Chemical Injection Program, Soil Vapour Extraction System Installation, and Groundwater Monitoring Program
202 Main Street, Barons, Alberta
Alberta Municipal Affairs Site #9557

PRESENTED TO
Village of Barons

MAY 2017
ISSUED FOR USE
FILE: CENV03133-01

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EXECUTIVE SUMMARY

FOREWORD

The Village of Barons (Barons) retained Tetra Tech Canada Inc. (Tetra Tech), to conduct an in-situ remedial program (chemical injection program [CIP] and soil vapour extraction [SVE]) and a post injection groundwater monitoring program for a property located at 202 Main Street in Barons, Alberta; hereinafter referred to as "the site". The site is included within the Alberta Municipal Affairs Tank Site Remediation Program (AMA Program), Site Number: 9557.

The scope of work for this project was based on previous environmental site assessments (ESAs) conducted at the site by Tetra Tech which identified concentrations of petroleum hydrocarbon (PHCs) impacts in the soil, groundwater, and soil vapour greater than the referenced 2016 Alberta Environment and Parks (AEP) 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.

On behalf of Barons, Tetra Tech contracted Sequoia Environmental Remediation Inc. (Sequoia) based out of Calgary, Alberta for the CIP and SVE installation. Tetra Tech was on site with Sequoia during the CIP and SVE installation to document all activities and summarize the details in this report.

The objective of the CIP was to enhance the natural attenuation of PHC impacted areas by injecting an oxidation agent (hydrogen peroxide) into the subsurface using a direct push system. The objective of the SVE system was to remove volatile contaminants (e.g., benzene, toluene, ethylbenzene, xylenes) from the subsurface unsaturated soil (vadose zone) in an area at the site adjacent to the residence to the east where the potential for impacts from exposure of soil vapour has been identified. The SVE system was connected to the existing soil vapour wells installed in close proximity to this residence.

The objective of the groundwater monitoring program was: 1) to evaluate whether the chemical quality of the groundwater had improved post injection when compared to historical analytical results; and 2) to evaluate the capacity of the monitored area for continued attenuation of PHC compounds.

DISCUSSION AND CONCLUSIONS

Petroleum Hydrocarbon Trends

Concentrations of benzene, ethylbenzene, xylenes and PHC fraction F2 were greater than the referenced Tier 1 Guideline at one or more monitoring wells in 2017. The highest concentrations of these parameters are typically measured at 08MW02 and 09MW13, down-gradient of the former underground storage tank (UST) location.

Benzene concentrations at most wells have been decreasing since the April 2015 monitoring event. The exception to this is at 08MW07, where the 2017 concentration was measured at the highest value to date for the well.

Ethylbenzene concentrations at 08MW02 have exhibited an increasing trend since July 2014; however, the concentrations have remained less than the initial value measured in November 2008. The concentration at 09MW13 has been variable over time; however, has generally decreased overall since the initial value measured in March 2009.

Xylene concentrations at 09MW10 increased to greater than the guideline in 2017 for the first time since the initial event in March 2009. The concentration at 09MW13 has exhibited an increasing trend since July 2014; however, the concentrations have remained less than the initial value measured in 2009.

PHC fraction F2 concentrations at 08MW02 and 09MW13 have been variable over time with no clear trends identified. The 2017 concentration at 08MW02 was measured at the highest value to date for the well. The 2017 concentration at 09MW13 is the highest value measured for the well since July 2014; however, the concentration is less than the initial value measured in March 2009.

Natural Attenuation

Analytical results for reduction-oxidation (redox) sensitive routine water chemistry parameters (nitrate, nitrite, sulphate, and dissolved iron and manganese) are used to assess the inferred redox conditions at the groundwater monitoring wells. Assessing redox conditions is relevant to determine if monitored natural attenuation (MNA), an approach that relies on natural processes (biodegradation, dispersion, dilution, sorption, volatilization, and chemical stabilization of chemicals of concern), can be used to remediate groundwater within a reasonable time frame, or to assess if a dissolved hydrocarbon plume is stable.

The inferred redox conditions of groundwater at the site have remained generally consistent since 2014. In 2017, anoxic groundwater conditions were noted at 08MW02, suggesting the conditions are not favourable for natural attenuation at this well. Suboxic conditions are noted at all other wells which suggests that subsurface conditions are suitable, but not optimal (when compared to oxic conditions) for the continued attenuation of PHCs.

Soil Vapour Extraction System

Results from the analytical testing of soil vapour entering the SVE (RVU1, RVU2, and RVU3) showed that concentrations of benzene and ethylbenzene increased overall between the first sample collected (RVU1 - August 2016) and final sampling event (RVU3 - February 2017). Concentrations of toluene, xylenes, and PHC fractions F1 and F2 generally decreased overall between the first and last event. It should be noted that seasonal fluctuations (e.g., rise and fall in groundwater levels) may impact the trends observed as the sampling events were completed during the summer and winter months. The 2016 and 2017 soil vapour results from the SVE system are generally lower than the 2014 and 2015 soil vapour results collected at vapour wells 14VW01 to 14VW04. No exceedances of the indoor screening levels for both residential land use and commercial land use were reported in the 2016 and 2017 soil vapour results collected from the SVE system.

RECOMMENDATIONS

Based on the results of the above CIP, SVE, groundwater monitoring program, and historical data collected to date, Tetra Tech recommends the following.

- The Village of Barons should continue to operate and maintain the SVE system in order to reduce soil vapour risk to occupants at the adjacent residence. If access can be granted, an indoor air quality sample from the adjacent residence should be collected.
- Continue the current groundwater monitoring and sampling program in order to confirm PHC trends and to evaluate the natural attenuation progress to determine if an additional CIP is warranted. The next proposed groundwater monitoring event is recommended to be scheduled in September 2017.

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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 Canada Inc. (Tetra Tech) 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's Services Agreement. Tetra Tech's General Conditions are provided in Appendix A of this report.

1.0 INTRODUCTION

1.1 General

The Village of Barons (Barons) retained Tetra Tech Canada Inc. (Tetra Tech) to conduct an in-situ remedial program (chemical injection program [CIP] and soil vapour extraction [SVE]) and a post injection groundwater monitoring program for a property located at 202 Main Street in Barons, Alberta; hereinafter 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 for this project was based on previous environmental site assessments (ESAs) conducted at the site by Tetra Tech which identified concentrations of petroleum hydrocarbon (PHCs) impacts in the soil, groundwater, and soil vapour greater than the referenced 2016 Alberta Environment and Parks (AEP) 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.

On behalf of Barons, Tetra Tech contracted Sequoia Environmental Remediation Inc. (Sequoia) based out of Calgary, Alberta for the CIP and SVE installation. Tetra Tech was on site with Sequoia during the CIP and SVE installation to document all activities and summarize the details in this report. The work was conducted according to Tetra Tech's terms and conditions for environmental work. A copy of these terms and conditions is provided in Appendix A.

1.2 Background

Details of the previous ESAs completed by Tetra Tech for the site 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.
- 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.
- Groundwater and Soil Vapour Monitoring Program. 202 Main Street, Barons, Alberta. Alberta Municipal Affairs Site #9557. File No. ENVIND03354-03, February 2016.

1.3 Objectives

The objective of the CIP was to enhance the natural attenuation of PHC impacted areas by injecting an oxidation agent (hydrogen peroxide) into the subsurface using a direct push system. The objective of the SVE system was to remove volatile contaminants (e.g., benzene, toluene, ethylbenzene, xylenes) from the subsurface unsaturated soil (vadose zone) in an area at the site adjacent to the residence to the east where the potential for impacts from exposure of soil vapour has been identified. The SVE system was connected to the existing soil vapour wells installed in close proximity to this residence.

The objective of the groundwater monitoring program was: 1) to evaluate whether the chemical quality of the groundwater had improved post injection when compared to historical analytical results; and 2) to evaluate the capacity of the monitored area for continued attenuation of PHC compounds.

1.4 Authorization

Ms. Laurie Beck, of the Village of Barons, provided written authorization to Tetra Tech to proceed with the present project (CIP, SVE, and groundwater monitoring program) via a signed Services Agreement dated June 16, 2016.

1.5 Scope of Work

To meet the objectives stated in Section 1.3, the scope of work for the CIP, SVE installation/maintenance, and groundwater monitoring program included the following tasks:

- Provided project management, safety, and coordination services.
- Requested Alberta One-Call and a private company to conduct utility locates prior to commencing the CIP and SVE installation (completed by Sequoia).
- Injected approximately 2,400 liters (L) of 9% hydrogen peroxide into the subsurface at twelve points (evenly distributed). Tetra Tech selected the locations and the depth of the injection points and monitored the CIP.
- Installed a SVE system by connecting a regenerative blower complete with a granular activated carbon (GAC) chamber to three of the soil vapour wells located on the eastern portion of the site (14VW01, 14VW02, and 14VW03).
- Monitored the operation and effectiveness of the SVE approximately one week, one month, and four months after installation. Monitored vapour concentrations (VCs) into and out of the SVE using a MiniRae^{tm} 3000 Photoionization Detector (PID). Collected vapour samples from the SVE system (prior to the GAC barrel) in Tedlar^{TM} bags. Submitted three samples to Maxxam Analytics Inc. (Maxxam), located in Calgary, Alberta for laboratory analysis of volatile organic compounds (VOCs). Completed an additional 10 site visits to ensure the SVE was operating and to perform general maintenance.
- Monitored four groundwater monitoring wells (08MW02, 08MW07, 09MW10, and 09MW13). Monitoring included measurements of well headspace VCs using a PID; and the measurement of liquid levels including light non-aqueous phase liquid (LNAPL), if present, using a Heron^{TM} Interface Probe at each well.
- Purged each well, prior to sampling, of at least three standing volumes of water or until practically dry. The groundwater levels were given sufficient time to recover and samples were collected on the same day purging took place.
- Submitted four groundwater samples to Maxxam for chemical analyses of benzene, toluene, ethylbenzene, and xylenes (BTEX), PHC fractions F1 and F2, dissolved iron, dissolved manganese, and routine groundwater parameters.
- Prepared this report discussing the CIP, SVE system installation, operation, and maintenance, and the groundwater monitoring program including field observations and analytical results, comparing the results to historical data and the 2016 AEP Tier 1 Soil and Groundwater Remediation Guidelines (Tier 1 Guidelines)[1].

[1] Alberta Environment and Parks (AEP). 2016. Alberta Tier 1 Soil and Groundwater Remediation Guidelines. Land Policy Branch, Policy and Planning Division. 197 pp.

- Prepared an updated record of site condition (RSC) to include with this report.

1.6 Qualifications of Assessors

Mr. Jamie LaMontagne, EP, was on site to monitor the CIP, VES installation and operation, conducted the groundwater monitoring and sampling program, and wrote this report. Mr. LaMontagne is an Environmental Technologist with Tetra Tech's Environment and Water Practice and has 16 years of experience in the environmental industry.

Mr. Jaymes Going, B.Sc., EP, acted as the Project Manager, planned the CIP and SVE, assisted with the interpretation of the data, and provided the intermediate review of this report. Mr. Going is an Environmental Scientist with Tetra Tech's Environment and Water Practice and has over 9 years of experience in the environment industry.

Mr. Henri Carriere, P.Eng., M.N.R.M., conducted the final review of the report. Mr. Carriere is a Senior Project Engineer with Tetra Tech in the Environment and Water Practice in Calgary, Alberta. Mr. Carriere has over 24 years of experience in the environment industry.

2.0 METHODS

This section describes the methods applied by Tetra Tech during the CIP, SVE system installation and operation/maintenance, and the groundwater monitoring program.

2.1 Project Safety

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

2.1.1 Chemical Injection Program (CIP)

Tetra Tech was on site with Sequoia on July 27, 2016 to conduct the CIP. Injection points were selected based on the locations of PHC impacts identified during previous assessments and to ensure safe proximity from buried facilities.

Twelve temporary injection points were installed on the north side of the building and/or on the roadway to the west (Alberta Avenue) and north (Main Street) of the site using a direct push method, attached to a Bobcat skid-steer machine. Tetra Tech selected the locations and the depth of the injection points and spaced them evenly throughout the area to target PHC impacts. Approximately 2,400 L of 9% hydrogen peroxide was injected (evenly distributed) into the subsurface, and the temporary injection point removed. The injection locations are presented on Figure 2.

2.1.2 Soil Vapour Extraction (SVE) System

In conjunction with the CIP, qualified SVE technicians from Sequoia connected a two horsepower regenerative blower, capable of extracting vapours up to approximately 4.5 m^3/minute to the existing soil vapour wells on site (14VW01, 14VW02, and 14VW03) with a 3" PVC header buried below grade. The unit was equipped with a moisture knockout barrel prior to entering the SVE system; and a GAC barrel to reduce vapour emissions exiting the SVE system. The unit was placed at the northeast corner of the site building with an effluent vapour vent stack attached to the building and terminating above the roof of the structure.

Tetra Tech monitored the operation of the SVE periodically (approximately every two weeks) between the date of installation and February 2, 2017, to ensure that the unit was in operation and to empty the moisture knockout drum. Vapour samples were collected from the SVE system using Tedlar™ bags approximately one week (August 9, 2016) and again one month (September 12, 2016) after the installation. An additional vapour sampling event was conducted in conjunction with the groundwater monitoring program (approximately six months after the installation) on February 2, 2017. The vapour samples were collected through a port prior to entering the GAC barrel. In addition to the sample collection, VCs were measured from the SVE system during each sampling event using a PID at points where vapours entered and exited the activated carbon barrel. VCs ranged between 4.6 ppm (August 9, 2016) and 8.7 ppm (February 2, 2017) entering the system; and 0.2 ppm (August 9, 2016) and 0.6 ppm (February 2, 2017) exiting the system. Vapour samples were stored in laboratory-supplied Tedlar™ bags, and were transported to Maxxam in Calgary, Alberta under chain-of-custody (COC) for analysis of VOCs.

2.2 Groundwater Monitoring, Sampling, and Analytical Testing

Tetra Tech personnel conducted the groundwater monitoring and sampling program on February 2, 2017. Monitoring wells were screened for headspace VCs at each location using a PID immediately upon removing the well cap. Liquid levels were measured using a Heron™ electronic interface probe at all accessible groundwater monitoring wells (08MW02, 08MW07, 09MW10, and 09MW13). Monitoring well headspace VC measurements ranged from 0.2 ppm (08MW07) to 116 ppm (09MW13).

Prior to sampling, groundwater wells were purged of approximately three standing well volumes of water, or until the well was practically dry, and given sufficient time 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 COC for analysis of BTEX, PHC fractions F1 and F2, dissolved iron and manganese, and routine groundwater parameters. Tetra Tech's standard procedures for purging, sampling, preserving, and transporting groundwater samples were followed to avoid cross-contamination and to ensure sample quality was maintained.

Table 1 summarizes groundwater monitoring well completion details and the 2017 field monitoring results. Groundwater analytical results are presented on Table 2. A site plan showing all groundwater monitoring well locations, including historical borehole locations and the location of the former UST is presented on Figure 3.

2.3 Regulatory Framework

2.3.1 Groundwater

Based on the surrounding land use and the desired end land use for the site, 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.

2.3.2 Air Screening Criteria

The AEP Tier 2 Guidelines (AEP 2016) for the protection of indoor air for residential occupants and commercial workers were applied to evaluate the potential risk associated with volatile chemicals in indoor air. For this evaluation, air screening criteria protective of residential and commercial exposure to chemicals in indoor air were developed in accordance with the AEP Tier 2 Guidelines. The available reference tables within the AEP Tier 2

Guidelines cite the most up-to-date and available criteria from both the Canadian Council of Ministers of the Environment (CCME) and from the US Environmental Protection Agency (US EPA).

The AEP Tier 2 Guidelines include human toxicity reference values (TRVs) for inhalation (Table A-7 in AEP Tier 2 Guidelines). 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 inhalation tolerable concentration (ITC). 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 (1x10-5) after a lifetime of continuous exposure, the RSC is calculated (as per Health Canada 2012, Preliminary Quantitative Risk Assessment [PQRA] Guidance) as follows:

RSC = 1x10-5/ IUR

Continuous exposure is expressed as an exposure term (ET) which is unit-less. The ET for residential land use is 1 and the ET for commercial land use is 0.2747 (AEP 2016). The ET is used to determine appropriate indoor air screening levels for air in buildings. Indoor air screening levels were calculated (as per Health Canada 2012, PQRA Guidance) using the equation below:

Indoor Screening Level = (ITC or RSC) / 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 Guideline 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 historical soil analytical results having PHC concentrations in excess of the Tier 1 Guidelines within 3 m of the residence (and historical soil results with benzene concentrations in excess of the Tier 1 vapour inhalation guideline within 5 m), Tetra Tech 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 compared the soil vapour data to the ITC (or RSC in the case of carcinogenic compounds).

2.3.3 Comparative Guidelines Following BC MoE Guidance

The AEP recommends a default attenuation coefficient of 0.01 (DF of 100) to be applied. This value was used in for the commercial land use scenario. As stated above, the AEP 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 ITC or RSC adequately represents the risk to receptors, the BC MoE DF for earthen basements was also applied. The ITC, IUR, and ET are the same in models from both provinces.

For non-carcinogens (i.e., threshold substances), AEP 2016 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). The AEP 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 advises that in accordance with Alberta Guidance, the SAF was not applied to the carcinogens (i.e., non-threshold substances).

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

Soil Vapour Screening Level (non-carcinogen) = ITC x SAF (a SAF of 0.5 was applied) x DF / ET

Soil Vapour Screening Level (carcinogen) = RSC x DF / ET

See the attached Tables 3 and 4 for the soil vapour screening levels applied.

3.0 RESULTS

3.1 Groundwater Levels

Groundwater levels measured on February 2, 2017 ranged from 3.06 metres below grade (mbg) at 09MW13 and 3.43 mbg at 08MW02. The 2017 groundwater elevations are on average 0.63 m deeper than the previous measurements conducted on October 7, 2015. Based on the calculated groundwater elevations, the inferred shallow groundwater flow direction was interpreted to be towards the northwest (Figure 4) under an estimated horizontal hydraulic gradient of 0.004 m/m. These results are consistent with historical data for the site.

3.2 Groundwater Chemical Quality

In 2017, routine and/or dissolved metal parameters greater than the referenced Tier 1 Guidelines included nitrite, total dissolved solids (TDS), sodium, sulphate, dissolved iron, and dissolved manganese. These parameters are not interpreted to be potential contaminants of concern related to the site and elevated concentrations are often naturally occurring in shallow groundwater in southern Alberta. These parameters are included in the groundwater program to assist in determining the potential for the natural attenuation of PHCs at the site and are discussed further in Section 4.0. Results for the potential contaminants of concern for the site include BTEX and PHC fractions F1 and F2 are discussed below.

- Benzene concentrations were greater than the Tier 1 Guideline (0.005 mg/L) at all monitoring wells sampled in February 2017, with concentrations ranging between 0.0073 mg/L (09MW13) and 0.067 mg/L (08MW02). Benzene concentrations at most wells have been decreasing since the April 2015 monitoring event. The exception to this is at 08MW07, where the 2017 concentration was measured at the highest value since the initial November 2008 monitoring event.

- Toluene concentrations were less than the analytical detection limit at all wells sampled in 2017. This result is generally consistent with historical data; however, detectable concentrations (less than the Tier 1 Guideline) have been measured at 08MW02 (2008), 09MW10 (2009), and 09MW13 (2009) historically.

- Concentrations of ethylbenzene were greater than the Tier 1 Guideline (0.0016 mg/L) at 08MW02 (0.0071 mg/L) and 09MW13 (0.018 mg/L) in 2017. Concentrations at 08MW07 and 09MW10 were less than the analytical detection limit in 2017, which is generally consistent with historical data.
- Concentrations of xylenes were greater than the Tier 1 Guideline (0.02 mg/L) at 09MW10 (0.027 mg/L) and 09MW13 (0.027 mg/L) in 2017. Concentrations at 08MW02 have remained less than the Tier 1 Guideline since July 2014, while the concentrations at 08MW07 has consistently remained less than the guideline since 2008.
- Concentrations of PHC fraction F1 were less than the analytical detection limit and/or Tier 1 Guideline at all locations sampled in 2017, which is generally consistent with historical data for most wells. The exception to this is at 09MW13 which was measured greater than the guideline during the initial event in March 2009 (3.9 mg/L).
- Concentrations of PHC fraction F2 were greater than the Tier 1 Guideline (1.1 mg/L) at 08MW02 (70 mg/L) and 09MW13 (21 mg/L) in 2017. The concentrations at 08MW07 and 09MW10 were less than the analytical detection limit in 2017, and these locations have consistently remained less than the guideline since 2008 and 2009, respectively.

Laboratory analytical results, including methods of analyses, are attached in Appendix B. A summary of recent groundwater analytical results (2014 through 2017) is provided in Table 2. Historical groundwater analytical results (2008, 2009, and 2011) are provided as Appendix C. Historical soil analytical results are also provided as Appendix C. An updated copy of the Record of Site Condition (RSC) is included in Appendix D.

3.3 SVE Results

The following volatile parameters generally exhibited increasing trends between the first (August 9, 2016) and final (February 2, 2017) SVE system sampling events: benzene, ethylbenzene, chloromethane, trichloroethylene, and hexane.

The following volatile parameters have generally exhibited decreasing trends between the first (August 9, 2016) and final (February 2, 2017) SVE system sampling events: toluene, xylenes, F1, F2, 2-propanone, methyl ethyl ketone (2-butanone), 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene, 1,4-dichlorobenzene, tetrahydrofuran, and carbon disulfide.

Additionally, detectable concentrations of the following volatile parameters were detected during one or more of the events with no trends identified: dichlorodifluoromethane (FREON 12), trichlorofluoromethane (FREON 11), ethanol (ethyl alcohol), chloroform, 1,1,2,2-tetrachloroethane, styrene, 1,2-dichlorobenzene, 1,2,4-trichlorobenzene, heptane, cyclohexane, naphthalene, 2,2,4-trimethylpentane.

Results of the SVE system analytical testing are provided in the attached Table 3. Historical soil vapour analytical results (2014 and 2015) from the soil vapour wells (14VW01, 14VW02, 14VW03, and 14VW04) are provided in Table 4.

4.0 DISCUSSION AND CONCLUSIONS

4.1 Petroleum Hydrocarbon Trends

Concentrations of benzene, ethylbenzene, xylenes and PHC fraction F2 were greater than the referenced Tier 1 Guidelines at one or more monitoring wells in 2017. The highest concentrations of these parameters are typically measured at 08MW02 and 09MW13, down-gradient of the former UST location.

Benzene concentrations at most wells have been decreasing since the April 2015 monitoring event. The exception to this is at 08MW07, where the 2017 concentration was measured at the highest value to date for the well.

Ethylbenzene concentrations at 08MW02 have exhibited an increasing trend since July 2014; however, the concentrations have remained less than the initial value measured in November 2008. The concentration at 09MW13 has been variable over time, however, has generally decreased overall since the initial value measured in March 2009.

Total xylene concentrations at 09MW10 increased to greater than the guideline in 2017 for the first time since the initial event in March 2009. The concentration at 09MW13 has exhibited an increasing trend since July 2014; however, the concentrations have remained less than the initial value measured in 2009.

PHC fraction F2 concentrations at 08MW02 and 09MW13 have been variable over time with no clear trends identified. The 2017 concentration at 08MW02 was measured at the highest value to date for the well. The 2017 concentration at 09MW13 is the highest value measured for the well since July 2014; however, the concentration is less than the initial value measured in March 2009.

4.2 Natural Attenuation

Analytical results for reduction-oxidation (redox) sensitive routine water chemistry parameters (nitrate, nitrite, sulphate, and dissolved iron and manganese) are used to assess the inferred redox conditions at the groundwater monitoring wells. Assessing redox conditions is relevant to determine if monitored natural attenuation (MNA), an approach that relies on natural processes (biodegradation, dispersion, dilution, sorption, volatilization, and chemical stabilization of chemicals of concern), can be used to remediate groundwater within a reasonable time frame, or to assess if a dissolved hydrocarbon plume is stable.

Degradation occurs both under aerobic and anaerobic conditions, although aerobic breakdown of many potential contaminants of concern is often more rapid (Howard et al. 1991). The significance of the redox condition is, therefore, that under aerobic (oxic) conditions, many BTEX compounds are expected to attenuate much faster than under anoxic conditions. Therefore, if inferred oxic conditions prevail at the edge of the former plume, the migration of hydrocarbons may stabilize or decrease.

Empirical redox measurements in groundwater are difficult and often yield unreliable results. Stuyfzand (1993) proposed a semi-empirical redox indexing based on measured concentrations of redox sensitive elements.

To demonstrate the relative redox conditions on site and off site, a system of three redox levels was used, based on the analytical results of the redox sensitive elements including nitrate, sulphate, dissolved iron, and dissolved manganese. The three simplified redox levels in groundwater are presented as follows:

- 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 increase in dissolved iron.
- 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 considerably less than background values.

Using this system of simplified redox levels, the spatial distribution of inferred redox conditions at the monitoring wells was summarized for the data collected in 2017.

The inferred redox conditions of groundwater at the site have remained generally consistent since 2014. In 2017, anoxic groundwater conditions were noted at 08MW02, suggesting the conditions are not favourable for natural attenuation at this well. Suboxic conditions are noted at all other wells which suggests that subsurface conditions are suitable, but not optimal (when compared to oxic conditions) for the continued attenuation of PHCs.

4.3 Soil Vapour Extraction System

Results from the analytical testing of soil vapour entering the SVE (RVU1, RVU2, and RVU3) showed that concentrations of benzene and ethylbenzene increased overall between the first sample collected (RVU1 - August 2016) and final sampling event (RVU3 - February 2017). Concentrations of toluene, xylenes, and PHC fractions F1 and F2 generally decreased overall between the first and last event. In should be noted that seasonal fluctuations (e.g., rise and fall in groundwater levels) may impact the trends observed as the sampling events were completed during the summer and winter months. The 2016 and 2017 soil vapour results from the SVE system (Table 3) are generally lower than the 2014 and 2015 soil vapour results collected at vapour wells 14VW01 to 14VW04 (Table 4). No exceedances of the indoor screening levels for both residential land use and commercial land use were reported in the 2016 and 2017 soil vapour results collected from the SVE system.

5.0 RECOMMENDATIONS

Based on the results of the above CIP, SVE, groundwater monitoring program, and historical data collected to date, Tetra Tech recommends the following:

- The Village of Barons should continue to operate and maintain the SVE system in order to reduce soil vapour risk to occupants at the adjacent residence. If access can be granted, an indoor air quality sample from the adjacent residence should be collected.
- Continue the current groundwater monitoring and sampling program in order to confirm PHC trends and to evaluate the natural attenuation progress to determine if an additional CIP is warranted. The next proposed groundwater monitoring event is recommended to be scheduled in September 2017.

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 Canada Inc.

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PERMIT TO PRACTICE
TETRA TECH CANADA INC.
Signature _____
Date May 24, 2017
PERMIT NUMBER: P13774
The Association of Professional Engineers and Geoscientists of Alberta

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TABLES

Table 1 Monitoring Well Completion Details and 2017 Field Monitoring Results
Table 2 Groundwater Analytical Results (2014 to 2017)
Table 3 Soil Vapour Extraction (SVE) System - Vapour Analytical Results
Table 4 2014 and 2015 Soil Vapour Analytical Results

Table 1: Monitoring Well Completion Details and 2017 Field Monitoring Results

Monitoring Well I.D.	Date of Installation	Elevation[1] (m)	Monitoirng Well Pipe Stick-Up	Monitoring Well Depth (mbg)[2]	Screen Interval (mbg)	Screened In	Depth to Groundwater (mBTOC)[3]	Depth to Groundwater (mbg)	Groundwater Elevation (m)	Combustible Vapour Concetrations[4]
							February 2, 2017			
08MW02	17-Nov-08	99.33	0.04	5.2	2.2 to 5.2	Clay and bedrock	3.47	3.43	95.86	24.5 ppm
08MW07	17-Nov-08	99.13	-0.05	6.1	1.6 to 6.1	Clay and bedrock	3.19	3.24	95.94	0.2 ppm
09MW10	12-Mar-09	99.29	0.0	6.1	3.1 to 6.1	Clay and bedrock	3.38	3.38	95.91	12.2 ppm
09MW13	12-Mar-09	98.86	-0.03	6.1	3.1 to 6.1	Clay and bedrock	3.03	3.06	95.83	116 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 MiniRae 3000^{tm} Photoionization Detector.

Table 2: Groundwater Analytical Results (2014 to 2017)

Parameter	Unit	Detection Limit	Tier 1 Guideline[1]	08MW02				08MW07				09MW10				09MW13			
				7/18/2014	4/23/2015	10/8/2015	2/2/2017	7/18/2014	4/23/2015	10/8/2015	2/2/2017	7/18/2014	4/23/2015	10/8/2015	2/2/2017	7/18/2014	4/23/2015	10/8/2015	2/2/2017
Hydrocarbons																			
Benzene	mg/L	0.0004	0.005	**0.042**	**0.12**	**0.18**	**0.067**	0.0038	**0.0069**	<0.0004	**0.017**	**0.11**	**0.15**	**0.12**	**0.015**	**0.15**	**0.22**	**0.17**	**0.0073**
Toluene	mg/L	0.0004	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	<0.0004	<0.0004	<0.0004	<0.0004
Ethylbenzene	mg/L	0.0004	0.0016	**0.0020**	**0.0040**	**0.0049**	**0.0071**	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	**0.02**	**0.016**	**0.16**	**0.018**
Xylene Total	mg/L	0.0008	0.02	0.0014	0.0026	<0.0008	0.0065	<0.0008	<0.0008	<0.0008	0.0022	0.0032	0.01	0.011	**0.027**	0.017	0.019	**0.2**	**0.027**
F1 (C6-C10) - BTEX	mg/L	0.1	2.2	0.14	0.19	0.24	1.1	<0.1	<0.1	<0.1	<0.1	0.27	0.28	0.12	<0.1	0.78	0.51	1.1	0.45
F2 (C10-C16 Hydrocarbons)	mg/L	0.1	1.1	**1.4**	**26**	**3.9**	**70**	0.33	0.13	<0.1	<0.1	<0.1	0.21	0.23	<0.1	**14**	**1.5**	**18**	**21**
Nutrients																			
Nitrate (as N)	mg/L	0.01	3	0.21	0.22	<0.01	<0.01	2.6	**4.7**	**48**	0.04	0.78	0.48	3.0	0.3	1.6	0.18	**3.4**	0.18
Nitrite (as N)	mg/L	0.01	0.06	0.034	0.043	<0.01	<0.01	**0.20**	**0.31**	0.054	**0.77**	**3.3**	**2.4**	**2.2**	**2**	**2.3**	**2.4**	**1.3**	**1.1**
Routine																			
Sodium (Filtered)	mg/L	0.5	200	190	**210**	**340**	**250**	**600**	**700**	**1,600**	**800**	**1,000**	**1,100**	**1,000**	**1,100**	**1,300**	**1,300**	**1,300**	**720**
Sulphate (SO4) (Filtered)	mg/L	1	429	**680**	**820**	**1,500**	**830**	**2,300**	**2400**	**5,100**	**2,700**	**3,400**	**3,400**	**3,100**	**3,400**	**4,100**	**4,300**	**4,000**	**3,600**
Metals																			
Iron (Filtered)	mg/L	0.06	0.3	**1.3**	**3.6**	**8.7**	**8.6**	<0.06	<0.06	**0.41**	<0.060	<0.06	<0.06	**0.35**	<0.060	**1.1**	**2.9**	**2.4**	0.21
Manganese (Filtered)	mg/L	0.004	0.05	**1.7**	**2.1**	**3.5**	**2.6**	**1.6**	**1.5**	**0.22**	**1.7**	**0.81**	**0.88**	**1.1**	**2.6**	**1.3**	**1.3**	**1.6**	**0.89**

Notes:

[1] Alberta Environment and Parks (AEP). 2016. Alberta Tier 1 Soil and Groundwater Remediation Guidelines. Land and Forestry Policy Branch, Policy Division. 197 pp. Referenced guidelines are for residential/parkland land use for fine-grained soil, under the most stringent pathway.

-- = No Guideline / Data

BOLD AND SHADED - Greater than the Tier 1 Guidleine.

Table 3: Soil Vapour Extraction (SVE) System- Vapour Analytical Results

Parameters	UNITS	RDL	RVU1*	RVU2*	RVU3*	RSC [1] (ug/m^3)	ITC[1] (ug/m^3)	Residential Soil Vapour Screening Level Concentration[2] (ug/m^3)	Commercial Soil Vapour Screening Level Concentration[2] (ug/m^3)
			9-Aug-16	12-Sep-16	2-Feb-17				
BTEXS and F1 and F2									
Benzene	ug/m^3	0.10	<3.19	0.719	2.11	3	NG	30	1,092
Toluene	ug/m^3	0.10	108	16.8	51.4	NG	3,800	19,000	691,664
Ethylbenzene	ug/m^3	0.10	<4.34	0.704	1.17	NG	1,000	5,000	182,017
Total Xylenes	ug/m^3	0.10	13.6	3.67	3.51	NG	180	900	32,763
Styrene	ug/m^3	0.10	<4.26	0.471	<0.426	NG	92	460	16,746
F1 - BTEX (C6 - C10)	ug/m^3	0.10	**2,900**	344	**1,650**	NG	1,000	5,000	182,017
F2 (C10 - C16)	ug/m^3	0.10	**512**	**746**	**384**	NG	200	1,000	36,403
Volatile Organics									
Dichlorodifluoromethane (FREON 12)	ug/m^3	0.20	<9.89	2.70	2.49	NG	NG	NG	NG
1,2-Dichlorotetrafluoroethane	ug/m^3	0.17	<11.9	<1.19	<1.19	NG	NG	NG	NG
Chloromethane	ug/m^3	0.30	<6.20	0.696	1.21	NG	NG	NG	NG
Vinyl Chloride	ug/m^3	0.10	<2.56	<0.256	<0.256	1	100	11	414
Chloroethane	ug/m^3	0.30	<7.92	<0.792	<0.792	NG	NG	NG	NG
1,3-Butadiene	ug/m^3	0.50	<11.1	<1.11	<1.11	NG	2	10	36
Trichlorofluoromethane (FREON 11)	ug/m^3	0.20	<11.2	1.42	1.35	NG	NG	NG	NG
Ethanol (ethyl alcohol)	ug/m^3	1.0	<52.8	5.16	4.09	NG	NG	NG	NG
Trichlorotrifluoroethane	ug/m^3	0.15	<11.5	<1.15	<1.15	NG	NG	NG	NG
2-propanol	ug/m^3	1.0	<32.0	<2.46	<2.46	NG	NG	NG	NG
2-Propanone	ug/m^3	0.80	388	45.4	30.2	NG	NG	NG	NG
Methyl Ethyl Ketone (2-Butanone)	ug/m^3	1.0	536	7.37	7.73	NG	NG	NG	NG
Methyl Isobutyl Ketone	ug/m^3	1.0	<41.0	<4.10	<4.10	NG	3,000	15,000	54,605
Methyl Butyl Ketone (2-Hexanone)	ug/m^3	1.0	<41.0	<4.10	<4.10	NG	NG	NG	NG
Methyl t-butyl ether (MTBE)	ug/m^3	0.20	<7.21	<0.721	<0.721	NG	37	185	673
Ethyl Acetate	ug/m^3	1.0	<36.0	<3.60	<3.60	NG	NG	NG	NG
1,1-Dichloroethylene	ug/m^3	0.10	<3.96	<0.396	<0.396	NG	200	1,000	3,640
cis-1,2-Dichloroethylene	ug/m^3	0.10	<3.96	<0.396	<0.396	NG	NG	NG	NG
trans-1,2-Dichloroethylene	ug/m^3	0.10	<3.96	<0.396	<0.396	NG	NG	NG	NG
Methylene Chloride(Dichloromethane)	ug/m^3	0.80	<27.8	<2.78	<2.78	435	3,000	4,348	158,275
Chloroform	ug/m^3	0.10	8.16	<0.488	<0.488	NG	28	140	510
Carbon Tetrachloride	ug/m^3	0.10	<6.29	<0.629	<0.629	1	3	7	243
1,1-Dichloroethane	ug/m^3	0.10	<4.05	<0.405	<0.405	NG	NG	NG	NG
1,2-Dichloroethane	ug/m^3	0.10	<4.05	<0.405	<0.405	0.4	NG	4	140
Ethylene Dibromide	ug/m^3	0.10	<7.68	<0.768	<0.768	NG	NG	NG	NG
1,1,1-Trichloroethane	ug/m^3	0.10	<5.46	<0.546	<0.546	NG	NG	NG	NG
1,1,2-Trichloroethane	ug/m^3	0.10	<5.46	<0.546	<0.546	NG	NG	NG	NG
1,1,2,2-Tetrachloroethane	ug/m^3	0.10	<6.87	0.801	<0.687	NG	NG	NG	NG
cis-1,3-Dichloropropene	ug/m^3	0.10	<4.54	<0.454	<0.454	NG	20	100	364
trans-1,3-Dichloropropene	ug/m^3	0.10	<4.54	<0.454	<0.454	NG	20	100	364
1,2-Dichloropropane	ug/m^3	0.10	<4.62	<0.462	<0.462	NG	4	20	73
Bromomethane	ug/m^3	0.10	<3.88	<0.388	<0.388	NG	5	25	91
Bromoform	ug/m^3	0.20	<20.7	<2.07	<2.07	NG	NG	NG	NG
Bromodichloromethane	ug/m^3	0.20	<13.4	<1.34	<1.34	NG	NG	NG	NG
Dibromochloromethane	ug/m^3	0.20	<17.0	<1.70	<1.70	NG	89	447	1,629
Trichloroethylene	ug/m^3	0.10	6.02	7.31	**83.7**	16	40	164	5,968
Tetrachloroethylene	ug/m^3	0.10	<6.78	<0.678	<0.678	NG	40	200	728
4-ethyltoluene	ug/m^3	0.50	<24.6	<2.46	<2.46	NG	NG	NG	NG
1,3,5-Trimethylbenzene	ug/m^3	0.50	37.5	4.51	3.15	NG	NG	NG	NG
1,2,4-Trimethylbenzene	ug/m^3	0.50	<24.6	10.8	8.08	NG	NG	NG	NG
Chlorobenzene	ug/m^3	0.10	<4.60	<0.460	<0.460	NG	10	50	182
Benzyl chloride	ug/m^3	0.50	<25.9	<2.59	<2.59	NG	NG	NG	NG
1,3-Dichlorobenzene	ug/m^3	0.40	<24.0	<2.40	<2.40	NG	NG	NG	NG
1,4-Dichlorobenzene	ug/m^3	0.10	10.6	1.57	0.815	NG	95	475	1,729
1,2-Dichlorobenzene	ug/m^3	0.10	<6.01	1.07	<0.601	NG	1,924	9,621	35,022
1,2,4-Trichlorobenzene	ug/m^3	0.50	<37.1	5.41	<3.71	NG	7	35	127
Hexachlorobutadiene	ug/m^3	0.50	<53.3	<5.33	<5.33	NG	NG	NG	NG
Hexane	ug/m^3	0.30	<10.6	1.30	5.18	NG	700	3,500	12,741
Heptane	ug/m^3	0.30	22.0	1.42	9.80	NG	NG	NG	NG
Cyclohexane	ug/m^3	0.20	10.9	<0.688	14.4	NG	6,000	30,000	109,210
Tetrahydrofuran	ug/m^3	0.40	2900	15.3	1.79	NG	2,000	10,000	36,403
1,4-Dioxane	ug/m^3	1.0	<36.0	<3.60	<3.60	NG	30	150	546
Naphthalene	ug/m^3	0.50	<26.2	**7.67**	<2.62	NG	3	15	55
1,1,1,2-Tetrachloroethane	ug/m^3	0.10	<6.87	<0.687	<0.687	NG	NG	NG	NG
Vinyl Bromide	ug/m^3	0.20	<8.75	<0.875	<0.875	NG	3	15	55
Propene	ug/m^3	2.4	<8.61	<0.861	<4.13	NG	NG	NG	NG
2,2,4-Trimethylpentane	ug/m^3	0.20	<9.34	<0.934	3.38	NG	NG	NG	NG
Carbon Disulfide	ug/m^3	0.50	<15.6	4.84	3.08	NG	700	3,500	12,741
Vinyl Acetate	ug/m^3	9.7	<7.04	<0.704	<34.2	NG	200	1,000	3,640

Notes:

[1] = Alberta Tier 2 Soil and Groundwater Remediation Guidelines - Inhalation tolerable concentration (ITC) and the calculated RSC from the IUR from Table A-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. The BC MoE attenuation coefficient for an earthen basement for residential use was applied (Dilution factor of 10) and for commercial land use the attenuation coefficient was based on Alberta Tier 2 guidance (Dilution factor of 100). Exposure term applied: Residential exposure term = 1 and commerical exposure term = 0.2747 from Alberta Tier 2 Table A-1. A soil allocation factor (SAF) of 0.5 was also applied to the non-carcinogenic results.

* RVU samples collected from soil vapour extraction system prior to entering GAC barrel.

< = less than laboratory reportable detection limit.
NG = no guideline.
All results in ug/m^3.
ITC = inhalation tolerable concentration.
RSC = risk specific concentration calculated.

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

Table 4: 2014 and 2015 Soil Vapour Analytical Results

Parameters	Sample Location	14VW01			14VW02			14VW03			14VW04			RSC [1] (ug/m^3)	ITC[1] (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	18-Jul-14	23-Apr-15	8-Oct-15	18-Jul-14	23-Apr-15	8-Oct-15	18-Jul-14	23-Apr-15	8-Oct-15	18-Jul-14	23-Apr-15	8-Oct-15				
Volatile Organics																	
Benzene		**535**	**316**	**273**	**238**	**52.6**	**79.8**	**639**	**176**	**184**	**205**	**149**	**197**	3	NG	30	1,092
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	NG	3,800	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	NG	1,000	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	NG	180	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	NG	18,400	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	NG	1,000	5,000	182,017
>C8-C10 Aromatic		**442**	**341**	192	**387**	97.9	79.6	**732**	**297**	**215**	145	**224**	179	NG	200	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	NG	1,000	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	NG	1,000	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	NG	200	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	NG	200	1,000	36,403

Notes:

[1] = Alberta Tier 2 Soil and Groundwater Remediation Guidelines - Inhalation tolerable concentration (ITC) and the calculated RSC from the IUR from Table A-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. The BC MoE attenuation coefficient for an earthen basement for residential use was applied (Dilution factor of 10) and for commercial land use the attenuation coefficient was based on Alberta Tier 2 guidance (Dilution factor of 100). Exposure term applied: Residential exposure term = 1 and commerical exposure term = 0.2747 from Alberta Tier 2 Table A-1. A soil allocation factor (SAF) of 0.5 was also applied to the non-carcinogenic results.

mL/min = millilitres per minute.

< = less than laboratory reportable detection limit.

NG = no guideline.

All results in ug/m^3.

ITC = inhalation tolerable concentration.

RSC = risk specific concentration calculated.

442 Measured concentration exceeds residential ITC 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

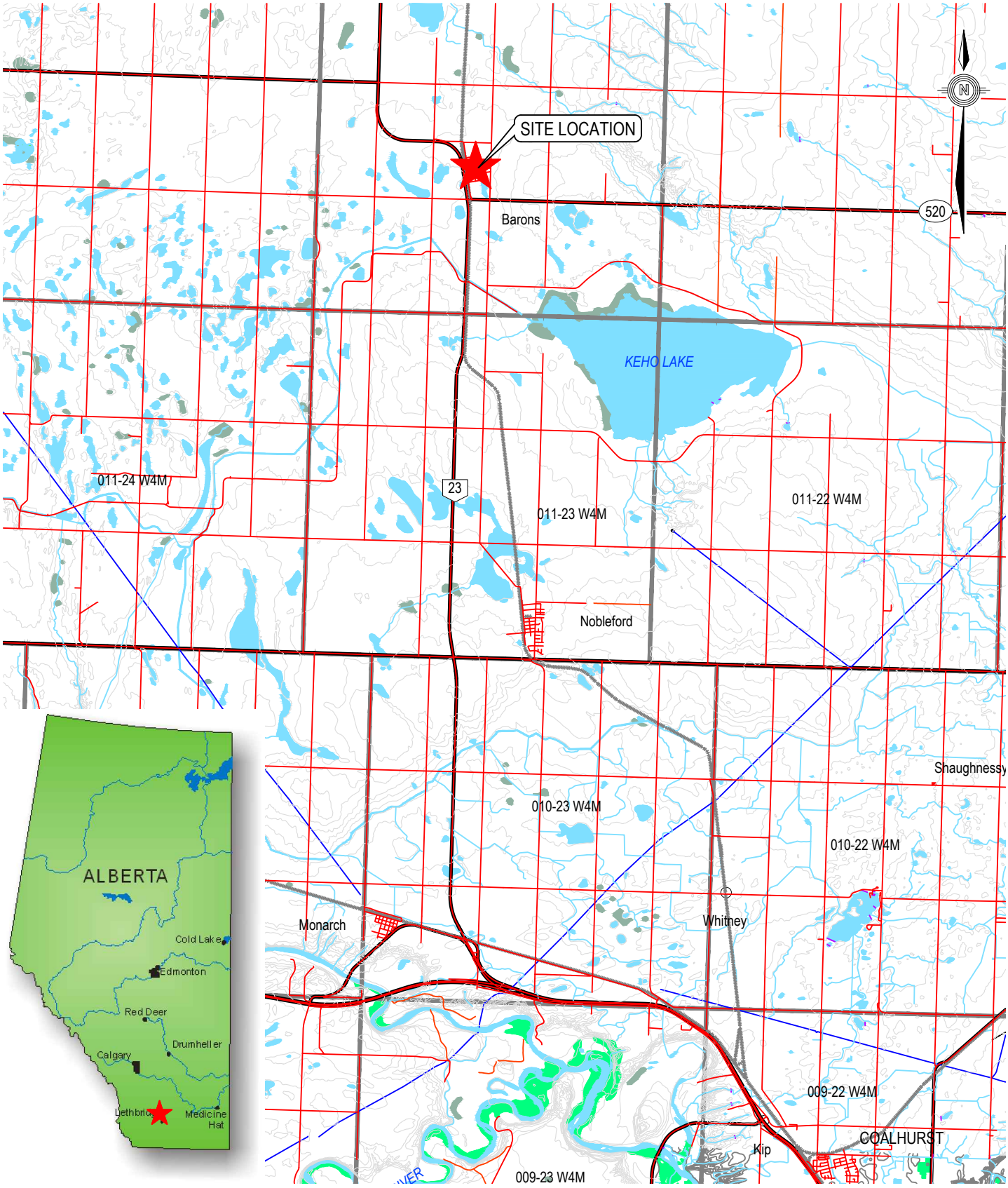
FIGURES

Figure 1 Site Location Plan

Figure 2 Site Plan Showing the Chemical Injection Points, Vapour Wells, and Soil Vapour Extraction (SVE) System

Figure 3 Site Plan Showing Borehole and Groundwater Monitoring Well Locations, and the Location of the Former UST

Figure 4 Groundwater Elevation Contours (February 2, 2017)



NOTES

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0 8 km

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

CLIENT

Village of Barons

CHEMICAL INJECTION PROGRAM, SOIL VAPOUR EXTRACTION SYSTEM INSTALLATION AND GROUNDWATER MONITORING PROGRAM, 202 MAIN STREET, BARONS, AB, AMA SITE 9557

SITE LOCATION PLAN

TETRA TECH

PROJECT NO.	DWN	CKD	REV
CENV03133-01	LCH	JL	0

OFFICE	DATE
LETHBRIDGE	April 2017

Figure 1

C:\Riverbend\Drafting\ENV.CEN\CENV03133\CENV03133-01 Figure 1.dwg [FIGURE 1] April 12, 2017 - 10:09:53 am (BY: HUGHES, LEANNE)

LEGEND

- SITE BOUNDARY
- SOIL VAPOUR WELL
- X CHEMICAL INJECTION POINT
- SVE 3" PIPE HEADER CONNNECTION SOIL VAPOUR WELLS AND SVE SYSTEM

0 20m

Scale: 1:400 @ 8.5"x11"

CLIENT

Village of Barons

CHEMICAL INJECTION PROGRAM, SOIL VAPOUR EXTRACTION SYSTEM INSTALLATION AND GROUNDWATER MONITORING PROGRAM, 202 MAIN STREET, BARONS, AB, AMA SITE 9557

SITE PLAN SHOWING THE CHEMICAL INJECTION POINTS, VAPOUR WELLS AND SOIL VAPOUR EXTRACTION (SVE) SYSTEM

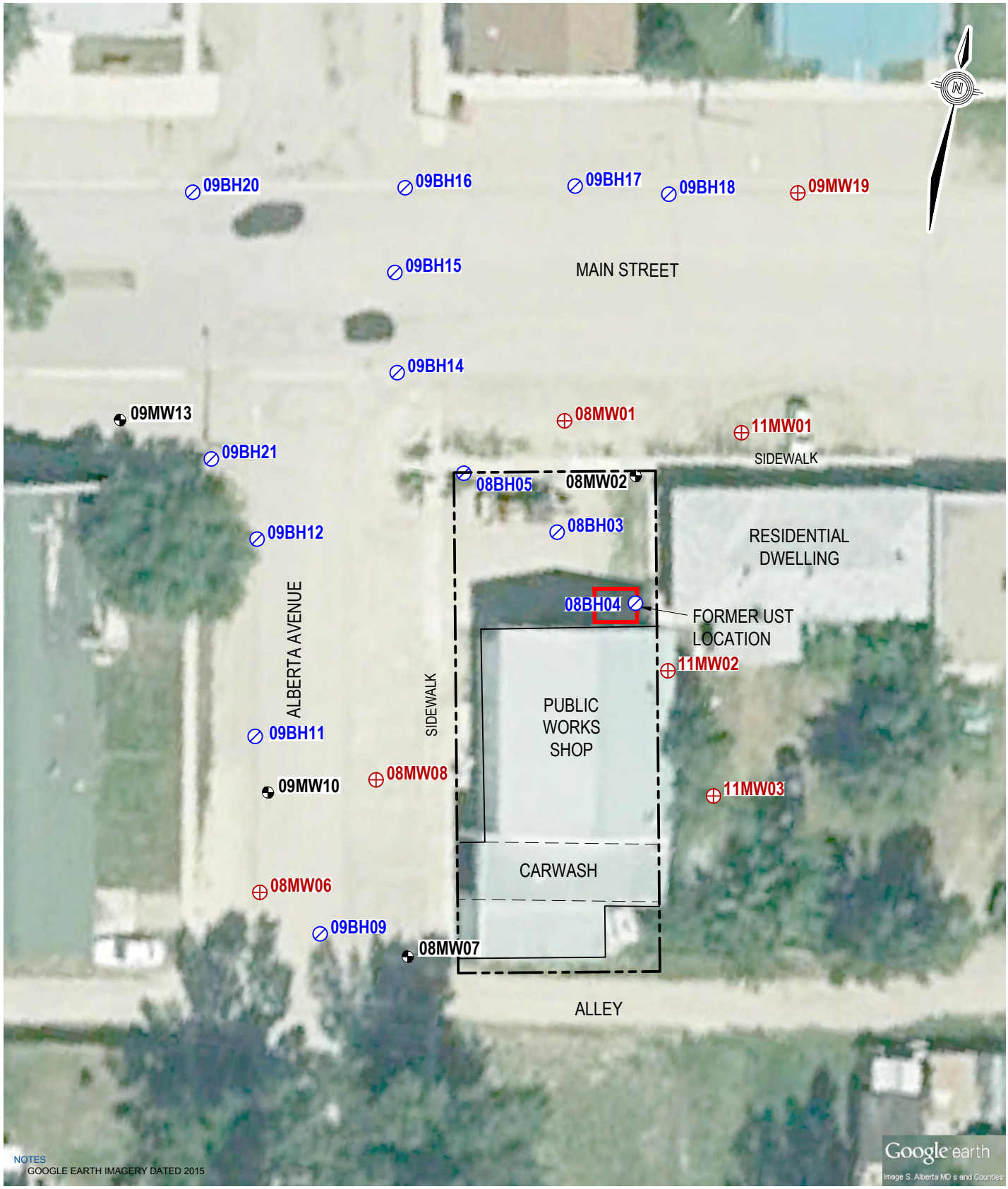
TETRA TECH

PROJECT NO.	DWN	CKD	REV
CENV03133-01	LCH	JL	0

OFFICE	DATE
LETHBRIDGE	May 2017

Figure 2

C:\Riverbend\Drafting\ENV.CEN\CENV03133\CENV03133-01 Figures 2.3.4.dwg [FIGURE 2] May 22, 2017 - 9:33:03 pm (BY: HUGHES, LEANNE)



LEGEND

- SITE BOUNDARY
- COMPLIANCE MONITORING WELL
- HISTORICAL MONITORING WELL
- HISTORIC BOREHOLE

0 20m

Scale: 1:400 @ 8.5"x11"

CLIENT

Village of Barons

CHEMICAL INJECTION PROGRAM, SOIL VAPOUR EXTRACTION SYSTEM INSTALLATION AND GROUNDWATER MONITORING PROGRAM, 202 MAIN STREET, BARONS, AB, AMA SITE 9557

SITE PLAN SHOWING BOREHOLE AND GROUNDWATER MONITORING WELL LOCATIONS, AND THE LOCATION OF THE FORMER UST

TETRA TECH

PROJECT NO.	DWN	CKD	REV
CENV03133-01	LCH	JL	0

OFFICE	DATE
LETHBRIDGE	April 2017

Figure 3

C:\Riverbend\Drafting\ENV.CEN\CENV03133\CENV03133-01 Figures 2.3.4.dwg [FIGURE 3] April 12, 2017 - 11:30:45 am (BY: HUGHES, LEANNE)

LEGEND

- SITE BOUNDARY
- COMPLIANCE MONITORING WELL
- (95.91) GROUNDWATER ELEVATION (m)
- GROUNDWATER CONTOUR
- GROUNDWATER FLOW DIRECTION

0 15m

Scale: 1:300 @ 8.5"x11"

CLIENT

Village of Barons

CHEMICAL INJECTION PROGRAM, SOIL VAPOUR EXTRACTION SYSTEM INSTALLATION AND GROUNDWATER MONITORING PROGRAM, 202 MAIN STREET, BARONS, AB, AMA SITE 9557

GROUNDWATER ELEVATION CONTOURS (February 2, 2017)

TETRA TECH

PROJECT NO.	DWN	CKD	REV
CENV03133-01	LCH	JL	0

OFFICE	DATE
LETHBRIDGE	April 2017

Figure 4

C:\Riverbend\Drafting\ENV.CEN\CENV03133\CENV03133-01 Figures 2.3.4.dwg [FIGURE 4] April 12, 2017 - 11:30:24 am (BY: HUGHES, LEANNE)

APPENDIX A
TETRA TECH'S GENERAL CONDITIONS

GENERAL CONDITIONS

GEOENVIRONMENTAL REPORT

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

1.1 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’s client. TETRA TECH 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’s Client unless otherwise authorized in writing by TETRA TECH. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of TETRA TECH. Additional copies of the report, if required, may be obtained upon request.

1.2 ALTERNATE REPORT FORMAT

Where TETRA TECH submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed TETRA TECH’s instruments of professional service); only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by TETRA TECH shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of TETRA TECH’s instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except TETRA TECH. The Client warrants that TETRA TECH’s instruments of professional service will be used only and exactly as submitted by TETRA TECH.

Electronic files submitted by TETRA TECH have been prepared and submitted using specific software and hardware systems. TETRA TECH makes no representation about the compatibility of these files with the Client’s current or future software and hardware systems.

1.3 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by TETRA TECH in its reasonably exercised discretion.

1.4 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of the report, TETRA TECH may rely on information provided by persons other than the Client. While TETRA TECH endeavours to verify the accuracy of such information when instructed to do so by the Client, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

APPENDIX B
LABORATORY CERTIFICATES

Your Project #: AMA SITE 9557
Site#: ENV.CENV03133-01
Site Location: 202 MAIN STREET BARONS AB
Your C.O.C. #: 1 of 1

Attention:JAYMES GOING

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

Report Date: 2017/02/09
Report #: R2343559
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B708046
Received: 2017/02/03, 08:30

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	4	N/A	2017/02/06	AB SOP-00005	SM 22 2320 B m
BTEX/F1 in Water by HS GC/MS/FID	4	N/A	2017/02/04	AB SOP-00039	CCME CWS/EPA 8260c m
Chloride by Automated Colourimetry	4	N/A	2017/02/09	AB SOP-00020	SM 22-4500-Cl G m
Conductivity @25C	4	N/A	2017/02/06	AB SOP-00005	SM 22 2510 B m
CCME Hydrocarbons in Water (F2; C10-C16)	4	2017/02/04	2017/02/04	AB SOP-00040 AB SOP-00037	CCME PHC-CWS m
Hardness	4	N/A	2017/02/05	AB WI-00065	Auto Calc
Elements by ICP - Dissolved	4	N/A	2017/02/05	AB SOP-00042	EPA 200.7 CFR 2012 m
Ion Balance	4	N/A	2017/02/05	AB WI-00065	Auto Calc
Sum of cations, anions	4	N/A	2017/02/05	AB WI-00065	Auto Calc
Nitrate and Nitrite	4	N/A	2017/02/07	AB WI-00065	Auto Calc
Nitrate + Nitrite-N (calculated)	4	N/A	2017/02/07	AB WI-00065	Auto Calc
Nitrogen, (Nitrite, Nitrate) by IC	4	N/A	2017/02/06	AB SOP-00023	SM 22 4110 B m
pH @25°C	4	N/A	2017/02/06	AB SOP-00005	SM 22 4500-H+B m
Sulphate by Automated Colourimetry	4	N/A	2017/02/09	AB SOP-00018	SM 22 4500-SO4 E m
Total Dissolved Solids (Calculated)	4	N/A	2017/02/09	AB WI-00065	Auto Calc

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods. Results relate to samples tested.

Your Project #: AMA SITE 9557
Site#: ENV.CENV03133-01
Site Location: 202 MAIN STREET BARONS AB
Your C.O.C. #: 1 of 1

Attention:JAYMES GOING

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

Report Date: 2017/02/09
Report #: R2343559
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B708046
Received: 2017/02/03, 08:30

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.
Sherlyne Sim, B.Eng, Project Manager
Email: SSim@maxxam.ca
Phone# (780)577-7113

==========

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 #: B708046
Report Date: 2017/02/09

TETRA TECH EBA INC.
Client Project #: AMA SITE 9557
Site Location: 202 MAIN STREET BARONS AB
Sampler Initials: JL

AT1 BTEX AND F1-F2 IN WATER (WATER)

Maxxam ID		QM6175	QM6176	QM6177	QM6178		
Sampling Date		2017/02/02 10:00	2017/02/02 10:40	2017/02/02 11:30	2017/02/02 12:15		
COC Number		1 of 1	1 of 1	1 of 1	1 of 1		
	UNITS	09MW10	08MW07	09MW13	08MW02	RDL	QC Batch
Ext. Pet. Hydrocarbon							
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	21	70	0.10	8545135
Volatiles							
Benzene	mg/L	0.015	0.017	0.0073	0.067	0.00040	8545041
Toluene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	8545041
Ethylbenzene	mg/L	<0.00040	<0.00040	0.018	0.0071	0.00040	8545041
m & p-Xylene	mg/L	0.00097	0.0012	0.027	0.0065	0.00080	8545041
o-Xylene	mg/L	0.0017	0.00099	<0.00040	<0.00040	0.00040	8545041
Xylenes (Total)	mg/L	0.0027	0.0022	0.027	0.0065	0.00080	8545041
F1 (C6-C10) - BTEX	mg/L	<0.10	<0.10	0.45	1.1	0.10	8545041
F1 (C6-C10)	mg/L	<0.10	<0.10	0.50	1.2	0.10	8545041
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	99	98	98	98	N/A	8545041
4-Bromofluorobenzene (sur.)	%	110	113	110	111	N/A	8545041
D4-1,2-Dichloroethane (sur.)	%	112	104	105	107	N/A	8545041
O-TERPHENYL (sur.)	%	111	109	107	115	N/A	8545135

RDL = Reportable Detection Limit
N/A = Not Applicable

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

Maxxam Job #: B708046
Report Date: 2017/02/09

TETRA TECH EBA INC.
Client Project #: AMA SITE 9557
Site Location: 202 MAIN STREET BARONS AB
Sampler Initials: JL

ROUTINE WATER (WATER)

Maxxam ID		QM6175	QM6176		QM6177		QM6178		
Sampling Date		2017/02/02 10:00	2017/02/02 10:40		2017/02/02 11:30		2017/02/02 12:15		
COC Number		1 of 1	1 of 1		1 of 1		1 of 1		
	UNITS	09MW10	08MW07	RDL	09MW13	RDL	08MW02	RDL	QC Batch
Calculated Parameters									
Anion Sum	meq/L	91	76	N/A	95	N/A	33	N/A	8544288
Cation Sum	meq/L	90	75	N/A	92	N/A	34	N/A	8544288
Hardness (CaCO3)	mg/L	2100	2000	0.50	3000	0.50	1200	0.50	8544286
Ion Balance	N/A	0.98	0.99	0.010	0.97	0.010	1.0	0.010	8544287
Dissolved Nitrate (NO3)	mg/L	8.9	3.4	0.044	4.8	0.044	<0.044	0.044	8544289
Nitrate plus Nitrite (N)	mg/L	2.3	0.80	0.010	1.3	0.010	<0.010	0.010	8544290
Dissolved Nitrite (NO2)	mg/L	1.1	0.12	0.033	0.60	0.033	<0.033	0.033	8544289
Calculated Total Dissolved Solids	mg/L	5800	4700	10	5900	10	1900	10	8544292
Misc. Inorganics									
Conductivity	uS/cm	6500	5400	1.0	6200	1.0	2600	1.0	8546452
pH	pH	7.45	7.45	N/A	7.43	N/A	7.49	N/A	8546451
Anions									
Alkalinity (PP as CaCO3)	mg/L	<0.50	<0.50	0.50	<0.50	0.50	<0.50	0.50	8546450
Alkalinity (Total as CaCO3)	mg/L	910	880	0.50	910	0.50	770	0.50	8546450
Bicarbonate (HCO3)	mg/L	1100	1100	0.50	1100	0.50	940	0.50	8546450
Carbonate (CO3)	mg/L	<0.50	<0.50	0.50	<0.50	0.50	<0.50	0.50	8546450
Hydroxide (OH)	mg/L	<0.50	<0.50	0.50	<0.50	0.50	<0.50	0.50	8546450
Dissolved Sulphate (SO4)	mg/L	3400 (1)	2700 (1)	20	3600 (1)	25	830 (1)	5.0	8548778
Dissolved Chloride (Cl)	mg/L	84	65	1.0	48	1.0	13	1.0	8548776
Nutrients									
Dissolved Nitrite (N)	mg/L	0.34	0.035	0.010	0.18	0.010	<0.010	0.010	8546047
Dissolved Nitrate (N)	mg/L	2.0	0.77	0.010	1.1	0.010	<0.010	0.010	8546047
Elements									
Dissolved Calcium (Ca)	mg/L	370	340	0.30	460	0.30	180	0.30	8545439
Dissolved Iron (Fe)	mg/L	<0.060	<0.060	0.060	0.21	0.060	8.6	0.060	8545439
Dissolved Magnesium (Mg)	mg/L	280	280	0.20	450	0.20	170	0.20	8545439
Dissolved Manganese (Mn)	mg/L	2.6	1.7	0.0040	0.89	0.0040	2.6	0.0040	8545439
Dissolved Potassium (K)	mg/L	8.8	7.4	0.30	6.9	0.30	4.4	0.30	8545439
Dissolved Sodium (Na)	mg/L	1100 (1)	800 (1)	2.5	720 (1)	2.5	250	0.50	8545439

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

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

Maxxam Job #: B708046
Report Date: 2017/02/09

TETRA TECH EBA INC.
Client Project #: AMA SITE 9557
Site Location: 202 MAIN STREET BARONS AB
Sampler Initials: JL

GENERAL COMMENTS

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

Package 1	6.0°C

Results relate only to the items tested.

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

Maxxam Job #: B708046
Report Date: 2017/02/09

TETRA TECH EBA INC.
Client Project #: AMA SITE 9557
Site Location: 202 MAIN STREET BARONS AB
Sampler Initials: JL

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8545041	MJ0	Matrix Spike	1,4-Difluorobenzene (sur.)	2017/02/04		97	%	70 - 130
			4-Bromofluorobenzene (sur.)	2017/02/04		109	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2017/02/04		99	%	70 - 130
			Benzene	2017/02/04		108	%	70 - 130
			Toluene	2017/02/04		104	%	70 - 130
			Ethylbenzene	2017/02/04		103	%	70 - 130
			m & p-Xylene	2017/02/04		102	%	70 - 130
			o-Xylene	2017/02/04		100	%	70 - 130
			F1 (C6-C10)	2017/02/04		83	%	70 - 130
8545041	MJ0	Spiked Blank	1,4-Difluorobenzene (sur.)	2017/02/04		100	%	70 - 130
			4-Bromofluorobenzene (sur.)	2017/02/04		110	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2017/02/04		95	%	70 - 130
			Benzene	2017/02/04		110	%	70 - 130
			Toluene	2017/02/04		102	%	70 - 130
			Ethylbenzene	2017/02/04		101	%	70 - 130
			m & p-Xylene	2017/02/04		100	%	70 - 130
			o-Xylene	2017/02/04		98	%	70 - 130
			F1 (C6-C10)	2017/02/04		113	%	70 - 130
8545041	MJ0	Method Blank	1,4-Difluorobenzene (sur.)	2017/02/04		102	%	70 - 130
			4-Bromofluorobenzene (sur.)	2017/02/04		109	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2017/02/04		95	%	70 - 130
			Benzene	2017/02/04	<0.00040		mg/L	
			Toluene	2017/02/04	<0.00040		mg/L	
			Ethylbenzene	2017/02/04	<0.00040		mg/L	
			m & p-Xylene	2017/02/04	<0.00080		mg/L	
			o-Xylene	2017/02/04	<0.00040		mg/L	
			Xylenes (Total)	2017/02/04	<0.00080		mg/L	
			F1 (C6-C10) - BTEX	2017/02/04	<0.10		mg/L	
			F1 (C6-C10)	2017/02/04	<0.10		mg/L	
8545041	MJ0	RPD	Benzene	2017/02/04	NC		%	30
			Toluene	2017/02/04	NC		%	30
			Ethylbenzene	2017/02/04	NC		%	30
			m & p-Xylene	2017/02/04	NC		%	30
			o-Xylene	2017/02/04	NC		%	30
			Xylenes (Total)	2017/02/04	NC		%	30
			F1 (C6-C10) - BTEX	2017/02/04	NC		%	30
			F1 (C6-C10)	2017/02/04	NC		%	30
8545135	EC0	Matrix Spike	O-TERPHENYL (sur.)	2017/02/04		124	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2017/02/04		NC	%	60 - 130
8545135	EC0	Spiked Blank	O-TERPHENYL (sur.)	2017/02/04		123	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2017/02/04		103	%	70 - 130
8545135	EC0	Method Blank	O-TERPHENYL (sur.)	2017/02/04		123	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2017/02/04	<0.10		mg/L	
8545135	EC0	RPD	F2 (C10-C16 Hydrocarbons)	2017/02/04	NC		%	30
8545439	JHC	Matrix Spike	Dissolved Calcium (Ca)	2017/02/04		NC	%	80 - 120
			Dissolved Iron (Fe)	2017/02/04		89	%	80 - 120
			Dissolved Magnesium (Mg)	2017/02/04		NC	%	80 - 120
			Dissolved Manganese (Mn)	2017/02/04		86	%	80 - 120
			Dissolved Potassium (K)	2017/02/04		93	%	80 - 120
			Dissolved Sodium (Na)	2017/02/04		NC	%	80 - 120
8545439	JHC	Spiked Blank	Dissolved Calcium (Ca)	2017/02/04		98	%	80 - 120
			Dissolved Iron (Fe)	2017/02/04		95	%	80 - 120

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

Maxxam Job #: B708046
Report Date: 2017/02/09

TETRA TECH EBA INC.
Client Project #: AMA SITE 9557
Site Location: 202 MAIN STREET BARONS AB
Sampler Initials: JL

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Magnesium (Mg)	2017/02/04		97	%	80 - 120
			Dissolved Manganese (Mn)	2017/02/04		96	%	80 - 120
			Dissolved Potassium (K)	2017/02/04		92	%	80 - 120
			Dissolved Sodium (Na)	2017/02/04		91	%	80 - 120
8545439	JHC	Method Blank	Dissolved Calcium (Ca)	2017/02/04	<0.30		mg/L	
			Dissolved Iron (Fe)	2017/02/04	<0.060		mg/L	
			Dissolved Magnesium (Mg)	2017/02/04	<0.20		mg/L	
			Dissolved Manganese (Mn)	2017/02/04	<0.0040		mg/L	
			Dissolved Potassium (K)	2017/02/04	<0.30		mg/L	
			Dissolved Sodium (Na)	2017/02/04	<0.50		mg/L	
8545439	JHC	RPD	Dissolved Calcium (Ca)	2017/02/04	0.16		%	20
			Dissolved Iron (Fe)	2017/02/04	NC		%	20
			Dissolved Magnesium (Mg)	2017/02/04	0.87		%	20
			Dissolved Manganese (Mn)	2017/02/04	2.4		%	20
			Dissolved Potassium (K)	2017/02/04	0.63		%	20
			Dissolved Sodium (Na)	2017/02/04	1.0		%	20
8546047	LQ1	Matrix Spike	Dissolved Nitrite (N)	2017/02/06		98	%	80 - 120
			Dissolved Nitrate (N)	2017/02/06		98	%	80 - 120
8546047	LQ1	Spiked Blank	Dissolved Nitrite (N)	2017/02/06		98	%	80 - 120
			Dissolved Nitrate (N)	2017/02/06		98	%	80 - 120
8546047	LQ1	Method Blank	Dissolved Nitrite (N)	2017/02/06	<0.010		mg/L	
			Dissolved Nitrate (N)	2017/02/06	<0.010		mg/L	
8546047	LQ1	RPD	Dissolved Nitrite (N)	2017/02/06	NC		%	20
			Dissolved Nitrate (N)	2017/02/06	NC		%	20
8546450	SSO	Spiked Blank	Alkalinity (Total as CaCO3)	2017/02/06		97	%	80 - 120
8546450	SSO	Method Blank	Alkalinity (PP as CaCO3)	2017/02/06	<0.50		mg/L	
			Alkalinity (Total as CaCO3)	2017/02/06	<0.50		mg/L	
			Bicarbonate (HCO3)	2017/02/06	<0.50		mg/L	
			Carbonate (CO3)	2017/02/06	<0.50		mg/L	
			Hydroxide (OH)	2017/02/06	<0.50		mg/L	
8546450	SSO	RPD	Alkalinity (PP as CaCO3)	2017/02/06	NC		%	20
			Alkalinity (Total as CaCO3)	2017/02/06	0.054		%	20
			Bicarbonate (HCO3)	2017/02/06	0.054		%	20
			Carbonate (CO3)	2017/02/06	NC		%	20
			Hydroxide (OH)	2017/02/06	NC		%	20
8546451	SSO	Spiked Blank	pH	2017/02/06		100	%	97 - 103
8546451	SSO	RPD	pH	2017/02/06	0.20		%	N/A
8546452	SSO	Spiked Blank	Conductivity	2017/02/06		101	%	90 - 110
8546452	SSO	Method Blank	Conductivity	2017/02/06	<1.0		uS/cm	
8546452	SSO	RPD	Conductivity	2017/02/06	0.44		%	20
8548776	ZI	Matrix Spike	Dissolved Chloride (Cl)	2017/02/09		NC	%	80 - 120
8548776	ZI	Spiked Blank	Dissolved Chloride (Cl)	2017/02/09		103	%	80 - 120
8548776	ZI	Method Blank	Dissolved Chloride (Cl)	2017/02/09	<1.0		mg/L	
8548776	ZI	RPD	Dissolved Chloride (Cl)	2017/02/09	0.64		%	20
8548778	ZI	Matrix Spike	Dissolved Sulphate (SO4)	2017/02/09		NC	%	80 - 120
8548778	ZI	Spiked Blank	Dissolved Sulphate (SO4)	2017/02/09		105	%	80 - 120
8548778	ZI	Method Blank	Dissolved Sulphate (SO4)	2017/02/09	<1.0		mg/L	

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

Maxxam Job #: B708046
Report Date: 2017/02/09

TETRA TECH EBA INC.
Client Project #: AMA SITE 9557
Site Location: 202 MAIN STREET BARONS AB
Sampler Initials: JL

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8548778	ZI	RPD	Dissolved Sulphate (SO4)	2017/02/09	0.63		%	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 Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B708046
Report Date: 2017/02/09

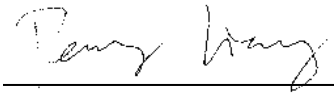
TETRA TECH EBA INC.
Client Project #: AMA SITE 9557
Site Location: 202 MAIN STREET BARONS AB
Sampler Initials: JL

VALIDATION SIGNATURE PAGE

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

Dennis Ngondu, B.Sc., P.Chem., QP, Supervisor, Organics

Janet Gao, B.Sc., QP, Supervisor, Organics



Harry (Peng) Liang, Senior Analyst

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

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

015

Maxxam
A Bureau Veritas Group Company

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

CHAIN OF CUSTODY RECORD

Page 1 of 1

Invoice Information		Report Information (if differs from invoice)		Project Information		Turnaround Time (TAT) Required
Company :	Tetra Tech Canada Inc.	Company:	Same As	Quotation #:		X 5 - 7 Days Regular (Most analyses)
Contact Name:	Jaymes Going	Contact Name:		P.O. #/ AFE#:		PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address:	442 - 10th Street North	Address:				Rush TAT (Surcharges will be applied)
	Lethbridge, AB			Project #:	AMA Site 9557	☐ Same Day ☐ 2 Days ☐ 1 Day ☐ 3-4 Days
Phone:	403.634.3566	Phone:		Site Location:	202 Main Street Barons AB	Date Required:
Email:	jgoing@eba.ca	Email:		Site #:	ENV.CENV03133-01	Rush Confirmation #:
Copies:	jlamontagne@eba.ca	Copies:		Sampled By:	Jamie Lamontagne	

Laboratory Use Only

	YES	NO	Cooler ID			
Seal Present		✓				
Seal Intact		✓	Temp	6	4	8
Cooling Media	✓					

	YES	NO	Cooler ID			
Seal Present						
Seal Intact			Temp			
Cooling Media						

	YES	NO	Cooler ID			
Seal Present						
Seal Intact			Temp			
Cooling Media						

Depot Reception

Analysis Requested

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals ☐ Tot ☐ Diss	Mercury ☐ Total ☐ Dissolved	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	DISSOLVED Mn and Fe	HOLD - DO NOT ANALYZE
1	09MW10	MW	2/2/2017	10:00	GW	7		X		X							X	
2	08MW07	MW	2/2/2017	10:40	GW	7		X		X							X	
3	09MW13	MW	2/2/2017	11:30	GW	7		X		X							X	
4	08MW02	MW	2/2/2017	12:15	GW	7		X		X							X	
5																		
6																		
7																		
8																		
9																		
10																		

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

Regulatory Criteria

- X AT1
- ☐ CCME
- ☐ Drinking Water
- ☐ D50 (Drilling Waste)
- ☐ Saskatchewan
- ☐ Other:

Special Instructions

Dissolved manganese and Iron field filtered and preserved (Dissolved Metals Bottle)

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)
JAMIE LAMONTAGNE	2/2/2017	15:00	Jasmine M	2017/02/03	08:36
			Jasmine Maynne		

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms which are available for viewing at www.maxxam

03-Feb-17 08:30
Sherlyne Sim
B708046
ASQ INS-0152

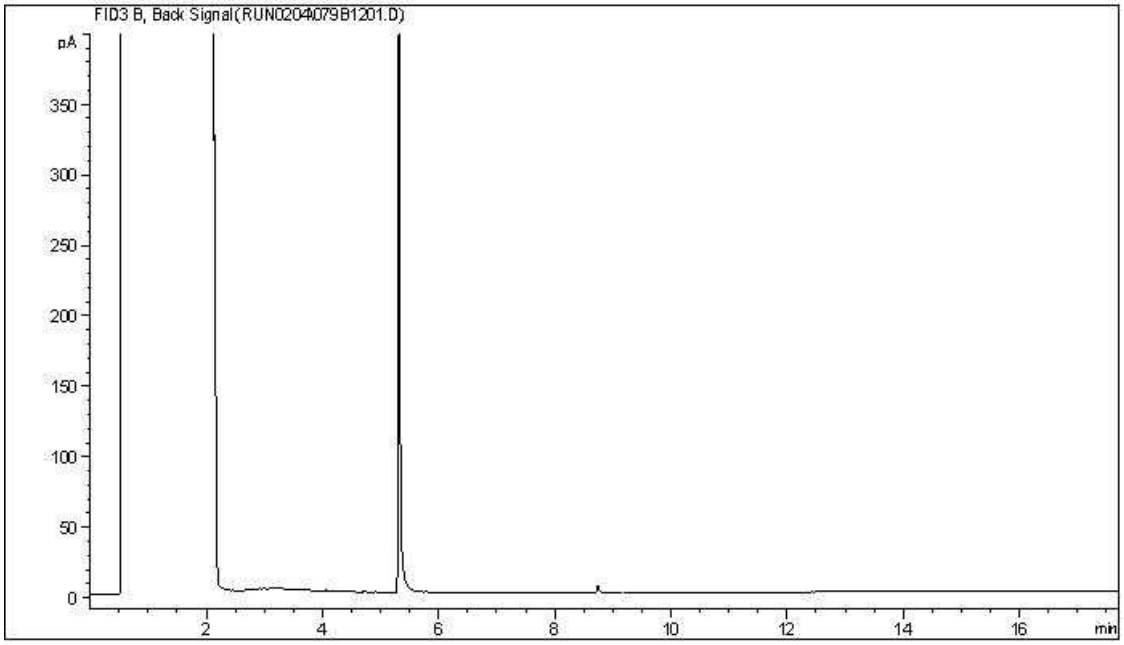
AB FCD-00331/7

Maxxam Job #: B708046
Report Date: 2017/02/09
Maxxam Sample: QM6175

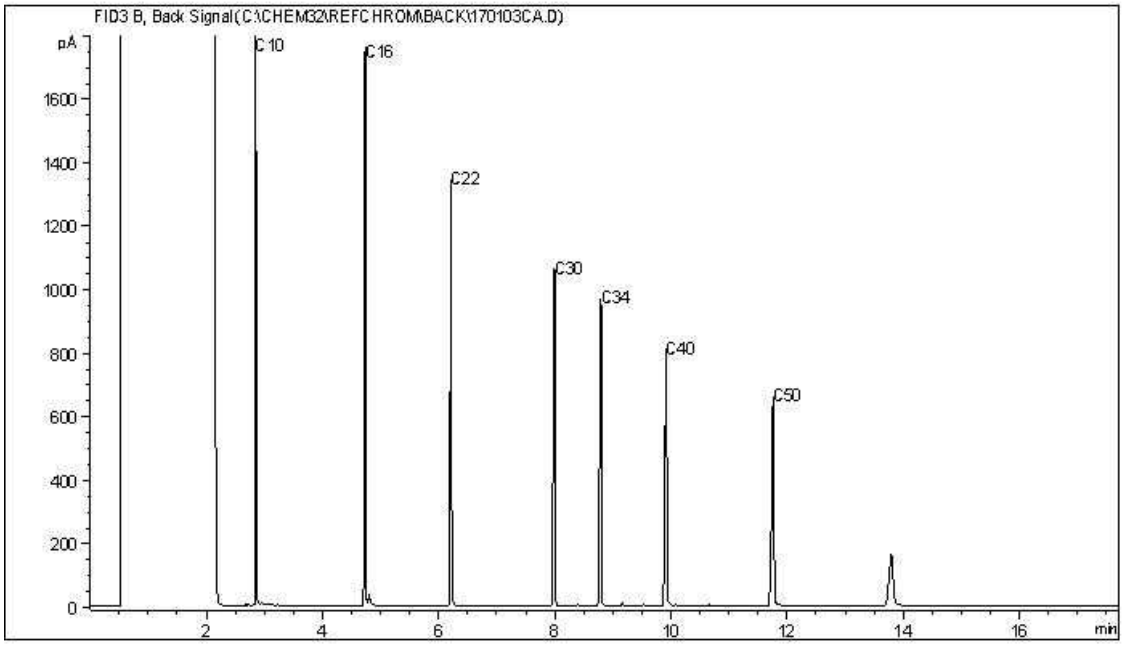
TETRA TECH EBA INC.
Client Project #: AMA SITE 9557
Site Reference: 202 MAIN STREET BARONS AB
Client ID: 09MW10

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

Instrument: GC15



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+

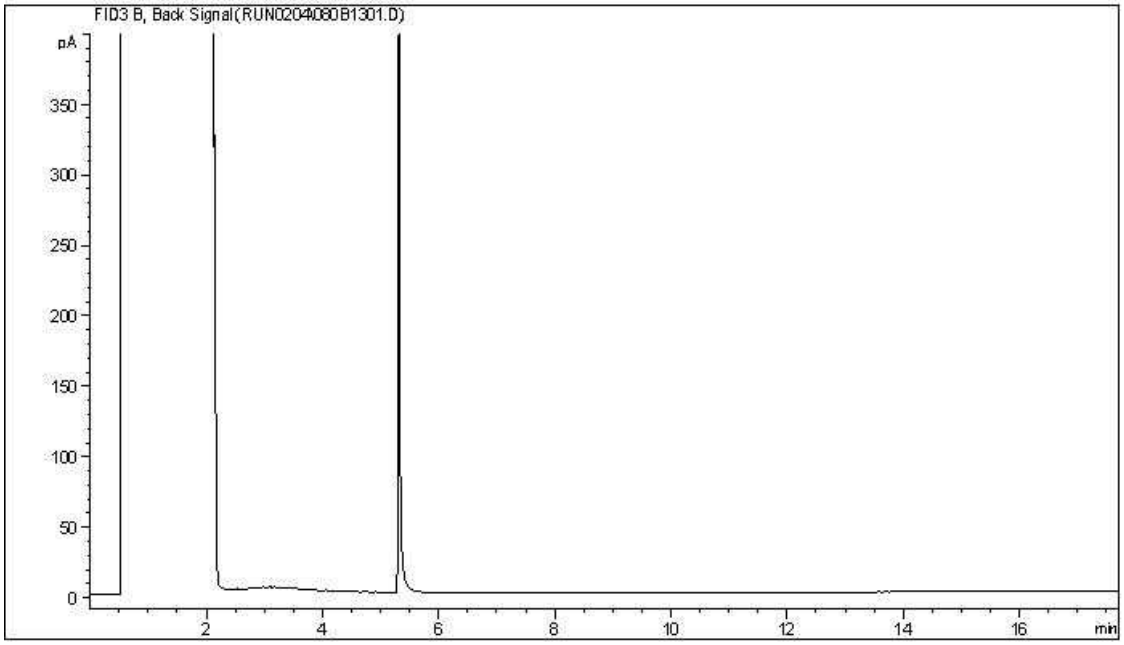
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B708046
Report Date: 2017/02/09
Maxxam Sample: QM6176

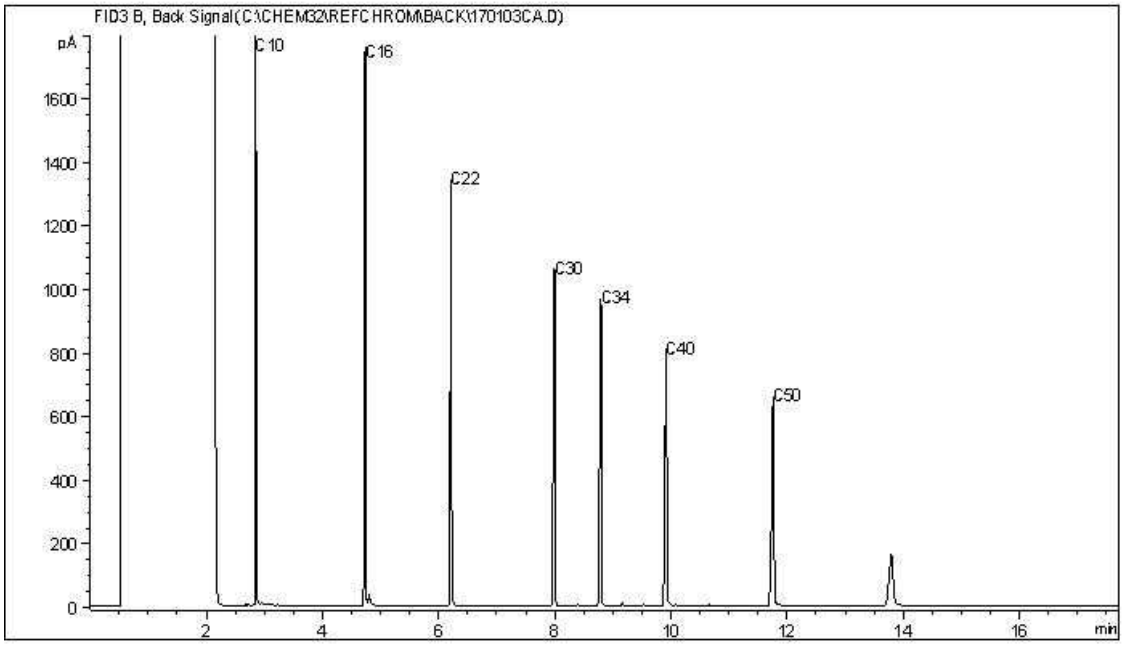
TETRA TECH EBA INC.
Client Project #: AMA SITE 9557
Site Reference: 202 MAIN STREET BARONS AB
Client ID: 08MW07

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

Instrument: GC15



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+

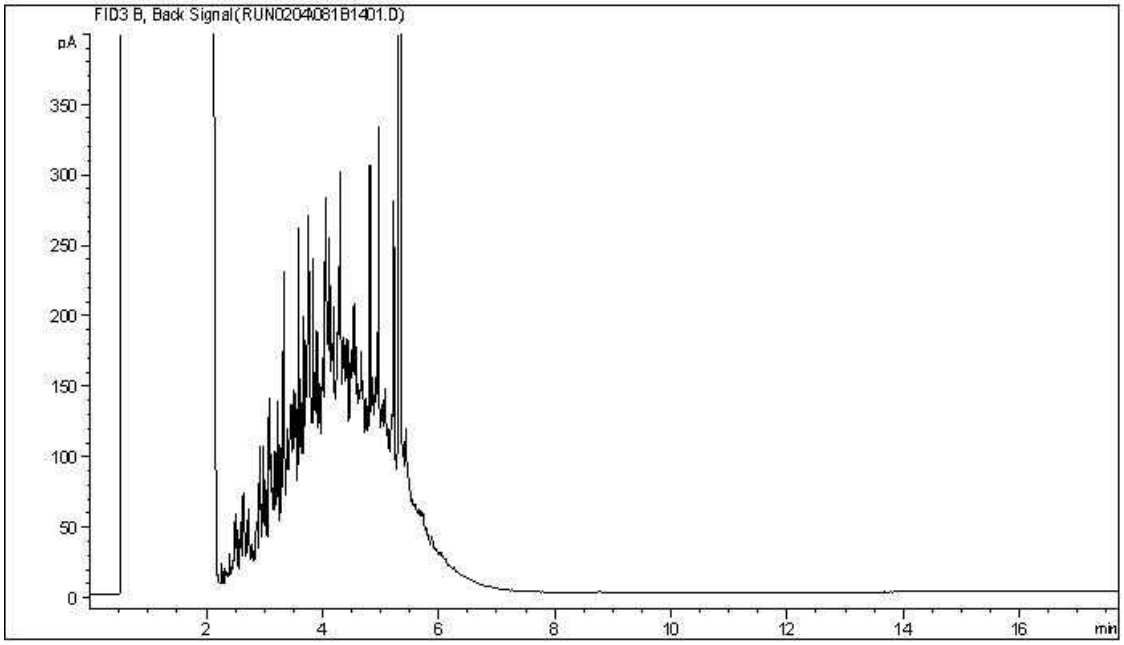
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B708046
Report Date: 2017/02/09
Maxxam Sample: QM6177

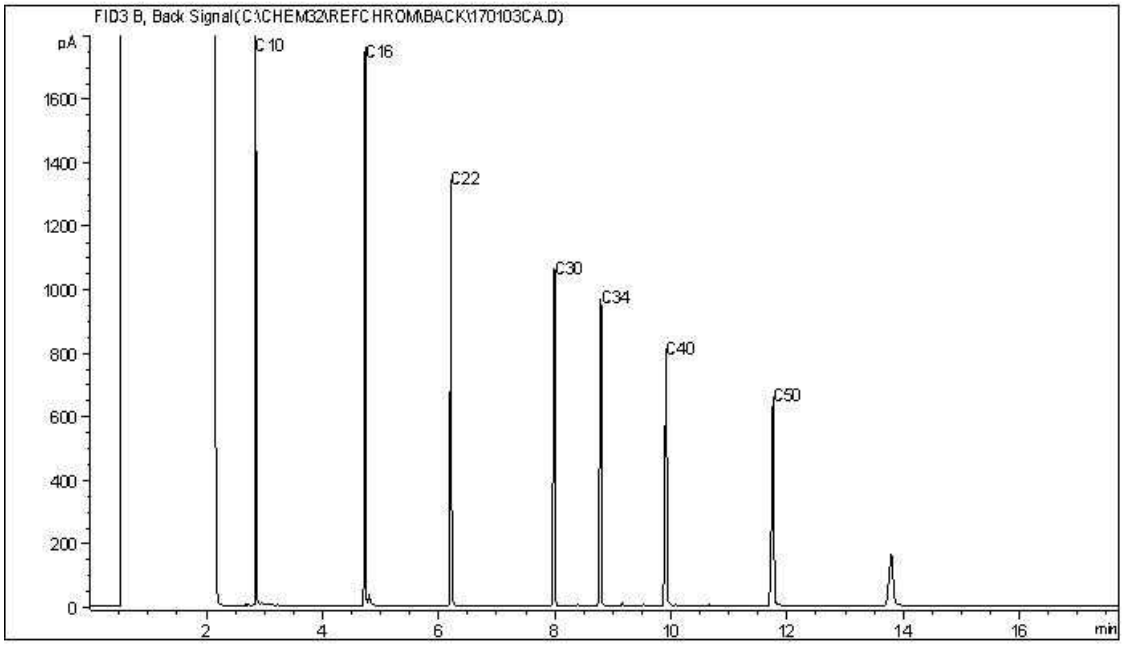
TETRA TECH EBA INC.
Client Project #: AMA SITE 9557
Site Reference: 202 MAIN STREET BARONS AB
Client ID: 09MW13

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

Instrument: GC15



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+

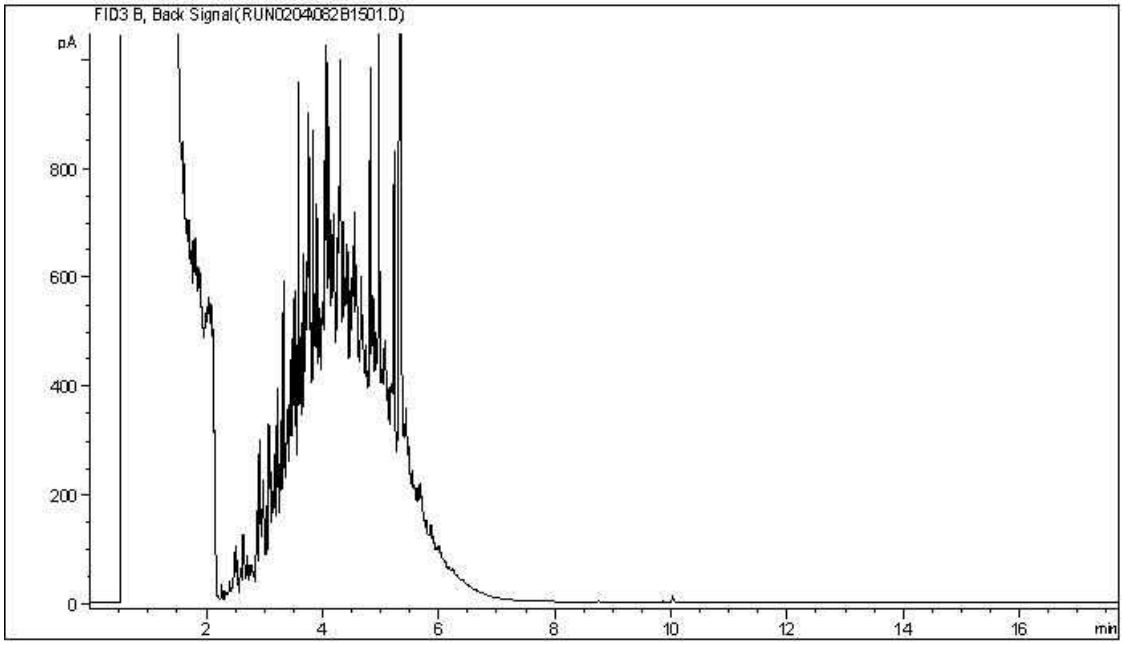
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B708046
Report Date: 2017/02/09
Maxxam Sample: QM6178

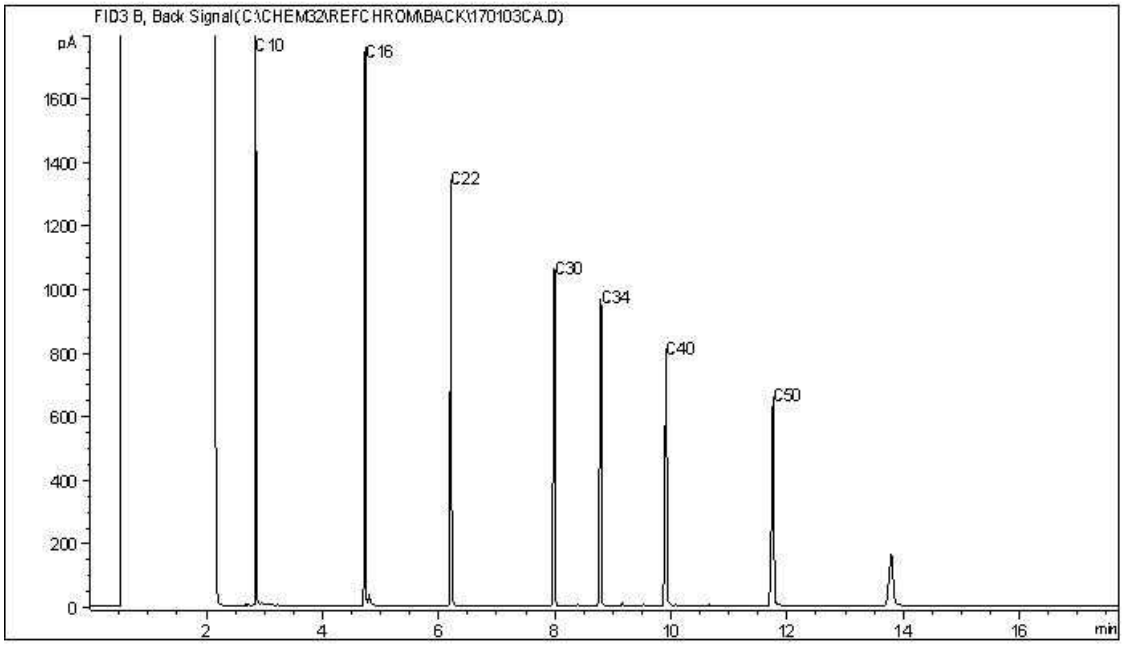
TETRA TECH EBA INC.
Client Project #: AMA SITE 9557
Site Reference: 202 MAIN STREET BARONS AB
Client ID: 08MW02

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

Instrument: GC15



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 Project #: ENV.CENV03133-01
Site Location: BARONS, AB
Your C.O.C. #: na

Attention:Jaymes Going

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

Report Date: 2017/04/28
Report #: R4441982
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B6G8933
Received: 2016/08/11, 09:00

Sample Matrix: AIR
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
BTEX and CCME Compounds in Air(TO-15mod)	1	N/A	2016/08/11	BRL SOP-00304	EPA TO-15 m
Volatile Organics in Air (TO-15) (1)	1	N/A	2016/08/11	BRL SOP-00304	EPA TO-15 m

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

(1) Air sampling canisters have been cleaned in accordance with U.S. EPA Method TO14A. At the end of the cleaning, evacuation, and pressurization cycles, one canister was selected and was pressurized with Zero Air. This canister was then analyzed via TO14A on a GC/MS. The canister must have been found to contain <0.2 ppbv concentration of all target analytes in order for the batch to have been considered clean. Each canister also underwent a leak check prior to shipment.

Please Note: SUMMA® canister samples will be retained by Maxxam for a period of 5 calendar days or as contractually agreed from the date of this report, after which time they will be cleaned for reuse. If you require a longer sample storage period, please contact your service representative.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Cristina (Maria) Bacchus, Project Manager
Email: CBacchus@maxxam.ca
Phone# (905)817-5763

==========

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 #: B6G8933
Report Date: 2017/04/28

Tetra Tech Canada Inc.
Client Project #: ENV.CENV03133-01
Site Location: BARONS, AB

VOLATILE ORGANIC HYDROCARBONS BY GC/MS (AIR)

Maxxam ID		CWC904		
Sampling Date		2016/08/09 10:00		
COC Number		na		
	UNITS	**RVU1**	**RDL**	**QC Batch**
Volatile Organics				
F1-BTEX, C6-C10 (as Toluene)	ug/m3	2900	50	4959477
F2, C10-C16 (as Decane)	ug/m3	512	50	4959477

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B6G8933
Report Date: 2017/04/28

Tetra Tech Canada Inc.
Client Project #: ENV.CENV03133-01
Site Location: BARONS, AB

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		CWC904				
Sampling Date		2016/08/09 10:00				
COC Number		na				
	UNITS	RVU1	RDL	ug/m3	DL (ug/m3)	QC Batch
Volatile Organics						
Dichlorodifluoromethane (FREON 12)	ppbv	<2.0	2.0	<9.89	9.89	4615593
1,2-Dichlorotetrafluoroethane	ppbv	<1.7	1.7	<11.9	11.9	4615593
Chloromethane	ppbv	<3.0	3.0	<6.20	6.20	4615593
Vinyl Chloride	ppbv	<1.0	1.0	<2.56	2.56	4615593
Chloroethane	ppbv	<3.0	3.0	<7.92	7.92	4615593
1,3-Butadiene	ppbv	<5.0	5.0	<11.1	11.1	4615593
Trichlorofluoromethane (FREON 11)	ppbv	<2.0	2.0	<11.2	11.2	4615593
Ethanol (ethyl alcohol)	ppbv	<28	28	<52.8	52.8	4615593
Trichlorotrifluoroethane	ppbv	<1.5	1.5	<11.5	11.5	4615593
2-propanol	ppbv	<13	13	<32.0	32.0	4615593
2-Propanone	ppbv	163	8.0	388	19.0	4615593
Methyl Ethyl Ketone (2-Butanone)	ppbv	182	10	536	29.5	4615593
Methyl Isobutyl Ketone	ppbv	<10	10	<41.0	41.0	4615593
Methyl Butyl Ketone (2-Hexanone)	ppbv	<10	10	<41.0	41.0	4615593
Methyl t-butyl ether (MTBE)	ppbv	<2.0	2.0	<7.21	7.21	4615593
Ethyl Acetate	ppbv	<10	10	<36.0	36.0	4615593
1,1-Dichloroethylene	ppbv	<1.0	1.0	<3.96	3.96	4615593
cis-1,2-Dichloroethylene	ppbv	<1.0	1.0	<3.96	3.96	4615593
trans-1,2-Dichloroethylene	ppbv	<1.0	1.0	<3.96	3.96	4615593
Methylene Chloride(Dichloromethane)	ppbv	<8.0	8.0	<27.8	27.8	4615593
Chloroform	ppbv	1.7	1.0	8.16	4.88	4615593
Carbon Tetrachloride	ppbv	<1.0	1.0	<6.29	6.29	4615593
1,1-Dichloroethane	ppbv	<1.0	1.0	<4.05	4.05	4615593
1,2-Dichloroethane	ppbv	<1.0	1.0	<4.05	4.05	4615593
Ethylene Dibromide	ppbv	<1.0	1.0	<7.68	7.68	4615593
1,1,1-Trichloroethane	ppbv	<1.0	1.0	<5.46	5.46	4615593
1,1,2-Trichloroethane	ppbv	<1.0	1.0	<5.46	5.46	4615593
1,1,2,2-Tetrachloroethane	ppbv	<1.0	1.0	<6.87	6.87	4615593
cis-1,3-Dichloropropene	ppbv	<1.0	1.0	<4.54	4.54	4615593
trans-1,3-Dichloropropene	ppbv	<1.0	1.0	<4.54	4.54	4615593
1,2-Dichloropropane	ppbv	<1.0	1.0	<4.62	4.62	4615593
Bromomethane	ppbv	<1.0	1.0	<3.88	3.88	4615593
Bromoform	ppbv	<2.0	2.0	<20.7	20.7	4615593
Bromodichloromethane	ppbv	<2.0	2.0	<13.4	13.4	4615593

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		CWC904				
Sampling Date		2016/08/09 10:00				
COC Number		na				
	UNITS	RVU1	RDL	ug/m3	DL (ug/m3)	QC Batch
Dibromochloromethane	ppbv	<2.0	2.0	<17.0	17.0	4615593
Trichloroethylene	ppbv	1.1	1.0	6.02	5.37	4615593
Tetrachloroethylene	ppbv	<1.0	1.0	<6.78	6.78	4615593
Benzene	ppbv	<1.0	1.0	<3.19	3.19	4615593
Toluene	ppbv	28.8	1.0	108	3.76	4615593
Ethylbenzene	ppbv	<1.0	1.0	<4.34	4.34	4615593
p+m-Xylene	ppbv	3.1	2.0	13.6	8.68	4615593
o-Xylene	ppbv	<1.0	1.0	<4.34	4.34	4615593
Styrene	ppbv	<1.0	1.0	<4.26	4.26	4615593
4-ethyltoluene	ppbv	<5.0	5.0	<24.6	24.6	4615593
1,3,5-Trimethylbenzene	ppbv	7.6	5.0	37.5	24.6	4615593
1,2,4-Trimethylbenzene	ppbv	<5.0	5.0	<24.6	24.6	4615593
Chlorobenzene	ppbv	<1.0	1.0	<4.60	4.60	4615593
Benzyl chloride	ppbv	<5.0	5.0	<25.9	25.9	4615593
1,3-Dichlorobenzene	ppbv	<4.0	4.0	<24.0	24.0	4615593
1,4-Dichlorobenzene	ppbv	1.8	1.0	10.6	6.01	4615593
1,2-Dichlorobenzene	ppbv	<1.0	1.0	<6.01	6.01	4615593
1,2,4-Trichlorobenzene	ppbv	<5.0	5.0	<37.1	37.1	4615593
Hexachlorobutadiene	ppbv	<5.0	5.0	<53.3	53.3	4615593
Hexane	ppbv	<3.0	3.0	<10.6	10.6	4615593
Heptane	ppbv	5.4	3.0	22.0	12.3	4615593
Cyclohexane	ppbv	3.2	2.0	10.9	6.88	4615593
Tetrahydrofuran	ppbv	984	4.0	2900	11.8	4615593
1,4-Dioxane	ppbv	<10	10	<36.0	36.0	4615593
Naphthalene	ppbv	<5.0	5.0	<26.2	26.2	4615593
Total Xylenes	ppbv	3.1	3.0	13.6	13.0	4615593
1,1,1,2-Tetrachloroethane	ppbv	<1.0	1.0	<6.87	6.87	4615593
Vinyl Bromide	ppbv	<2.0	2.0	<8.75	8.75	4615593
Propene	ppbv	<5.0	5.0	<8.61	8.61	4615593
2,2,4-Trimethylpentane	ppbv	<2.0	2.0	<9.34	9.34	4615593
Carbon Disulfide	ppbv	<5.0	5.0	<15.6	15.6	4615593
Vinyl Acetate	ppbv	<2.0	2.0	<7.04	7.04	4615593
Surrogate Recovery (%)						
Bromochloromethane	%	83		N/A	N/A	4615593

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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Maxxam Job #: B6G8933
Report Date: 2017/04/28

Tetra Tech Canada Inc.
Client Project #: ENV.CENV03133-01
Site Location: BARONS, AB

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		CWC904				
Sampling Date		2016/08/09 10:00				
COC Number		na				
	UNITS	**RVU1**	**RDL**	**ug/m3**	**DL (ug/m3)**	**QC Batch**
D5-Chlorobenzene	%	78		N/A	N/A	4615593
Difluorobenzene	%	82		N/A	N/A	4615593

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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GENERAL COMMENTS

4/28/17- report amended, F1-F2 added as per client request.

Sample CWC904 [RVU1] : Sample was analyzed at a 10X dilution. The DL's were adjusted accordingly.

Increased DL for ethanol and 2-propanol due to possible background.

Results relate only to the items tested.

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Maxxam Job #: B6G8933
Report Date: 2017/04/28

Tetra Tech Canada Inc.
Client Project #: ENV.CENV03133-01
Site Location: BARONS, AB

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4615593	LSY	Spiked Blank	Bromochloromethane	2016/08/11		103	%	60 - 140
			D5-Chlorobenzene	2016/08/11		100	%	60 - 140
			Difluorobenzene	2016/08/11		102	%	60 - 140
			Dichlorodifluoromethane (FREON 12)	2016/08/11		99	%	70 - 130
			1,2-Dichlorotetrafluoroethane	2016/08/11		80	%	70 - 130
			Chloromethane	2016/08/11		88	%	70 - 130
			Vinyl Chloride	2016/08/11		88	%	70 - 130
			Chloroethane	2016/08/11		88	%	70 - 130
			1,3-Butadiene	2016/08/11		90	%	70 - 130
			Trichlorofluoromethane (FREON 11)	2016/08/11		96	%	70 - 130
			Ethanol (ethyl alcohol)	2016/08/11		87	%	70 - 130
			Trichlorotrifluoroethane	2016/08/11		100	%	70 - 130
			2-propanol	2016/08/11		94	%	70 - 130
			2-Propanone	2016/08/11		101	%	70 - 130
			Methyl Ethyl Ketone (2-Butanone)	2016/08/11		109	%	70 - 130
			Methyl Isobutyl Ketone	2016/08/11		101	%	70 - 130
			Methyl Butyl Ketone (2-Hexanone)	2016/08/11		102	%	70 - 130
			Methyl t-butyl ether (MTBE)	2016/08/11		106	%	70 - 130
			Ethyl Acetate	2016/08/11		104	%	70 - 130
			1,1-Dichloroethylene	2016/08/11		104	%	70 - 130
			cis-1,2-Dichloroethylene	2016/08/11		101	%	70 - 130
			trans-1,2-Dichloroethylene	2016/08/11		102	%	70 - 130
			Methylene Chloride(Dichloromethane)	2016/08/11		88	%	70 - 130
			Chloroform	2016/08/11		99	%	70 - 130
			Carbon Tetrachloride	2016/08/11		123	%	70 - 130
			1,1-Dichloroethane	2016/08/11		99	%	70 - 130
			1,2-Dichloroethane	2016/08/11		111	%	70 - 130
			Ethylene Dibromide	2016/08/11		101	%	70 - 130
			1,1,1-Trichloroethane	2016/08/11		103	%	70 - 130
			1,1,2-Trichloroethane	2016/08/11		97	%	70 - 130
			1,1,2,2-Tetrachloroethane	2016/08/11		90	%	70 - 130
			cis-1,3-Dichloropropene	2016/08/11		109	%	70 - 130
			trans-1,3-Dichloropropene	2016/08/11		113	%	70 - 130
			1,2-Dichloropropane	2016/08/11		93	%	70 - 130
			Bromomethane	2016/08/11		95	%	70 - 130
			Bromoform	2016/08/11		110	%	70 - 130
			Bromodichloromethane	2016/08/11		112	%	70 - 130
			Dibromochloromethane	2016/08/11		115	%	70 - 130
			Trichloroethylene	2016/08/11		106	%	70 - 130
			Tetrachloroethylene	2016/08/11		106	%	70 - 130
			Benzene	2016/08/11		98	%	70 - 130
			Toluene	2016/08/11		105	%	70 - 130
			Ethylbenzene	2016/08/11		102	%	70 - 130
			p+m-Xylene	2016/08/11		100	%	70 - 130
			o-Xylene	2016/08/11		102	%	70 - 130
			Styrene	2016/08/11		104	%	70 - 130
			4-ethyltoluene	2016/08/11		109	%	70 - 130
			1,3,5-Trimethylbenzene	2016/08/11		99	%	70 - 130
			1,2,4-Trimethylbenzene	2016/08/11		100	%	70 - 130
			Chlorobenzene	2016/08/11		103	%	70 - 130
			Benzyl chloride	2016/08/11		106	%	70 - 130
			1,3-Dichlorobenzene	2016/08/11		104	%	70 - 130
			1,4-Dichlorobenzene	2016/08/11		103	%	70 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			1,2-Dichlorobenzene	2016/08/11		96	%	70 - 130
			1,2,4-Trichlorobenzene	2016/08/11		87	%	70 - 130
			Hexachlorobutadiene	2016/08/11		86	%	70 - 130
			Hexane	2016/08/11		95	%	70 - 130
			Heptane	2016/08/11		98	%	70 - 130
			Cyclohexane	2016/08/11		95	%	70 - 130
			Tetrahydrofuran	2016/08/11		95	%	70 - 130
			1,4-Dioxane	2016/08/11		84	%	70 - 130
			Naphthalene	2016/08/11		81	%	70 - 130
			Total Xylenes	2016/08/11		101	%	70 - 130
			Vinyl Bromide	2016/08/11		92	%	70 - 130
			Propene	2016/08/11		91	%	70 - 130
			2,2,4-Trimethylpentane	2016/08/11		95	%	70 - 130
			Carbon Disulfide	2016/08/11		103	%	70 - 130
			Vinyl Acetate	2016/08/11		104	%	70 - 130
4615593	LSY	Method Blank	Bromochloromethane	2016/08/11		87	%	60 - 140
			D5-Chlorobenzene	2016/08/11		79	%	60 - 140
			Difluorobenzene	2016/08/11		88	%	60 - 140
			Dichlorodifluoromethane (FREON 12)	2016/08/11	<0.20		ppbv	
			1,2-Dichlorotetrafluoroethane	2016/08/11	<0.17		ppbv	
			Chloromethane	2016/08/11	<0.30		ppbv	
			Vinyl Chloride	2016/08/11	<0.10		ppbv	
			Chloroethane	2016/08/11	<0.30		ppbv	
			1,3-Butadiene	2016/08/11	<0.50		ppbv	
			Trichlorofluoromethane (FREON 11)	2016/08/11	<0.20		ppbv	
			Ethanol (ethyl alcohol)	2016/08/11	<1.0		ppbv	
			Trichlorotrifluoroethane	2016/08/11	<0.15		ppbv	
			2-propanol	2016/08/11	<1.0		ppbv	
			2-Propanone	2016/08/11	<0.80		ppbv	
			Methyl Ethyl Ketone (2-Butanone)	2016/08/11	<1.0		ppbv	
			Methyl Isobutyl Ketone	2016/08/11	<1.0		ppbv	
			Methyl Butyl Ketone (2-Hexanone)	2016/08/11	<1.0		ppbv	
			Methyl t-butyl ether (MTBE)	2016/08/11	<0.20		ppbv	
			Ethyl Acetate	2016/08/11	<1.0		ppbv	
			1,1-Dichloroethylene	2016/08/11	<0.10		ppbv	
			cis-1,2-Dichloroethylene	2016/08/11	<0.10		ppbv	
			trans-1,2-Dichloroethylene	2016/08/11	<0.10		ppbv	
			Methylene Chloride(Dichloromethane)	2016/08/11	<0.80		ppbv	
			Chloroform	2016/08/11	<0.10		ppbv	
			Carbon Tetrachloride	2016/08/11	<0.10		ppbv	
			1,1-Dichloroethane	2016/08/11	<0.10		ppbv	
			1,2-Dichloroethane	2016/08/11	<0.10		ppbv	
			Ethylene Dibromide	2016/08/11	<0.10		ppbv	
			1,1,1-Trichloroethane	2016/08/11	<0.10		ppbv	
			1,1,2-Trichloroethane	2016/08/11	<0.10		ppbv	
			1,1,2,2-Tetrachloroethane	2016/08/11	<0.10		ppbv	
			cis-1,3-Dichloropropene	2016/08/11	<0.10		ppbv	
			trans-1,3-Dichloropropene	2016/08/11	<0.10		ppbv	
			1,2-Dichloropropane	2016/08/11	<0.10		ppbv	
			Bromomethane	2016/08/11	<0.10		ppbv	
			Bromoform	2016/08/11	<0.20		ppbv	
			Bromodichloromethane	2016/08/11	<0.20		ppbv	
			Dibromochloromethane	2016/08/11	<0.20		ppbv	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Trichloroethylene	2016/08/11	<0.10		ppbv	
			Tetrachloroethylene	2016/08/11	<0.10		ppbv	
			Benzene	2016/08/11	<0.10		ppbv	
			Toluene	2016/08/11	<0.10		ppbv	
			Ethylbenzene	2016/08/11	<0.10		ppbv	
			p+m-Xylene	2016/08/11	<0.20		ppbv	
			o-Xylene	2016/08/11	<0.10		ppbv	
			Styrene	2016/08/11	<0.10		ppbv	
			4-ethyltoluene	2016/08/11	<0.50		ppbv	
			1,3,5-Trimethylbenzene	2016/08/11	<0.50		ppbv	
			1,2,4-Trimethylbenzene	2016/08/11	<0.50		ppbv	
			Chlorobenzene	2016/08/11	<0.10		ppbv	
			Benzyl chloride	2016/08/11	<0.50		ppbv	
			1,3-Dichlorobenzene	2016/08/11	<0.40		ppbv	
			1,4-Dichlorobenzene	2016/08/11	<0.10		ppbv	
			1,2-Dichlorobenzene	2016/08/11	<0.10		ppbv	
			1,2,4-Trichlorobenzene	2016/08/11	<0.50		ppbv	
			Hexachlorobutadiene	2016/08/11	<0.50		ppbv	
			Hexane	2016/08/11	<0.30		ppbv	
			Heptane	2016/08/11	<0.30		ppbv	
			Cyclohexane	2016/08/11	<0.20		ppbv	
			Tetrahydrofuran	2016/08/11	<0.40		ppbv	
			1,4-Dioxane	2016/08/11	<1.0		ppbv	
			Naphthalene	2016/08/11	<0.50		ppbv	
			Total Xylenes	2016/08/11	<0.30		ppbv	
			1,1,1,2-Tetrachloroethane	2016/08/11	<0.10		ppbv	
			Vinyl Bromide	2016/08/11	<0.20		ppbv	
			Propene	2016/08/11	<0.50		ppbv	
			2,2,4-Trimethylpentane	2016/08/11	<0.20		ppbv	
			Carbon Disulfide	2016/08/11	<0.50		ppbv	
			Vinyl Acetate	2016/08/11	<0.20		ppbv	
4959477	LSY	Method Blank	F1-BTEX, C6-C10 (as Toluene)	2016/08/11	<5.0		ug/m3	
			F2, C10-C16 (as Decane)	2016/08/11	<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.

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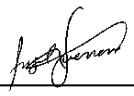
Maxxam Job #: B6G8933
Report Date: 2017/04/28

Tetra Tech Canada Inc.
Client Project #: ENV.CENV03133-01
Site Location: BARONS, AB

VALIDATION SIGNATURE PAGE

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 #: ENV.CENV03133-01
Site Location: BARONS,AB
Your C.O.C. #: na

Attention:Jaymes Going

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

Report Date: 2017/04/28
Report #: R4442111
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B6J0197
Received: 2016/09/07, 10:37

Sample Matrix: AIR
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
BTEX and CCME Compounds in Air(TO-15mod)	1	N/A	2016/09/07	BRL SOP-00304	EPA TO-15 m
Volatile Organics in Air (TO-15) (1)	1	N/A	2016/09/07	BRL SOP-00304	EPA TO-15 m

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

(1) Air sampling canisters have been cleaned in accordance with U.S. EPA Method TO14A. At the end of the cleaning, evacuation, and pressurization cycles, one canister was selected and was pressurized with Zero Air. This canister was then analyzed via TO14A on a GC/MS. The canister must have been found to contain <0.2 ppbv concentration of all target analytes in order for the batch to have been considered clean. Each canister also underwent a leak check prior to shipment.

Please Note: SUMMA® canister samples will be retained by Maxxam for a period of 5 calendar days or as contractually agreed from the date of this report, after which time they will be cleaned for reuse. If you require a longer sample storage period, please contact your service representative.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Cristina (Maria) Bacchus, Project Manager
Email: CBacchus@maxxam.ca
Phone# (905)817-5763
==========
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 #: B6J0197
Report Date: 2017/04/28

Tetra Tech Canada Inc.
Client Project #: ENV.CENV03133-01
Site Location: BARONS,AB

VOLATILE ORGANIC HYDROCARBONS BY GC/MS (AIR)

Maxxam ID		DAD239		
Sampling Date		2016/09/06 12:00		
COC Number		na		
	UNITS	**RVU 2**	**RDL**	**QC Batch**
Volatile Organics				
F1-BTEX, C6-C10 (as Toluene)	ug/m3	344	5.0	4959601
F2, C10-C16 (as Decane)	ug/m3	746	5.0	4959601

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B6J0197
Report Date: 2017/04/28

Tetra Tech Canada Inc.
Client Project #: ENV.CENV03133-01
Site Location: BARONS,AB

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		DAD239				
Sampling Date		2016/09/06 12:00				
COC Number		na				
	UNITS	RVU 2	RDL	ug/m3	DL (ug/m3)	QC Batch
Volatile Organics						
Dichlorodifluoromethane (FREON 12)	ppbv	0.55	0.20	2.70	0.989	4650060
1,2-Dichlorotetrafluoroethane	ppbv	<0.17	0.17	<1.19	1.19	4650060
Chloromethane	ppbv	0.34	0.30	0.696	0.620	4650060
Vinyl Chloride	ppbv	<0.10	0.10	<0.256	0.256	4650060
Chloroethane	ppbv	<0.30	0.30	<0.792	0.792	4650060
1,3-Butadiene	ppbv	<0.50	0.50	<1.11	1.11	4650060
Trichlorofluoromethane (FREON 11)	ppbv	0.25	0.20	1.42	1.12	4650060
Ethanol (ethyl alcohol)	ppbv	2.7	1.0	5.16	1.88	4650060
Trichlorotrifluoroethane	ppbv	<0.15	0.15	<1.15	1.15	4650060
2-propanol	ppbv	<1.0	1.0	<2.46	2.46	4650060
2-Propanone	ppbv	19.1	0.80	45.4	1.90	4650060
Methyl Ethyl Ketone (2-Butanone)	ppbv	2.5	1.0	7.37	2.95	4650060
Methyl Isobutyl Ketone	ppbv	<1.0	1.0	<4.10	4.10	4650060
Methyl Butyl Ketone (2-Hexanone)	ppbv	<1.0	1.0	<4.10	4.10	4650060
Methyl t-butyl ether (MTBE)	ppbv	<0.20	0.20	<0.721	0.721	4650060
Ethyl Acetate	ppbv	<1.0	1.0	<3.60	3.60	4650060
1,1-Dichloroethylene	ppbv	<0.10	0.10	<0.396	0.396	4650060
cis-1,2-Dichloroethylene	ppbv	<0.10	0.10	<0.396	0.396	4650060
trans-1,2-Dichloroethylene	ppbv	<0.10	0.10	<0.396	0.396	4650060
Methylene Chloride(Dichloromethane)	ppbv	<0.80	0.80	<2.78	2.78	4650060
Chloroform	ppbv	<0.10	0.10	<0.488	0.488	4650060
Carbon Tetrachloride	ppbv	<0.10	0.10	<0.629	0.629	4650060
1,1-Dichloroethane	ppbv	<0.10	0.10	<0.405	0.405	4650060
1,2-Dichloroethane	ppbv	<0.10	0.10	<0.405	0.405	4650060
Ethylene Dibromide	ppbv	<0.10	0.10	<0.768	0.768	4650060
1,1,1-Trichloroethane	ppbv	<0.10	0.10	<0.546	0.546	4650060
1,1,2-Trichloroethane	ppbv	<0.10	0.10	<0.546	0.546	4650060
1,1,2,2-Tetrachloroethane	ppbv	0.12	0.10	0.801	0.687	4650060
cis-1,3-Dichloropropene	ppbv	<0.10	0.10	<0.454	0.454	4650060
trans-1,3-Dichloropropene	ppbv	<0.10	0.10	<0.454	0.454	4650060
1,2-Dichloropropane	ppbv	<0.10	0.10	<0.462	0.462	4650060
Bromomethane	ppbv	<0.10	0.10	<0.388	0.388	4650060
Bromoform	ppbv	<0.20	0.20	<2.07	2.07	4650060
Bromodichloromethane	ppbv	<0.20	0.20	<1.34	1.34	4650060

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B6J0197
Report Date: 2017/04/28

Tetra Tech Canada Inc.
Client Project #: ENV.CENV03133-01
Site Location: BARONS,AB

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		DAD239				
Sampling Date		2016/09/06 12:00				
COC Number		na				
	UNITS	RVU 2	RDL	ug/m3	DL (ug/m3)	QC Batch
Dibromochloromethane	ppbv	<0.20	0.20	<1.70	1.70	4650060
Trichloroethylene	ppbv	1.36	0.10	7.31	0.537	4650060
Tetrachloroethylene	ppbv	<0.10	0.10	<0.678	0.678	4650060
Benzene	ppbv	0.22	0.10	0.719	0.319	4650060
Toluene	ppbv	4.47	0.10	16.8	0.376	4650060
Ethylbenzene	ppbv	0.16	0.10	0.704	0.434	4650060
p+m-Xylene	ppbv	0.56	0.20	2.44	0.868	4650060
o-Xylene	ppbv	0.28	0.10	1.23	0.434	4650060
Styrene	ppbv	0.11	0.10	0.471	0.426	4650060
4-ethyltoluene	ppbv	<0.50	0.50	<2.46	2.46	4650060
1,3,5-Trimethylbenzene	ppbv	0.92	0.50	4.51	2.46	4650060
1,2,4-Trimethylbenzene	ppbv	2.19	0.50	10.8	2.46	4650060
Chlorobenzene	ppbv	<0.10	0.10	<0.460	0.460	4650060
Benzyl chloride	ppbv	<0.50	0.50	<2.59	2.59	4650060
1,3-Dichlorobenzene	ppbv	<0.40	0.40	<2.40	2.40	4650060
1,4-Dichlorobenzene	ppbv	0.26	0.10	1.57	0.601	4650060
1,2-Dichlorobenzene	ppbv	0.18	0.10	1.07	0.601	4650060
1,2,4-Trichlorobenzene	ppbv	0.73	0.50	5.41	3.71	4650060
Hexachlorobutadiene	ppbv	<0.50	0.50	<5.33	5.33	4650060
Hexane	ppbv	0.37	0.30	1.30	1.06	4650060
Heptane	ppbv	0.35	0.30	1.42	1.23	4650060
Cyclohexane	ppbv	<0.20	0.20	<0.688	0.688	4650060
Tetrahydrofuran	ppbv	5.19	0.40	15.3	1.18	4650060
1,4-Dioxane	ppbv	<1.0	1.0	<3.60	3.60	4650060
Naphthalene	ppbv	1.46	0.50	7.67	2.62	4650060
Total Xylenes	ppbv	0.84	0.30	3.67	1.30	4650060
1,1,1,2-Tetrachloroethane	ppbv	<0.10	0.10	<0.687	0.687	4650060
Vinyl Bromide	ppbv	<0.20	0.20	<0.875	0.875	4650060
Propene	ppbv	<0.50	0.50	<0.861	0.861	4650060
2,2,4-Trimethylpentane	ppbv	<0.20	0.20	<0.934	0.934	4650060
Carbon Disulfide	ppbv	1.55	0.50	4.84	1.56	4650060
Vinyl Acetate	ppbv	<0.20	0.20	<0.704	0.704	4650060
Surrogate Recovery (%)						
Bromochloromethane	%	85		N/A	N/A	4650060

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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Maxxam Job #: B6J0197
Report Date: 2017/04/28

Tetra Tech Canada Inc.
Client Project #: ENV.CENV03133-01
Site Location: BARONS,AB

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		DAD239				
Sampling Date		2016/09/06 12:00				
COC Number		na				
	UNITS	**RVU 2**	**RDL**	**ug/m3**	**DL (ug/m3)**	**QC Batch**
D5-Chlorobenzene	%	84		N/A	N/A	4650060
Difluorobenzene	%	86		N/A	N/A	4650060

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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Maxxam Job #: B6J0197
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Tetra Tech Canada Inc.
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Site Location: BARONS,AB

GENERAL COMMENTS

4/28/17 - report amended, F1-F2 added as per request.

Results relate only to the items tested.

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Maxxam Job #: B6J0197
Report Date: 2017/04/28

Tetra Tech Canada Inc.
Client Project #: ENV.CENV03133-01
Site Location: BARONS,AB

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4650060	NS2	Spiked Blank	Bromochloromethane	2016/09/07		86	%	60 - 140
			D5-Chlorobenzene	2016/09/07		85	%	60 - 140
			Difluorobenzene	2016/09/07		85	%	60 - 140
			Dichlorodifluoromethane (FREON 12)	2016/09/07		92	%	70 - 130
			1,2-Dichlorotetrafluoroethane	2016/09/07		79	%	70 - 130
			Chloromethane	2016/09/07		87	%	70 - 130
			Vinyl Chloride	2016/09/07		89	%	70 - 130
			Chloroethane	2016/09/07		87	%	70 - 130
			1,3-Butadiene	2016/09/07		90	%	70 - 130
			Trichlorofluoromethane (FREON 11)	2016/09/07		91	%	70 - 130
			Ethanol (ethyl alcohol)	2016/09/07		74	%	70 - 130
			Trichlorotrifluoroethane	2016/09/07		94	%	70 - 130
			2-propanol	2016/09/07		86	%	70 - 130
			2-Propanone	2016/09/07		95	%	70 - 130
			Methyl Ethyl Ketone (2-Butanone)	2016/09/07		102	%	70 - 130
			Methyl Isobutyl Ketone	2016/09/07		93	%	70 - 130
			Methyl Butyl Ketone (2-Hexanone)	2016/09/07		94	%	70 - 130
			Methyl t-butyl ether (MTBE)	2016/09/07		98	%	70 - 130
			Ethyl Acetate	2016/09/07		98	%	70 - 130
			1,1-Dichloroethylene	2016/09/07		96	%	70 - 130
			cis-1,2-Dichloroethylene	2016/09/07		91	%	70 - 130
			trans-1,2-Dichloroethylene	2016/09/07		97	%	70 - 130
			Methylene Chloride(Dichloromethane)	2016/09/07		84	%	70 - 130
			Chloroform	2016/09/07		93	%	70 - 130
			Carbon Tetrachloride	2016/09/07		104	%	70 - 130
			1,1-Dichloroethane	2016/09/07		89	%	70 - 130
			1,2-Dichloroethane	2016/09/07		99	%	70 - 130
			Ethylene Dibromide	2016/09/07		96	%	70 - 130
			1,1,1-Trichloroethane	2016/09/07		94	%	70 - 130
			1,1,2-Trichloroethane	2016/09/07		92	%	70 - 130
			1,1,2,2-Tetrachloroethane	2016/09/07		88	%	70 - 130
			cis-1,3-Dichloropropene	2016/09/07		98	%	70 - 130
			trans-1,3-Dichloropropene	2016/09/07		105	%	70 - 130
			1,2-Dichloropropane	2016/09/07		89	%	70 - 130
			Bromomethane	2016/09/07		93	%	70 - 130
			Bromoform	2016/09/07		106	%	70 - 130
			Bromodichloromethane	2016/09/07		105	%	70 - 130
			Dibromochloromethane	2016/09/07		111	%	70 - 130
			Trichloroethylene	2016/09/07		96	%	70 - 130
			Tetrachloroethylene	2016/09/07		96	%	70 - 130
			Benzene	2016/09/07		91	%	70 - 130
			Toluene	2016/09/07		97	%	70 - 130
			Ethylbenzene	2016/09/07		93	%	70 - 130
			p+m-Xylene	2016/09/07		90	%	70 - 130
			o-Xylene	2016/09/07		92	%	70 - 130
			Styrene	2016/09/07		98	%	70 - 130
			4-ethyltoluene	2016/09/07		99	%	70 - 130
			1,3,5-Trimethylbenzene	2016/09/07		91	%	70 - 130
			1,2,4-Trimethylbenzene	2016/09/07		90	%	70 - 130
			Chlorobenzene	2016/09/07		96	%	70 - 130
			Benzyl chloride	2016/09/07		104	%	70 - 130
			1,3-Dichlorobenzene	2016/09/07		100	%	70 - 130
			1,4-Dichlorobenzene	2016/09/07		100	%	70 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			1,2-Dichlorobenzene	2016/09/07		90	%	70 - 130
			1,2,4-Trichlorobenzene	2016/09/07		88	%	70 - 130
			Hexachlorobutadiene	2016/09/07		87	%	70 - 130
			Hexane	2016/09/07		87	%	70 - 130
			Heptane	2016/09/07		90	%	70 - 130
			Cyclohexane	2016/09/07		90	%	70 - 130
			Tetrahydrofuran	2016/09/07		88	%	70 - 130
			1,4-Dioxane	2016/09/07		79	%	70 - 130
			Naphthalene	2016/09/07		90	%	70 - 130
			Total Xylenes	2016/09/07		91	%	70 - 130
			Vinyl Bromide	2016/09/07		95	%	70 - 130
			Propene	2016/09/07		92	%	70 - 130
			2,2,4-Trimethylpentane	2016/09/07		96	%	70 - 130
			Carbon Disulfide	2016/09/07		101	%	70 - 130
			Vinyl Acetate	2016/09/07		92	%	70 - 130
4650060	NS2	Method Blank	Bromochloromethane	2016/09/07		87	%	60 - 140
			D5-Chlorobenzene	2016/09/07		83	%	60 - 140
			Difluorobenzene	2016/09/07		88	%	60 - 140
			Dichlorodifluoromethane (FREON 12)	2016/09/07	<0.20		ppbv	
			1,2-Dichlorotetrafluoroethane	2016/09/07	<0.17		ppbv	
			Chloromethane	2016/09/07	<0.30		ppbv	
			Vinyl Chloride	2016/09/07	<0.10		ppbv	
			Chloroethane	2016/09/07	<0.30		ppbv	
			1,3-Butadiene	2016/09/07	<0.50		ppbv	
			Trichlorofluoromethane (FREON 11)	2016/09/07	<0.20		ppbv	
			Ethanol (ethyl alcohol)	2016/09/07	<1.0		ppbv	
			Trichlorotrifluoroethane	2016/09/07	<0.15		ppbv	
			2-propanol	2016/09/07	<1.0		ppbv	
			2-Propanone	2016/09/07	<0.80		ppbv	
			Methyl Ethyl Ketone (2-Butanone)	2016/09/07	<1.0		ppbv	
			Methyl Isobutyl Ketone	2016/09/07	<1.0		ppbv	
			Methyl Butyl Ketone (2-Hexanone)	2016/09/07	<1.0		ppbv	
			Methyl t-butyl ether (MTBE)	2016/09/07	<0.20		ppbv	
			Ethyl Acetate	2016/09/07	<1.0		ppbv	
			1,1-Dichloroethylene	2016/09/07	<0.10		ppbv	
			cis-1,2-Dichloroethylene	2016/09/07	<0.10		ppbv	
			trans-1,2-Dichloroethylene	2016/09/07	<0.10		ppbv	
			Methylene Chloride(Dichloromethane)	2016/09/07	<0.80		ppbv	
			Chloroform	2016/09/07	<0.10		ppbv	
			Carbon Tetrachloride	2016/09/07	<0.10		ppbv	
			1,1-Dichloroethane	2016/09/07	<0.10		ppbv	
			1,2-Dichloroethane	2016/09/07	<0.10		ppbv	
			Ethylene Dibromide	2016/09/07	<0.10		ppbv	
			1,1,1-Trichloroethane	2016/09/07	<0.10		ppbv	
			1,1,2-Trichloroethane	2016/09/07	<0.10		ppbv	
			1,1,2,2-Tetrachloroethane	2016/09/07	<0.10		ppbv	
			cis-1,3-Dichloropropene	2016/09/07	<0.10		ppbv	
			trans-1,3-Dichloropropene	2016/09/07	<0.10		ppbv	
			1,2-Dichloropropane	2016/09/07	<0.10		ppbv	
			Bromomethane	2016/09/07	<0.10		ppbv	
			Bromoform	2016/09/07	<0.20		ppbv	
			Bromodichloromethane	2016/09/07	<0.20		ppbv	
			Dibromochloromethane	2016/09/07	<0.20		ppbv	

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Maxxam Job #: B6J0197
Report Date: 2017/04/28

Tetra Tech Canada Inc.
Client Project #: ENV.CENV03133-01
Site Location: BARONS,AB

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Trichloroethylene	2016/09/07	<0.10		ppbv	
			Tetrachloroethylene	2016/09/07	<0.10		ppbv	
			Benzene	2016/09/07	<0.10		ppbv	
			Toluene	2016/09/07	<0.10		ppbv	
			Ethylbenzene	2016/09/07	<0.10		ppbv	
			p+m-Xylene	2016/09/07	<0.20		ppbv	
			o-Xylene	2016/09/07	<0.10		ppbv	
			Styrene	2016/09/07	<0.10		ppbv	
			4-ethyltoluene	2016/09/07	<0.50		ppbv	
			1,3,5-Trimethylbenzene	2016/09/07	<0.50		ppbv	
			1,2,4-Trimethylbenzene	2016/09/07	<0.50		ppbv	
			Chlorobenzene	2016/09/07	<0.10		ppbv	
			Benzyl chloride	2016/09/07	<0.50		ppbv	
			1,3-Dichlorobenzene	2016/09/07	<0.40		ppbv	
			1,4-Dichlorobenzene	2016/09/07	<0.10		ppbv	
			1,2-Dichlorobenzene	2016/09/07	<0.10		ppbv	
			1,2,4-Trichlorobenzene	2016/09/07	<0.50		ppbv	
			Hexachlorobutadiene	2016/09/07	<0.50		ppbv	
			Hexane	2016/09/07	<0.30		ppbv	
			Heptane	2016/09/07	<0.30		ppbv	
			Cyclohexane	2016/09/07	<0.20		ppbv	
			Tetrahydrofuran	2016/09/07	<0.40		ppbv	
			1,4-Dioxane	2016/09/07	<1.0		ppbv	
			Naphthalene	2016/09/07	<0.50		ppbv	
			Total Xylenes	2016/09/07	<0.30		ppbv	
			1,1,1,2-Tetrachloroethane	2016/09/07	<0.10		ppbv	
			Vinyl Bromide	2016/09/07	<0.20		ppbv	
			Propene	2016/09/07	<0.50		ppbv	
			2,2,4-Trimethylpentane	2016/09/07	<0.20		ppbv	
			Carbon Disulfide	2016/09/07	<0.50		ppbv	
			Vinyl Acetate	2016/09/07	<0.20		ppbv	
4650060	NS2	RPD	Benzene	2016/09/07	NC		%	25
			Toluene	2016/09/07	1.4		%	25
			Ethylbenzene	2016/09/07	9.0		%	25
			p+m-Xylene	2016/09/07	0.19		%	25
			o-Xylene	2016/09/07	NC		%	25
			Naphthalene	2016/09/07	NC		%	25
			Total Xylenes	2016/09/07	0.19		%	25
4959601	NS2	Method Blank	F1-BTEX, C6-C10 (as Toluene)	2016/09/07	<5.0		ug/m3	
			F2, C10-C16 (as Decane)	2016/09/07	<5.0		ug/m3	

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

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 (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 (absolute difference <= 2x RDL).

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Maxxam Job #: B6J0197
Report Date: 2017/04/28

Tetra Tech Canada Inc.
Client Project #: ENV.CENV03133-01
Site Location: BARONS,AB

VALIDATION SIGNATURE PAGE

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

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.

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Your Project #: AMA SITE 9557
Site Location: 202 MAIN STREET BARONS AB ENV.CENV03133 -01
Your C.O.C. #: na

Attention:Jaymes Going

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

Report Date: 2017/04/28
Report #: R4442085
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B724091
Received: 2017/02/04, 11:10

Sample Matrix: AIR
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
BTEX and CCME Compounds in Air(TO-15mod)	1	N/A	2017/02/06	BRL SOP-00304	EPA TO-15 m
Volatile Organics in Air (TO-15) (1)	1	N/A	2017/02/06	BRL SOP-00304	EPA TO-15 m

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

(1) Air sampling canisters have been cleaned in accordance with U.S. EPA Method TO14A. At the end of the cleaning, evacuation, and pressurization cycles, one canister was selected and was pressurized with Zero Air. This canister was then analyzed via TO14A on a GC/MS. The canister must have been found to contain <0.2 ppbv concentration of all target analytes in order for the batch to have been considered clean. Each canister also underwent a leak check prior to shipment.

Please Note: SUMMA® canister samples will be retained by Maxxam for a period of 5 calendar days or as contractually agreed from the date of this report, after which time they will be cleaned for reuse. If you require a longer sample storage period, please contact your service representative.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Cristina (Maria) Bacchus, Project Manager
Email: CBacchus@maxxam.ca
Phone# (905)817-5763

==========

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 #: B724091
Report Date: 2017/04/28

Tetra Tech Canada Inc.
Client Project #: AMA SITE 9557
Site Location: 202 MAIN STREET BARONS AB ENV.CENV03133 -01
Sampler Initials: JL

VOLATILE ORGANIC HYDROCARBONS BY GC/MS (AIR)

Maxxam ID		DWB908		
Sampling Date		2017/02/02 13:00		
COC Number		na		
	UNITS	**RVU 2**	**RDL**	**QC Batch**
Volatile Organics				
F1-BTEX, C6-C10 (as Toluene)	ug/m3	1650	5.0	4959473
F2, C10-C16 (as Decane)	ug/m3	384	5.0	4959473

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B724091
Report Date: 2017/04/28

Tetra Tech Canada Inc.
Client Project #: AMA SITE 9557
Site Location: 202 MAIN STREET BARONS AB ENV.CENV03133 -01
Sampler Initials: JL

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		DWB908				
Sampling Date		2017/02/02 13:00				
COC Number		na				
	UNITS	RVU 2	RDL	ug/m3	DL (ug/m3)	QC Batch
Volatile Organics						
Dichlorodifluoromethane (FREON 12)	ppbv	0.50	0.20	2.49	0.989	4852799
1,2-Dichlorotetrafluoroethane	ppbv	<0.17	0.17	<1.19	1.19	4852799
Chloromethane	ppbv	0.58	0.30	1.21	0.620	4852799
Vinyl Chloride	ppbv	<0.10	0.10	<0.256	0.256	4852799
Chloroethane	ppbv	<0.30	0.30	<0.792	0.792	4852799
1,3-Butadiene	ppbv	<0.50	0.50	<1.11	1.11	4852799
Trichlorofluoromethane (FREON 11)	ppbv	0.24	0.20	1.35	1.12	4852799
Ethanol (ethyl alcohol)	ppbv	2.2	1.0	4.09	1.88	4852799
Trichlorotrifluoroethane	ppbv	<0.15	0.15	<1.15	1.15	4852799
2-propanol	ppbv	<1.0	1.0	<2.46	2.46	4852799
2-Propanone	ppbv	12.7	0.80	30.2	1.90	4852799
Methyl Ethyl Ketone (2-Butanone)	ppbv	2.6	1.0	7.73	2.95	4852799
Methyl Isobutyl Ketone	ppbv	<1.0	1.0	<4.10	4.10	4852799
Methyl Butyl Ketone (2-Hexanone)	ppbv	<1.0	1.0	<4.10	4.10	4852799
Methyl t-butyl ether (MTBE)	ppbv	<0.20	0.20	<0.721	0.721	4852799
Ethyl Acetate	ppbv	<1.0	1.0	<3.60	3.60	4852799
1,1-Dichloroethylene	ppbv	<0.10	0.10	<0.396	0.396	4852799
cis-1,2-Dichloroethylene	ppbv	<0.10	0.10	<0.396	0.396	4852799
trans-1,2-Dichloroethylene	ppbv	<0.10	0.10	<0.396	0.396	4852799
Methylene Chloride(Dichloromethane)	ppbv	<0.80	0.80	<2.78	2.78	4852799
Chloroform	ppbv	<0.10	0.10	<0.488	0.488	4852799
Carbon Tetrachloride	ppbv	<0.10	0.10	<0.629	0.629	4852799
1,1-Dichloroethane	ppbv	<0.10	0.10	<0.405	0.405	4852799
1,2-Dichloroethane	ppbv	<0.10	0.10	<0.405	0.405	4852799
Ethylene Dibromide	ppbv	<0.10	0.10	<0.768	0.768	4852799
1,1,1-Trichloroethane	ppbv	<0.10	0.10	<0.546	0.546	4852799
1,1,2-Trichloroethane	ppbv	<0.10	0.10	<0.546	0.546	4852799
1,1,2,2-Tetrachloroethane	ppbv	<0.10	0.10	<0.687	0.687	4852799
cis-1,3-Dichloropropene	ppbv	<0.10	0.10	<0.454	0.454	4852799
trans-1,3-Dichloropropene	ppbv	<0.10	0.10	<0.454	0.454	4852799
1,2-Dichloropropane	ppbv	<0.10	0.10	<0.462	0.462	4852799
Bromomethane	ppbv	<0.10	0.10	<0.388	0.388	4852799
Bromoform	ppbv	<0.20	0.20	<2.07	2.07	4852799

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B724091
Report Date: 2017/04/28

Tetra Tech Canada Inc.
Client Project #: AMA SITE 9557
Site Location: 202 MAIN STREET BARONS AB ENV.CENV03133 -01
Sampler Initials: JL

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		DWB908				
Sampling Date		2017/02/02 13:00				
COC Number		na				
	UNITS	RVU 2	RDL	ug/m3	DL (ug/m3)	QC Batch
Bromodichloromethane	ppbv	<0.20	0.20	<1.34	1.34	4852799
Dibromochloromethane	ppbv	<0.20	0.20	<1.70	1.70	4852799
Trichloroethylene	ppbv	15.6	0.10	83.7	0.537	4852799
Tetrachloroethylene	ppbv	<0.10	0.10	<0.678	0.678	4852799
Benzene	ppbv	0.66	0.10	2.11	0.319	4852799
Toluene	ppbv	13.7	0.10	51.4	0.376	4852799
Ethylbenzene	ppbv	0.27	0.10	1.17	0.434	4852799
p+m-Xylene	ppbv	0.54	0.20	2.36	0.868	4852799
o-Xylene	ppbv	0.27	0.10	1.15	0.434	4852799
Styrene	ppbv	<0.10	0.10	<0.426	0.426	4852799
4-ethyltoluene	ppbv	<0.50	0.50	<2.46	2.46	4852799
1,3,5-Trimethylbenzene	ppbv	0.64	0.50	3.15	2.46	4852799
1,2,4-Trimethylbenzene	ppbv	1.64	0.50	8.08	2.46	4852799
Chlorobenzene	ppbv	<0.10	0.10	<0.460	0.460	4852799
Benzyl chloride	ppbv	<0.50	0.50	<2.59	2.59	4852799
1,3-Dichlorobenzene	ppbv	<0.40	0.40	<2.40	2.40	4852799
1,4-Dichlorobenzene	ppbv	0.14	0.10	0.815	0.601	4852799
1,2-Dichlorobenzene	ppbv	<0.10	0.10	<0.601	0.601	4852799
1,2,4-Trichlorobenzene	ppbv	<0.50	0.50	<3.71	3.71	4852799
Hexachlorobutadiene	ppbv	<0.50	0.50	<5.33	5.33	4852799
Hexane	ppbv	1.47	0.30	5.18	1.06	4852799
Heptane	ppbv	2.39	0.30	9.80	1.23	4852799
Cyclohexane	ppbv	4.18	0.20	14.4	0.688	4852799
Tetrahydrofuran	ppbv	0.61	0.40	1.79	1.18	4852799
1,4-Dioxane	ppbv	<1.0	1.0	<3.60	3.60	4852799
Naphthalene	ppbv	<0.50	0.50	<2.62	2.62	4852799
Total Xylenes	ppbv	0.81	0.30	3.51	1.30	4852799
1,1,1,2-Tetrachloroethane	ppbv	<0.10	0.10	<0.687	0.687	4852799
Vinyl Bromide	ppbv	<0.20	0.20	<0.875	0.875	4852799
Propene	ppbv	<2.4	2.4	<4.13	4.13	4852799
2,2,4-Trimethylpentane	ppbv	0.72	0.20	3.38	0.934	4852799
Carbon Disulfide	ppbv	0.99	0.50	3.08	1.56	4852799
Vinyl Acetate	ppbv	<9.7	9.7	<34.2	34.2	4852799

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B724091
Report Date: 2017/04/28

Tetra Tech Canada Inc.
Client Project #: AMA SITE 9557
Site Location: 202 MAIN STREET BARONS AB ENV.CENV03133 -01
Sampler Initials: JL

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		DWB908				
Sampling Date		2017/02/02 13:00				
COC Number		na				
	UNITS	**RVU 2**	**RDL**	**ug/m3**	**DL (ug/m3)**	**QC Batch**
Surrogate Recovery (%)						
Bromochloromethane	%	83		N/A	N/A	4852799
D5-Chlorobenzene	%	80		N/A	N/A	4852799
Difluorobenzene	%	84		N/A	N/A	4852799

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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Maxxam Job #: B724091
Report Date: 2017/04/28

Tetra Tech Canada Inc.
Client Project #: AMA SITE 9557
Site Location: 202 MAIN STREET BARONS AB ENV.CENV03133 -01
Sampler Initials: JL

GENERAL COMMENTS

4/28/17 - report amended, F1-F2 added as per request.

Sample received and analyzed after hold time.

Sample DWB908 [RVU 2] : Increased DL for propene due to interference from propane.
Increased DL for Vinyl acetate due to hydrocarbon interference.
2-Butanone biased high due to co-elution with hexane. This result represents the highest concentration possible of 2-butanone.

Results relate only to the items tested.

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Tetra Tech Canada Inc.
Client Project #: AMA SITE 9557
Site Location: 202 MAIN STREET BARONS AB ENV.CENV03133 -01
Sampler Initials: JL

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4852799	KM2	Spiked Blank	Bromochloromethane	2017/02/06		98	%	60 - 140
			D5-Chlorobenzene	2017/02/06		97	%	60 - 140
			Difluorobenzene	2017/02/06		97	%	60 - 140
			Dichlorodifluoromethane (FREON 12)	2017/02/06		93	%	70 - 130
			1,2-Dichlorotetrafluoroethane	2017/02/06		81	%	70 - 130
			Chloromethane	2017/02/06		80	%	70 - 130
			Vinyl Chloride	2017/02/06		82	%	70 - 130
			Chloroethane	2017/02/06		83	%	70 - 130
			1,3-Butadiene	2017/02/06		87	%	70 - 130
			Trichlorofluoromethane (FREON 11)	2017/02/06		87	%	70 - 130
			Ethanol (ethyl alcohol)	2017/02/06		61 (1)	%	70 - 130
			Trichlorotrifluoroethane	2017/02/06		95	%	70 - 130
			2-propanol	2017/02/06		89	%	70 - 130
			2-Propanone	2017/02/06		79	%	70 - 130
			Methyl Ethyl Ketone (2-Butanone)	2017/02/06		100	%	70 - 130
			Methyl Isobutyl Ketone	2017/02/06		90	%	70 - 130
			Methyl Butyl Ketone (2-Hexanone)	2017/02/06		86	%	70 - 130
			Methyl t-butyl ether (MTBE)	2017/02/06		98	%	70 - 130
			Ethyl Acetate	2017/02/06		89	%	70 - 130
			1,1-Dichloroethylene	2017/02/06		91	%	70 - 130
			cis-1,2-Dichloroethylene	2017/02/06		87	%	70 - 130
			trans-1,2-Dichloroethylene	2017/02/06		90	%	70 - 130
			Methylene Chloride(Dichloromethane)	2017/02/06		81	%	70 - 130
			Chloroform	2017/02/06		90	%	70 - 130
			Carbon Tetrachloride	2017/02/06		104	%	70 - 130
			1,1-Dichloroethane	2017/02/06		90	%	70 - 130
			1,2-Dichloroethane	2017/02/06		91	%	70 - 130
			Ethylene Dibromide	2017/02/06		97	%	70 - 130
			1,1,1-Trichloroethane	2017/02/06		96	%	70 - 130
			1,1,2-Trichloroethane	2017/02/06		97	%	70 - 130
			1,1,2,2-Tetrachloroethane	2017/02/06		92	%	70 - 130
			cis-1,3-Dichloropropene	2017/02/06		108	%	70 - 130
			trans-1,3-Dichloropropene	2017/02/06		101	%	70 - 130
			1,2-Dichloropropane	2017/02/06		91	%	70 - 130
			Bromomethane	2017/02/06		93	%	70 - 130
			Bromoform	2017/02/06		104	%	70 - 130
			Bromodichloromethane	2017/02/06		103	%	70 - 130
			Dibromochloromethane	2017/02/06		104	%	70 - 130
			Trichloroethylene	2017/02/06		107	%	70 - 130
			Tetrachloroethylene	2017/02/06		106	%	70 - 130
			Benzene	2017/02/06		98	%	70 - 130
			Toluene	2017/02/06		105	%	70 - 130
			Ethylbenzene	2017/02/06		97	%	70 - 130
			p+m-Xylene	2017/02/06		96	%	70 - 130
			o-Xylene	2017/02/06		97	%	70 - 130
			Styrene	2017/02/06		99	%	70 - 130
			4-ethyltoluene	2017/02/06		94	%	70 - 130
			1,3,5-Trimethylbenzene	2017/02/06		90	%	70 - 130
			1,2,4-Trimethylbenzene	2017/02/06		89	%	70 - 130
			Chlorobenzene	2017/02/06		97	%	70 - 130
			Benzyl chloride	2017/02/06		91	%	70 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			1,3-Dichlorobenzene	2017/02/06		92	%	70 - 130
			1,4-Dichlorobenzene	2017/02/06		88	%	70 - 130
			1,2-Dichlorobenzene	2017/02/06		82	%	70 - 130
			1,2,4-Trichlorobenzene	2017/02/06		89	%	70 - 130
			Hexachlorobutadiene	2017/02/06		84	%	70 - 130
			Hexane	2017/02/06		87	%	70 - 130
			Heptane	2017/02/06		87	%	70 - 130
			Cyclohexane	2017/02/06		92	%	70 - 130
			Tetrahydrofuran	2017/02/06		86	%	70 - 130
			1,4-Dioxane	2017/02/06		81	%	70 - 130
			Naphthalene	2017/02/06		89	%	70 - 130
			Total Xylenes	2017/02/06		96	%	70 - 130
			Vinyl Bromide	2017/02/06		95	%	70 - 130
			Propene	2017/02/06		80	%	70 - 130
			2,2,4-Trimethylpentane	2017/02/06		93	%	70 - 130
			Carbon Disulfide	2017/02/06		103	%	70 - 130
			Vinyl Acetate	2017/02/06		91	%	70 - 130
4852799	KM2	Method Blank	Bromochloromethane	2017/02/06		90	%	60 - 140
			D5-Chlorobenzene	2017/02/06		90	%	60 - 140
			Difluorobenzene	2017/02/06		92	%	60 - 140
			Dichlorodifluoromethane (FREON 12)	2017/02/06	<0.20		ppbv	
			1,2-Dichlorotetrafluoroethane	2017/02/06	<0.17		ppbv	
			Chloromethane	2017/02/06	<0.30		ppbv	
			Vinyl Chloride	2017/02/06	<0.10		ppbv	
			Chloroethane	2017/02/06	<0.30		ppbv	
			1,3-Butadiene	2017/02/06	<0.50		ppbv	
			Trichlorofluoromethane (FREON 11)	2017/02/06	<0.20		ppbv	
			Ethanol (ethyl alcohol)	2017/02/06	<1.0		ppbv	
			Trichlorotrifluoroethane	2017/02/06	<0.15		ppbv	
			2-propanol	2017/02/06	<1.0		ppbv	
			2-Propanone	2017/02/06	<0.80		ppbv	
			Methyl Ethyl Ketone (2-Butanone)	2017/02/06	<1.0		ppbv	
			Methyl Isobutyl Ketone	2017/02/06	<1.0		ppbv	
			Methyl Butyl Ketone (2-Hexanone)	2017/02/06	<1.0		ppbv	
			Methyl t-butyl ether (MTBE)	2017/02/06	<0.20		ppbv	
			Ethyl Acetate	2017/02/06	<1.0		ppbv	
			1,1-Dichloroethylene	2017/02/06	<0.10		ppbv	
			cis-1,2-Dichloroethylene	2017/02/06	<0.10		ppbv	
			trans-1,2-Dichloroethylene	2017/02/06	<0.10		ppbv	
			Methylene Chloride(Dichloromethane)	2017/02/06	<0.80		ppbv	
			Chloroform	2017/02/06	<0.10		ppbv	
			Carbon Tetrachloride	2017/02/06	<0.10		ppbv	
			1,1-Dichloroethane	2017/02/06	<0.10		ppbv	
			1,2-Dichloroethane	2017/02/06	<0.10		ppbv	
			Ethylene Dibromide	2017/02/06	<0.10		ppbv	
			1,1,1-Trichloroethane	2017/02/06	<0.10		ppbv	
			1,1,2-Trichloroethane	2017/02/06	<0.10		ppbv	
			1,1,2,2-Tetrachloroethane	2017/02/06	<0.10		ppbv	
			cis-1,3-Dichloropropene	2017/02/06	<0.10		ppbv	
			trans-1,3-Dichloropropene	2017/02/06	<0.10		ppbv	
			1,2-Dichloropropane	2017/02/06	<0.10		ppbv	

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Sampler Initials: JL

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Bromomethane	2017/02/06	<0.10		ppbv	
			Bromoform	2017/02/06	<0.20		ppbv	
			Bromodichloromethane	2017/02/06	<0.20		ppbv	
			Dibromochloromethane	2017/02/06	<0.20		ppbv	
			Trichloroethylene	2017/02/06	<0.10		ppbv	
			Tetrachloroethylene	2017/02/06	<0.10		ppbv	
			Benzene	2017/02/06	<0.10		ppbv	
			Toluene	2017/02/06	<0.10		ppbv	
			Ethylbenzene	2017/02/06	<0.10		ppbv	
			p+m-Xylene	2017/02/06	<0.20		ppbv	
			o-Xylene	2017/02/06	<0.10		ppbv	
			Styrene	2017/02/06	<0.10		ppbv	
			4-ethyltoluene	2017/02/06	<0.50		ppbv	
			1,3,5-Trimethylbenzene	2017/02/06	<0.50		ppbv	
			1,2,4-Trimethylbenzene	2017/02/06	<0.50		ppbv	
			Chlorobenzene	2017/02/06	<0.10		ppbv	
			Benzyl chloride	2017/02/06	<0.50		ppbv	
			1,3-Dichlorobenzene	2017/02/06	<0.40		ppbv	
			1,4-Dichlorobenzene	2017/02/06	<0.10		ppbv	
			1,2-Dichlorobenzene	2017/02/06	<0.10		ppbv	
			1,2,4-Trichlorobenzene	2017/02/06	<0.50		ppbv	
			Hexachlorobutadiene	2017/02/06	<0.50		ppbv	
			Hexane	2017/02/06	<0.30		ppbv	
			Heptane	2017/02/06	<0.30		ppbv	
			Cyclohexane	2017/02/06	<0.20		ppbv	
			Tetrahydrofuran	2017/02/06	<0.40		ppbv	
			1,4-Dioxane	2017/02/06	<1.0		ppbv	
			Naphthalene	2017/02/06	<0.50		ppbv	
			Total Xylenes	2017/02/06	<0.30		ppbv	
			1,1,1,2-Tetrachloroethane	2017/02/06	<0.10		ppbv	
			Vinyl Bromide	2017/02/06	<0.20		ppbv	
			Propene	2017/02/06	<0.50		ppbv	
			2,2,4-Trimethylpentane	2017/02/06	<0.20		ppbv	
			Carbon Disulfide	2017/02/06	<0.50		ppbv	
			Vinyl Acetate	2017/02/06	<0.20		ppbv	
4959473	KM2	Method Blank	F1-BTEX, C6-C10 (as Toluene)	2017/02/06	<5.0		ug/m3	
			F2, C10-C16 (as Decane)	2017/02/06	<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.

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

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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).

Angel Guerrero, Team Leader, VOC Air

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.

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APPENDIX C

HISTORICAL SOIL AND GROUNDWATER ANALYTICAL DATA

Appendix C1: Historical 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	**2.0**	<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	<0.01	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_{16})	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_{16} to C_{34})	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_{34} 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	<0.01	<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_{16})	10	mg/kg	150	300	13	11	<10	<10	**180**	69	**1,400**	<10	<10	<10	**660**	<10
F3 (C_{16} to C_{34})	10	mg/kg	1,300	2,600	<10	<10	<10	<10	24	<10	520	<10	<10	<10	230	<10
F4 (C_{34} 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_{16})	10	mg/kg	150	300	<10	21	<10	<10	<10	230	<10	**1,700**	<10
F3 (C_{16} to C_{34})	10	mg/kg	1,300	2,600	<10	<10	<10	<10	<10	110	<10	800	<10
F4 (C_{34} 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 C2: Historical 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
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	0.0016	**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	0.02	**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	1.0	2.0	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															
Dissolved 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 Parks (AEP). 2016. Alberta Tier 1 Soil and Groundwater Remediation Guidelines. Land and Forestry Policy Branch, Policy Division. 197 pp. Referenced guidelines are for residential/parkland land use for fine-grained soil, under the most stringent pathway.

-- = No Guideline / Data

BOLD AND SHADED - Greater than the Tier 1 Guidleine.

APPENDIX D
RECORD OF SITE CONDITION

Record of Site Condition

1 REPORT AND FORM INFORMATION

Title of report	Chemical Injection Program, Soil Vapour Extraction System Installation, and Groundwater Monitoring Program. 202 Main Street Barons, AB. Alberta Municipal Affairs Site #9557		
Report date (*dd-mon-yyyy*)	May 2017	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 Canada Inc.	Contact person	Jaymes Going
Mailing address	**442 - 10 Street North** **Lethbridge, AB** **T1H 2C7**	Position held	Environmental Consultant
		Business phone No.	403.359.6512
		Business fax No.	403.328.8817
		Business e-mail	Jaymes.Going@tetratech.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.

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*) Public Works Building		

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):* Former (abandoned)

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	☐	Pipeline
☐	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	☐	Landfill
☐	Metal manufacturing plant	☐	Oil refinery	☐	Oilsands processing plant	☐	Oil production site
☐	Pesticide manufacturing plant	☐	Petrochemical manufacturing plant	☐	Pipeline	☐	Power plant
☐	Pulp and paper processing plant	☐	Sour gas processing plant	☐	Sulphur manufacturing or processing plant	☐	Waste management facility
☐	Wood treatment plant	☐	Other *(specify):* _____				

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	☐	Landfill
☐	Pesticides	☐	Pipeline	☐	Land treatment of soils containing hydrocarbons	☐	Sand and gravel pit
☐	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 I 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*): _____

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 *Assessing Drilling Waste Disposal Areas: Compliance Options for Reclamation Certification* (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 *Assessing Drilling Waste Disposal Areas: Compliance Options for Reclamation Certification* (AER, 2014), as amended?

☐ Yes ☐ No

6.2.2.3 For any COPC that did not meet the compliance options in Assessing Drilling Waste Disposal Areas, 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*): _____

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? _____ (m^2) ☐ 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 ×10^{-7} m/sec.) for the 5.0 m vertical layer from the bottom of the contaminated zone.

_____(×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: 3.43 (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*) _____

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 *Record of Site Condition* form is a public record that is disclosed in accordance with section 35 of the *Environmental Protection and Enhancement Act, Disclosure of Information Regulation*, and *Ministerial Order 23/2004*. 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 *Environmental Protection and Enhancement Act* and is in compliance with section 33(a) and 33(c) of the *Freedom of Information and Protection of Privacy Act* (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.

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 Standard[‡] 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 ‡:

"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	Tetra Tech Canada Inc.	Henri Carriere - Project Engineer	HC	May 24, 2017
Name of operator	Name of authorized representative	Title of authorized representative (*e.g. officer, director*)	Signature	Date (*dd-mon-yyyy*)