVATIONS
 (April 23, 2015)**

PROJECT NO. ENVIND03354-03	DWN LCH	CKD BC	REV 0
OFFICE LETHBRIDGE	DATE January 2016		

Figure 3

C:\Riverbend\Drafting\ENV\IND\ENV\IND03354\ENV\IND03354-03 Figures 2,3,4.dwg [FIGURE 4] January 20, 2016 - 10:28:39 am (BY: HUGHES, LEANNE)



- (97.50 m) GROUNDWATER ELEVATION
GROUNDWATER ELEVATION CONTOUR
INFERRED GROUNDWATER FLOW DIRECTION

LEGEND

- SITE BOUNDARY
COMPLIANCE MONITORING WELL
SOIL VAPOUR WELL

0 10 m
Scale: 1:250 @ 8.5"x11"

CLIENT

Village of Barons



TETRA TECH EBA

2015 GROUNDWATER AND SOIL VAPOUR
MONITORING PROGRAM, 202 MAIN STREET
BARONS, ALBERTA, AMA SITE 9557

SITE PLAN SHOWING
GROUNDWATER ELEVATIONS
(October 7, 2015)

PROJECT NO.
ENVIND03354-03

DWN
LCH

CKD
BC

REV
0

OFFICE
LETHBRIDGE

DATE
January 2016

Figure 4

APPENDIX A

TETRA TECH'S GENERAL CONDITIONS

GENERAL CONDITIONS

GEOENVIRONMENTAL REPORT

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of Tetra Tech EBA's client. Tetra Tech EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than Tetra Tech EBA's Client unless otherwise authorized in writing by Tetra Tech EBA. Any unauthorized use of the report is at the sole risk of the user.

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2.0 ALTERNATE REPORT FORMAT

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4.0 INFORMATION PROVIDED TO TETRA TECH EBA BY OTHERS

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APPENDIX B

LABORATORY CERTIFICATES

Your Project #: ENVIND03354-03
Site Location: 202-MAIN ST.- G.W. MONITORING, BARONS,
AB/AMA 9557
Your C.O.C. #: A186127

Attention: JAYMES GOING

TETRA TECH EBA INC.
442-10 STREET NORTH
LETHBRIDGE, AB
CANADA T1H 2C7

Report Date: 2015/04/29

Report #: R1860501

Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B533575

Received: 2015/04/25, 09:40

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO ₃ ,HCO ₃ ,OH	4	N/A	2015/04/28	AB SOP-00005	SM 22 2320 B m
BTEX/F1 in Water by HS GC/MS/FID	4	N/A	2015/04/27	AB SOP-00039	CCME CWS/EPA 8260C m
Chloride by Automated Colourimetry	4	N/A	2015/04/29	AB SOP-00020	SM 22-4500-Cl G m
Conductivity @25C	4	N/A	2015/04/28	AB SOP-00005	SM 22 2510 B m
CCME Hydrocarbons in Water (F2; C10-C16)	4	2015/04/27	2015/04/28	AB SOP-00040 AB SOP-00037	CCME PHC-CWS
Hardness	4	N/A	2015/04/29	AB WI-00065	Auto Calc
Elements by ICP - Dissolved	1	N/A	2015/04/27	AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICP - Dissolved	3	N/A	2015/04/28	AB SOP-00042	EPA 200.7 CFR 2012 m
Ion Balance	4	N/A	2015/04/28	AB WI-00065	SM 1030E
Sum of cations, anions	4	N/A	2015/04/29	AB WI-00065	SM 1030E
Nitrate and Nitrite	4	N/A	2015/04/28	AB SOP-00023	Auto Calc
Nitrate + Nitrite-N (calculated)	4	N/A	2015/04/28	AB SOP-00023	Auto Calc
Nitrogen, (Nitrite, Nitrate) by IC	4	N/A	2015/04/27	AB SOP-00023	SM 22 4110 B m
pH @25°C (Alkalinity titrator)	4	N/A	2015/04/28	AB SOP-00005	SM 22 4500-H+B m
Sulphate by Automated Colourimetry	4	N/A	2015/04/29	AB SOP-00018	SM 22 4500-SO4 E m
Total Dissolved Solids (Calculated)	4	N/A	2015/04/29	AB WI-00065	SM 1030E

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.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ioana Stoica, Project Manager

Email: IStoica@maxxam.ca

Phone# (403)735-2227

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 #: B533575
Report Date: 2015/04/29

TETRA TECH EBA INC.
Client Project #: ENVIND03354-03
Site Location: 202-MAIN ST.- G.W. MONITORING, BARONS,
AB/AMA 9557
Sampler Initials: JL

AT1 BTEX AND F1-F2 (WATER)

Maxxam ID		MC8653	MC8654	MC8655	MC8656		
Sampling Date		2015/04/23 11:00	2015/04/23 11:30	2015/04/23 12:00	2015/04/23 12:30		
COC Number		A186127	A186127	A186127	A186127		
	Units	08MW07	09MW10	08MW02	09MW13	RDL	QC Batch
Hydrocarbons							
F2 (C10-C16 Hydrocarbons)	mg/L	0.13	0.21	26	1.5	0.10	7883013
Volatiles							
Benzene	mg/L	0.0069	0.15	0.12	0.22	0.00040	7883280
Toluene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	7883280
Ethylbenzene	mg/L	<0.00040	<0.00040	0.0040	0.016	0.00040	7883280
m & p-Xylene	mg/L	<0.00080	0.0036	0.0026	0.015	0.00080	7883280
o-Xylene	mg/L	<0.00040	0.0065	<0.00040	0.0039	0.00040	7883280
Xylenes (Total)	mg/L	<0.00080	0.010	0.0026	0.019	0.00080	7883280
F1 (C6-C10) - BTEX	mg/L	<0.10	0.12	<0.10	0.26	0.10	7883280
(C6-C10)	mg/L	<0.10	0.28	0.19	0.51	0.10	7883280
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	108	107	109	109	N/A	7883280
4-Bromofluorobenzene (sur.)	%	111	111	111	111	N/A	7883280
D4-1,2-Dichloroethane (sur.)	%	114	120	120	116	N/A	7883280
O-TERPHENYL (sur.)	%	94	102	103	93	N/A	7883013
RDL = Reportable Detection Limit N/A = Not Applicable							

Maxxam Job #: B533575
Report Date: 2015/04/29

TETRA TECH EBA INC.
Client Project #: ENVIND03354-03
Site Location: 202-MAIN ST.- G.W. MONITORING, BARONS,
AB/AMA 9557
Sampler Initials: JL

ROUTINE WATER (WATER)

Maxxam ID		MC8653		MC8654		MC8655		MC8656		
Sampling Date		2015/04/23 11:00		2015/04/23 11:30		2015/04/23 12:00		2015/04/23 12:30		
COC Number		A186127		A186127		A186127		A186127		
	Units	08MW07	RDL	09MW10	RDL	08MW02	RDL	09MW13	RDL	QC Batch
Calculated Parameters										
Anion Sum	meq/L	68	N/A	94	N/A	33	N/A	120	N/A	7882644
Cation Sum	meq/L	65	N/A	84	N/A	31	N/A	100	N/A	7882644
Hardness (CaCO ₃)	mg/L	1700	0.50	1900	0.50	1100	0.50	2100	0.50	7882642
Ion Balance	N/A	0.96	0.010	0.90	0.010	0.93	0.010	0.86	0.010	7882643
Dissolved Nitrate (NO ₃)	mg/L	21	0.044	2.1	0.044	0.99	0.044	0.81	0.044	7882587
Nitrate plus Nitrite (N)	mg/L	5.0	0.010	2.9	0.010	0.27	0.010	2.6	0.010	7882588
Dissolved Nitrite (NO ₂)	mg/L	1.0	0.033	7.9	0.033	0.14	0.033	7.9	0.033	7882587
Total Dissolved Solids	mg/L	4200	10	5800	10	1900	10	7200	10	7882675
Misc. Inorganics										
Conductivity	uS/cm	5000	1.0	6900	1.0	2700	1.0	8200	1.0	7884142
pH	pH	7.90	N/A	7.89	N/A	7.86	N/A	7.83	N/A	7884141
Anions										
Alkalinity (PP as CaCO ₃)	mg/L	<0.50	0.50	<0.50	0.50	<0.50	0.50	<0.50	0.50	7884140
Alkalinity (Total as CaCO ₃)	mg/L	790	0.50	970	0.50	760	0.50	1100	0.50	7884140
Bicarbonate (HCO ₃)	mg/L	960	0.50	1200	0.50	930	0.50	1400	0.50	7884140
Carbonate (CO ₃)	mg/L	<0.50	0.50	<0.50	0.50	<0.50	0.50	<0.50	0.50	7884140
Hydroxide (OH)	mg/L	<0.50	0.50	<0.50	0.50	<0.50	0.50	<0.50	0.50	7884140
Dissolved Sulphate (SO ₄)	mg/L	2400 (1)	20	3400 (1)	25	820 (1)	5.0	4300 (1)	50	7885971
Dissolved Chloride (Cl)	mg/L	56	1.0	87	1.0	27	1.0	130	1.0	7885966
Nutrients										
Dissolved Nitrite (N)	mg/L	0.31	0.010	2.4	0.010	0.043	0.010	2.4	0.010	7884093
Dissolved Nitrate (N)	mg/L	4.7	0.010	0.48	0.010	0.22	0.010	0.18	0.010	7884093
Elements										
Dissolved Calcium (Ca)	mg/L	290	0.30	320	0.30	170	0.30	330	0.30	7883688
Dissolved Iron (Fe)	mg/L	<0.060	0.060	<0.060	0.060	3.6	0.060	2.9	0.060	7883688
Dissolved Magnesium (Mg)	mg/L	240	0.20	260	0.20	150	0.20	310	0.20	7883688
Dissolved Manganese (Mn)	mg/L	1.5	0.0040	0.88	0.0040	2.1	0.0040	1.3	0.0040	7883688
Dissolved Potassium (K)	mg/L	6.2	0.30	7.6	0.30	3.7	0.30	8.2	0.30	7883688
Dissolved Sodium (Na)	mg/L	700 (1)	2.5	1100 (1)	2.5	210	0.50	1300 (1)	2.5	7883688
RDL = Reportable Detection Limit										
N/A = Not Applicable										
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.										

Maxxam Job #: B533575
Report Date: 2015/04/29

TETRA TECH EBA INC.
Client Project #: ENVIND03354-03
Site Location: 202-MAIN ST.- G.W. MONITORING, BARONS,
AB/AMA 9557
Sampler Initials: JL

GENERAL COMMENTS

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

Package 1	9.3°C
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Sample MC8656-01 : Cation anion balance investigated data quality confirmed.

Results relate only to the items tested.

Maxxam Job #: B533575
Report Date: 2015/04/29

TETRA TECH EBA INC.
Client Project #: ENVIND03354-03
Site Location: 202-MAIN ST.- G.W. MONITORING, BARONS,
AB/AMA 9557
Sampler Initials: JL

QUALITY ASSURANCE REPORT

QA/QC				Date					
Batch	Init	QC Type	Parameter	Analyzed	Value	Recovery	Units	QC Limits	
7883013	MWB	Matrix Spike	O-TERPHENYL (sur.)	2015/04/27		103	%	50 - 130	
			F2 (C10-C16 Hydrocarbons)	2015/04/27		110	%	50 - 130	
7883013	MWB	Spiked Blank	O-TERPHENYL (sur.)	2015/04/27		104	%	50 - 130	
			F2 (C10-C16 Hydrocarbons)	2015/04/27		107	%	70 - 130	
7883013	MWB	Method Blank	O-TERPHENYL (sur.)	2015/04/27		104	%	50 - 130	
			F2 (C10-C16 Hydrocarbons)	2015/04/27	<0.10	mg/L			
7883013	MWB	RPD	F2 (C10-C16 Hydrocarbons)	2015/04/27	NC		%	40	
7883280	ABG	Matrix Spike	1,4-Difluorobenzene (sur.)	2015/04/27		107	%	70 - 130	
			4-Bromofluorobenzene (sur.)	2015/04/27		112	%	70 - 130	
			D4-1,2-Dichloroethane (sur.)	2015/04/27		111	%	70 - 130	
			Benzene	2015/04/27		103	%	70 - 130	
			Toluene	2015/04/27		96	%	70 - 130	
			Ethylbenzene	2015/04/27		99	%	70 - 130	
			m & p-Xylene	2015/04/27		99	%	70 - 130	
			o-Xylene	2015/04/27		97	%	70 - 130	
			(C6-C10)	2015/04/27		101	%	70 - 130	
			1,4-Difluorobenzene (sur.)	2015/04/27		110	%	70 - 130	
			4-Bromofluorobenzene (sur.)	2015/04/27		109	%	70 - 130	
			D4-1,2-Dichloroethane (sur.)	2015/04/27		114	%	70 - 130	
7883280	ABG	Spiked Blank	Benzene	2015/04/27		110	%	70 - 130	
			Toluene	2015/04/27		103	%	70 - 130	
			Ethylbenzene	2015/04/27		106	%	70 - 130	
			m & p-Xylene	2015/04/27		106	%	70 - 130	
			o-Xylene	2015/04/27		106	%	70 - 130	
			(C6-C10)	2015/04/27		105	%	70 - 130	
			1,4-Difluorobenzene (sur.)	2015/04/27		108	%	70 - 130	
			4-Bromofluorobenzene (sur.)	2015/04/27		111	%	70 - 130	
			D4-1,2-Dichloroethane (sur.)	2015/04/27		111	%	70 - 130	
			Benzene	2015/04/27	<0.00040	mg/L			
			Toluene	2015/04/27	<0.00040	mg/L			
			Ethylbenzene	2015/04/27	<0.00040	mg/L			
7883280	ABG	Method Blank	m & p-Xylene	2015/04/27	<0.00080	mg/L			
			o-Xylene	2015/04/27	<0.00040	mg/L			
			Xylenes (Total)	2015/04/27	<0.00080	mg/L			
			F1 (C6-C10) - BTEX	2015/04/27	<0.10	mg/L			
			(C6-C10)	2015/04/27	<0.10	mg/L			
			Benzene	2015/04/27	1.9	%	40		
			Toluene	2015/04/27	1.5	%	40		
			Ethylbenzene	2015/04/27	1.5	%	40		
			m & p-Xylene	2015/04/27	1.7	%	40		
			o-Xylene	2015/04/27	1.3	%	40		
			Xylenes (Total)	2015/04/27	1.6	%	40		
			F1 (C6-C10) - BTEX	2015/04/27	NC	%	40		
(C6-C10)	2015/04/27	NC	%	40					
7883688	SRT	Matrix Spike	Dissolved Calcium (Ca)	2015/04/27		NC	%	80 - 120	
			Dissolved Iron (Fe)	2015/04/27		83	%	80 - 120	
			Dissolved Magnesium (Mg)	2015/04/27		NC	%	80 - 120	
			Dissolved Manganese (Mn)	2015/04/27		NC	%	80 - 120	
			Dissolved Potassium (K)	2015/04/27		93	%	80 - 120	
			Dissolved Sodium (Na)	2015/04/27		NC	%	80 - 120	
7883688	SRT	Spiked Blank	Dissolved Calcium (Ca)	2015/04/27		94	%	80 - 120	

Maxxam Job #: B533575
Report Date: 2015/04/29

TETRA TECH EBA INC.
Client Project #: ENVIND03354-03
Site Location: 202-MAIN ST.- G.W. MONITORING, BARONS,
AB/AMA 9557
Sampler Initials: JL

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
7883688	SRT	Method Blank	Dissolved Iron (Fe)	2015/04/27		94	%	80 - 120
			Dissolved Magnesium (Mg)	2015/04/27		97	%	80 - 120
			Dissolved Manganese (Mn)	2015/04/27		93	%	80 - 120
			Dissolved Potassium (K)	2015/04/27		94	%	80 - 120
			Dissolved Sodium (Na)	2015/04/27		92	%	80 - 120
			Dissolved Calcium (Ca)	2015/04/27	<0.30		mg/L	
			Dissolved Iron (Fe)	2015/04/27	<0.060		mg/L	
			Dissolved Magnesium (Mg)	2015/04/27	<0.20		mg/L	
			Dissolved Manganese (Mn)	2015/04/27	<0.0040		mg/L	
			Dissolved Potassium (K)	2015/04/27	<0.30		mg/L	
7883688	SRT	RPD	Dissolved Sodium (Na)	2015/04/27	<0.50		mg/L	
			Dissolved Calcium (Ca)	2015/04/28	0.099		%	20
			Dissolved Iron (Fe)	2015/04/28	1.2		%	20
			Dissolved Magnesium (Mg)	2015/04/28	1.4		%	20
			Dissolved Manganese (Mn)	2015/04/28	0.86		%	20
			Dissolved Potassium (K)	2015/04/28	2.3		%	20
			Dissolved Sodium (Na)	2015/04/28	2.9		%	20
			Dissolved Nitrite (N)	2015/04/27		101	%	80 - 120
			Dissolved Nitrate (N)	2015/04/27		101	%	80 - 120
			Dissolved Nitrite (N)	2015/04/27		102	%	80 - 120
7884093	JLD	Matrix Spike	Dissolved Nitrate (N)	2015/04/27		103	%	80 - 120
			Dissolved Nitrite (N)	2015/04/27			%	
7884093	JLD	Method Blank	Dissolved Nitrite (N)	2015/04/27	<0.010		mg/L	
			Dissolved Nitrate (N)	2015/04/27	<0.010		mg/L	
7884093	JLD	RPD	Dissolved Nitrite (N)	2015/04/27	NC		%	20
			Dissolved Nitrate (N)	2015/04/27	NC		%	20
7884140	CPI	Spiked Blank	Alkalinity (Total as CaCO ₃)	2015/04/28		95	%	80 - 120
7884140	CPI	Method Blank	Alkalinity (PP as CaCO ₃)	2015/04/28	<0.50		mg/L	
			Alkalinity (Total as CaCO ₃)	2015/04/28	0.55, RDL=0.50		mg/L	
			Bicarbonate (HCO ₃)	2015/04/28	0.67, RDL=0.50		mg/L	
7884140	CPI	RPD	Carbonate (CO ₃)	2015/04/28	<0.50		mg/L	
			Hydroxide (OH)	2015/04/28	<0.50		mg/L	
			Alkalinity (PP as CaCO ₃)	2015/04/28	NC		%	20
			Alkalinity (Total as CaCO ₃)	2015/04/28	NC		%	20
			Bicarbonate (HCO ₃)	2015/04/28	NC		%	20
			Carbonate (CO ₃)	2015/04/28	NC		%	20
			Hydroxide (OH)	2015/04/28	NC		%	20
			pH	2015/04/28		100	%	97 - 103
			pH	2015/04/28	0.091		%	N/A
			Conductivity	2015/04/28		103	%	90 - 110
7884142	CPI	Method Blank	Conductivity	2015/04/28	<1.0		uS/cm	
7884142	CPI	RPD	Conductivity	2015/04/28	2.7		%	20
7885966	KP9	Matrix Spike	Dissolved Chloride (Cl)	2015/04/29		NC	%	80 - 120
7885966	KP9	Spiked Blank	Dissolved Chloride (Cl)	2015/04/29		105	%	80 - 120
7885966	KP9	Method Blank	Dissolved Chloride (Cl)	2015/04/29	<1.0		mg/L	
7885966	KP9	RPD	Dissolved Chloride (Cl)	2015/04/29	0.62		%	20
7885971	KP9	Matrix Spike	Dissolved Sulphate (SO ₄)	2015/04/29		NC	%	80 - 120
7885971	KP9	Spiked Blank	Dissolved Sulphate (SO ₄)	2015/04/29		104	%	80 - 120
7885971	KP9	Method Blank	Dissolved Sulphate (SO ₄)	2015/04/29	<1.0		mg/L	

Maxxam Job #: B533575
Report Date: 2015/04/29

TETRA TECH EBA INC.
Client Project #: ENVIND03354-03
Site Location: 202-MAIN ST.- G.W. MONITORING, BARONS,
AB/AMA 9557
Sampler Initials: JL

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC					Date				
Batch	Init	QC Type	Parameter		Analyzed	Value	Recovery	Units	QC Limits
7885971	KP9	RPD	Dissolved Sulphate (SO4)		2015/04/29	3.5		%	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).									

Maxxam Job #: B533575
Report Date: 2015/04/29

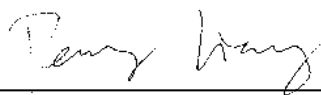
TETRA TECH EBA INC.
Client Project #: ENVIND03354-03
Site Location: 202-MAIN ST.- G.W. MONITORING, BARONS,
AB/AMA 9557
Sampler Initials: JL

VALIDATION SIGNATURE PAGE

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



Luba Shymushovska, Organics – Senior Analyst



Peng Liang, Senior Analyst

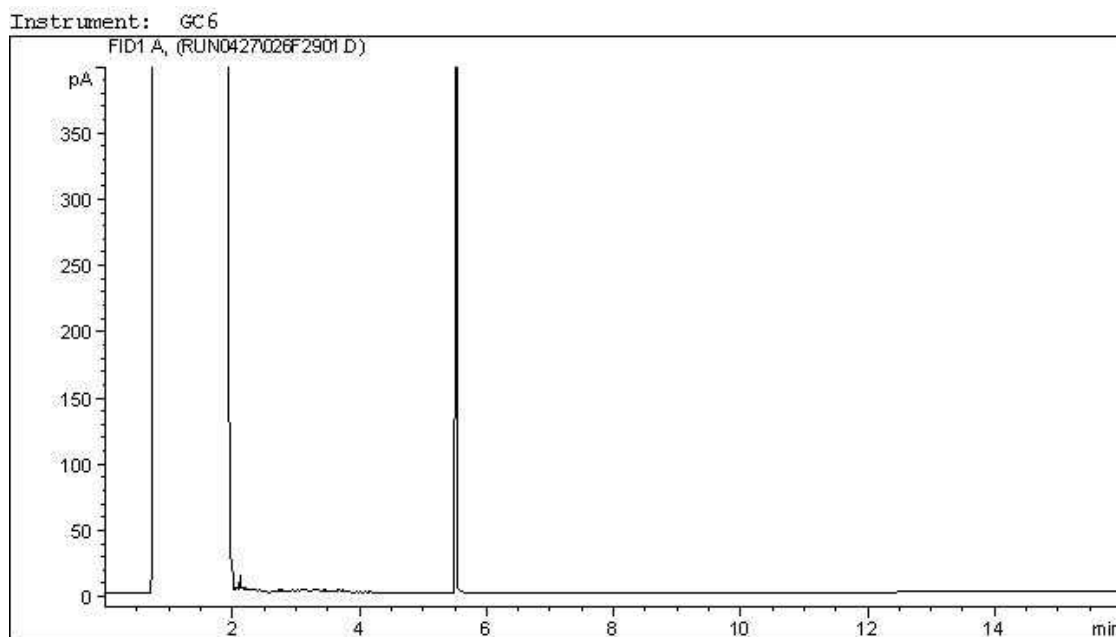
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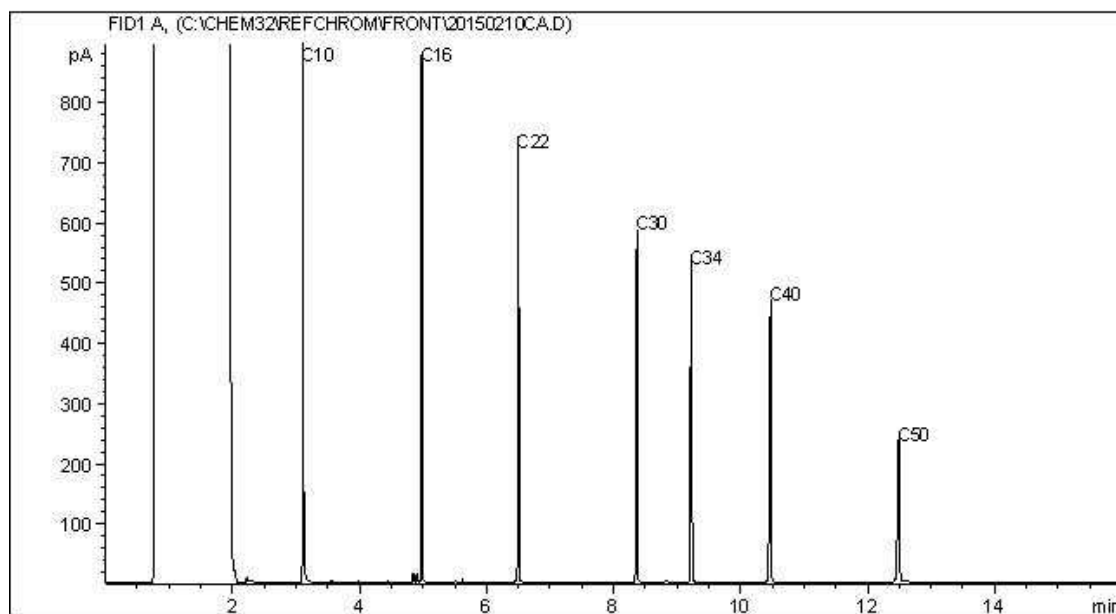
Please indicate Filtered, Preserved or Both (F, P, F/P)

Received By: 		Date: 15/04/25		Time: 0940		Maxconn Job #:	
Jesse Wong		Custody Seal		Temperature		Ice	
Lab Comments:		N		9, 9, 10		H ₂ O	

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



Carbon Range Distribution - Reference Chromatogram

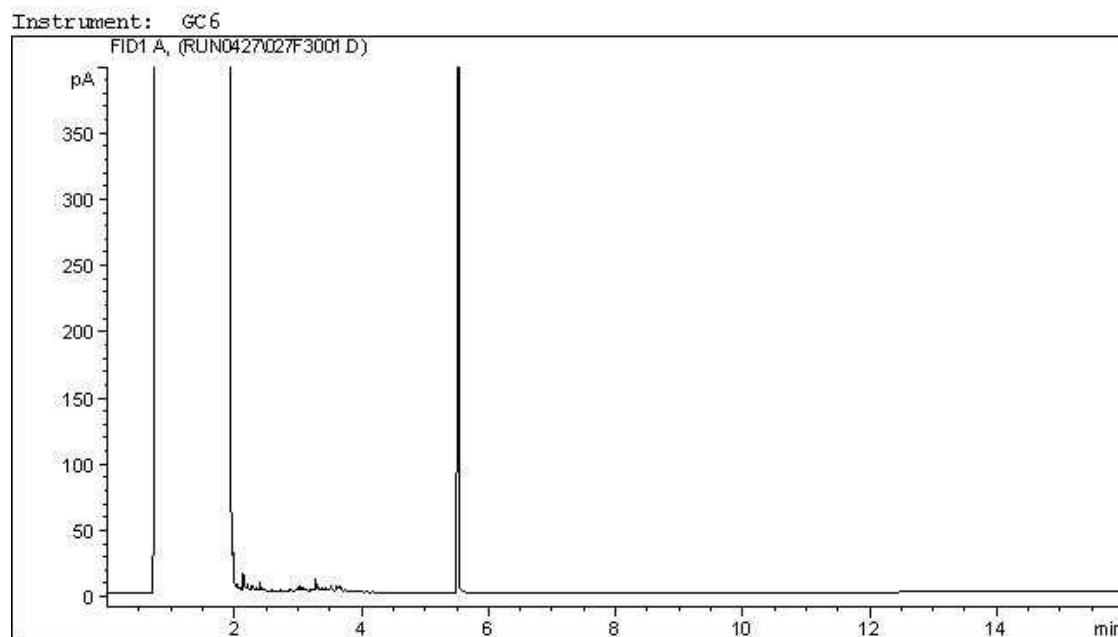


TYPICAL PRODUCT CARBON NUMBER RANGES

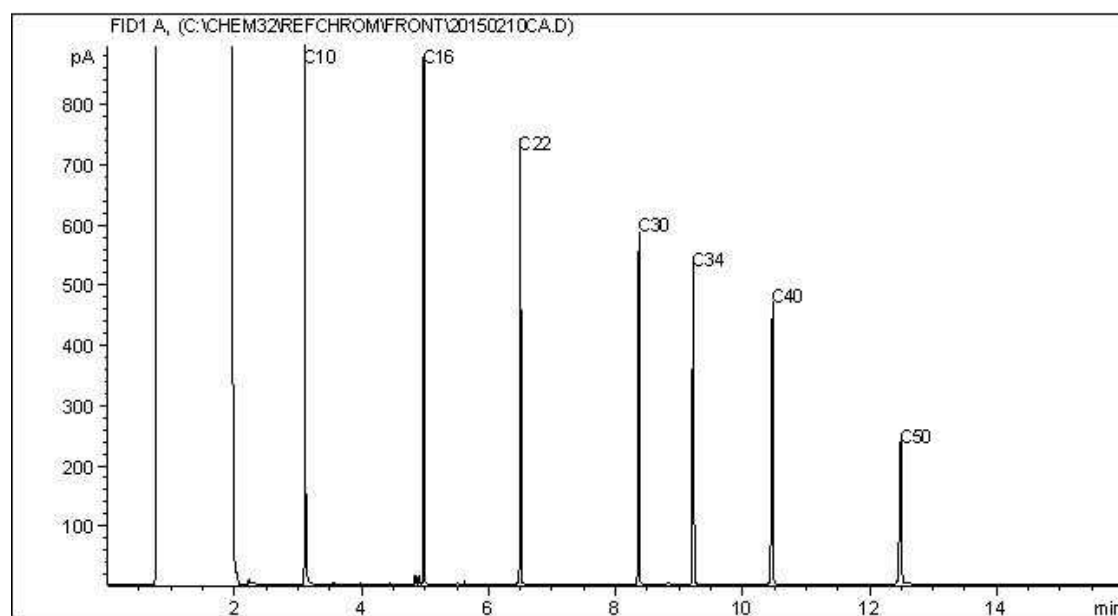
Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

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

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



Carbon Range Distribution - Reference Chromatogram



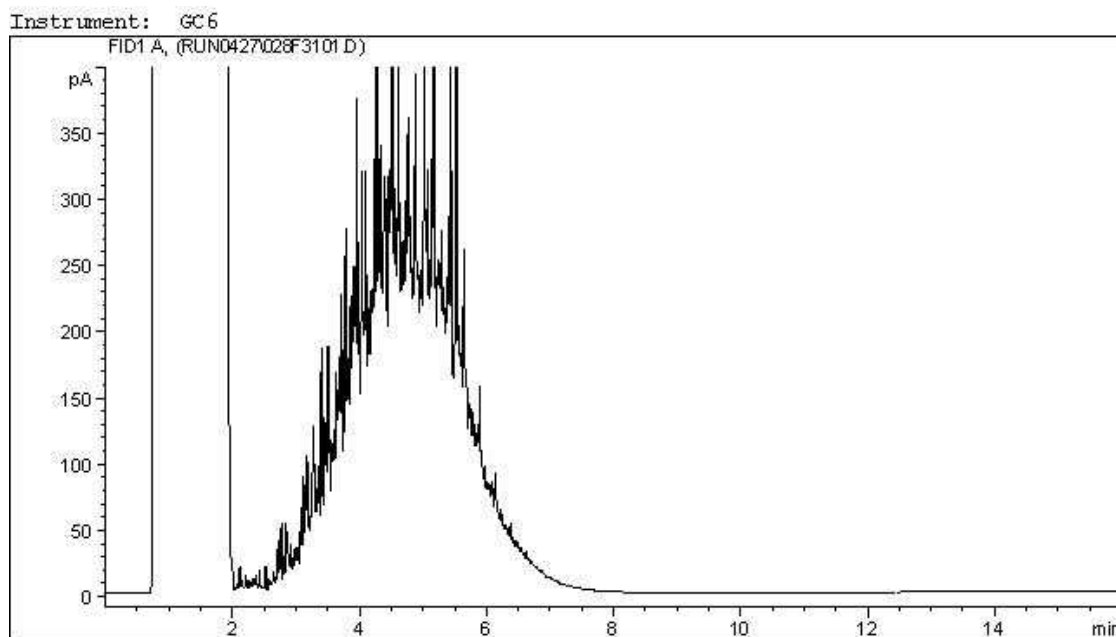
TYPICAL PRODUCT CARBON NUMBER RANGES

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

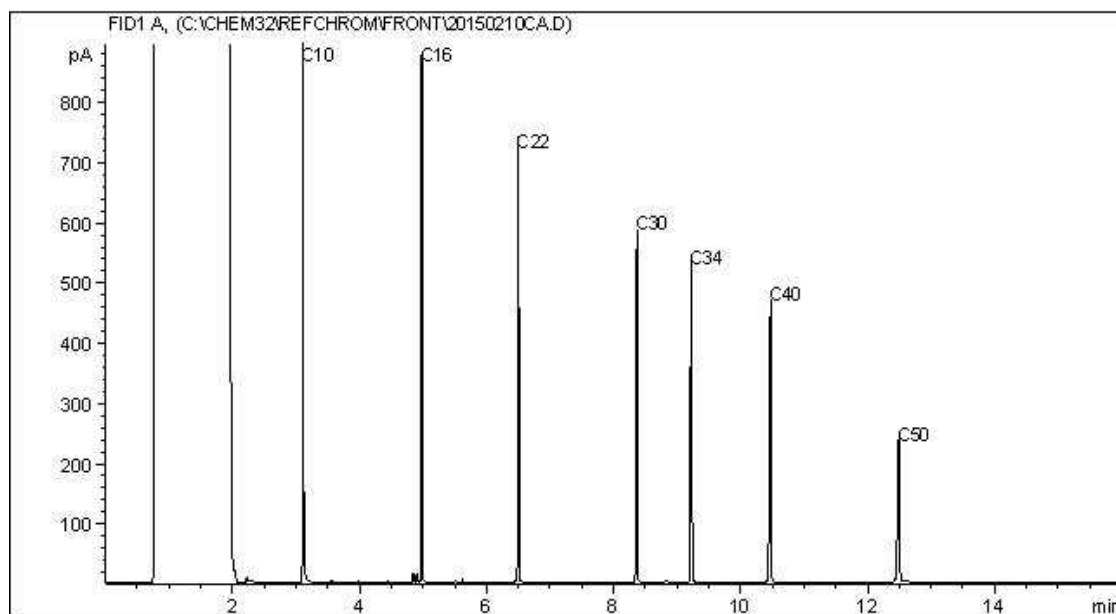
Page 1 of 1

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

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



Carbon Range Distribution - Reference Chromatogram

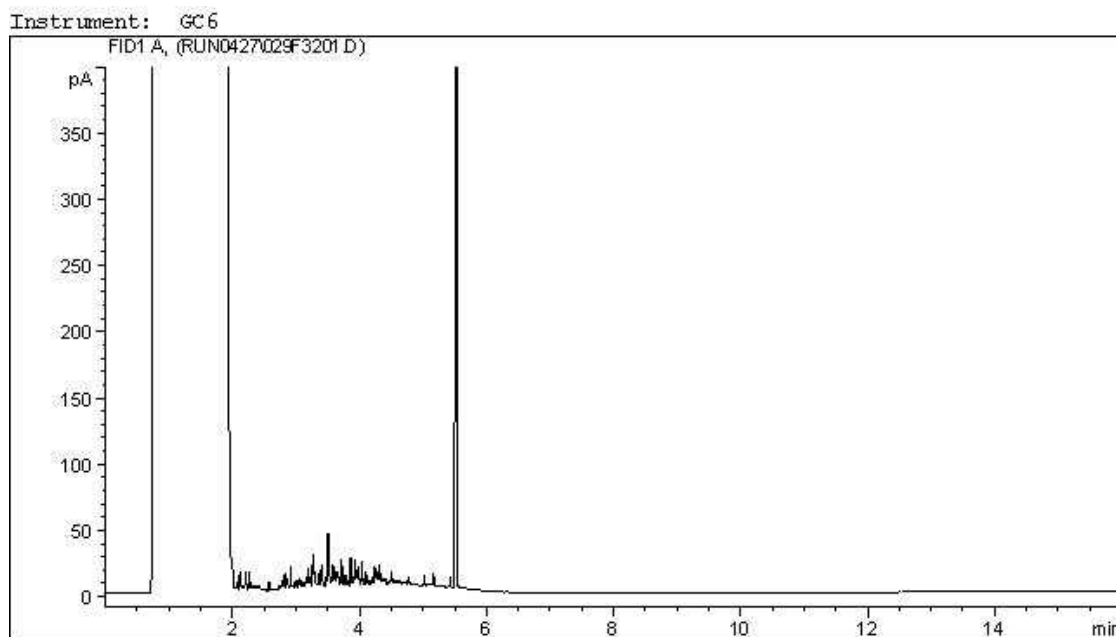


TYPICAL PRODUCT CARBON NUMBER RANGES

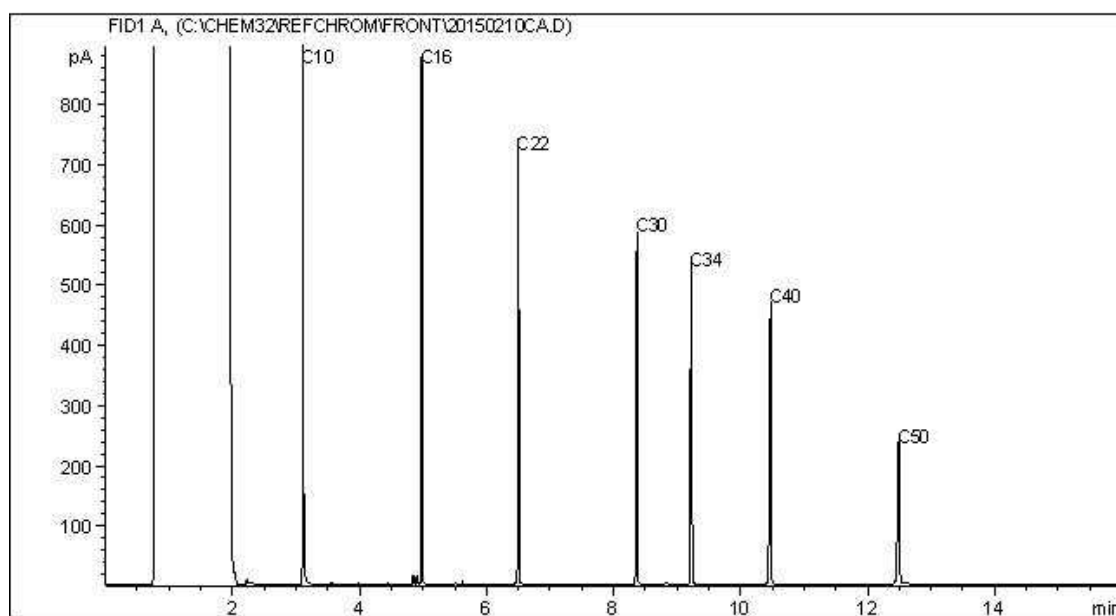
Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

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

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



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+

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

Your P.O. #: ENVIND03354-03
Your Project #: BARONS AMA 9557-G.W.M
Site Location: 202 MAIN ST. BARONS
Your C.O.C. #: A108367

Attention: JAYMES GOING

TETRA TECH EBA INC.
442-10 STREET NORTH
LETHBRIDGE, AB
CANADA T1H 2C7

Report Date: 2015/10/20

Report #: R2061328

Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B589876

Received: 2015/10/10, 09:53

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO ₃ ,HCO ₃ ,OH	4	N/A	2015/10/14	AB SOP-00005	SM 22 2320 B m
BTEX/F1 in Water by HS GC/MS/FID	4	N/A	2015/10/20	AB SOP-00039	CCME CWS/EPA 8260c m
Chloride by Automated Colourimetry	4	N/A	2015/10/16	AB SOP-00020	SM 22-4500-Cl G m
Conductivity @25C	4	N/A	2015/10/14	AB SOP-00005	SM 22 2510 B m
CCME Hydrocarbons in Water (F2; C10-C16)	4	2015/10/15	2015/10/16	AB SOP-00040 AB SOP-00037	CCME PHC-CWS m
Hardness	4	N/A	2015/10/19	AB WI-00065	Auto Calc
Elements by ICP - Dissolved	4	N/A	2015/10/18	AB SOP-00042	EPA 200.7 CFR 2012 m
Ion Balance	4	N/A	2015/10/15	AB WI-00065	Auto Calc
Sum of cations, anions	4	N/A	2015/10/19	AB WI-00065	Auto Calc
Nitrate and Nitrite	4	N/A	2015/10/18	AB WI-00065	Auto Calc
Nitrate + Nitrite-N (calculated)	4	N/A	2015/10/18	AB WI-00065	Auto Calc
Nitrogen, (Nitrite, Nitrate) by IC	4	N/A	2015/10/15	AB SOP-00023	SM 22 4110 B m
pH @25°C (Alkalinity titrator)	4	N/A	2015/10/14	AB SOP-00005	SM 22 4500-H+B m
Sulphate by Automated Colourimetry	4	N/A	2015/10/16	AB SOP-00018	SM 22 4500-SO4 E m
Total Dissolved Solids (Calculated)	4	N/A	2015/10/19	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.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ioana Stoica, Project Manager

Email: IStoica@maxxam.ca

Phone# (403)735-2227

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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 #: B589876
Report Date: 2015/10/20

TETRA TECH EBA INC.
Client Project #: BARONS AMA 9557-G.W.M
Site Location: 202 MAIN ST. BARONS
Your P.O. #: ENVIND03354-03
Sampler Initials: JL

AT1 BTEX AND F1-F2 (WATER)

Maxxam ID		NJ1443	NJ1444	NJ1445	NJ1446		
Sampling Date		2015/10/08 12:00	2015/10/08 12:30	2015/10/08 12:30	2015/10/08 13:00		
COC Number		A108367	A108367	A108367	A108367		
	UNITS	08MW07	09MW10	08MW02	09MW13	RDL	QC Batch
Hydrocarbons							
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	0.23	3.9	18	0.10	8072492
Volatiles							
Benzene	mg/L	<0.00040	0.12	0.18	0.17	0.00040	8075570
Toluene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	8075570
Ethylbenzene	mg/L	<0.00040	<0.00040	0.0049	0.16	0.00040	8075570
m & p-Xylene	mg/L	<0.00080	0.0039	<0.00080	0.20	0.00080	8075570
o-Xylene	mg/L	<0.00040	0.0075	<0.00040	0.0024	0.00040	8075570
Xylenes (Total)	mg/L	<0.00080	0.011	<0.00080	0.20	0.00080	8075570
F1 (C6-C10) - BTEX	mg/L	<0.10	<0.10	<0.10	0.62	0.10	8075570
F1 (C6-C10)	mg/L	<0.10	0.12	0.24	1.1	0.10	8075570
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	108	105	106	105	N/A	8075570
4-Bromofluorobenzene (sur.)	%	104	104	105	100	N/A	8075570
D4-1,2-Dichloroethane (sur.)	%	114	120	126	126	N/A	8075570
O-TERPHENYL (sur.)	%	96	97	97	101	N/A	8072492
RDL = Reportable Detection Limit							
N/A = Not Applicable							

Maxxam Job #: B589876
Report Date: 2015/10/20

TETRA TECH EBA INC.
Client Project #: BARONS AMA 9557-G.W.M
Site Location: 202 MAIN ST. BARONS
Your P.O. #: ENVIND03354-03
Sampler Initials: JL

ROUTINE WATER (WATER)

Maxxam ID		NJ1443			NJ1444	NJ1444			NJ1445		
Sampling Date		2015/10/08 12:00			2015/10/08 12:30	2015/10/08 12:30			2015/10/08 12:30		
COC Number		A108367			A108367	A108367			A108367		
	UNITS	08MW07	RDL	QC Batch	09MW10	09MW10 Lab-Dup	RDL	QC Batch	08MW02	RDL	QC Batch

Calculated Parameters											
Anion Sum	meq/L	130	N/A	8070983	88	N/A	N/A	8070983	49	N/A	8070983
Cation Sum	meq/L	120	N/A	8070983	88	N/A	N/A	8070983	50	N/A	8070983
Hardness (CaCO ₃)	mg/L	2600	0.50	8070981	2100	N/A	0.50	8070981	1700	0.50	8070981
Ion Balance	N/A	1.0	0.010	8070982	1.0	N/A	0.010	8070982	1.0	0.010	8070982
Dissolved Nitrate (NO ₃)	mg/L	210	0.44	8070984	13	N/A	0.044	8070984	<0.044	0.044	8070984
Nitrate plus Nitrite (N)	mg/L	48	0.020	8070985	5.2	N/A	0.020	8070985	<0.020	0.020	8070985
Dissolved Nitrite (NO ₂)	mg/L	0.18	0.033	8070984	7.4	N/A	0.033	8070984	<0.033	0.033	8070984
Total Dissolved Solids	mg/L	8300	10	8070986	5500	N/A	10	8070986	2900	10	8070986
Misc. Inorganics											
Conductivity	uS/cm	9300	1.0	8073162	6400	N/A	1.0	8073162	3600	1.0	8073162
pH	pH	7.67	N/A	8073161	7.44	N/A	N/A	8073161	7.35	N/A	8073161
Anions											
Alkalinity (PP as CaCO ₃)	mg/L	<0.50	0.50	8073158	<0.50	N/A	0.50	8073158	<0.50	0.50	8073158
Alkalinity (Total as CaCO ₃)	mg/L	610	0.50	8073158	960	N/A	0.50	8073158	870	0.50	8073158
Bicarbonate (HCO ₃)	mg/L	750	0.50	8073158	1200	N/A	0.50	8073158	1100	0.50	8073158
Carbonate (CO ₃)	mg/L	<0.50	0.50	8073158	<0.50	N/A	0.50	8073158	<0.50	0.50	8073158
Hydroxide (OH)	mg/L	<0.50	0.50	8073158	<0.50	N/A	0.50	8073158	<0.50	0.50	8073158
Dissolved Sulphate (SO ₄)	mg/L	5100 (1)	50	8077569	3100 (1)	3100	20	8077566	1500 (1)	10	8077569
Dissolved Chloride (Cl)	mg/L	120	1.0	8077568	90	90	1.0	8077565	20	1.0	8077568
Nutrients											
Dissolved Nitrite (N)	mg/L	0.054	0.010	8073779	2.2	N/A	0.010	8073779	<0.010	0.010	8073779
Dissolved Nitrate (N)	mg/L	48 (1)	0.10	8073779	3.0	N/A	0.010	8073779	<0.010	0.010	8073779
Elements											
Dissolved Calcium (Ca)	mg/L	420	0.30	8075101	370	N/A	0.30	8075101	280	0.30	8075101
Dissolved Iron (Fe)	mg/L	0.41	0.060	8075101	0.35	N/A	0.060	8075101	8.7	0.060	8075101
Dissolved Magnesium (Mg)	mg/L	380	0.20	8075101	290	N/A	0.20	8075101	250	0.20	8075101
Dissolved Manganese (Mn)	mg/L	0.22	0.0040	8075101	1.1	N/A	0.0040	8075101	3.5	0.0040	8075101
Dissolved Potassium (K)	mg/L	11	0.30	8075101	9.3	N/A	0.30	8075101	5.5	0.30	8075101
Dissolved Sodium (Na)	mg/L	1600 (1)	2.5	8075101	1000 (1)	N/A	2.5	8075101	340	0.50	8075101
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 Job #: B589876
Report Date: 2015/10/20

TETRA TECH EBA INC.
Client Project #: BARONS AMA 9557-G.W.M
Site Location: 202 MAIN ST. BARONS
Your P.O. #: ENVIND03354-03
Sampler Initials: JL

ROUTINE WATER (WATER)

Maxxam ID		NJ1446		
Sampling Date		2015/10/08 13:00		
COC Number		A108367		
	UNITS	09MW13	RDL	QC Batch
Calculated Parameters				
Anion Sum	meq/L	110	N/A	8070983
Cation Sum	meq/L	110	N/A	8070983
Hardness (CaCO ₃)	mg/L	2600	0.50	8070981
Ion Balance	N/A	0.98	0.010	8070982
Dissolved Nitrate (NO ₃)	mg/L	15	0.044	8070984
Nitrate plus Nitrite (N)	mg/L	4.7	0.020	8070985
Dissolved Nitrite (NO ₂)	mg/L	4.4	0.033	8070984
Total Dissolved Solids	mg/L	6800	10	8070986
Misc. Inorganics				
Conductivity	uS/cm	7700	1.0	8073162
pH	pH	7.31	N/A	8073161
Anions				
Alkalinity (PP as CaCO ₃)	mg/L	<0.50	0.50	8073158
Alkalinity (Total as CaCO ₃)	mg/L	1100	0.50	8073158
Bicarbonate (HCO ₃)	mg/L	1400	0.50	8073158
Carbonate (CO ₃)	mg/L	<0.50	0.50	8073158
Hydroxide (OH)	mg/L	<0.50	0.50	8073158
Dissolved Sulphate (SO ₄)	mg/L	4000 (1)	25	8077569
Dissolved Chloride (Cl)	mg/L	120	1.0	8077568
Nutrients				
Dissolved Nitrite (N)	mg/L	1.3	0.010	8073779
Dissolved Nitrate (N)	mg/L	3.4	0.010	8073779
Elements				
Dissolved Calcium (Ca)	mg/L	390	0.30	8075101
Dissolved Iron (Fe)	mg/L	2.4	0.060	8075101
Dissolved Magnesium (Mg)	mg/L	390	0.20	8075101
Dissolved Manganese (Mn)	mg/L	1.6	0.0040	8075101
Dissolved Potassium (K)	mg/L	11	0.30	8075101
Dissolved Sodium (Na)	mg/L	1300 (1)	2.5	8075101
RDL = Reportable Detection Limit				
N/A = Not Applicable				
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.				

Maxxam Job #: B589876
Report Date: 2015/10/20

TETRA TECH EBA INC.
Client Project #: BARONS AMA 9557-G.W.M
Site Location: 202 MAIN ST. BARONS
Your P.O. #: ENVIND03354-03
Sampler Initials: JL

GENERAL COMMENTS

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

Package 1	9.7°C
Package 2	5.3°C

Results relate only to the items tested.

Maxxam Job #: B589876
Report Date: 2015/10/20

TETRA TECH EBA INC.
Client Project #: BARONS AMA 9557-G.W.M
Site Location: 202 MAIN ST. BARONS
Your P.O. #: ENVIND03354-03
Sampler Initials: JL

QUALITY ASSURANCE REPORT

QA/QC	Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8072492	JA7		Matrix Spike	O-TERPHENYL (sur.)	2015/10/16		103	%	50 - 130
				F2 (C10-C16 Hydrocarbons)	2015/10/16		110	%	50 - 130
8072492	JA7		Spiked Blank	O-TERPHENYL (sur.)	2015/10/16		96	%	50 - 130
				F2 (C10-C16 Hydrocarbons)	2015/10/16		107	%	70 - 130
8072492	JA7		Method Blank	O-TERPHENYL (sur.)	2015/10/16		98	%	50 - 130
				F2 (C10-C16 Hydrocarbons)	2015/10/16	<0.10		mg/L	
8072492	JA7		RPD	F2 (C10-C16 Hydrocarbons)	2015/10/16	NC		%	40
8073158	XLI		Spiked Blank	Alkalinity (Total as CaCO3)	2015/10/14		94	%	80 - 120
8073158	XLI		Method Blank	Alkalinity (PP as CaCO3)	2015/10/14	<0.50		mg/L	
				Alkalinity (Total as CaCO3)	2015/10/14	<0.50		mg/L	
				Bicarbonate (HCO3)	2015/10/14	<0.50		mg/L	
				Carbonate (CO3)	2015/10/14	<0.50		mg/L	
				Hydroxide (OH)	2015/10/14	<0.50		mg/L	
8073158	XLI		RPD	Alkalinity (PP as CaCO3)	2015/10/14	NC		%	20
				Alkalinity (Total as CaCO3)	2015/10/14	0.30		%	20
				Bicarbonate (HCO3)	2015/10/14	0.30		%	20
				Carbonate (CO3)	2015/10/14	NC		%	20
				Hydroxide (OH)	2015/10/14	NC		%	20
8073161	XLI		Spiked Blank	pH	2015/10/14		100	%	97 - 103
8073161	XLI		RPD	pH	2015/10/14	0.13		%	N/A
8073162	XLI		Spiked Blank	Conductivity	2015/10/14		101	%	90 - 110
8073162	XLI		Method Blank	Conductivity	2015/10/14	<1.0		uS/cm	
8073162	XLI		RPD	Conductivity	2015/10/14	0.52		%	20
8073779	JLD		Matrix Spike	Dissolved Nitrite (N)	2015/10/15		100	%	80 - 120
				Dissolved Nitrate (N)	2015/10/15		101	%	80 - 120
8073779	JLD		Spiked Blank	Dissolved Nitrite (N)	2015/10/15		100	%	80 - 120
				Dissolved Nitrate (N)	2015/10/15		101	%	80 - 120
8073779	JLD		Method Blank	Dissolved Nitrite (N)	2015/10/15	<0.010		mg/L	
				Dissolved Nitrate (N)	2015/10/15	<0.010		mg/L	
8073779	JLD		RPD	Dissolved Nitrite (N)	2015/10/15	NC		%	20
				Dissolved Nitrate (N)	2015/10/15	NC		%	20
8075101	MAP		Matrix Spike	Dissolved Calcium (Ca)	2015/10/17		114	%	80 - 120
				Dissolved Iron (Fe)	2015/10/17		109	%	80 - 120
				Dissolved Magnesium (Mg)	2015/10/17		108	%	80 - 120
				Dissolved Manganese (Mn)	2015/10/17		109	%	80 - 120
				Dissolved Potassium (K)	2015/10/17		108	%	80 - 120
				Dissolved Sodium (Na)	2015/10/17		105	%	80 - 120
8075101	MAP		Spiked Blank	Dissolved Calcium (Ca)	2015/10/17		115	%	80 - 120
				Dissolved Iron (Fe)	2015/10/17		111	%	80 - 120
				Dissolved Magnesium (Mg)	2015/10/17		109	%	80 - 120
				Dissolved Manganese (Mn)	2015/10/17		111	%	80 - 120
				Dissolved Potassium (K)	2015/10/17		108	%	80 - 120
				Dissolved Sodium (Na)	2015/10/17		106	%	80 - 120
8075101	MAP		Method Blank	Dissolved Calcium (Ca)	2015/10/17	<0.30		mg/L	
				Dissolved Iron (Fe)	2015/10/17	<0.060		mg/L	
				Dissolved Magnesium (Mg)	2015/10/17	<0.20		mg/L	
				Dissolved Manganese (Mn)	2015/10/17	<0.0040		mg/L	
				Dissolved Potassium (K)	2015/10/17	<0.30		mg/L	
				Dissolved Sodium (Na)	2015/10/17	<0.50		mg/L	
8075101	MAP		RPD	Dissolved Calcium (Ca)	2015/10/18	NC		%	20
				Dissolved Magnesium (Mg)	2015/10/18	NC		%	20

Maxxam Job #: B589876
Report Date: 2015/10/20

TETRA TECH EBA INC.
Client Project #: BARONS AMA 9557-G.W.M
Site Location: 202 MAIN ST. BARONS
Your P.O. #: ENVIND03354-03
Sampler Initials: JL

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC	Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8075570	ABG	Matrix Spike		Dissolved Potassium (K)	2015/10/18	NC		%	20
				Dissolved Sodium (Na)	2015/10/18	NC		%	20
				1,4-Difluorobenzene (sur.)	2015/10/20		105	%	70 - 130
				4-Bromofluorobenzene (sur.)	2015/10/20		106	%	70 - 130
				D4-1,2-Dichloroethane (sur.)	2015/10/20		110	%	70 - 130
				Benzene	2015/10/20		92	%	70 - 130
				Toluene	2015/10/20		89	%	70 - 130
				Ethylbenzene	2015/10/20		93	%	70 - 130
				m & p-Xylene	2015/10/20		92	%	70 - 130
				o-Xylene	2015/10/20		92	%	70 - 130
8075570	ABG	Spiked Blank		F1 (C6-C10)	2015/10/20		87	%	70 - 130
				1,4-Difluorobenzene (sur.)	2015/10/20		108	%	70 - 130
				4-Bromofluorobenzene (sur.)	2015/10/20		105	%	70 - 130
				D4-1,2-Dichloroethane (sur.)	2015/10/20		111	%	70 - 130
				Benzene	2015/10/20		94	%	70 - 130
				Toluene	2015/10/20		91	%	70 - 130
				Ethylbenzene	2015/10/20		95	%	70 - 130
				m & p-Xylene	2015/10/20		94	%	70 - 130
				o-Xylene	2015/10/20		94	%	70 - 130
				F1 (C6-C10)	2015/10/20		87	%	70 - 130
8075570	ABG	Method Blank		1,4-Difluorobenzene (sur.)	2015/10/20		110	%	70 - 130
				4-Bromofluorobenzene (sur.)	2015/10/20		104	%	70 - 130
				D4-1,2-Dichloroethane (sur.)	2015/10/20		111	%	70 - 130
				Benzene	2015/10/20	<0.00040		mg/L	
				Toluene	2015/10/20	<0.00040		mg/L	
				Ethylbenzene	2015/10/20	<0.00040		mg/L	
				m & p-Xylene	2015/10/20	<0.00080		mg/L	
				o-Xylene	2015/10/20	<0.00040		mg/L	
				Xylenes (Total)	2015/10/20	<0.00080		mg/L	
				F1 (C6-C10) - BTEX	2015/10/20	<0.10		mg/L	
8075570	ABG	RPD		F1 (C6-C10)	2015/10/20	<0.10		mg/L	
				Benzene	2015/10/20	NC		%	40
				Toluene	2015/10/20	NC		%	40
				Ethylbenzene	2015/10/20	NC		%	40
				m & p-Xylene	2015/10/20	NC		%	40
				o-Xylene	2015/10/20	NC		%	40
				Xylenes (Total)	2015/10/20	NC		%	40
				F1 (C6-C10) - BTEX	2015/10/20	NC		%	40
				F1 (C6-C10)	2015/10/20	NC		%	40
				Benzene	2015/10/20	NC		%	40
8077565	JH0	Matrix Spike [NJ1444-01]		Dissolved Chloride (Cl)	2015/10/16		NC	%	80 - 120
8077565	JH0	Spiked Blank		Dissolved Chloride (Cl)	2015/10/16		103	%	80 - 120
8077565	JH0	Method Blank		Dissolved Chloride (Cl)	2015/10/16	<1.0		mg/L	
8077565	JH0	RPD [NJ1444-01]		Dissolved Chloride (Cl)	2015/10/16	0.45		%	20
8077566	JH0	Matrix Spike [NJ1444-01]		Dissolved Sulphate (SO4)	2015/10/16		NC	%	80 - 120
8077566	JH0	Spiked Blank		Dissolved Sulphate (SO4)	2015/10/16		104	%	80 - 120
8077566	JH0	Method Blank		Dissolved Sulphate (SO4)	2015/10/16	<1.0		mg/L	
8077566	JH0	RPD [NJ1444-01]		Dissolved Sulphate (SO4)	2015/10/16	0.96		%	20
8077568	JH0	Matrix Spike		Dissolved Chloride (Cl)	2015/10/16		105	%	80 - 120
8077568	JH0	Spiked Blank		Dissolved Chloride (Cl)	2015/10/16		103	%	80 - 120
8077568	JH0	Method Blank		Dissolved Chloride (Cl)	2015/10/16	<1.0		mg/L	
8077568	JH0	RPD		Dissolved Chloride (Cl)	2015/10/16	NC		%	20

Maxxam Job #: B589876
Report Date: 2015/10/20

TETRA TECH EBA INC.
Client Project #: BARONS AMA 9557-G.W.M
Site Location: 202 MAIN ST. BARONS
Your P.O. #: ENVIND03354-03
Sampler Initials: JL

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8077569	JH0	Matrix Spike	Dissolved Sulphate (SO4)	2015/10/16		109	%	80 - 120
8077569	JH0	Spiked Blank	Dissolved Sulphate (SO4)	2015/10/16		107	%	80 - 120
8077569	JH0	Method Blank	Dissolved Sulphate (SO4)	2015/10/16	<1.0		mg/L	
8077569	JH0	RPD	Dissolved Sulphate (SO4)	2015/10/16	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).

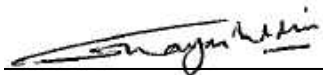
NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

Maxxam Job #: B589876
Report Date: 2015/10/20

TETRA TECH EBA INC.
Client Project #: BARONS AMA 9557-G.W.M
Site Location: 202 MAIN ST. BARONS
Your P.O. #: ENVIND03354-03
Sampler Initials: JL

VALIDATION SIGNATURE PAGE

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



Ghayasuddin Khan, M.Sc., B.Ed., P.Chem, Scientific Specialist



Janet Gao, Supervisor

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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

578

Chain of Custody

A108367

Page: 1 of 1

Company:	Invoice To:	C/O Report Address	Report To:	Same as Invoice
TETRA TECH EBA	JAMES GOING	442-10th ST. N. LETHBRIDGE	S/A	
Address:	Prov:	PC:	Prov:	PC:
442-10th ST. N. LETHBRIDGE	AB	T1H2C7		
Contact #s:	Ph:	Cell:	Ph:	Cell:
403.329.9009	403.634.3566			

Report Distribution (E-Mail):
jlamontagne@eba.ca
jgoing@eba.ca

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

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

PO #:	ENVIND03354-03
Project # / Name:	BARONS AMA 9557 - G.W.M.
Site Location:	202 Main St. BARONS
Quote #:	EBA
Sampled By:	J. Lamontagne

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

Sample ID				Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	BTEX F	Sieve (	Regulat	Salinity	Assesse	Basic C	☐ BTEX F		☒ BTEX F	☒ BTEX F	☒ BTEX F	☐ TOG	Total	Dissolv	Mercur	Diss	HOLD -	# of Co
1	08MW07			Monitoring well	GW	15/10/08 12:00									X	X					X		6	
2	09MW10			↓	↓	12:30									X	X					X		6	
3	08MW02					13:30									X	X					X		6	
4	09MW13			↓	↓	13:00									X	X					X		6	
5																								
6																								
7																								
8																								
9																								
10																								
11																								
12																								

10-Oct-15 09:53

Ioana Stoica



B589876

HD

10-Oct-15 09:53
 Ioana Stoica
 B589876
 NB6 INS-0059

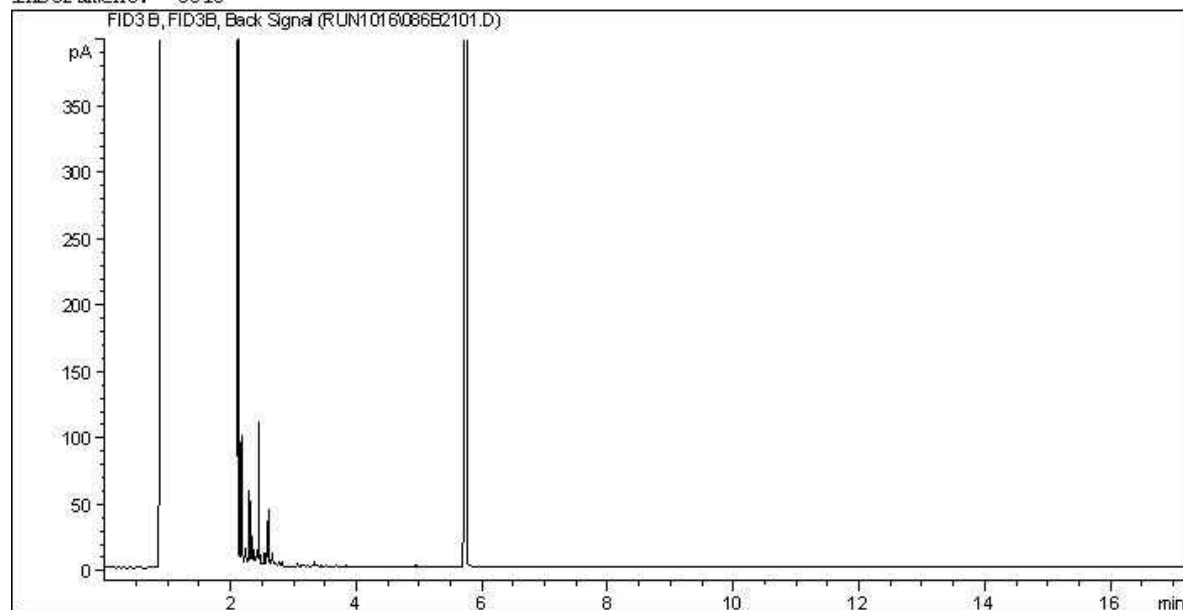
Please indicate Filtered, Preserved or Both (F, P, F/P)

Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):
JAMIE LAMONTAGNE	15/10/08	9:00
Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):
Special Instructions:	# of Jars Used & Not Submitted	
Diss. Metals field filtered & preserved		

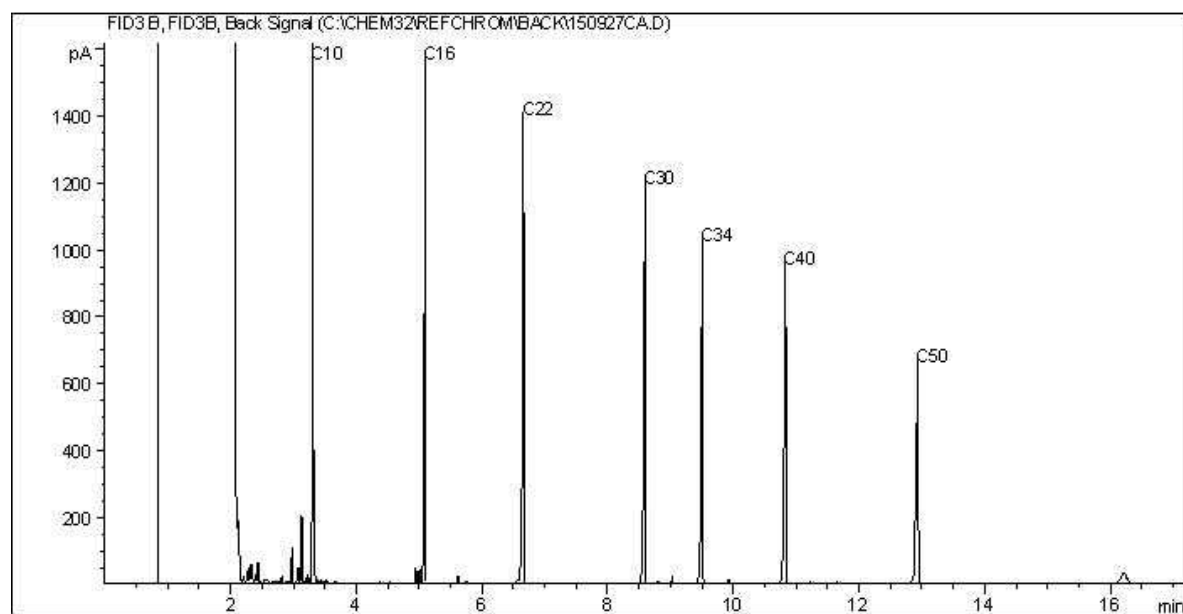
LAB USE ONLY		
Received By:	Date:	Time:
W. W. CHUNG	2015/10/10	9:53
Lab Comments:	Maxxam Job #:	
	Custody Seal	Temperature
	Ice	
	Yes	10,10,9
		515.6

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

Instrument: GC13



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

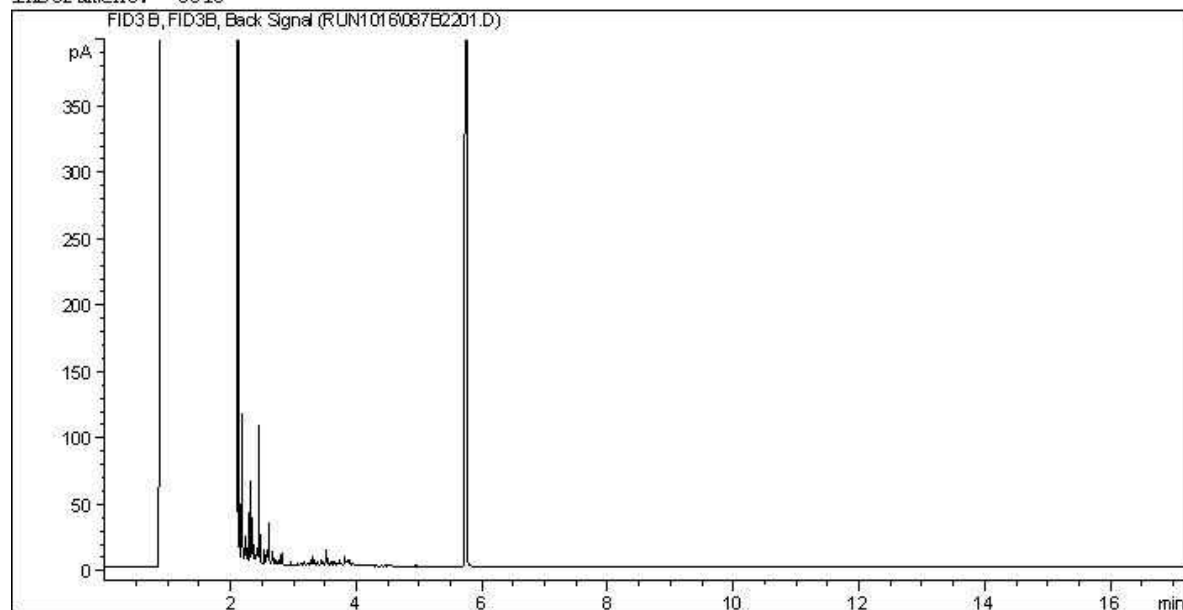
Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

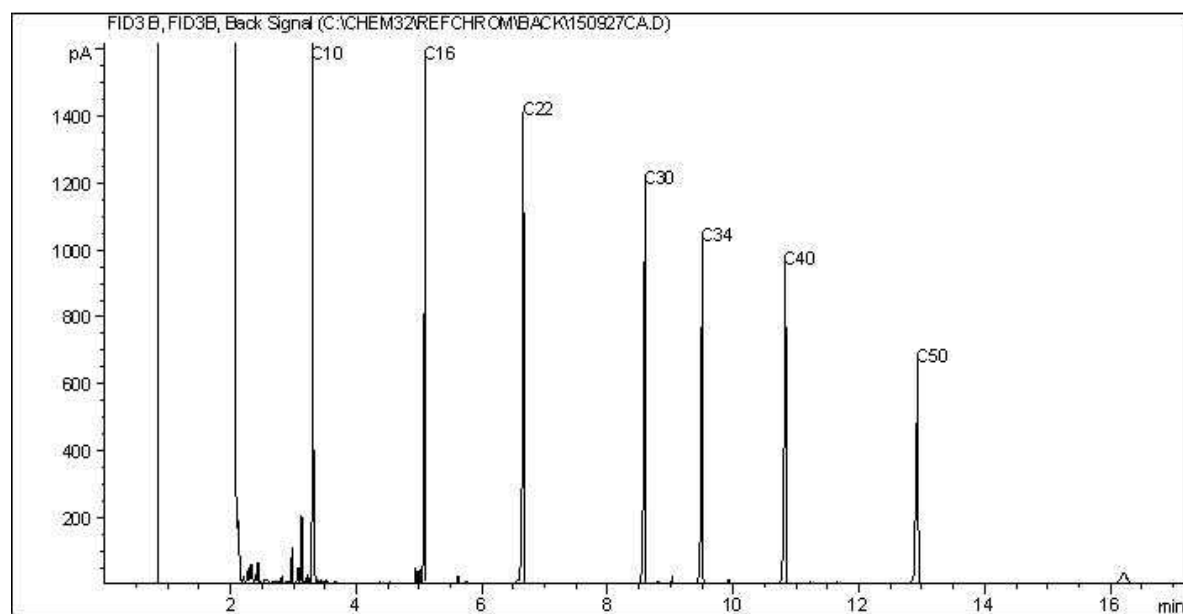
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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

Instrument: GC13



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

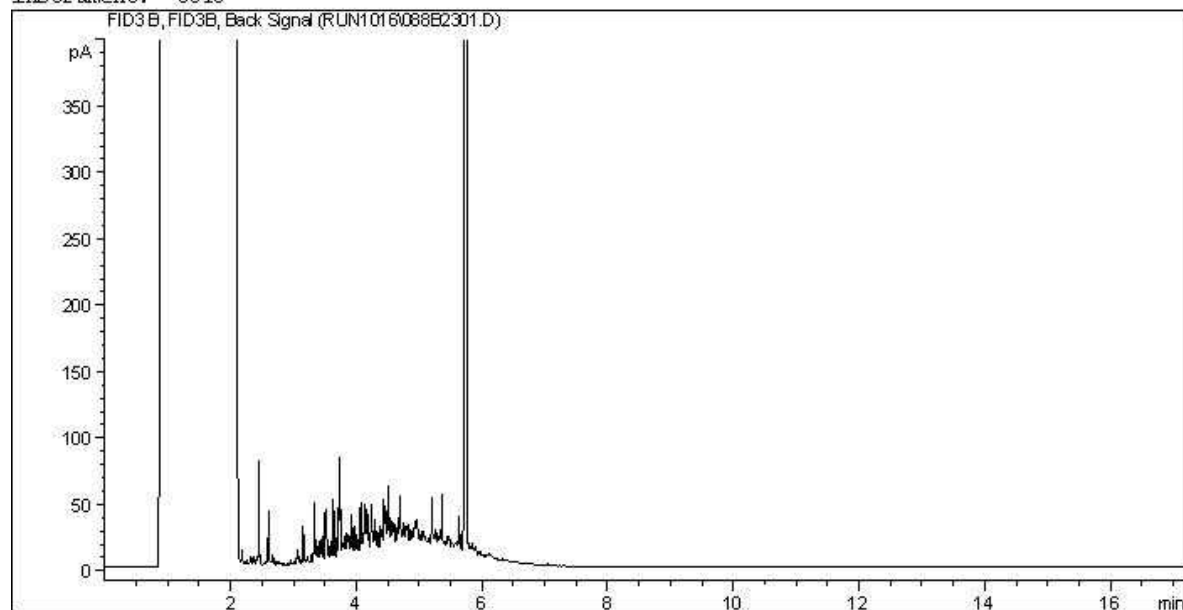
Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

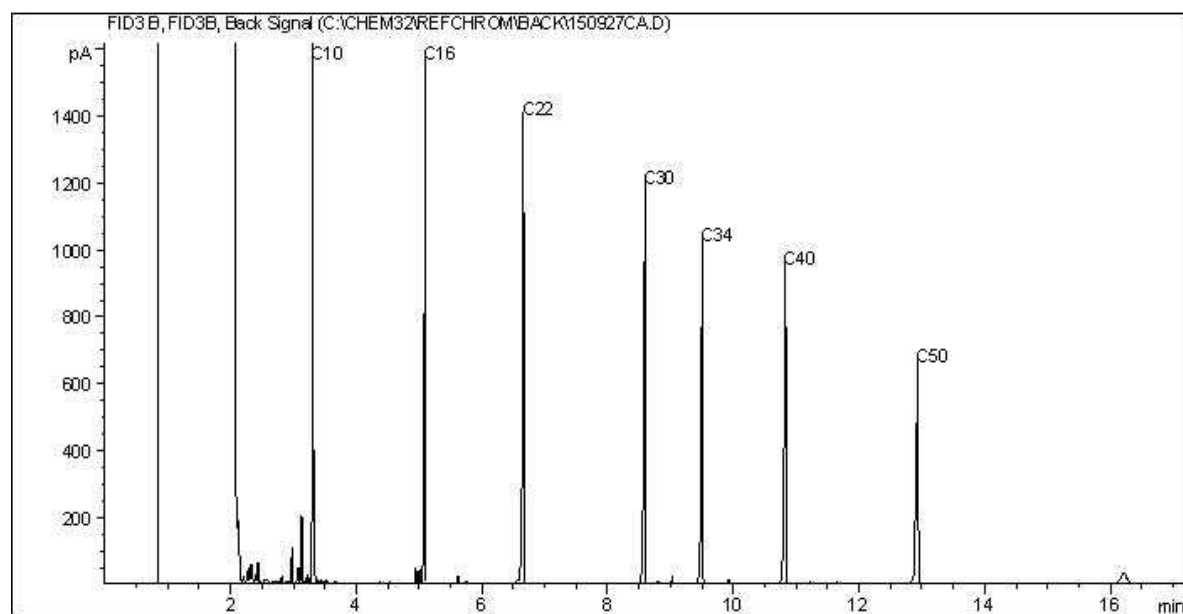
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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

Instrument: GC13



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

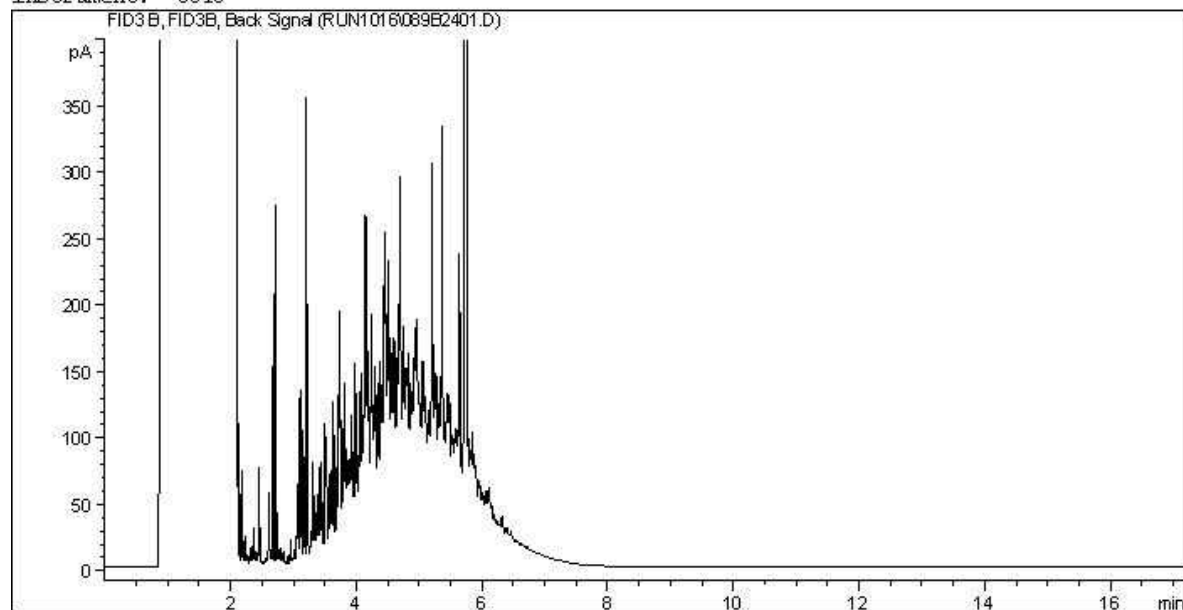
Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

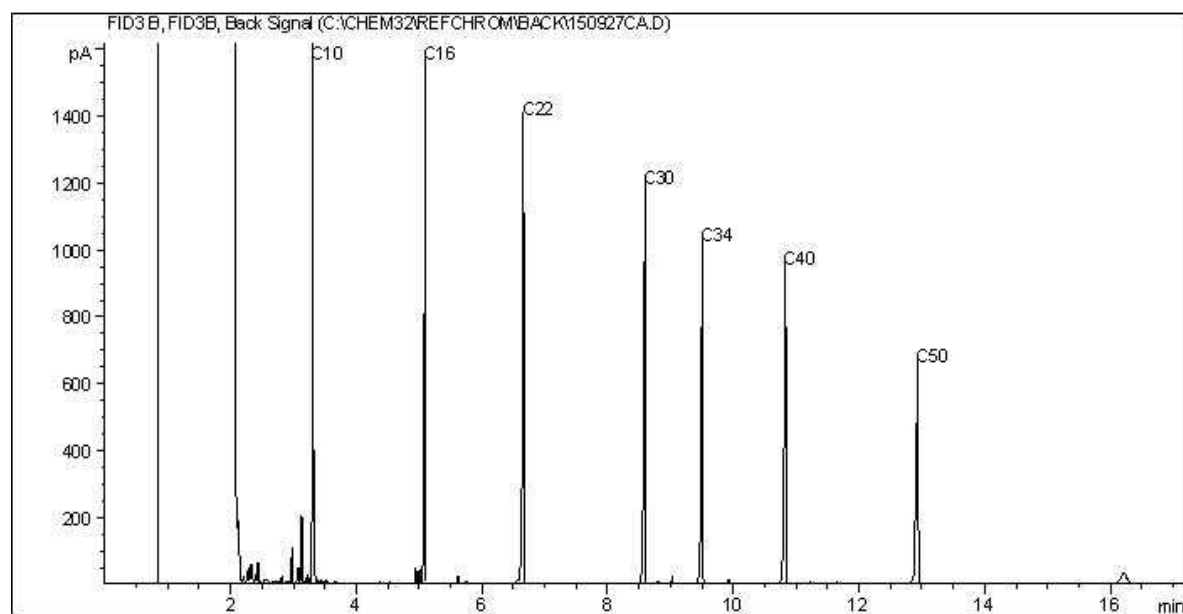
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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

Instrument: GC13



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+

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

Your P.O. #: ENVINDO3354-03
Your Project #: 202 MAIN ST - SOIL VAPOUR
Site Location: BARONS, AB / AMA 9557
Your C.O.C. #: 20150424

Attention: Jaymes Going

Tetra Tech EBA Inc.
442 - 10 Street North
Lethbridge, AB
CANADA T1H 2C7

Report Date: 2015/05/06
Report #: R3416508
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B576585

Received: 2015/04/28, 09:00

Sample Matrix: AIR
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
BTEX Fractionation in Air (TO-15mod)	4	N/A	2015/04/29	BRL SOP-00304	EPA TO-15 m
Canister Pressure (TO-15)	4	N/A	2015/04/29	BRL SOP-00304	EPA TO-15 m

Remarks:

The lab certifies that the test results meet all requirements of NELAC, where applicable.

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.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Theresa Stephenson, Project Manager
Email: TStephenson@maxxam.ca
Phone# (905) 817-5763

=====

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Total cover pages: 1

Page 1 of 6

Maxxam Job #: B576585
Report Date: 2015/05/06

Tetra Tech EBA Inc.
Client Project #: 202 MAIN ST - SOIL VAPOUR
Site Location: BARONS, AB / AMA 9557
Your P.O. #: ENVINDO3354-03
Sampler Initials: JL

RESULTS OF ANALYSES OF AIR

Maxxam ID		AEJ790	AEJ791	AEJ792	AEJ793	
Sampling Date		2015/04/23 10:00	2015/04/23 10:40	2015/04/23 11:15	2015/04/23 11:45	
COC Number		20150424	20150424	20150424	20150424	
	Units	14VW01	14VW02	14VW03	14VW04	QC Batch

Volatile Organics						
Pressure on Receipt	psig	(-1.6)	(-2.5)	(-3.1)	(-2.0)	4003848

QC Batch = Quality Control Batch

Maxxam Job #: B576585
Report Date: 2015/05/06

Tetra Tech EBA Inc.
Client Project #: 202 MAIN ST - SOIL VAPOUR
Site Location: BARONS, AB / AMA 9557
Your P.O. #: ENVINDO3354-03
Sampler Initials: JL

VOLATILE ORGANIC HYDROCARBONS BY GC/MS (AIR)

Maxxam ID		AEJ790	AEJ791	AEJ792	AEJ793		
Sampling Date		2015/04/23 10:00	2015/04/23 10:40	2015/04/23 11:15	2015/04/23 11:45		
COC Number		20150424	20150424	20150424	20150424		
	Units	14VW01	14VW02	14VW03	14VW04	RDL	QC Batch

Volatile Organics							
Benzene	ug/m3	316	52.6	176	149	1.2	4005959
Toluene	ug/m3	1.8	<1.6	1.7	<1.6	1.6	4005959
Ethylbenzene	ug/m3	<1.6	<1.6	<1.6	<1.6	1.6	4005959
Total Xylenes	ug/m3	<2.2	<2.2	<2.2	<2.2	2.2	4005959
Aliphatic >C5-C6	ug/m3	<5.0	<5.0	9.3	35.1	5.0	4005959
Aliphatic >C6-C8	ug/m3	5.9	<5.0	6.8	154	5.0	4005959
Aliphatic >C8-C10	ug/m3	<5.0	<5.0	<5.0	80.3	5.0	4005959
Aliphatic >C10-C12	ug/m3	14.4	7.1	19.9	16.6	5.0	4005959
Aliphatic >C12-C16	ug/m3	19.7	9.2	7.0	<5.0	5.0	4005959
Aromatic >C7-C8 (TEX Excluded)	ug/m3	<5.0	<5.0	<5.0	<5.0	5.0	4005959
Aromatic >C8-C10	ug/m3	341	97.9	297	224	5.0	4005959
Aromatic >C10-C12	ug/m3	39.2	40.1	52.6	29.1	5.0	4005959
Aromatic >C12-C16	ug/m3	<5.0	<5.0	<5.0	<5.0	5.0	4005959
Surrogate Recovery (%)							
1,4-Difluorobenzene	%	87	88	87	88		4005959
Bromochloromethane	%	89	89	89	90		4005959
D5-Chlorobenzene	%	80	79	80	83		4005959

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B576585
Report Date: 2015/05/06

Tetra Tech EBA Inc.
Client Project #: 202 MAIN ST - SOIL VAPOUR
Site Location: BARONS, AB / AMA 9557
Your P.O. #: ENVINDO3354-03
Sampler Initials: JL

GENERAL COMMENTS

Results relate only to the items tested.

Tetra Tech EBA Inc.
Attention: Jaymes Going
Client Project #: 202 MAIN ST - SOIL VAPOUR
P.O. #: ENVINDO3354-03
Site Location: BARONS,AB / AMA 9557

Quality Assurance Report

Maxxam Job Number: GB576585

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
4005959 LSY	Spiked Blank	1,4-Difluorobenzene	2015/04/29		99	%	60 - 140
		Bromochloromethane	2015/04/29		98	%	60 - 140
		D5-Chlorobenzene	2015/04/29		99	%	60 - 140
		Benzene	2015/04/29		91	%	70 - 130
		Toluene	2015/04/29		91	%	70 - 130
		Ethylbenzene	2015/04/29		88	%	70 - 130
		Total Xylenes	2015/04/29		88	%	70 - 130
	Method Blank	1,4-Difluorobenzene	2015/04/29		91	%	60 - 140
		Bromochloromethane	2015/04/29		91	%	60 - 140
		D5-Chlorobenzene	2015/04/29		87	%	60 - 140
		Benzene	2015/04/29	<1.2		ug/m3	
		Toluene	2015/04/29	<1.6		ug/m3	
		Ethylbenzene	2015/04/29	<1.6		ug/m3	
		Total Xylenes	2015/04/29	<2.2		ug/m3	
		Aliphatic >C5-C6	2015/04/29	<5.0		ug/m3	
		Aliphatic >C6-C8	2015/04/29	<5.0		ug/m3	
		Aliphatic >C8-C10	2015/04/29	<5.0		ug/m3	
		Aliphatic >C10-C12	2015/04/29	<5.0		ug/m3	
		Aliphatic >C12-C16	2015/04/29	<5.0		ug/m3	
		Aromatic >C7-C8 (TEX Excluded)	2015/04/29	<5.0		ug/m3	
		Aromatic >C8-C10	2015/04/29	<5.0		ug/m3	
		Aromatic >C10-C12	2015/04/29	<5.0		ug/m3	
		Aromatic >C12-C16	2015/04/29	<5.0		ug/m3	
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.							

Validation Signature Page

Maxxam Job #: B576585

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



Angel Guerrero, Team Leader, VOC Air

=====

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Your Project #: ENVINDO3354-03
Your C.O.C. #: 16541

Attention:Jaymes Going

Tetra Tech EBA Inc
442 - 10th St N
Lethbridge, AB
CANADA T1H 2C7

Report Date: 2015/10/27

Report #: R3736253

Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5L0008

Received: 2015/10/15, 11:43

Sample Matrix: AIR
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
BTEX Fractionation in Air (TO-15mod)	4	N/A	2015/10/16	BRL SOP-00304	EPA TO-15 m
Canister Pressure (TO-15)	4	N/A	2015/10/16	BRL SOP-00304	EPA TO-15 m

Remarks:

The lab certifies that the test results meet all requirements of NELAC, where applicable.

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.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Theresa Stephenson, Project Manager

Email: TStephenson@maxxam.ca

Phone# (905)817-5763

=====

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RESULTS OF ANALYSES OF AIR

Maxxam ID		BDY016	BDY017	BDY018	BDY019	
Sampling Date		2015/10/08	2015/10/08	2015/10/08	2015/10/08	
COC Number		16541	16541	16541	16541	
	UNITS	14VW01	14VW02	14VW03	14VW04	QC Batch
Volatile Organics						
Pressure on Receipt	psig	(-3.7)	(-3.4)	(-2.7)	(-3.3)	4236228
QC Batch = Quality Control Batch						

VOLATILE ORGANIC HYDROCARBONS BY GC/MS (AIR)

Maxxam ID		BDY016	BDY017	BDY018	BDY019		
Sampling Date		2015/10/08	2015/10/08	2015/10/08	2015/10/08		
COC Number		16541	16541	16541	16541		
	UNITS	14VW01	14VW02	14VW03	14VW04	RDL	QC Batch
Volatile Organics							
Benzene	ug/m3	273	79.8	184	197	1.2	4236249
Toluene	ug/m3	4.1	<1.6	1.6	1.7	1.6	4236249
Ethylbenzene	ug/m3	<1.6	<1.6	<1.6	<1.6	1.6	4236249
Total Xylenes	ug/m3	<2.2	<2.2	<2.2	<2.2	2.2	4236249
Aliphatic >C5-C6	ug/m3	<5.0	<5.0	<5.0	<5.0	5.0	4236249
Aliphatic >C6-C8	ug/m3	<5.0	8.5	<5.0	20.2	5.0	4236249
Aliphatic >C8-C10	ug/m3	<5.0	<5.0	<5.0	<5.0	5.0	4236249
Aliphatic >C10-C12	ug/m3	5.7	5.0	11.1	5.8	5.0	4236249
Aliphatic >C12-C16	ug/m3	<5.0	8.3	8.9	7.2	5.0	4236249
Aromatic >C7-C8 (TEX Excluded)	ug/m3	<5.0	<5.0	<5.0	<5.0	5.0	4236249
Aromatic >C8-C10	ug/m3	192	79.6	215	179	5.0	4236249
Aromatic >C10-C12	ug/m3	46.3	193	143	45.8	5.0	4236249
Aromatic >C12-C16	ug/m3	<5.0	<5.0	<5.0	<5.0	5.0	4236249
Surrogate Recovery (%)							
1,4-Difluorobenzene	%	91	92	93	92		4236249
Bromochloromethane	%	92	93	93	93		4236249
D5-Chlorobenzene	%	86	88	89	88		4236249
RDL = Reportable Detection Limit							
QC Batch = Quality Control Batch							

GENERAL COMMENTS

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4236249	LSY	Spiked Blank	1,4-Difluorobenzene	2015/10/16		100	%	60 - 140
			Bromochloromethane	2015/10/16		100	%	60 - 140
			D5-Chlorobenzene	2015/10/16		101	%	60 - 140
			Benzene	2015/10/16		105	%	70 - 130
			Toluene	2015/10/16		107	%	70 - 130
			Ethylbenzene	2015/10/16		105	%	70 - 130
			Total Xylenes	2015/10/16		101	%	70 - 130
4236249	LSY	Method Blank	1,4-Difluorobenzene	2015/10/16		99	%	60 - 140
			Bromochloromethane	2015/10/16		97	%	60 - 140
			D5-Chlorobenzene	2015/10/16		95	%	60 - 140
			Benzene	2015/10/16	<1.2		ug/m3	
			Toluene	2015/10/16	<1.6		ug/m3	
			Ethylbenzene	2015/10/16	<1.6		ug/m3	
			Total Xylenes	2015/10/16	<2.2		ug/m3	
			Aliphatic >C5-C6	2015/10/16	<5.0		ug/m3	
			Aliphatic >C6-C8	2015/10/16	<5.0		ug/m3	
			Aliphatic >C8-C10	2015/10/16	<5.0		ug/m3	
			Aliphatic >C10-C12	2015/10/16	<5.0		ug/m3	
			Aliphatic >C12-C16	2015/10/16	<5.0		ug/m3	
			Aromatic >C7-C8 (TEX Excluded)	2015/10/16	<5.0		ug/m3	
			Aromatic >C8-C10	2015/10/16	<5.0		ug/m3	
			Aromatic >C10-C12	2015/10/16	<5.0		ug/m3	
			Aromatic >C12-C16	2015/10/16	<5.0		ug/m3	

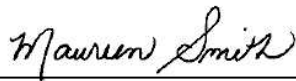
Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

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.

VALIDATION SIGNATURE PAGE

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



Maureen Smith, Supervisor, Volatiles

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.

APPENDIX C

HISTORIC SOIL ANALYTICAL DATA

Appendix C: Historic Soil Analytical Results

Parameters	Detection Limits	Units	Tier 1 Guidelines ¹		17-Nov-08																				
					08MW01			08MW02			08BH03			08BH04			08BH05			08MW06			08MW07		
			Surface Soil	Subsoil	1.5 m	4.2 m	4.8 m	1.6 m	2.2 m	4.2 m	1.2 m	1.8 m	4.8 m	1.9 m	3.0 m	5.4 m	1.8 m	2.4 m	4.8 m	1.6 m	2.4 m	5.4 m	3.0 m	4.2 m	6.0 m
Petroleum Hydrocarbons																									
Benzene	0.02	mg/kg	0.046	0.046	<0.02	6.3	<0.02	<0.02	3.2	<0.02	0.15	54	<0.02	<0.02	19	<0.02	<0.02	1.1	<0.02	<0.02	<0.02	2.0	<0.02	<0.02	<0.02
Toluene	0.01	mg/kg	0.52	0.52	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.11	6.4	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ethylbenzene	0.04	mg/kg	0.11	0.11	<0.04	13	0.092	<0.04	41	<0.04	0.21	310	<0.04	<0.04	36	<0.04	<0.04	6.3	<0.04	<0.04	21	<0.04	<0.04	<0.04	<0.04
Xylenes	0.04	mg/kg	15	15	<0.04	16	0.16	<0.04	50	<0.04	1.0	1,500	<0.04	0.24	50	<0.04	<0.04	8	<0.04	<0.04	31	<0.04	<0.04	<0.04	<0.04
F1 (C ₆ to C ₁₀)	12	mg/kg	210	420	<12	710	<12	<12	1,000	<12	<12	5,300	<12	<12	1,300	<12	<12	140	<12	<12	280	<12	<12	<12	<12
F2 (C ₁₀ to C ₁₄)	10	mg/kg	150	300	<10	4,700	250	<10	310	23	<10	3,500	<10	<10	4,200	<10	<10	2,000	<10	<10	1,300	<10	<10	<10	<10
F3 (C ₁₄ to C ₂₄)	10	mg/kg	1,300	2,600	<10	2,100	140	<10	<10	21	360	9,400	<10	<10	1,700	<10	<10	1,000	<10	<10	510	<10	<10	<10	<10
F4 (C ₂₄ to C ₅₀)	10	mg/kg	5,600	10,000	<10	23	<10	<10	<10	<10	100	1,500	<10	<10	<10	<10	<10	nd	<10	<10	<10	<10	<10	<10	<10
Metals																									
Lead (Pb)	1	mg/kg	140	NG	9	8	6	8	13	5	46	67	7	21	17	7	6	16	9	9	14	8	9	9	8
Physical Properties																									
Soil Moisture Content	0.3	%	NG	NG	22	14	5.3	20	26	6.1	16	24	14	20	20	19	17	23	12	24	23	11	24	14	10
<75 um Sieve	0.2	%	NG	NG	94	--	49	--	--	--	--	--	--	--	73	--	--	--	--	--	--	--	--	--	--
>75 um Sieve	0.2	%	NG	NG	6	--	51	--	--	--	--	--	--	--	27	--	--	--	--	--	--	--	--	--	--
Grain Size	0.2		NG	NG	FINE	--	COARSE	--	--	--	--	--	--	--	FINE	--	--	--	--	--	--	--	--	--	--

Parameters	Detection Limits	Units	Tier 1 Guidelines ¹		12-Mar-09											
					09BH09		09BH11	09BH12		09MW13	09BH17		09MW19		09BH20	
			Surface Soil	Subsoil	5.4 m	6.0 m	4.2 m	2.4 m	3.0 m	4.8 m	3.0 m	4.2 m	4.8 m	5.4 m	3.0 m	3.6 m
Petroleum Hydrocarbons																
Benzene	0.02	mg/kg	0.046	0.046	<0.02	<0.02	0.023	0.016	1.5	0.054	0.97	0.036	0.02	0.018	9.7	0.53
Toluene	0.01	mg/kg	0.52	0.52	<0.01	<0.01	<0.01	<0.04	<0.01	<0.01	<0.04	<0.01	<0.04	<0.04	0.06	0.1
Ethylbenzene	0.04	mg/kg	0.11	0.11	<0.04	<0.04	0.028	<0.04	12	0.057	19	0.051	<0.04	<0.04	21	0.2
Xylenes	0.04	mg/kg	15	15	<0.04	<0.04	0.11	<12	18	0.069	29	0.066	<12	<12	36	0.7
F1 (C ₆ to C ₁₀)	12	mg/kg	210	420	<12	<12	<12	<12	410	<12	580	<12	<12	<12	430	<12
F2 (C ₁₀ to C ₁₄)	10	mg/kg	150	300	13	11	<10	<10	180	69	1,400	<10	<10	<10	660	<10
F3 (C ₁₄ to C ₂₄)	10	mg/kg	1,300	2,600	<10	<10	<10	<10	24	<10	520	<10	<10	<10	230	<10
F4 (C ₂₄ to C ₅₀)	10	mg/kg	5,600	10,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Metals																
Lead (Pb)	1	mg/kg	140	NG	10	8	7	9	13	4	13	7	8	8	12	7
Physical Properties																
Soil Moisture Content	0.3	%	NG	NG	18	19	14	18	23	17	21	15	18	17	19	13
<75 um Sieve	0.2	%	NG	NG	--	51	--	89	--	71	90	--	--	52	--	--
>75 um Sieve	0.2	%	NG	NG	--	49	--	11	--	29	10	--	--	48	--	--
Grain Size	0.2		NG	NG	--	FINE	--	FINE	--	FINE	FINE	--	--	FINE	--	--

Parameters	Detection Limits	Units	Tier 1 Guidelines ¹		15-Mar-11								
					11MW01			11MW02			11MW03		
			Surface Soil	Subsoil	1.8 m	2.4 m	4.2 m	1.6 m	2.2 m	6.0 m	3.6 m	4.8 m	5.4 m
Petroleum Hydrocarbons													
Benzene	0.02	mg/kg	0.046	0.046	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Toluene	0.01	mg/kg	0.52	0.52	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04	<0.01	<0.04	<0.01
Ethylbenzene	0.04	mg/kg	0.11	0.11	0.059	5.5	0.062	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Xylenes	0.04	mg/kg	15	15	0.14	16	<0.04	<0.04	<0.04	<0.04	<0.04	<12	<0.04
F1 (C ₆ to C ₁₀)	12	mg/kg	210	420	<12	150	<12	<12	<12	<12	<12	260	<12
F2 (C ₁₀ to C ₁₄)	10	mg/kg	150	300	<10	21	<10	<10	<10	230	<10	1,700	<10
F3 (C ₁₄ to C ₂₄)	10	mg/kg	1,300	2,600	<10	<10	<10	<10	<10	110	<10	800	<10
F4 (C ₂₄ to C ₅₀)	10	mg/kg	5,600	10,000	<10	<10	<10	<10	<10	<10	<10	<10	<10
Physical Properties													
Soil Moisture Content	0.3	%	NG	NG	22	13	15	15	16	10	13	15	12
<75 um Sieve	0.2	%	NG	NG	--	--	48	--	--	60	--	--	41
>75 um Sieve	0.2	%	NG	NG	--	--	52	--	--	40	--	--	59
Grain Size	0.2		NG	NG	--	--	Coarse	--	--	Fine	--	--	Coarse

Parameter	Detection Limits	Units	Tier 1 Guideline ¹		6-Jun-14					
					14VW01	14VW02	14VW03	14VW03	14VW03	14VW04
			Surface Soil	Subsoil	1.6 m	1.6 m	0.2-0.4 m	0.6-0.8 m	1.6 m	1.0 m
Hydrocarbons										
Benzene	0.005	mg/kg	0.046	0.046	<0.005	<0.005	--	--	0.018	<0.005
Toluene	0.02	mg/kg	0.52	0.52	<0.02	<0.02	--	--	0.14	<0.02
Ethylbenzene	0.01	mg/kg	0.11	0.11	<0.01	<0.01	--	--	0.037	<0.01
Xylene Total	0.04	mg/kg	15	15	<0.04	<0.04	--	--	0.49	<0.04
Xylene (m & p)	0.04	mg/kg	NG	NG	<0.04	<0.04	--	--	0.33	<0.04
Xylene (o)	0.02	mg/kg	NG	NG	<0.02	<0.02	--	--	0.16	<0.02
F1 (C6-C10 Hydrocarbons)	12	mg/kg	210	420	<12	<12	--	--	<12	<12
F1 (C6-C10) - BTEX	12	mg/kg	210	420	<12	<12	--	--	<12	<12
F2 (C10-C16 Hydrocarbons)	10	mg/kg	150	300	<10	<10	--	--	24	<10
F3 (C16-C34 Hydrocarbons)	50	mg/kg	1,300	2,600	<50	<50	--	--	310	<50
F4 (C34-C50 Hydrocarbons)	50	mg/kg	5,600	10,000	<50	<50	--	--	540	<50
Physical Properties										
Dry Bulk Density	0.01	g/cm3	NG	NG	--	--	1.6	1.7	--	--
Moisture	0.3	%	NG	NG	21	21	14	13	16	18
Organics										
Total Organic Carbon (TOC)	0.02	%	NG	NG	--	--	1.1	0.67	--	--
Fraction of Organic Carbon	0.0002	g/g	NG	NG	--	--	0.011	0.0067	--	--
Particle Size										
Sieve-Pan	0.2	%	NG	NG	--	--	81	64	--	--
Sieve-Pan - # 200 (>0.075 mm)		N/A	NG	NG	--	--	19	36	--	--
Grain Size		N/A	NG	NG	--	--	Fine	Fine	--	--

Notes:

¹ Alberta Environment and Sustainable Resource Development (ESRD). 2014. Alberta Tier 1 Soil and Groundwater Remediation Guidelines. Land and Forestry Policy Branch, Policy Division. 195 pp. References guidelines are for fine-grained surface and subsoil under residential/parkland land use.

NG - No guideline.

-- = Not analyzed.

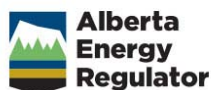
<= less than laboratory reportable detection limit.

BOLD AND SHADED - Exceeds Guideline.

APPENDIX D

RECORD OF SITE CONDITION

Record of Site Condition



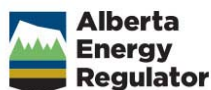
1 REPORT AND FORM INFORMATION			
Title of report	2015 Groundwater and Soil Vapour Monitoring Program. 202 Main Street Barons, AB. Alberta Municipal Affairs Site #9557		
Report date (dd-mon-yyyy)	Feb 2016	Record of Site Condition (RSC) ID No. ^ψ	

2 SITE IDENTIFICATION AND PHYSICAL LOCATION								
2.1 Site name		AMA Site #9557						
2.2 Address of site		202 Main Street						
		Municipality	Barons					Alberta
2.3 Legal land description of site (if multiple, list all.)								
Plan, Block, Lot (PBL)			Alberta Township System (ATS)					
Plan	Block	Lot	LSD	Quarter	Section	Township	Range	Meridian
2605X	7	1						
2605X	7	2						

3 STAKEHOLDERS			
3.1 Operator			
Company	Village of Barons	Contact person	Laurie Beck
Mailing address	PO Box 129 Barons AB T0L 0G0	Position held	Administrator
		Business phone No.	403.757.3633
		Business fax No.	403.757.2599
		Business e-mail	Barons@figment.ca
3.2 Consultant ☐ Not applicable			
Company	Tetra Tech EBA Inc.	Contact person	Jaymes Going
Mailing address	442 - 10 Street North Lethbridge, AB T1H 2C7	Position held	Environmental Consultant
		Business phone No.	403.329.9009
		Business fax No.	403.328.8817
		Business e-mail	Jaymes.Going@tetrattech.com
3.3 Landowner(s)			
Land type	☐ Private ☐ Special Areas ☐ Parks and protected area ☒ Public (if not private, provide Disposition No.: _____)		
Landowner(s)	☒ Same as operator ☐ Other		

^ψ: Do not fill in. Reserved for internal administrative purposes only.

Record of Site Condition

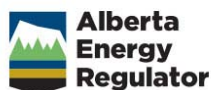


3.4 Occupant(s)			
Are there occupants at the site?	☒ Yes	☐ No	☐ To be determined (TBD)
Occupant(s)	☒ Same as operator	☐ Same as landowner	☐ Other
What is the type of occupancy?	☐ Apartment building	☐ Town house	☐ Single detached house
	☐ Agricultural	☐ Industrial	☐ Commercial
	☒ Other (specify) <u>Public Works Building</u>		

4 OPERATING STATUS	
☐ Operating ☐ Suspended ☒ Abandoned ☐ Decommissioning in progress ☐ Closed ☐ Reclaimed (provide Reclamation Certificate No.(s): _____) ☐ Not applicable	

5 TYPE OF ACTIVITY AND SITE					
5.1 Petroleum Storage Tank Site					☒ Yes
5.1.1 ESRD file No.(s)				PTMAA site No.	
5.1.2 Types of activity					
☒	Retail gas station	☐	Aviation fuelling station	☐	Bulk fuel
☐ Other (specify): _____					
5.2 Upstream Oil and Gas Facility					☐ Yes
5.2.1 ESRD file No.(s)				AER approval No.(s)	
5.2.2 AER authorization type					
☐ Approval ☐ License ☐ Permit ☐ Order ☐ Other (specify) _____					
5.2.3 Types of activity					
☐	Wellsite and associated facility	☐	Satellite	☐	Battery
☐	Compressor and pumping station	☐ Other (specify): _____			
5.3 Approved Facility Under Environmental Protection and Enhancement Act (EPEA)					☐ Yes
5.3.1 ESRD approval No.(s)				AER approval No.(s)	
5.3.2 Types of approved activity					
☐	Chemical manufacturing plant	☐	Enhanced recovery in-situ oil sands or heavy oil processing plant	☐	Fertilizer manufacturing plant
☐	Metal manufacturing plant	☐	Oil refinery	☐	Oilsands processing plant
☐	Pesticide manufacturing plant	☐	Petrochemical manufacturing plant	☐	Pipeline
☐	Pulp and paper processing plant	☐	Sour gas processing plant	☐	Sulphur manufacturing or processing plant
☐	Wood treatment plant	☐ Other (specify): _____			
☐		☐		☐	Landfill
☐		☐		☐	Oil production site
☐		☐		☐	Power plant
☐		☐		☐	Waste management facility

Record of Site Condition



5.4 Facility Under EPEA Code of Practice				☐ Yes	
5.4.1 ESRD registration No.(s)				AER registration No.(s)	
5.4.2 Type of Code of Practice					
☐	Asphalt paving plant	☐	Compressor and pumping station	☐	Concrete producing plant
☐	Pesticides	☐	Pipeline	☐	Land treatment of soils containing hydrocarbons
☐	Small incinerator	☐	Sweet gas processing plant	☐	Other (specify): _____
5.5 Other Activity					
☐ Yes					
5.5.1 ESRD file No.(s)				Other site ID No.(s)	
				Authorized by	
5.5.2 Types of activity					
☐	Dry cleaning operation	☐	Highway maintenance yard	☐	Transportation
☐	Other (specify): _____				

6 SITE CHARACTERIZATION					
6.1 What Environmental Site Assessments (ESA) Have Been Conducted and Completed to Date?					
☒ Phase I ESA ☒ Phase II ESA (check all that apply.) ☒ Initial intrusive sampling ☐ delineation completed ☒ post-remediation monitoring ☐ final confirmatory sampling					
6.2 Contaminants of Potential Concern (COPC)					
6.2.1 Does the site have any of the conditions that require the mandatory use of Alberta Tier 2 Soil and Groundwater Remediation Guidelines (ESRD, 2007 and updates)? (check all that apply in Section 6.2.1.1.)					
☒ Yes ☐ No (→ proceed to Section 6.2.2.)					
6.2.1.1 Identify any conditions that require the approaches of the Alberta Tier 2 guidelines. (see Alberta Tier 1 Soil and Groundwater Remediation Guidelines (ESRD, 2007 and updates), for details.)					
☒	Contamination within 30 cm of building foundation	☒	Unusual building feature (eg. earthen floor)	☐	Contamination within 10 m distance of surface water body
☒	Fractured bedrock	☐	Potentially high hydraulic conductivity ($> 10^{-5}$ m/sec.)	☐	Other (see Alberta Tier 1 guidelines and specify): _____
6.2.1.2 Did the Alberta Tier 2 approach lead to a soil or groundwater guideline that was lower than the corresponding Tier 1 guideline for the same contaminant(s)?					
☐ Yes ☐ TBD ☒ No (→ proceed to Section 6.2.2.)					
6.2.1.3 If you answered 'yes' or 'TBD' to Section 6.2.1.2, identify the group of contaminants for each COPC with a mandatory Tier 2 guideline that is lower than the corresponding Tier 1 guideline (check all that apply, see Alberta Tier 1 guidelines, Tables 1-4 for detailed listing).					
☐	General and inorganic parameters	☐	Metals		
☐	Hydrocarbons	☐	Halogenated aliphatics		
☐	Chlorinated aromatics	☐	Pesticides		
☐	Other organics	☐	Radionuclides		
☐	Salt	☐	Other (specify): _____		

Record of Site Condition



6.2.1.4 Did any past or current ESA relevant to this investigation identify an exceedance of the mandatory Tier 2 guidelines referred to in Section 6.2.1.3 (e.g. Tier 2 guidelines that are lower than the corresponding Tier 1 guidelines)? ☐ Yes ☐ No ☐ TBD	
6.2.1.5 If you answered 'yes' in Section 6.2.1.4, have all relevant COPC been remediated to meet the mandatory Tier 2 guidelines? ☐ Yes ☐ No	
6.2.2. Did any past or current ESA relevant to this investigation identify a drilling waste disposal area? ☐ Yes ☒ No (→proceed to Section 6.2.3.)	
6.2.2.1 If a drilling waste disposal area was identified, did any past or current ESA identify non-compliance with the compliance options outlined in <i>Assessing Drilling Waste Disposal Areas: Compliance Options for Reclamation Certification</i> (AER, 2014), as amended? ☐ Yes ☐ No	
6.2.2.2 If you answered 'yes' in Section 6.2.2.1, have all COPC been remediated to meet the compliance options outlined in <i>Assessing Drilling Waste Disposal Areas: Compliance Options for Reclamation Certification</i> (AER, 2014), as amended? ☐ Yes ☐ No	
6.2.2.3 For any COPC that did not meet the compliance options in <i>Assessing Drilling Waste Disposal Areas</i>, identify the group of contaminants (check of all that apply, see the Alberta Tier 1 guidelines, Tables 1-4 for detailed listing).	
☐ General and inorganic parameters	☐ Metals
☐ Hydrocarbons	☐ Halogenated aliphatics
☐ Chlorinated aromatics	☐ Pesticides
☐ Other organics	☐ Radionuclides
☐ Salt	☐ Other (specify): _____
6.2.3 For all areas and COPCs not assessed under Sections 6.2.1 or 6.2.2, did any ESA relevant to this investigation identify an exceedance over the Alberta Tier 1 guidelines? ☒ Yes ☐ No (→proceed to Section 6.3.)	
6.2.3.1 If you answered 'yes' in Section 6.2.3, have all COPC been remediated to meet the Alberta Tier 1 guidelines? ☐ Yes ☒ No ☐ TBD	
6.2.3.2 For any COPC that exceeded Alberta Tier 1 guidelines in Section 6.2.3.1, identify the group of contaminants. (check all that apply, see the Alberta Tier 1 guidelines, Tables 1-4 for detailed listing.)	
☐ General and inorganic parameters	☐ Metals
☒ Hydrocarbons	☐ Halogenated aliphatics
☐ Chlorinated aromatics	☐ Pesticides
☐ Other organics	☐ Radionuclides
☐ Salt	☐ Other (specify): _____

Record of Site Condition



6.3 Status of Investigation

6.3.1 Identify soil and groundwater guidelines used to assess the COPCs that are the subject of this investigation (check all that apply).

- ☒ Alberta Tier 1 Soil and Groundwater Remediation Guidelines – 2007 and updates,
☐ Coarse grained ☒ Fine grained
☒ Alberta Tier 2 Soil and Groundwater Remediation Guidelines – 2007 and updates,
☐ Pathway exclusion ☐ Guideline adjustment ☐ Site specific remediation objectives
☐ Assessing Drilling Waste Disposal Areas: Compliance Options for Reclamation Certification (AER, 2014), as amended
☐ Other (specify): _____

6.3.2 What land use classification(s) is used?

- ☐ Natural ☐ Agricultural ☒ Residential ☐ Commercial ☐ Industrial ☐ Other (specify: _____)

6.3.3 What is the outcome of the investigation? (check one only.)

- ☐ For all COPCs on-site and off-site, no exceedance has been found above any applicable soil and groundwater guidelines in any prior and current assessments.
☐ All contamination on-site and off-site has been completely remediated and meets the applicable soil and groundwater guidelines.
☒ One or more COPC still exceeds the applicable soil or groundwater guidelines.

6.3.4 How many contaminated areas are there currently at the site?

☒ One ☐ None ☐ TBD

6.3.5 Are all contaminated areas and potential contaminated areas assessed during this investigation?

☒ Yes ☐ No

6.3.6 For all areas of potential environmental concern, list the dates when the contamination was discovered (specify dd-mon-yyyy): 17-Nov-08; _____

6.3.7 For all areas that have been identified in Section 6.3.4, have all substance releases been reported to ESRD?

☒ Yes ☐ No ☐ Not applicable

6.3.8 If the answer to Section 6.3.7 is 'yes', list all Incident No.(s) (attach separate sheet if necessary): _____; _____

☒ Not assigned

6.3.9 What is the approximate, cumulative amount of land area remaining exceeding applicable remediation guidelines? _____ (m²) ☐ None ☒ TBD

6.3.10 Is there non-aqueous phase liquid (NAPL) product remaining on site? ☐ Yes ☒ No ☐ TBD

6.3.11 Is there non-aqueous phase liquid (NAPL) product remaining off site? ☐ Yes ☐ No ☒ TBD

6.3.12 What is the remediation status of the contaminated areas at site?

- | | |
|---|---|
| ☐ No remediation required | ☐ Site has exceedance but no remediation plan |
| ☒ Remediation plan developed | ☐ Active remediation |
| ☐ Remediation completed | ☐ Post remediation assessment completed |
| ☒ Ongoing risk management plan – on-site | ☒ Ongoing risk management plan – off-site |
| ☐ Remediation Certificate issued for some area(s) (provide Remediation Certificate No.(s): _____) | |
| ☐ Remediation Certificate cancelled for some area(s) (provide Remediation Certificate No.(s): _____) | |

Direction for Completing the Remainder of the Form

Attach the analytical summary tables of the COPCs that are the subject of this investigation and still present at this site. A detailed listing of COPCs can be found with Tables 1-4 in *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* (ESRD, 2007 and updates), as amended. Refer to the *RSC User's Guide* for detailed information on format and other requirements regarding the summary table.

For the remainder of the form, follow the directions below:

- If the COPCs on-site and off-site have never exceeded any applicable soil and groundwater guidelines in any prior and current assessments, → proceed to Section 8, or
- If the COPCs on-site and off-site have been completely remediated and meet the applicable soil and groundwater guidelines, → proceed to Section 8, or
- For all other circumstances, continue with Section 6.4.

6.4 Key Transport Factors for Existing COPCs

6.4.1 What is the horizontal distance to the nearest water well from the edge of the nearest contaminated area?

☐ 0-50 m ☐ 50-100 m ☒ 100-300 m ☐ 300-1000 m ☐ > 1000 m

6.4.2 What is the horizontal distance to the nearest surface water body from the edge of the contaminated area?

☐ ≤10 m ☐ 10-50 m ☐ 50-100 m ☐ 100-300 m ☒ 300-1000 m ☐ > 1000 m

6.4.3 Does delineation achieve closure above the groundwater water table that is nearest to the ground surface?

☐ Yes (→ go to Section 6.5.) ☒ No ☐ TBD

6.4.4 Is the groundwater that is nearest the ground surface a domestic use aquifer (DUA) as defined in Alberta Tier 2 guidelines?

☒ Yes ☐ No ☐ TBD ☐ Not required (NR)

6.4.5 Is there a hydraulic barrier, as defined in Alberta Tier 2 guidelines, between the base of the contaminated area and the DUA?

☐ Yes ☒ No ☐ TBD ☐ NR

6.4.6 If you answered 'yes' to Section 6.4.5, provide the measured largest value of the hydraulic conductivity (as value $\times 10^{-7}$ m/sec.) for the 5.0 m vertical layer from the bottom of the contaminated zone.

_____ ($\times 10^{-7}$ m/sec.) ☐ TBD ☐ NR

6.5 On-site Characterization

6.5.1 What is the dominant soil texture that governs substance transport at the site?

☐ Coarse grained ☒ Fine grained ☐ TBD ☐ Not applicable (must identify reason in Section 6.2.1.1.)

6.5.2 What are the shallowest and deepest measured depths (meters below ground surface) of the water table at site?

Shallowest: 1.56 (m) Deepest: 2.84 (m) ☐ TBD ☐ NR (specify max. depth assessed: _____ (m))

6.5.3 What is the dominant horizontal direction of groundwater flow for the near surface water table?

(N, NW, etc.: North) ☐ TBD ☐ NR

6.5.4 What is the existing land use classification?

☐ Natural ☐ Agricultural ☒ Residential ☐ Commercial ☐ Industrial ☐ Other (specify) _____

6.5.5 What is the end land use classification?

☐ Natural ☐ Agricultural ☒ Residential ☐ Commercial ☐ Industrial ☐ Other (specify) _____

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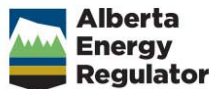
6.5.6 Identify exposure pathways for which the applicable guidelines are exceeded on-site (check all that apply).			
☒	Vapour inhalation	☐	Soil ingestion
☒	Ingestion of potable water	☐	Soil dermal (skin) contact
☐	Fresh water aquatic life	☒	Soil contact for plants and invertebrates
☐	TBD	☐	Other (specify): _____

6.6 Off-site Characterization			
6.6.1 Are there COPCs off-site exceeding applicable soil or groundwater guidelines?			
☐ No (→ if on-site contamination was reported, proceed to Section 7, otherwise, proceed to Section 8.) ☒ Yes ☐ TBD			
6.6.2 What is the current land use classification for any off-site area(s) identified in Section 6.6.1?			
☐ Natural ☐ Agricultural ☒ Residential ☐ Commercial ☐ Industrial ☐ Other (specify) _____			
6.6.3 What is the end land use classification for any off-site area(s) identified in Section 6.6.1?			
☐ Natural ☐ Agricultural ☒ Residential ☐ Commercial ☐ Industrial ☐ Other (specify) _____			
6.6.4 Is there any substance concentration under a road allowance exceeding the applicable soil or groundwater guidelines?			
☒ Yes ☐ No (→ proceed to Section 6.6.6.) ☐ TBD			
6.6.5 What is the most sensitive land use classification adjacent to the road allowance?			
☐ Natural ☐ Agricultural ☒ Residential ☐ Commercial ☐ Industrial ☐ Other (specify) _____			
6.6.6 Identify exposure pathways for which the applicable guidelines are exceeded off-site (check all that apply).			
☒	Vapour inhalation	☐	Soil ingestion
☒	Ingestion of potable water	☐	Soil dermal (skin) contact
☐	Fresh water aquatic life	☒	Soil contact for plants and invertebrates
☐	TBD	☐	Other (specify): _____

7 RISK MANAGEMENT PLAN (RMP)		
7.1 What is the Plan for Contaminated Areas Still Remaining on and off the Site? (check one only.)		
☐ Complete remediation (→ proceed to Section 8). ☒ Partial remediation with risk management for some residual contamination. ☐ Risk management for all remaining contamination.		
7.2 Key Progress of RMP		
7.2.1 If the site needs an on-going RMP, answer all the following questions that apply to the RMP.		
☐ Yes	☒ No	Are contaminated areas completely delineated horizontally and vertically in soil?
☐ Yes	☒ No	Are contaminated areas completely delineated horizontally and vertically in groundwater?
☒ Yes	☐ No	Is source identified and completely delineated?
☒ Yes	☐ No	Is source migrating or has migrated off-site?
☐ Yes	☒ No	Is source left as is?
☒ Yes	☐ No	Is source partially removed and residual source being managed?
☐ Yes	☒ No	Is source controlled with physical or administrative methods?
☒ Yes	☐ No	Are all pathways of concern identified?
☐ Yes	☒ No	Have all relevant receptors been identified and protected?
☒ Yes	☐ No	Is there a monitoring program in place to verify RMP success?
☒ Yes	☐ No	Are there third parties related to this RMP? (if the answer is 'no', skip the next question.)
☒ Yes	☐ No	If there are third parties, have all of them accepted the RMP?
☒ Yes	☐ No	Is there a commitment from person(s) responsible to implement and monitor the RMP until final remediation guidelines are achieved?
☒ Yes	☐ No	Is there a contingency plan in place should the RMP fail?
☒ Yes	☐ No	Is the RMP implemented for the site?

Public Disclosure and Privacy Notification
The <i>Record of Site Condition</i> form is a public record that is disclosed in accordance with section 35 of the <i>Environmental Protection and Enhancement Act</i>, <i>Disclosure of Information Regulation</i>, and <i>Ministerial Order 23/2004</i>. Reasonable efforts have been made to minimize collection of personal information where possible. Personal information on the form is collected under the authority of section 12(c) and other provisions of the <i>Environmental Protection and Enhancement Act</i> and is in compliance with section 33(a) and 33(c) of the <i>Freedom of Information and Protection of Privacy Act</i> (FOIP). Personal information collected on this form will be used by Alberta Environment and Sustainable Resource Development (ESRD) or the Alberta Energy Regulator (AER), as the case may be, for the purposes of administering its programs.
Accuracy of Information
The information in this document has been submitted by persons other than ESRD or the AER. The Department, the Government of Alberta, and the AER cannot and do not warrant that the information in this document is current, accurate, complete, or free of errors. Persons accessing the information provided should not rely on it, and any reliance on the information provided is taken at the sole risk of the user. Users of this information are advised to conduct their own due diligence to satisfy themselves of the environmental condition of the property of interest.

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8 DECLARATION

This *Record of Site Condition* form was prepared for the purpose of reporting on the state of environmental site conditions and, where applicable, for the purpose of remediation or reclamation, for:

AMA Site 9557 (site name) (the "Site").

I, as the licensed operator or authorized representative, have reviewed all information that was used in preparation of this form and I am satisfied that it was prepared in a manner consistent with the Applicable Standard¹ together with any relevant additional guidance that is available from Alberta Environment and Sustainable Resource Development as of this date for conducting environmental site assessments.

Having conducted reasonable inquiries to obtain all relevant information, to my knowledge, the statements made in this form are true as of this date. I have disclosed all pertinent information of which I am aware concerning the historical and current environmental condition of the Site to the Director.

Any use which a third party, other than the Crown in right of Alberta or the AER, makes of this form, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. The undersigned accepts no responsibility for damages, if any, suffered by any third party, other than the Crown in right of Alberta and the AER, as a result of decisions made or actions based on this form. Any exclusions or disclaimers to the contrary contained in any attachment to this form are of no force or effect as against the Crown in right of Alberta and the AER.

Footnote ¹:

"Applicable Standard" means

- a) for the purposes of upstream oil and gas sites,
 - i) *2010 Reclamation Criteria for Wellsites and Associated Facilities Application Guidelines* (ESRD 2011),
 - ii) CSA Standard Z769, *Phase II Environmental Site Assessment*, as amended, for any Phase II site assessment information used in preparation of this form on all upstream oil and gas sites not included in a) i);
- b) for the purposes of all other sites, CSA Standard Z768, *Phase I Environmental Site Assessment*, as amended, for any Phase I site assessment information and with CSA Standard Z769, *Phase II Environmental Site Assessment*, as amended, for any Phase II site assessment information used in preparation of this form.

By signing below, I as the licensed operator or authorized representative, confirm the information provided herein is correct and complete, to the best of my knowledge and belief.

Village of Barons				
Name of operator	Name of authorized representative	Title of authorized representative (e.g. officer, director)	Signature	Date (dd-mon-yyyy)