2019 Groundwater and Soil Vapour Monitoring Report
Riverside Light Industrial Park Site
NW 21-038-27 W4M

PRESENTED TO

City of Red Deer

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EXECUTIVE SUMMARY

The City of Red Deer (The City) retained Tetra Tech Canada Inc. (Tetra Tech) to conduct the 2019 groundwater and soil vapour monitoring program at the former landfill located beneath the Riverside Light Industrial Park (RLIP), located within NW 21-038-27 W4M, hereafter referred to as the site. The objective of the monitoring program is to identify potential environmental concerns related to former operations at the site.

Tetra Tech's scope of work for the 2019 monitoring and sampling program at the RLIP site included conducting semi-annual events of groundwater and vapour monitoring, annual groundwater and soil vapour sampling, updating the hazard quotients, reviewing and updating previous recommendations for the site, and preparing an annual report.

The groundwater monitoring network at the site consists of six monitoring wells (MW-01 to MW-03 within the industrial park, and MW-01 to MW-03 on Lot 4, Block 8, south of the industrial park, closer to the Red Deer River). Monitoring wells MW-01 and MW-01 (Lot 4) were completed within the shale bedrock. MW-02 was screened in the native shale and gravel layer and into the clay and MW-03 was screened in the native sand and gravel. In 2019, groundwater monitoring wells MW-02 and MW-02 (Lot 4) could not be located and were assumed destroyed as a result of construction and development.

The vapour monitoring network consists of two vapour monitoring wells (VW-01 and VW-02).

Based upon the results of the groundwater monitoring program in 2019 and previous years, Tetra Tech has developed the following conclusions:

- Based on the monitoring well groundwater elevations, the groundwater table is essentially level with minimal horizontal gradients within the east portion of the site near the Red Deer River. As such, groundwater elevation contours have not been prepared. Based on the location of the site relative to the river, an overall easterly or northeasterly groundwater flow direction is expected. Historically in 2013, groundwater flow was indicated to be to southeasterly towards the Red Deer River.
- Groundwater parameters that exceeded the Alberta Tier 1 Soil and Groundwater Remediation Guidelines (Tier 1 Guidelines) at one or more monitoring wells in 2019 included total dissolved solids (TDS), chloride, nitrate, ammonia, and dissolved metals parameters including aluminum, cadmium, iron, and manganese. The measured concentrations of routine water chemistry parameters were generally consistent with previous results and ammonia concentrations measured at two monitoring wells [MW-03 and MW-03 (Lot 4), both hydraulically down-gradient] are likely indicative of leachate impact. The dissolved aluminum, cadmium, and iron concentration exceedances may be related to inadequate filtration and are not necessarily of concern.
- Concentrations of benzene, toluene, ethylbenzene, and xylenes (BTEX), petroleum hydrocarbon (PHC) fractions F1 to F2, adsorbable organic halides (AOX), volatile fatty/ carboxylic acids, and volatile organic compounds (VOCs) in 2019 were less than the analytical detection limits at all groundwater monitoring wells.
- Concentrations of BTEX, PHCs, and VOCs in soil vapour samples were less than the soil vapour screening criteria.
- Siloxanes were not detected in the vapour samples collected.
- The estimated individual and cumulative risks and hazards associated with the soil vapour samples collected in December 2019 did not exceed the corresponding target risk and hazard levels.
- Methane concentrations measured at VW-01 and VW-02 indicate the presence of landfill gas (LFG), which is consistent with historical results. The concentrations were greater than values referenced in the Standards for Landfills for on-site buildings or enclosed structures or in the area immediately outside the foundation of a building or structure (not directly applicable to the site but used for relative indicator of impact). The vapour analytical results for methane in December were significantly lower and less than the Standards for Landfills for on-site buildings or enclosed structures or in the area immediately outside the foundation of a building or structure.

Based upon the results of the vapour and groundwater monitoring program in 2019 and previous years, there are indications of residual impacts related to the former landfill operations at several monitoring well locations, and buried landfill waste remains beneath the site, therefore ongoing risk management is required. Risk management is recommended to include ongoing monitoring and administrative actions. The following recommendations are made according to these risk management elements:

- Ongoing Monitoring:
  - Continue with an additional year of semi-annual groundwater monitoring and annual groundwater sampling program at the site for routine groundwater chemistry parameters to confirm trends. If the groundwater quality at the monitoring wells is confirmed, specifically related to ammonia exceedances at the hydraulically down-gradient wells, an additional down-gradient monitoring well should be installed between MW-03 and the river to replace MW-02 (Lot 4). The monitoring program (including the newly installed well) should then continue for an additional year to evaluate the groundwater chemistry further down-gradient of the site. If the groundwater quality in 2019 is anomalous, the monitoring and sampling program may be discontinued.
  - The soil vapour concentrations of volatile chemicals were more than an order of magnitude less than levels of concern and groundwater concentrations of volatile chemicals were also less than the screening levels. Based on these results, there is little indication that this pathway will pose a hazard to receptors. However, methane gas was measured within the headspace at VW-01 and VW-02 in June 2019 at concentrations greater than LFG explosive limits as described in the 2010 Standards for Landfills and these concentrations warrant further monitoring. To confirm methane concentrations at the site and to monitor for potential trends, the base vapour monitoring program should be expanded to include quarterly headspace monitoring for methane at all groundwater wells and vapour probes.
  - Historical vapour probe VP-02 on Lot 4 is likely destroyed along with MW-02 (Lot 4), but VP-01 was located. The integrity of this vapour well should be assessed during the monitoring event, and if in good condition, the well should be included in the monitoring program going forward. If the well is unusable, it should be replaced and included as part of the monitoring program.
  - If elevated methane concentrations are measured during any of the quarterly events, the City should be informed, and an analytical sample of the soil vapour should be collected to confirm the concentrations within two weeks of the measurement. Should there be two consecutive samples that have concentrations of methane above 20% LEL, the City should prepare and implement a subsurface LFG contingency plan.
- Administrative Actions:
  - Utilize the revised generic mitigative measures when evaluating applications for development within the setback.
  - Ensure that the site is clearly identified within The City's property database(s) and flagged for specific review should site development or maintenance activities be contemplated. This may include requirements for minimizing site disturbance, utilizing material management plans during utility work, and including site-specific health and safety plans for workers.

Further to the above recommendations, as noted the site remains an historical landfill. It presently appears to be capped and has development overtop of it. The City should review this status on an ongoing basis to ensure that the cover remains intact and drainage remains positive; repairs or maintenance should be undertaken as required to maintain the site.

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LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of The City of Red Deer 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 The City of Red Deer, 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 document is subject to the Limitations on the Use of this Document attached in Appendix A or Contractual Terms and Conditions executed by both parties.

1.0 INTRODUCTION

The City of Red Deer (The City) retained Tetra Tech Canada Inc. (Tetra Tech) to conduct the 2019 groundwater and soil vapour monitoring program at the former landfill located beneath the Riverside Light Industrial Park (RLIP), located within NW 21-038-27 W4M, hereafter referred to as "the site". The objective of the monitoring program is to identify potential environmental concerns related to former operations at the site.

1.1 Scope of Work

Tetra Tech's scope of work for the 2019 monitoring and sampling program included the following activities:

- Conducting semi-annual events of groundwater and vapour monitoring, including measuring headspace vapours and groundwater levels within each monitoring well and observing monitoring well integrity.
- Conducting groundwater sampling:
  - Purging shallow monitoring wells until practically dry or until a minimum of three well volumes had been removed and allowing the water levels in the wells to recover.
  - Measuring field parameters (pH, electrical conductivity [EC], and water temperature) at the time of sampling.
  - Collecting groundwater samples from each well and submitting the samples for laboratory chemical analyses.
- Conducting vapour sampling:
  - Collecting vapour samples into Summa canisters for analysis.
  - Collecting vapour samples for siloxanes analysis into thermal desorption (TD) tubes.
  - Collecting one duplicate vapour sample for quality assurance/quality control (QA/QC) purposes.
- Conducting monitoring well repairs as required at select wells.
- Updating the hazard quotients prepared during the previous (2014) reporting using the 2019 monitoring and sampling results.
- Preparing an annual report summarizing the field activities undertaken for the year and interpreting groundwater and soil vapour analytical results.

The report was completed under Tetra Tech's Limitations on the Use of this Document for conducting environmental work. A copy of these conditions is provided in Appendix A. Cross-sections that were prepared using the wells included in the monitoring program are included in Appendix B (from Tiamat Environmental Consultants Ltd. [Tiamat] 2014a).

1.2 Pre-1972 Landfill Program

The scope of work for the program was based on the proposal submitted by Tetra Tech on January 11, 2019 to The City to conduct environmental monitoring services for the pre-1972 landfill sites in accordance with the Request for Proposal (RFP) No. 1090-2018-261 issued by The City on November 30, 2018, and Addendum 01 issued by The City on January 7, 2019. This report documents the scope and findings for the RLIP site.

The objectives of the project were to:

- Confirm and implement the prior recommendations, as per the RFP;
- Consult with the regulator on amendments to the program, as required;
- Conduct environmental monitoring and sampling for each of the eight sites, as outlined in the RFP recommendations, while incorporating any approved recommendations;
- Update the hazard quotients; and
- Prepare an environmental monitoring report for the site.

The eight pre-1972 landfill sites include:

- Great West Adventure Park;
- Lindsay Thurber Comprehensive High School;
- McKenzie Trails Recreation Area;
- Montfort;
- Red Deer College;
- Red Deer Motors;
- Riverside Heavy Dry Waste site; and
- RLIP.

Each site is summarized in a separate report and this report details the monitoring program at the RLIP. This report includes a description of the site geology and hydrogeology, the results of the 2019 monitoring activities at the site, and an interpretation and evaluation of the collected data.

2.0 BACKGROUND INFORMATION

2.1 General Information

The site is located within NW 21-038-27 W4M. The site is zoned I1 – Industrial District and is a business area used for commercial and light industrial business activities. The site is located on the west side of the Red Deer River, south of Alberta Highway 11 and east of Gaetz Avenue. Figure 1 shows the general site location plan. The area of historical waste disposal is located southeast of 62 Street and northwest of 64 Street, and southwest of 46 A Avenue. Monitoring wells and vapour wells are located across several city blocks, and are located within the industrial area (MW-01 to MW-03 and VW-01 and VW-02) and near the adjacent Lions Campground and Red Deer Native Friendship Society Building Asooahum Crossing (MW-01 to MW-03 [Lot 4]) along Riverside Drive. The area is surrounded by environmental preservation land use to the north and west, and parkland to the south and east. The Red Deer River is approximately 200 m from the southern portion of the site and flows in a northeasterly direction. A general site plan is shown on Figure 2.

2.2 Site History

Municipal records do not indicate a timeline for waste disposal at the site. Based on the Phase I environmental Site Assessment (ESA) (Tiamat 2013), aerial photographs were reviewed, and ground disturbance was observed from 1962 to 1976. Large pits and trenches were visible in the photographs prior to the commercial development. Historical information indicates the waste consisted of construction waste mixed with municipal solid waste (MSW).

Historical waste disposal areas identified during the 2014 Phase II ESA (Tiamat 2014a) were beneath commercial buildings, roadways, and other infrastructure in the industrial park. The historical waste disposal area is estimated to be within the central and northeast parts of the industrial park, and the nature of how buildings above the waste footprint were constructed, or if any immediate waste removal was conducted, is not known. The estimated waste area is identified on Figure 2. The Red Deer River is located east of the site within 200 m. The status of the former landfill is listed as closed and inactive.

Results of the Phase II ESA (Tiamat 2014a) indicated that surface material consisted of sod, loam, and asphalt with varying amounts of clay fill. This material was overlying sand and clay fill. In the southwest to northeast, the fill was overlying native gravel. TH-01 encountered shale bedrock. In the north area the fill was overlying native silt and in various other areas native sand and gravel was present beneath fill.

2.3 Historical Groundwater Monitoring and Investigation Summary

Monitoring wells were installed in 2013, including three groundwater monitoring wells (MW-01 to MW-03) within and beside the waste material boundary and two soil vapour wells (VW-01 and VW-02). An additional five testholes were advanced to monitor the material and determine the extent of the waste. Monitoring wells MW-01 to MW-03 on Lot 4 to the east were installed in 2013 as part of a site investigation in response to development interest. Development on the Lot 4 site was subsequently approved by the Subdivision and Development Appeal Board.

Previous reports conducted by Tiamat include:

- Environmental Site Assessment Landfill Variance Request, 4615 Riverside Drive, Red Deer, Alberta. May 10, 2013 (Tiamat 2013a).
- Phase I Environmental Site Assessment, Historic Waste Disposal Site, Riverside Light Site, The City of Red Deer. October 10, 2013 (Tiamat 2013b).
- Phase II Environmental Site Assessment, Historic Waste Disposal Site, Riverside Light Industrial Park, The City of Red Deer. February 7, 2014 (Tiamat 2014a)
- Environmental Risk Management Plan, Historic Waste Disposal Sites, Riverside Light Industrial Park, The City of Red Deer. November 24, 2014 (Tiamat 2014b).

The results of the site assessment at 4615 Riverside Drive (Lot 4) identified the presence of the adjacent historical waste disposal site, and included the following:

- Five boreholes were advanced and did not identify unusual conditions (odours or discolouration);
- Groundwater sampling did not identify obvious concerns, however soil vapour samples identified detectable VOCs in subsurface vapour. The levels were considered to be limited and manageable, and specific potential/proposed developments and associated infrastructure were recommended to be reviewed to determine whether mitigative measures may be required to limit exposure to soil vapours.

The results of the Phase II ESA conducted by Tiamat in 2014 indicated the following:

- The historical waste disposal area extends to under a public roadway and private land. Residential properties are located west of Gaetz Avenue at more than 500 m from the previous Riverside Light disposal area and are situated approximately 20 m higher than the industrial park.
- Commercial/Industrial guidelines have been established for the area.

The recommendations of the program were as follows:

- Monitor groundwater elevations and soil vapour data semi-annually for at least one hydrogeological cycle.
- Collect an additional set of soil vapour and groundwater analytical data, groundwater elevations, and volatile headspace measurement during the winter months to determine seasonal changes in soil vapour concentrations.
- Create a risk management plan (RMP) that outlines the environmental issues of the site and future land use.
- Review any available data to update the RMP.

The results of the RMP (Tiamat 2014b) indicated the following:

- Information in the preliminary quantitative risk assessment (PQRA) should be updated as new site information is obtained.
- A review of the RMP should be completed when the PQRA information is updated, if there are changes to the chemicals of potential concern (COPCs).
- The RMP should be reviewed and updated at five-year intervals.

2.4 Monitoring Well Network

The groundwater monitoring network at the site consists of six monitoring wells (MW-01 to MW-03 within the industrial park, and MW-01 to MW-03 on Lot 4, Block 8, south of the industrial park, closer to the Red Deer River). Monitoring wells MW-01 and MW-01 (Lot 4) were completed within the shale bedrock. MW-02 was screened in the native shale and gravel layer and into the clay and MW-03 was screened in the native sand and gravel. Monitoring well completion details are summarized in Table 1.

In 2019, groundwater monitoring wells MW-02 and MW-02 (Lot 4) could not be located and were assumed destroyed as a result of construction and development. New locks were added to MW-01 and MW-03 on Lot 4. All other monitoring wells were reported to be in good condition.

The vapour monitoring network consists of two vapour monitoring wells (VW-01 and VW-02). Both vapour monitoring wells were reported to be in good condition during the 2019 events.

Groundwater and vapour monitoring well locations are shown on Figure 2.

3.0 SITE SETTING

The following section presents an overview of the regional and local setting for the site.

3.1 Geology

The following sections summarize the regional and local geology.

3.1.1 Geological Setting and Stratigraphy

The City and site are located within the Red Deer River drainage basin with principal drainage via the Red Deer River located east of the site. The Red Deer River has incised the uplands with gentle slopes to the east and west of the river in the vicinity of the site.

The geology in the river valley is characterized by fluvial surficial sediments deposited by the Red Deer River, overlying shale and sandstone bedrock of the Paskapoo Formation.

Key elements of the geological setting are presented below from Tiamat's 2013 Phase I Report (Tiamat 2013):

"The fertile black soil in the region (Penhold Loam) is of alluvial lacustrine origin. The Penhold Loam is a well-drained fine sandy loam classified as Chernozemic. It is generally stone free and in natural areas, is typically 1.5 m thick, more or less.

The Quaternary deposits consist of drift deposits of clay, silt, gravel and sand. Published information indicates the banks of the Red Deer River comprise of dirty gravel with thickness ranging from 6 to 12 m, more or less.

Terrace gravels hydraulically connected to the Red Deer River are a known resource of groundwater. Surficial soils comprise largely of poorly to moderately sorted sand, silt and gravel with a varying amount of clay. The fluvial sediments generally have obscure bedding planes. Medium to coarse sized gravel with cross-bedded sand have been documented.

The Tertiary bedrock consists of sequences of alternating shales and sandstones of the Paskapoo Formation. The Paskapoo Formation underlies the gravel sediments. This non-marine bedrock is composed of mudstone, siltstone and sandstone. The formation of the Rocky Mountains subjected the Paskapoo Formation to a regional stress-induced fracture pattern."

3.1.2 Local Geology

Based on the 2014 Phase II ESA, the RLIP consisted of 10 cm to 20 cm of sod and loam overlying the waste. The MSW included a mix of construction debris, wood, and glass. Where no MSW was observed, under the fill material was a mixture of sand and gravel to depths of 6.1 m. Native gravel and sand were under the fill material and overlying a shale bedrock.

3.2 Hydrogeology

The following sections summarize the regional and local hydrogeology.

3.2.1 Regional Hydrogeology

The regional hydrogeology is most influenced by the presence of the river sediments situated within the valley along the Red Deer River and a bedrock valley trending north-northeast in the vicinity of the site.

Key elements of the hydrogeological setting are presented below from Tiamat's 2013 Phase I Report (Tiamat 2013):

"A significant buried valley and aquifer resource trending northeastward through the city has been partially mapped and lies in the SE 28-38-27 W4M (McKenzie Trail and Riverside). This buried valley extends to a depth of 21 m, more or less and may extend to the south into north portions of 21-28-27 W4M." Mapping by the Alberta Geological Survey (Andriashek 2018) indicates that the valley is east of the site, however the width of the valley is not defined.

"The dominant type of near-surface groundwater in the Paskapoo Formation in the area of assessment is sodium bicarbonate. Notable concentrations of sodium sulphate type groundwater have also been reported. The quality of groundwater for potable use is generally suitable to depths of 300 m on the west side of Red Deer and decreases to 90 m, more or less in the east.

Areas of recharge (downward flow) in unsaturated heterogeneous sediments include most areas above the river and creek valleys, whereas; the river valleys will generally exhibit discharge. The distribution of groundwater in the area can also be influenced by the local geology, topographic relief, areas of artesian flow, springs and reasonable yielding water source wells.

Numerous permanent surface water features within The City of Red Deer and vicinity include Red Deer River, Waskasoo Creek, Gaetz Lakes, Hazlett Lake, Bower Ponds (result of formerly mining gravel resources), various sloughs in the fringe areas of the city and an assortment of other smaller creeks and springs.

The regional groundwater flow is expected to follow the bedrock topography and will be influenced by the varying distribution of sediments in the river valley, which will have been deposited in various historical channels since filled in under varying depositional environments. Further, the river is in hydrologic connection with the adjacent sediments, and therefore seasonal changes in river stage will affect the local groundwater flow patterns (magnitude and direction). In seasons of higher river flow, bank storage will occur whereas in seasons of lower flow (such as late summer/fall), the storage will be released."

3.2.2 Local Hydrogeology

The RLIP area is relatively level with a gentle slope to the southeast. Areas to the west near Gaetz Avenue and north of Highway 11 are considerably higher in elevation. Groundwater flow direction is interpreted to be to the east or southeast towards the Red Deer River. The Red Deer River flows north. No other surface waterbodies were identified within 500 m of the site.

3.3 Groundwater Resource Usage

A search of the Alberta Water Well Database conducted in January 2020 for groundwater users within a 1 km radius of the RLIP identified 22 groundwater wells; 7 of the wells are listed as domestic use, 4 are listed as domestic and industrial use, 4 are listed as industrial use, 6 as investigation use, and 1 is unknown use (Alberta Environment and Parks[1] [AEP] 2019b).

[1] Formerly Alberta Environment (AENV).

The nearest water well to site is located approximately 370 m southeast of the site, near the Red Deer River. The proposed well use was listed as for investigation purposes. The water wells within a 1 km radius of the site range from 4.5 m to 235 m deep. The status and use of the surrounding groundwater wells were not confirmed and they were not field verified.

Information for groundwater wells within 1 km of the RLIP is provided in Appendix C.

4.0 CONCEPTUAL SITE MODEL

The selection of remediation guidelines is based on the conceptual site exposure model, which outlines the rationale of the selection of applicable exposure pathways and indicates which soil and groundwater exposure-specific remediation guidelines should apply. This evaluation is based on guidance presented in the Alberta Tier 1 Soil and Groundwater Remediation Guidelines (Tier 1 Guidelines; AEP 2019a).

A conceptual site model (CSM) was developed for the site. The CSM includes the following items:

- Description of any identified environmental issues including a description of processes or activities undertaken at or near the site and a listing of COPCs identified in earlier investigations.
- Description of known and reported historical releases, including locations and status of any subsequent ESAs and remediation.
- Identification of applicable exposure pathways and receptors.

4.1 Chemicals of Potential Concern

Based on the information provided in historical reporting, and on typical COPCs in an MSW setting such as this, the COPCs for the groundwater component of the site include:

- Inorganic parameters and nutrients (e.g., ammonia, chloride, and total dissolved solids [TDS]);
- Metals;
- Petroleum hydrocarbons (PHCs);
- Volatile organic compounds (VOCs); and
- Other indicator parameters, such as biological oxygen demand (BOD) and chemical oxygen demand (COD).

The COPCs for the soil vapour component of the site include:

- VOCs;
- Methane;
- Benzene, toluene, ethylbenzene, and xylenes (BTEX) and PHCs; and
- Siloxanes.

Amongst these COPCs, the soluble ones are expected to leach towards the groundwater table (e.g., BTEX, PHC fractions F1 and F2, chloride) while others will bind to the soil particles and are expected to migrate less (i.e., most metals).

4.2 Land Use

The Tier 1 Guidelines are subdivided by land use: natural area, agricultural, residential/parkland, and commercial/industrial. The site is currently zoned as Land Use District (I1) Industrial (Business Service). The site is surrounded by residential and commercial land to the west and north, and the Red Deer River and parkland to the east and south. The site is situated in a commercial area; however, the monitoring network includes wells in areas with multiple land use designation; therefore, the analytical results were compared to the most conservative guidelines for residential/parkland land use.

4.3 Grain Size Designation

The Tier 1 Guidelines are developed for both coarse-grained and fine-grained soils. Fine-grained soils are defined as having a median-grain size of less than or equal to 75 µm; coarse-grained soils have a median-grain size of greater than 75 µm. Where both fine- and coarse-grained strata are present, the dominant soil particle size is determined by the stratum governing horizontal and vertical migration to a receptor.

Particle size analyses was determined from the Phase II ESA completed by Tiamat (Tiamat 2014a). Analytical results were compared to coarse-grained criteria.

4.4 Exposure Pathways and Receptors for Soil and Groundwater

4.4.1 Human Receptors and Pathways

Human receptors assumed to be present on commercial parkland areas include adult workers, adult and child visitors, and adult and child residents. The following human exposure pathways were considered when developing and implementing remediation guidelines:

- Direct soil contact.
- Groundwater ingestion (drinking water).
- Vapour inhalation.
- Off-site surface migration (wind or water erosion).

These pathways are briefly discussed individually below.

4.4.1.1 Direct Soil Contact – Human Pathway

The direct soil contact pathway is considered to be applicable to all land uses except in natural areas. Direct contact implies that humans can come in direct contact with contaminated soil via incidental ingestion, dermal contact, or inhalation of airborne soil particles. Since the land use for this site is considered commercial/industrial and parkland, this pathway is considered to be applicable.

4.4.1.2 Drinking Water (Groundwater Ingestion)

Water-bearing units with a saturated hydraulic conductivity of greater than 1.0 x 10^{-6} m per second (m/sec) are considered to comprise a potential domestic use aquifer (DUA) (AEP 2019a). To eliminate this pathway, the presence of greater than 5 m of unimpacted, unfractured, saturated, fine-grained material with an assumed bulk

(vertical) hydraulic conductivity of less than 1.0 x 10^{-7} m/sec must exist below the proven depth of contaminated material. This is required to ensure that the impacted material is isolated from potential underlying DUAs.

A search was conducted of the Alberta Water Well Database. Groundwater at the site is not presently used as drinking water and the groundwater ingestion pathway is not applicable in this assessment.

The DUA pathway is not considered to be active relative to the site; however, it has been included as investigations to eliminate the DUA pathway have not been completed.

4.4.1.3 Inhalation

The inhalation pathway considers the migration of volatile contaminants (e.g., BTEX, PHC F1-F2, and VOCs) released from the soil and/or groundwater into living or working spaces of buildings where humans may be exposed through inhalation. The inhalation pathway is applicable to all land uses except natural areas. Since the current land use is considered commercial/industrial and parkland, there is a potential for the infiltration of vapours into buildings and subsequent inhalation by the workers. Therefore, the inhalation pathway is applicable in this assessment.

4.4.1.4 Off-site Surface Migration by Wind or Water Erosion

The off-site surface migration pathway considers migration of contaminated soil from the site to an adjacent site of more sensitive land use via wind or water erosion. This pathway applies to commercial and industrial sites only and is applicable to the site as the site is surrounded by commercial land to the northwest and southwest, and the Red Deer River is located approximately 200 m to the east.

4.4.2 Ecological Receptors and Pathways

Ecological receptors at a typical contaminated site span a range of trophic levels, including soil-dependent organisms (e.g., plants and soil invertebrates) and higher-order consumers (e.g., terrestrial and avian wildlife and livestock). This pathway is applicable to the land use for this assessment.

4.4.2.1 Direct Soil Contact – Ecological Pathway

Plants and soil invertebrates may come into direct contact with contaminants in soil or shallow groundwater. This pathway is applicable to all land uses; therefore, it is considered for evaluation in this assessment.

4.4.2.2 Freshwater Aquatic Life

The freshwater aquatic life (FAL) pathway is applicable if a surface waterbody is present less than 300 m from the site. The nearest surface waterbody is Red Deer River, which is located east of the site. This pathway is considered applicable.

4.4.2.3 Nutrient and Energy Cycling

The nutrient and energy cycling pathway consider the microbial functioning of the soil including carbon nitrogen cycling and is, therefore, applicable to all land uses.

4.4.3 Exposure Pathway Summary

To establish the appropriate guidelines for the site, the most sensitive land use was used (parkland). The receptors are a combination of the degree of potential exposure, the exposure pathway, and the contaminant of concern. Human receptor exposures applicable to the site include direct soil contact, inhalation and off-site surface migration by wind or water erosion pathways. The ecological receptor pathways applicable to the site include direct soil contact, FAL, and nutrient and energy cycling.

4.5 Soil Vapour

As recommended by Alberta Environment and Parks, the soil vapour results obtained during this investigation were compared to the Canadian Council of the Minister of Environment (CCME) document *A Protocol for the Derivation of Soil Vapour Quality Guidelines for Protection of Human Exposures Via Inhalation of Vapours* (CCME 2014). Generic soil vapour guidelines, that could indicate whether there are potential risks to indoor air from vapours in the soil, have been prepared using the default parameters outlined in the 2014 CCME protocol. The parameters used in the calculation of the generic soil vapour guidelines can be found in Table 6 to Table 9. The equations and model assumptions were taken directly from the CCME 2014 document. While CCME does not publish soil vapour screening criteria, the approach used to calculate soil guidelines for the vapour inhalation pathway is used to derive the soil vapour screening criteria.

4.5.1 Indoor Air Risk Calculations

The Alberta Tier 2 Guidelines (AEP 2019c) include human toxicity reference values (TRVs) for inhalation (Table A-7). 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 (1×10^{-5}) after a lifetime of continuous exposure, the RSC is calculated (as per Health Canada 2012, Preliminary Quantitative Risk Assessment [PQRA] Guidance) as follows:

$$RSC\ (mg/m^3) = 1 \times 10^{-5}/IUR$$

Continuous exposure is expressed as an exposure term (ET), which is unitless. The ET for residential land use is 1 (AEP 2019c) based on 24 hours/day, 7 days/week, and 52 weeks/year. The ET is used to determine appropriate soil vapour screening levels. Soil vapour screening levels were calculated (as per Health Canada 2012, PQRA Guidance) using the equation below:

$$Vapour\ Screening\ Level\ (mg/m^3) = (ITC\ or\ RSC)/ET$$

4.5.2 Methane and Explosive Risks

Landfill gas (LFG) can be generated from the degradation of wastes under anaerobic conditions. Methane gas can migrate through the ground and enter structures through porous concrete, joints, or fractures in foundations. When present, methane is considered a safety concern due to its explosive risk when it is in an atmosphere at concentrations between 5% and 15% by volume in air, in the presence of an ignition source. At concentrations below 5% (the lower explosive limit [LEL]) and above 15% (the upper explosive limit), methane is not explosive. Methane on its own is not considered a health risk, although it can represent a concern if it is present at very high concentrations, which could displace oxygen and present a risk of asphyxiation.

There are no guidelines for methane as part of the Alberta Tier 1 framework. However, for reference the Standards for Landfills in Alberta (AENV 2010) identify maximum methane concentrations proximate to approved landfills, and Alberta Health Services have provided guidance for methane (in conjunction with well headspace pressures that would constitute a driving force); however, that document has not been issued in a final format.

4.6 Overall Guidelines

Groundwater concentrations at the site were compared to the Tier 1 Guidelines under parkland uses for coarse-grained soils.

Soil vapour analytical results were compared to A Protocol for the Derivation of Soil Vapour Quality Guidelines for Protection of Human Exposures Via Inhalation of Vapours (CCME 2014) under residential land use for coarse-grained soils.

Residential/parkland criteria was selected for comparison of the groundwater concentrations at the site as it is the land use directly down-gradient of the monitoring wells. Residential land use was selected for the soil vapour concentrations as there are residences in the adjacent lots (Lot 4).

5.0 GROUNDWATER MONITORING AND SAMPLING PROGRAM

A discussion of the methods used for the fieldwork, laboratory testing, and data evaluation is presented in the following sections. In 2019, Tetra Tech conducted groundwater monitoring on June 26 and December 5. Groundwater sampling was conducted on December 5, 2019.

5.1 Field Program

Groundwater monitoring consisted of measuring combustible vapour concentrations (CVCs) and VOCs in monitoring well headspace, and static groundwater levels in each monitoring well using an electronic water level indicator, semi-annually (June and December).

The methodology for groundwater monitoring and sampling included the following:

- Observing the integrity of each well and noting drainage and site conditions near the well that may have an effect on monitoring results or groundwater quality.
- Measuring the CVCs and VOC headspace concentrations in each well using an RKI Eagle II calibrated to hexane and isobutylene and operated in methane elimination mode.
- Measuring liquid levels in each monitoring well with an interface probe and recording of total depths and thickness of light non-aqueous phase liquids (LNAPL), if present.
- Recording of field data on standardized forms as documented in Tetra Tech standard operating practices.
- Purging of at least three well volumes of water from each monitoring well using dedicated polyethylene bailers or Waterra tubing with inertial pump foot valves, or until the well was practically dry.

Following the completion of groundwater monitoring and purging, groundwater samples were collected from the required wells using the procedures identified below:

- Samples were collected and placed into appropriate laboratory supplied, sterile glass and plastic vials and bottles for the required analytical package. If required, samples were filtered and/or preserved in the field.
- Field measurements were taken for pH, EC, and temperature at the time of sampling.
- Samples were submitted in coolers with ice to ALS Laboratories (ALS) in Calgary, Alberta for laboratory analysis under chain-of-custody (COC) documentation.

More information on the analytical program is provided in Section 5.2. The groundwater monitoring well locations are shown on Figure 2.

5.2 Analytical Program

The analytical program for the groundwater monitoring wells was developed based on the recommendations of previous reports and is summarized below:

- BTEX and PHC fractions F1 to F2.
- VOCs.
- Total Kjeldahl nitrogen (TKN).
- Routine and dissolved metals.
- Dissolved organic carbon (DOC).
- Ammonia.
- Phosphorus.
- Adsorbable organic halides (AOX).
- Volatile fatty acids.

6.0 VAPOUR MONITORING AND SAMPLING PROGRAM

A discussion of the methods used for the fieldwork, laboratory testing, and data evaluation is presented in the following sections. In 2019, Tetra Tech conducted vapour monitoring on June 26 and December. Vapour sampling was conducted on December 5, 2019.

6.1 Field Program

Vapour monitoring consisted of measuring and recording soil gas pressure, composition (methane, carbon dioxide, oxygen, hydrogen sulphide, and balance gas) on a percent volumetric basis and groundwater elevation, semi-annually (June and December).

Each soil vapour probe was inspected for visible signs of damage and the position of the sampling labcock valve was noted. Soil gas pressure was recorded using a digital manometer. Once the soil gas pressure measurement was recorded, the soil gas probe was purged of three well volumes of air, or until readings stabilized. Small diameter soil gas probes (25 mm wells) were purged directly with the GEM LFG analyzer.

After purging, gas composition measurements for methane, carbon dioxide, oxygen, balance gas, and hydrogen sulphide were recorded using the GEM analyzer. After recording soil gas concentrations, the probe/well depths and water levels were measured and recorded to confirm the water level within the probe was beneath the screen portion of the soil gas probe (i.e., the probe was not blinded).

A leak detection test was completed to ensure the vapour probes were sealed properly. The test was completed using helium gas a tracer to inspect the testing probe and apparatus for any leaks. If there was a leak beyond the acceptable range (2% of helium concentration), the connections were tightened, and the leak test was conducted again.

Sampling of soil vapour probes was based on the methodology of the CCME sampling guidelines, which are summarized as follows:

- Prior to collecting the soil vapour probe samples, the well was purged of three well volumes, or until headspace readings stabilized.
- A 1.4 L Summa vacuum canister was used for the soil vapour probe monitoring location.
- Sample data was recorded on the provided sample tag for each canister.
- Sample tubing that was used to connect the canister to the soil vapour probe was low in VOCs and only used once to prevent sample contamination.
- When beginning sample collection, the end cap was removed and the 60-minute the flow controller was attached to the canister. Start time was recorded on the sample tag.
- When sampling was complete, the valve was closed, and the flow controller was removed. The end time was recorded on the sample tag.
- The protective end cap was replaced back on the canister.
- Canisters, flow controllers, and pressure gauges were placed in the original shipping container and returned to the laboratory under COC.
- The soil vapour probe sampling port was returned to the closed position and the well was securely locked.

The vapour samples were submitted to ALS for chemical analysis. Duplicate samples were collected during the vapour sampling event for QA/QC purposes. More information on the analytical program is provided in Section 6.2.

The vapour monitoring well locations are shown on Figure 2.

6.2 Analytical Program

The analytical program for the vapour sampling probes is summarized below:

- VOCs.
- Matrix gases including oxygen, carbon dioxide, methane, and nitrogen.
- BTEX and PHCs.
- Siloxanes.

7.0 RESULTS AND DISCUSSION

This section presents the results of the fieldwork conducted in 2019 at the site and discussions of these results.

7.1 Groundwater Well Headspace Monitoring

Tetra Tech monitored four groundwater monitoring wells during each monitoring event for measurements of well headspace including CVCs and VOC concentrations using an RKI Eagle Hydrocarbon Surveyor II (RKI).

In June 2019, CVCs ranged from 40 parts per million (ppm) at monitoring well MW-03 (Lot 4) to 770 ppm at MW-01. VOC concentrations in June 2019 ranged from non-detect to 1 ppm at MW-01. During the December 2019 monitoring event, CVC concentrations ranged from non-detect to 10 ppm at MW-03. VOC concentrations were non-detect at most monitoring wells and 1 ppm at MW-03.

Historical vapour concentrations at the Lot 1 wells ranged from 155 ppm at MW-02 to 510 ppm at MW-01 in 2013. The concentrations in 2020 were generally consistent with the historical concentrations.

Historical vapour concentrations at three monitoring wells at Lot 4 were less than the instrument detection limit at MW-01 and MW-02, with measurable concentrations of CVCs at MW-03 in April 2013 (20 ppm) and VOC concentrations at MW-03 (1 ppm in March and April 2013). The measured concentrations are not considered to represent a concern.

The volatile and combustible headspace concentrations for 2019 are presented in Table 1.

7.2 Groundwater Elevations

The measured groundwater levels and calculated groundwater elevations for 2019 are presented in Table 1.

Figure 3 presents the groundwater elevation trends (hydrographs) for all monitoring wells. This figure shows that the groundwater elevations in 2019 were generally consistent with groundwater elevations in 2013. The groundwater elevations measured in 2019 are presented on Figure 4 and Figure 5.

The average depth to groundwater in the monitoring wells in June 2019 was 4.73 m below grade (mbg) and in December 2019 was 4.76 mbg. Based on the monitoring well groundwater elevations, the groundwater table is essentially level with minimal horizontal gradients within the east portion of the site near the river. As such, groundwater elevation contours have not been prepared. Based on the location of the site relative to the Red Deer River, an overall easterly or northeasterly groundwater flow direction is expected.

The elevation contours prepared for the 2013 Phase II ESA suggested that groundwater flow was southeasterly towards the Red Deer River. The groundwater elevations from the 2013 Environmental Site Assessment for the Lot 4 indicated groundwater flow to the northeast, with the lowest groundwater elevation at MW-02 in the northeast corner.

7.3 Groundwater Field Parameters

Field measurements for temperature, pH, and EC in December 2019 are shown in Table 2. A discussion of the results of the field tests is summarized in this section.

Groundwater temperatures ranged from 5.77°C (MW-03) to 7.36°C (MW-03 – Lot 4).

Field pH values ranged from 7.50 (MW-01) to 8.35 (MW-03- Lot 4) in 2019. Field pH was generally greater than the laboratory pH. The difference between field recorded and laboratory pH values may be due to limitations of the field equipment and differences in sample temperature.

In 2019, field EC measurements ranged from 1,066 µS/cm (MW-01- Lot 4) to 1,409 µS/cm (MW-03- Lot 4). Field EC results were generally less than the laboratory measured EC results, which may be due to limitations of field equipment.

7.4 Groundwater Analytical Results

The groundwater analytical data for 2019 is summarized in Table 2. The 2019 laboratory analytical reports are included in Appendix D and historical tables are presented in Appendix E.

Background Groundwater Quality

Up-gradient monitoring well MW-02 could not be located during the monitoring events in 2019. In 2013, the concentration of ammonia was less than the analytical detection limit, and the concentration of chloride was 59 mg/L. The concentration of dissolved manganese in 2013 (0.14 mg/L) was greater than the 2019 Tier 1 Guidelines (0.05 mg/L). The concentration of dissolved manganese is interpreted to be naturally occurring and not related to former landfill operations.

Concentrations of BTEX, PHC fractions F1 and F2, and VOCs were less than the laboratory analytical detection limits in 2013.

Lot 4 Wells

Concentrations at the Lot 4 wells were overall consistent with the monitoring wells at Lot 1. Chloride concentrations at the monitoring wells in 2013 ranged from 72 mg/L at MW-03 (Lot 4) to 94 mg/L at MW-02 (Lot 4). Concentrations of ammonia in 2013 ranged from 0.11 mg/L at MW-01 (Lot 4) and MW-02 (Lot 4) to 2.14 mg/L at MW-03 (Lot 4); the 2019 concentrations ranged between less than the detection limit at MW-01 (Lot 4) to 2.06 mg/L at MW-03 (Lot 4).

Concentrations of BTEX, PHC fractions F1 and F2, and VOCs were less than the laboratory analytical detection limits at all monitoring wells in Lot 4 in 2013.

Routine Water Chemistry Parameters

In December 2019, TDS concentrations were greater than Tier 1 Guidelines at all monitoring wells sampled. TDS concentrations ranged from 654 mg/L (MW-03) to 1,190 mg/L (MW-01). TDS concentrations were not measured in 2013; however, the 2019 TDS concentrations were within the same order of magnitude as the field TDS measurements (based on EC measurements) from 2013. Elevated TDS concentrations often occur in groundwater as a result of the dissolution of naturally occurring salts and minerals in Alberta, and do not necessarily indicate groundwater quality impact related to the former landfill.

Chloride concentrations in December 2019 ranged from 106 mg/L at MW-03 (Lot 4) to 168 mg/L at MW-03. The maximum chloride concentration at Lot 4 in 2019 was 113 mg/L (MW-01 Lot 4). Chloride is often considered a useful parameter to assess groundwater quality impacts associated with landfills, as chloride is generally present in elevated concentrations in leachate, and due to the mobile and conservative (non-reactive) nature of the ion. However, in urban settings, the use of road salt typically also contributes to chloride concentrations in groundwater.

Ammonia concentrations at the site in December 2019 ranged from less than the analytical detection limit at monitoring wells MW-01 and MW-01 (Lot 4) to 2.06 mg-N/L at MW-03 (Lot 4) and 19.1 mg-N/L at MW-03. Concentrations of ammonia at all wells were consistent with historical results. The concentrations of MW-03 and MW-03 (Lot 4) are elevated and suggest possible quality impact by MSW landfill leachate. Nitrate concentrations exceeded the Tier 1 Guidelines at monitoring well MW-01 (29.6 mg-N/L) and at MW-01 (Lot 4) (8.05 mg-N/L). The concentrations were consistent with the historical results.

Ammonia and other forms of nitrogen in water, principally nitrate, can also be good indicators of man-made effects from landfill leachate. Ammonia and organic nitrogen, collectively detected as TKN, represent a high percentage of the total soluble nitrogen compounds in leachate. Accordingly, high concentrations of TKN can be used as an indicator of leachate impact, while high concentrations of nitrate and nitrite are typically indicative of other anthropogenic impacts and are often an indication of oxic groundwater conditions. Monitoring wells MW-01 and MW-01 (Lot 4) are located cross-gradient of the historical waste disposal area, and the identified nitrate concentrations are not necessarily indicative of landfill leachate impacts.

Ammonia concentrations measured at MW-03 and MW-03 (Lot 4) are likely indicative of landfill leachate impact. It should be noted that MW-03 is approximately 150 m from the Red Deer River and based on measured concentrations to date (16 mg-N/L in 2013 and 19.1 mg-N/L in 2019), there is a potential that any groundwater discharging near the river bank exceeds the referenced Tier 1 Guidelines. Monitoring well MW-02 (Lot 4) was previously installed down-gradient of MW-03 at approximately 60 m from the river but could not be located in 2019. The measured concentration of ammonia at MW-02 (Lot 4) in 2013 was 0.11 mg/L. Current groundwater quality data for that monitoring well would assist in qualifying risks associated with the elevated ammonia concentrations; however, such information is currently not available. The concentrations measured at MW-03 (Lot 4) were 2.06 mg/L in 2019 and 2.14 mg/L in 2013.

Dissolved Metals

The dissolved aluminum concentration (0.305 mg/L) and dissolved cadmium (0.000407 mg/L) concentration exceeded Tier 1 Guidelines at MW-01 in December 2019. Previously, in 2013 dissolved aluminum and dissolved cadmium were less than the Tier 1 Guidelines at MW-01 and the measured concentrations in December 2019 may be due to inadequate filtration and are not interpreted to be of environmental concern.

Iron and manganese are redox-sensitive parameters that also occur naturally in groundwater under anoxic conditions and can help determine whether the groundwater quality is affected by biodegradation reactions, for instance related to landfill leachate. The dissolved manganese concentrations were greater than the Tier 1 Guidelines (0.05 mg/L) at all monitoring wells during the December 2019 sampling event. The dissolved iron concentrations were less than the Tier 1 Guidelines (0.3 mg/L) at most shallow monitoring wells in 2019, with the exception MW-01, which marginally exceeded the guideline (0.379 mg/L). Manganese and iron also naturally occur in groundwater under anaerobic conditions and concentrations of these parameters do not necessarily indicate an adverse impact on groundwater quality. At MW-01, the measured dissolved iron concentration may be elevated due the possible filtration issue mentioned above.

Organic Parameters

Concentrations of BTEX, PHC fractions F1 to F2, AOX, volatile fatty/carboxylic acids, and VOCs were less than the analytical detection limits at all locations sampled in 2019.

7.5 Soil Vapour Monitoring Results

The soil vapour monitoring results are presented in Table 3.

Pressures at VW-01 and VW-02 were negligible during both monitoring events in 2019.

Concentrations of methane were elevated at both vapour wells in June 2019. VW-01 had a methane concentration of 11.3% and VW-02 had 17.1%. During the December 2019 monitoring events, the methane concentrations decreased significantly to less than instrument detection limit at VW-01 and to 1.4% at VW-02. The wells were both dry during the monitoring events; therefore, they were considered to not be blinded.

Because the vapour monitoring wells are present near buildings, the LFG results were evaluated in accordance with Section 5.12 (Table 5.5) of the Standards for Landfills (AENV 2010) (we note that the Standards are not applicable to the site but have been used as a relative indicator). The referenced value for an on-site building or enclosed structure or in the area immediately outside the foundation of the building or structure is 20% LEL methane, equivalent to 1% by volume (% v/v), which has been exceeded at both vapour wells, except in December 2019 at VW-01.

7.6 Vapour Analytical Results

The attached Table 4 summarizes the soil vapour chemical results collected in 2013 and 2019 and compares them to the soil vapour screening criteria protective of vapour intrusion into indoor air. The 2019 laboratory analytical reports are included in Appendix D.

BTEX and PHC fractions F1 and F2 (parameters with a TRV for inhalation) were compared against the screening criteria for residential land use for coarse-grained soil. BTEX, and/or PHC aliphatic and aromatic fractions that comprise F1 and F2 were detected at concentrations greater than the analytical detection limits in samples VW-01 and its duplicate (19DUP01) and VW-02. However, soil vapour concentrations were between 76 and 26,152 times less than the soil vapour screening criteria, which are protective of vapour intrusion into indoor air.

Siloxanes do not have TRVs for inhalation and were, therefore, not compared against the vapour screening criteria. Concentrations of siloxanes in samples VW-01 and VW-02 were less than the analytical detection limit.

Naphthalene was not detected at concentrations greater than the analytical detection limit.

VOCs (parameters with a TRV for inhalation) were compared against the screening criteria for residential land use, coarse-grained soil. Several parameters were detected greater than the analytical detection limit in samples VW-01, 19DUP01, and VW-02. However, soil vapour concentrations were between 3 and 167,925 times less than the soil vapour screening criteria, which are protective of vapour intrusion into indoor air.

The methane concentrations at VW-01 measured during field monitoring and in the vapour sample were consistent (non-detectable) in December. Methane concentrations in the vapour sample at VW-02 were lower than the field measurements. At this and other sites during the December events, the December methane monitoring results were notably lower than during prior events, suggesting that there may have been a field instrument error during the December event (at VW-02, methane concentrations were 1.4% during December and 17.1% during June).

7.7 Quality Assurance/Quality Control

7.7.1 Methods

Tetra Tech's QA/QC procedures include reviewing the data collected for precision and accuracy and following the appropriate field protocols.

The field procedures for QA/QC involved:

- Changing nitrile gloves between sample collections;
- Using sample containers provided by the laboratory;
- Cleaning monitoring and sampling tools between sample locations;
- Filling sample containers for PHC analysis with no headspace (air) when the containers were closed;
- Conducting leak testing at vapour wells prior to the collection of vapour samples;
- Collecting a duplicate vapour sample during the vapour sampling event; and
- Documenting field procedures and sampling activities.

7.7.2 Results

The QA/QC results for vapour sampling are included in Table 5. The duplicate samples were submitted for analysis of the same parameters as the original samples.

Leak testing was conducted at vapour wells prior to collected vapour samples for analysis. For leak testing, the test sample was collected into a tedlar bag while tubing was set up in shroud filled with helium. If resulting test samples included concentrations of helium less than 2% of the concentration within the shroud, the test was considered successful. Leak testing results for the wells were successful and contained non-detectable concentrations for helium.

The duplicate analysis is compared by relative percent difference (RPD). The RPD is calculated using the following equation:

$$\text{RPD} = \frac{(V_1 - V_2)}{\frac{(V_1 + V_2)}{2}} * 100\%$$

Where:

V_1 = Parent Sample

V_2 = Duplicate Sample

Chemical parameters were considered as having passed the QA/QC reproducibility procedure if the RPD was less than or equal to 20%, indicating a close correlation between the sample-duplicate pair.

RPD values were not calculated if one or both of the sample-duplicate concentrations were between the reportable detection limit (RDL) and five times the RDL. In these cases, chemical parameters were still considered as having passed the QA/QC reproducibility procedure if the sample duplicate concentration difference was less than one RDL value.

Several duplicate RPDs were greater than 20%; the differences are assumed to be based on the duplicate collection methods, which involve two separate flow regulators for the Summa canisters, which may lead to different flow rates into the canister at times. Based on the QA/QC results, the sample methods and results are considered acceptable.

8.0 HAZARD QUOTIENT CALCULATIONS

Using the soil vapour screening levels described above and the soil vapour sampling results, estimated cancer risks (for carcinogens) and estimated hazard quotients (for non-carcinogens) were calculated for the site.

Estimated risks were calculated by dividing the soil vapour concentration by the corresponding soil vapour screening level for carcinogenic effects and multiplying the ratio by the target risk level of 1×10^{-5}. Similarly, the estimated hazard quotients (HQ) represent the soil vapour concentration divided by the corresponding soil vapour screening level for non-carcinogenic effects.

Risk estimates for non-carcinogenic COPCs are defined as HQ. Hazard quotients are calculated based on a ratio of the estimated exposure and the toxicity reference values identified as the tolerable daily intake (TDI) or tolerable concentration (TC) according to the following equation:

$$\text{Hazard Quotient} = \frac{\text{Estimated Daily Dose (mg/kg-day or mg/m}^3\text{)}}{\text{Tolerable Daily Intake (mg/kg-day) or Tolerable Concentration (mg/m}^3\text{)}}$$

Non-carcinogenic risk characterization in the assessment was completed for all COPCs.

When the HQ is greater than the target risk value, the scenario poses a potential concern and requires further evaluation or risk management. It is important to note that HQs greater than the target risk value do not necessarily indicate that adverse health effects will occur. This is because of the conservative assumptions used in estimating concentrations and in setting the target values. HQ that are less than the target risk value indicate that exposure is within acceptable levels and no further risk management is necessary. HQ greater than the target risk value suggest that further investigation or risk management (e.g., remediation) may be warranted.

For non-carcinogens, the cumulative target risk value used was 1.0. This target risk value accounts for additional exposure to the chemicals of concern from sources other than the site. Therefore, the cumulative target risk value of 1.0 represents an allocation of 20% of a person's daily exposure from site sources and the remaining 80% would come from other sources. Other sources of exposure include ambient air, household products, and soil and water contact from locations other than the site.

For carcinogens, the risk of cancer is assumed to be proportional to dose with the assumption that any exposure results in a nonzero probability of risk. Carcinogenic risk probabilities were calculated by multiplying the estimated exposure level by the route-specific cancer slope factor (SF) or unit risk factor (URF) for each carcinogen:

$$R = E \times SF \text{ (or URF)}$$

Where:

R = Estimated individual excess lifetime cancer risk;
E = Exposure level for each chemical of potential concern (mg/kg/day or mg/m^3); and
SF = Route- and chemical-specific SF $(mg/kg/day)^{-1}$ or URF $((mg/m^3)^{-1})$.

Risk probabilities determined for each carcinogen were also considered to be additive over all exposure pathways so that an overall risk of cancer was estimated for each group of potentially exposed receptors.

When assessing risks posed by exposure to carcinogenic substances, Health Canada and other regulatory agencies assume that any level of exposure is associated with some hypothetical cancer risk. As a result, it is necessary for regulatory agencies to specify an acceptable risk level. Per Health Canada guidance (2010a, 2010b), cancer risks are deemed essentially negligible where the estimated cumulative incremental lifetime cancer risk is less than or equal to 1 in 100,000 (1×10^{-5}).

For this evaluation, target risk and hazard levels were determined in accordance with Alberta Tier 2 Guidelines. For carcinogens, the cumulative target risk level is 1 x 10^{-5}, as this value is considered by Health Canada to represent a negligible risk. For non-carcinogens a cumulative target hazard level of 1 is used as potential exposures that result in hazard indices equal to or less than 1 signify negligible potential for adverse health effects. Each sampling location was screened individually for every chemical detected.

The cumulative risk levels for carcinogens in sample VW-01 and its duplicate, and VW-02 were between 3.6 x 10^{-6} and 7.9 x 10^{-8}, which are less than the target risk level of 1 x 10^{-5}. The cumulative hazard levels identified in samples VW-01 and its duplicate, and VW-02, in total for the non-carcinogens were between 0.007 and 0.027, which are less than the target hazard level of 1. Table 6 summarizes the properties of the compound being assessed. Table 7 summarizes the soil properties used for the calculations. Table 8 summarizes the building properties used for the calculations, and Table 9 presents the generic soil vapour criteria calculated. Table 10 presents the estimated risk and hazard for the volatile compounds that were detected in soil vapour.

As shown in Table 10, the estimated individual and cumulative risks and hazards associated with the soil vapour samples collected in April 2013 and December 2019 did not exceed the corresponding target risk and hazard levels in any of the samples collected.

9.0 EVALUATION OF SITE CONDITIONS

9.1 Summary of Site Conditions

Based on the 2019 and historical data for the site, there is no evidence that there are significant concerns related to the former landfill operations at RSLI. However, the site does contain buried landfill waste and some risk management measures are required. Further, there are several elements of the site assessment data requiring further confirmation as detailed below.

Ammonia and other forms of nitrogen in water, principally nitrate, can be good indicators of man-made effects from landfill leachate. Ammonia concentrations at two down-gradient wells MW-03 and MW-03 (Lot 4) are elevated and suggest possible quality impact by MSW landfill leachate. MW-03 is approximately 150 m from the Red Deer River and based on measured concentrations to date (16 mg-N/L in 2013 and 19.1 mg-N/L in 2019), there is a potential that any groundwater discharging near the riverbank exceeds the referenced Tier 1 Guidelines. Monitoring well MW-02 (Lot 4) was previously installed down-gradient of MW-03 at approximately 60 m from the river but could not be located in 2019. Current groundwater quality data for that monitoring well would assist in qualifying risks associated with the elevated ammonia concentrations; however, such information is currently not available. If the groundwater quality at the monitoring wells is confirmed in an additional sampling event, an additional well should be installed between MW-03 and MW-02 (Lot 4).

Sampling of soil gas at the two vapour monitoring probes VW-01 and VW-02 did not identify exceedances of the corresponding target risks and hazard levels for the parameters tested. The analytical results for methane were non-detect for VW-01 and 0.234% for VW-02. These concentrations are low, also considering that the samples were collected under frozen ground conditions.

However, field monitoring of these probes for methane did identify concentrations indicative of impact by LFG. The Standards for Landfills (AEP 2010) identify values for subsurface methane. While not necessarily applicable to the site, they have been used as a relative indicator of impact. The June 2019 concentrations of methane at VW-01 (11.3%) and VW-02 (17.1%) were greater than the referenced value for an on-site building or enclosed structure or in the area immediately outside the foundation of the building or structure (1%). During the December 2019 monitoring events, the field methane concentrations decreased significantly to less than instrument detection limit

at VW-01 and to 1.4% at VW-02 (values were non-detect and 0.2%, respectively, in the analytical results in December). The wells were both dry during the monitoring events; therefore, they were considered to not be blinded. We note that pressure measurements at these probes recorded negligible pressures. Sampling at VW-01 and VW-02 in 2013 measured methane concentrations of 27.4% and 17.6%, respectively. These are a similar order of magnitude to the concentrations measured in 2019. Historical data is also available from 2013 at additional vapour wells on Lot 4 [VP-01 and VP-02, located adjacent to MW-01 (Lot 4) and MW-02 (Lot4), respectively]; the concentrations of methane at those wells in 2013 were non-detectable. Those Lot 4 wells were not located in 2019.

Further monitoring is recommended below to confirm methane concentrations at the vapour monitoring probes and in the headspace of monitoring wells.

9.2 Review of Mitigative Measures from Risk Management Plan

The 2014 RMP presented a proposed site-specific environmental risk management plan as a tool to assist with the review of future subdivision applications on lands lying within the regulated setback distance from the site (300 m). The focus was on potential ingress of soil gas for COPCs with a HQ greater than 1.0. Residential land use was considered most sensitive, and exposure ratings for other land uses (e.g. school, public institutions, commercial complexes) were considered to not be greater than residential; however, unique exceptions would have to be reviewed and addressed on a site-specific basis (Tiamat, 2014). Further, underground utility workers and subsurface utility infrastructure were considered relevant to potential exposure.

The RMP applied a 10x factor of safety to the hazard quotients to address uncertainties. Hazard quotients from the RMP ranged up to 1,406 (including the 10x factor of safety). Based on these, the RMP then provided recommended generic mitigative measures based on the calculated HQs, ranging from passive to active measures, recognizing that the ultimate approach would require a design professional for the proposed development.

Following the 2014 RMP, CCME released the document "*A Protocol for the Derivation of Soil Vapour Quality Guidelines for Protection of Human Exposures Via Inhalation of Vapours"* (CCME 2014), designed to provide guidance for developing site-appropriate soil vapour quality guidelines. The guidelines developed using the methods outlined in the CCME document were used for this current study and are included with the vapour sampling results in Table 4. Hazard quotients were calculated using estimated dose (based on concentrations measured at the site) and divided by tolerable daily intake. Soil vapour concentrations from the Phase II ESA conducted in 2013 were not compared to soil vapour quality guidelines, however spot checks of five target compounds with the highest HQs in the 2013 work (vinyl chloride, tetrachloroethylene, chloromethane, trichloroethylene, and chloroform) identified that none of the 2013 concentrations would have unacceptable HQs using the updated CCME methodology.

The 2014 RMP was prepared concurrent to RMPs at several other former City landfills, and a common set of mitigative measures was applied based on the HQs. Subsequent to the 2014 RMP and to the release of the CCME Protocol document, The City undertook additional assessment at another former City Landfill (Montfort); as part of that work, their consultant XCG Consulting Limited (XCG) revised the 2014 RMP criteria ranges for each generic mitigative measure category to include a Cancer Risk range to allow comparison of the 2014 RMP ranges with the HQ and Cancer Risks calculated by XCG[2]. From that work, XCG identified the following generic mitigative measures for developments within a 300 m setback of these landfills (based on Tiamat, 2014), and these have been adopted for this site:

[2] XCG Consulting Limited, 2018. Vapour Intrusion Assessment and Environmental Monitoring Report, prepared for the City of Red Deer's Montfort Landfill.

Passive Measures

1. Passive Measures – Level A: for Cancer Risk of > $1E^{-5}$ and < $5E^{-5}$ and/or HQ >0.2 and <1.

   Compacted clay liner with a minimum thickness of 1m and confirmed maximum hydraulic conductivity of 10^{-8} m/sec.

2. Passive Measures – Level B: for Cancer Risk of > $5E^{-5}$ and < $5E^{-4}$ and/or HQ >1 and <5.

   Synthetic liner with type of material, thickness and installation details dependent on the design professional.

3. Passive Measures – Level C: for Cancer Risk of > $5E^{-4}$ and < $1E^{-3}$ and/or HQ >5 and <50.

   Passive sub-slab depressurization (SSD) system with a minimum depressurization of 4 to 10 Pa. In some instances (such as a pervious subgrade), the actual depressurization necessary may require an active SSD or alternative active ventilation system.

Active Measures

Field verify the presence of the identified chemicals of concern and other potential chemicals in the soil gas state at the development site. If confirmed, determine the most appropriate manner to prevent soil vapour intrusion.

1. Active Measures – Level D: for Cancer Risk of > $1E^{-3}$ and < $2E^{-3}$ and/or HQ values >50 and <100.

   Active SSD must be configured to compensate for depressurization of the building and have adequate negative pressure gradients across the entire footprint of the foundation.

2. Active Measures - Level E: for Cancer Risk of >$2E^{-3}$ and/or HQ values >100.

   Installation of geomembrane and active soil vapour extraction with system fault notification alarm.

For consistency with XCG's approach from 2017, we compared individual hazard quotients with the individual target hazard level (0.2). Based on the 2019 program, the greatest hazard quotient calculated for the site was 0.016 (vs target individual hazard level of 0.2) and the greatest estimated cancer risk was 3.6×10^{-6} (vs target Risk of 1.0×10^{-5}). The greatest cumulative hazard quotient calculated for the site was 0.027 (vs target cumulative hazard level of 1.0) and the greatest cumulative estimated cancer risk was 3.6×10^{-6}. While development at the site is not currently proposed, for illustrative purposes, based on these hazard quotients and cancer risk levels calculated from the 2013 and 2019 vapour data no passive or active measures would be required for development within the setback area. It is noted that if the 10x factor of safety is applied, passive Level A measures may be required. The assumptions made in the calculations of hazard quotients and cancer risk above are inherently conservative and therefore applying a factor of safety is not needed.

Future applications for development within the setback are subject to review by The City. The developer's team would be responsible for reviewing and verifying the available data relative to their proposed development. The mitigative measures presented above are generic and can be used as a general guide for expectations by The City; ultimately, the developer's design engineer would be responsible for developing measures specific to the intended development based on the above or an appropriate equivalent. Protection of workers (e.g. construction and utility) should form part of any development plan.

10.0 CONCLUSIONS AND RECOMMENDATIONS

Based upon the results of the groundwater monitoring program in 2019 and previous years, Tetra Tech has developed the following conclusions:

- Based on the monitoring well groundwater elevations, the groundwater table is essentially level with minimal horizontal gradients within the east portion of the site near the Red Deer River. As such, groundwater elevation contours have not been prepared. Based on the location of the site relative to the river, an overall easterly or northeasterly groundwater flow direction is expected. Historically in 2013, groundwater flow was indicated to be to southeasterly towards the Red Deer River.
- Groundwater parameters that exceeded the Tier 1 Guidelines at one or more monitoring wells in 2019 included TDS, chloride, nitrate, ammonia, and dissolved metals parameters including aluminum, cadmium, iron, and manganese. The measured concentrations of routine water chemistry parameters were generally consistent with previous results and ammonia concentrations measured at two monitoring wells [MW-03 and MW-03 (Lot 4), both hydraulically down-gradient] are likely indicative of leachate impact. The dissolved aluminum, cadmium, and iron concentration exceedances may be related to inadequate filtration and are not necessarily of concern.
- Concentrations of BTEX, PHC fractions F1 to F2, AOX, volatile fatty/ carboxylic acids, and VOCs in 2019 were less than the analytical detection limits at all groundwater monitoring wells.
- Concentrations of BTEX, PHCs, and VOCs in soil vapour samples were less than the soil vapour screening criteria.
- Siloxanes were not detected in the vapour samples collected.
- The estimated individual and cumulative risks and hazards associated with the soil vapour samples collected in December 2019 did not exceed the corresponding target risk and hazard levels.
- Methane concentrations measured at VW-01 and VW-02 indicate the presence of LFG, which is consistent with historical results. The concentrations were greater than values referenced in the Standards for Landfills for on-site buildings or enclosed structures or in the area immediately outside the foundation of a building or structure (not directly applicable to the site but used for relative indicator of impact). The vapour analytical results for methane in December were significantly lower and less than the Standards for Landfills for on-site buildings or enclosed structures or in the area immediately outside the foundation of a building or structure.

Based upon the results of the vapour and groundwater monitoring program in 2019 and previous years, there are indications of residual impacts related to the former landfill operations at several monitoring well locations, and buried landfill waste remains beneath the site, therefore ongoing risk management is required. Risk management is recommended to include ongoing monitoring and administrative actions. The following recommendations are made according to these risk management elements:

- Ongoing Monitoring:
  - Continue with an additional year of semi-annual groundwater monitoring and annual groundwater sampling program at the site for routine groundwater chemistry parameters to confirm trends. If the groundwater quality at the monitoring wells is confirmed, specifically related to ammonia exceedances at the hydraulically down-gradient wells, an additional down-gradient monitoring well should be installed between MW-03 and the river to replace MW-02 (Lot 4). The monitoring program (including the newly installed well) should then continue for an additional year to evaluate the groundwater chemistry further down-gradient of the site. If the groundwater quality in 2019 is anomalous, the monitoring and sampling program may be discontinued. Historical vapour probe VP-02 on Lot 4 is likely destroyed along with MW-02(Lot 4), but VP-01 was located. The integrity of this vapour well should be assessed during the monitoring event, and if in good condition,

the well should be included in the monitoring program going forward. If the well is unusable, it should be replaced and included as part of the monitoring program.

  - If elevated methane concentrations are measured during any of the quarterly events, the City should be informed, and an analytical sample of the soil vapour should be collected to confirm the concentrations within 2 weeks of the measurement. Should there be two consecutive samples that have concentrations of methane above 20% LEL, the City should prepare and implement a subsurface LFG contingency plan.

- Administrative Actions:
  - Utilize the revised generic mitigative measures when evaluating applications for development within the setback.
  - Ensure that the site is clearly identified within The City's property database(s) and flagged for specific review should site development or maintenance activities be contemplated. This may include requirements for minimizing site disturbance, utilizing material management plans during utility work, and including site-specific health and safety plans for workers.

Further to the above recommendations, as noted the site remains an historical landfill. It presently appears to be capped and has development overtop of it. The City should review this status on an ongoing basis to ensure that the cover remains intact and drainage remains positive; repairs or maintenance should be undertaken as required to maintain the site.

11.0 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.

FILE: SWM.SWOP04071-01.008
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FILE: SWM.SWOP04071-01.008

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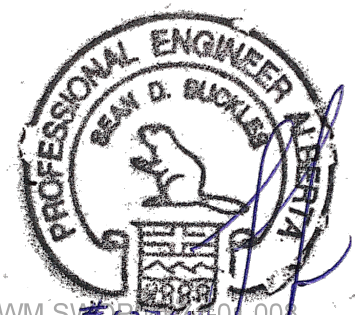

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2020-10-29

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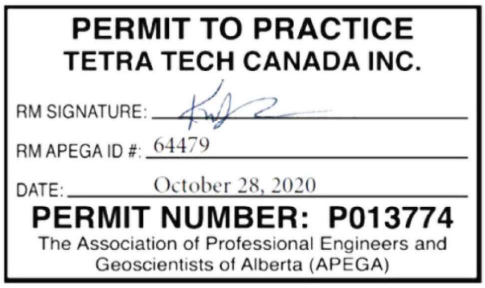

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TABLES

Table 1: Groundwater Elevations

Monitoring Well		MW-01	MW-02	MW-03	MW-01 (Lot 4)	MW-02 (Lot 4)	MW-03 (Lot 4)
Total Drilled Depth (m)		7.6	8.4	7.6	-	-	-
Top of Screened Interval (mbg)		3.0	3.8	3.0	-	-	-
Bottom of Screened Interval (mbg)		7.6	8.4	7.6	-	-	-
Stick up (m)		-0.13	-0.16	-0.09	0.76	-	0.93
Ground Elevation (m)		854.67	855.26	854.55	853.62	-	853.12
TPC Elevation (m)		854.54	855.10	854.46	854.38	-	854.05
Depth to Groundwater (mBTPC)	Mar-13	-	-	-	5.20	4.79	4.84
	Apr-13	-	-	-	5.19	4.78	4.82
	Aug-13	4.92	5.25	5.13	-	-	-
	Jun-19	5.14	CNL	5.29	5.17	CNL	4.81
	Dec-19	5.32	CNL	5.15	5.20	CNL	4.83
Groundwater Elevation (m)	Mar-13	-	-	-	849.18	-	849.21
	Apr-13	-	-	-	849.19	-	849.23
	Aug-13	849.62	849.84	849.33	-	-	-
	Jun-19	849.40	CNL	849.17	849.21	CNL	849.24
	Dec-19	849.22	CNL	849.32	849.18	CNL	849.22
Combustible Vapour Concentrations* (CVCs) (ppm)	Aug-13	510	155	460	-	-	-
	Jun-19	770	CNL	150	430	CNL	40
	Dec-19	5	CNL	10	ND	CNL	ND
Volatile Organic Compounds* (VOCs) (ppm)	Aug-13	ND	ND	ND	-	-	-
	Jun-19	1	CNL	ND	ND	CNL	ND
	Dec-19	ND	CNL	1	ND	CNL	ND

Notes:
mbg - Metres below grade.
mBTPC - Metres below top of plastic pipe casing.
- Not measured/information unavailable.
ppm - Parts per million.
*- Measured using an RKI Eagle II calibrated to hexane and isobutylene and operated in methane elimination mode.
ND - Non-detect.
CNL - Could not locate.

Table 2: Groundwater Analytical Results

		Location Code	MW-01	MW-01 (Lot 4)	MW-03	MW-03 (Lot 4)
		Sample Date	5-Dec-2019	5-Dec-2019	5-Dec-2019	5-Dec-2019
		Lab Report Number	L2393428	L2393428	L2393428	L2393428
		Laboratory ID	L2393428-1	L2393428-3	L2393428-2	L2393428-4
Parameter	**Unit**	**Tier 1 Guideline [1,2]**				
Field Testing						
Field Temperature	°C	-	6.48	7.22	5.77	7.36
Field Electric Conductivity	µS/cm	-	1,201	1,066	1,367	1,409
Field pH	pH Units	6.5 to 8.5	7.50	7.79	8.35	7.78
Routine						
pH	pH Units	6.5 to 8.5	7.32	7.59	7.42	7.61
Electrical Conductivity (EC)	µS/cm	-	1,820	1,460	2,100	1,370
Total Dissolved Solids (TDS)	mg/L	500	**1,190**	**963**	**654**	**820**
Hardness as $CaCO_3$	mg/L	-	881	874	831	658
Alkalinity (total as $CaCO_3$)	mg/L	-	692	559	1,040	591
Bicarbonate	mg/L	-	844	681	1,270	721
Carbonate	mg/L	-	<5.0	<5.0	<5.0	<5.0
Hydroxide	mg/L	-	<5.0	<5.0	<5.0	<5.0
Calcium	mg/L	-	229	220	190	157
Magnesium	mg/L	-	75.2	78.8	86.5	64.7
Potassium	mg/L	-	8.78	8.55	32.2	10.1
Sodium	mg/L	200	69.7	65.0	154	57.5
Chloride	mg/L	120	**125**	113	**168**	106
Fluoride	mg/L	1.5	<0.10	<0.10	<0.10	<0.10
Phosphorus - Total	mg/L	-	0.0997	2.4	0.129	0.399
Sulphate	mg/L	429 [3]	135	107	21.7	70.1
Ionic Balance	N/A	-	93.7	120	97.9	98.8
Nutrients						
Ammonia as N	mg/L	0.374 to 9.71 [6]	<0.050	<0.050	**19.1**	**2.06**
Nitrate (as NO_3)	mg/L	-	-	-	-	-
Nitrate (as NO_3-N)	mg/L	3	**29.6**	**8.05**	0.44	<0.10
Nitrite (as NO_2)	mg/L	-	-	-	-	-
Nitrite (as NO_2-N)	mg/L	0.08 to 0.20 [4]	<0.050	<0.050	<0.050	<0.050
Nitrate and Nitrite (as N)	mg/L	-	29.6	8.05	0.44	<0.101
Total Nitrogen	mg/L	-	-	-	-	-
Total Kjeldahl Nitrogen (TKN)	mg/L	-	<0.20	3.6	22.7	2.3
Carbon						
Total Organic Carbon (TOC)	mg/L	-	-	-	-	-
Dissolved Organic Carbon (DOC)	mg/L	-	7.5	6	17.5	7.8
Biochemical Oxygen Demand (BOD)	mg/L	-	-	-	-	-
Chemical Oxygen Demand (COD)	mg/L	-	-	-	-	-
Dissolved Metals						
Aluminum	mg/L	0.05 [5]	**0.305**	0.0187	<0.0050	0.004
Antimony	mg/L	0.006	<0.00050	0.00014	<0.00050	<0.00010
Arsenic	mg/L	0.005	0.00053	0.00030	0.00123	0.00046
Barium	mg/L	1	0.168	0.187	0.599	0.272
Boron	mg/L	1.5	0.114	0.078	0.176	0.070
Cadmium	mg/L	0.00036 to 0.00037 [3]	**0.000407**	0.000155	0.000033	0.0000707
Chromium	mg/L	0.05	<0.00050	<0.00010	<0.00050	<0.00010
Copper	mg/L	0.007	0.0021	0.00139	<0.0010	0.00055
Iron	mg/L	0.3	**0.379**	0.023	<0.050	0.106
Lead	mg/L	0.007 [3]	0.00062	<0.000050	<0.00025	<0.000050
Manganese	mg/L	0.05	**0.0950**	**1.22**	**0.727**	**1.03**
Mercury	mg/L	0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Nickel	mg/L	0.120 to 0.259 [3]	0.0061	0.0102	0.0108	0.00519
Selenium	mg/L	0.002	0.00056	0.000106	<0.00025	0.000088
Silver	mg/L	0.0001	<0.000050	<0.000010	<0.000050	<0.000010
Uranium	mg/L	0.015	0.00766	0.00967	0.00539	0.00551
Zinc	mg/L	0.03	0.0266	0.0019	0.0125	0.0015
Organics						
AOX	mg/L	-	ND	ND	ND	ND
Hydrocarbons						
Benzene	mg/L	0.005	<0.00050	<0.00050	<0.00050	<0.00050
Toluene	mg/L	0.021	<0.00050	<0.00050	<0.00050	<0.00050
Ethylbenzene	mg/L	0.0016	<0.00050	<0.00050	<0.00050	<0.00050
Xylenes (m & p)	mg/L	-	<0.00050	<0.00050	<0.00050	<0.00050
Xylene (o)	mg/L	-	<0.00050	<0.00050	<0.00050	<0.00050
Xylenes Total	mg/L	0.02	<0.00071	<0.00071	<0.00071	<0.00071
Styrene	mg/L	0.072	<0.00050	<0.00050	<0.00050	<0.00050
F1 (C_6-C_{10})	mg/L	-	<0.10	<0.10	<0.10	<0.10
F1 (C_6-C_{10}) - BTEX	mg/L	0.81	<0.10	<0.10	<0.10	<0.10
F2 (C_{10}-C_{16})	mg/L	1.1	<0.10	<0.10	<0.10	<0.10
Volatile Fatty/Carboxylic Acids						
Acetic Acid	mg/L	-	<10	<10	<10	<10
Butyric Acid	mg/L	-	<1.0	<1.0	<1.0	<1.0
Formic Acid	mg/L	-	<50	<50	<50	<50
Hexanoic Acid	mg/L	-	<1.0	<1.0	<1.0	<1.0
iso-Butyric Acid	mg/L	-	<1.0	<1.0	<1.0	<1.0
Isovaleric acid	mg/L	-	<1.0	<1.0	<1.0	<1.0
Propionic Acid	mg/L	-	<5.0	<5.0	<5.0	<5.0
Valeric Acid	mg/L	-	<1.0	<1.0	<1.0	<1.0

Notes:

[1] Alberta Environment and Parks (AEP). 2019. Alberta Tier 1 Soil and Groundwater Remediation Guidelines. Land Policy Branch, Policy and Planning Division. 198 pp.

[2] Alberta Environment and Parks (AEP). Environmental Quality Guidelines for Alberta Surface Waters. March 2018. Table 1 Surface water quality guidelines for the

[3] Guideline varies with hardness. Values shown based on site hardness range of 658 mg/L to 881 mg/L.

[4] Guideline varies with chloride. Values shown based on site chloride range of 106 mg/L to 168 mg/L.

[5] Guideline varies with pH. Values shown based on site pH range of 7.50 to 8.35.

[6] Guideline varies with pH and temperature. Values shown based on pH range of 7.50 to 8.35 and temperature range of 5.77°C to 7.36°C.

"-" No applicable guideline or not analyzed.

"ND" Non-detected.

BOLD - Greater than Tier 1 Guideline.

N/A - Not applicable.

Table 2: Groundwater Analytical Results

		Location Code	MW-01	MW-01 (Lot 4)	MW-03	MW-03 (Lot 4)
		Sample Date	5-Dec-2019	5-Dec-2019	5-Dec-2019	5-Dec-2019
		Lab Report Number	L2393428	L2393428	L2393428	L2393428
		Laboratory ID	L2393428-1	L2393428-3	L2393428-2	L2393428-4
Parameter	**Unit**	**Tier 1 Guideline [1,2]**				
Volatile Organic Compounds (VOCs)						
Bromobenzene	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010
Bromochloromethane	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010
Bromodichloromethane	mg/L	-	<0.00050	<0.00050	<0.00050	<0.00050
Bromoform	mg/L	-	<0.00050	<0.00050	<0.00050	<0.00050
Bromomethane	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010
n-Butylbenzene	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010
sec-Butylbenzene	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010
tert-Butylbenzene	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010
Carbon tetrachloride	mg/L	0.00057	<0.00050	<0.00050	<0.00050	<0.00050
Chlorobenzene	mg/L	0.0013	<0.00050	<0.00050	<0.00050	<0.00050
Chloroethane	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010
Chloroform	mg/L	0.018	<0.00050	<0.00050	<0.00050	<0.00050
Chloromethane	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010
2-Chlorotoluene	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010
4-Chlorotoluene	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010
Dibromochloromethane	mg/L	0.19	<0.00050	<0.00050	<0.00050	<0.00050
1,2-Dibromo-3-chloropropane	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010
1,2-Dibromoethane	mg/L	-	<0.00050	<0.00050	<0.00050	<0.00050
Dibromomethane	mg/L	-	<0.00050	<0.00050	<0.00050	<0.00050
1,2-Dichlorobenzene	mg/L	0.0007	<0.00050	<0.00050	<0.00050	<0.00050
1,3-Dichlorobenzene	mg/L	-	<0.00050	<0.00050	<0.00050	<0.00050
1,4-Dichlorobenzene	mg/L	0.001	<0.00050	<0.00050	<0.00050	<0.00050
1,1-Dichloroethane	mg/L	-	<0.00050	<0.00050	<0.00050	<0.00050
1,2-Dichloroethane	mg/L	0.005	<0.0010	<0.0010	<0.0010	<0.0010
1,1-Dichloroethene	mg/L	0.014	<0.00050	<0.00050	<0.00050	<0.00050
1,2-Dichloroethene (cis)	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010
1,2-Dichloroethene (trans)	mg/L	-	<0.00050	<0.00050	<0.00050	<0.00050
Dichlorodifluoromethane	mg/L	-	<0.00050	<0.00050	<0.00050	<0.00050
1,2-Dichloropropane	mg/L	-	<0.00050	<0.00050	<0.00050	<0.00050
1,3-Dichloropropane	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010
2,2-Dichloropropane	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010
1,1-Dichloropropene	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010
1,3-Dichloropropene [cis]	mg/L	-	<0.00050	<0.00050	<0.00050	<0.00050
1,3-Dichloropropene [trans]	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010
Hexachlorobutadiene	mg/L	0.0013	<0.0010	<0.0010	<0.0010	<0.0010
p-Isopropyltoluene	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010
Methylene Chloride	mg/L	0.05	<0.0010	<0.0010	<0.0010	<0.0010
iso-Propylbenzene (cumene)	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010
n-Propylbenzene	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010
1,1,1,2-Tetrachloroethane	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010
1,1,2,2-Tetrachloroethane	mg/L	-	<0.00050	<0.00050	<0.00050	<0.00050
Tetrachloroethene	mg/L	0.01	<0.00050	<0.00050	<0.00050	<0.00050
1,2,3-Trichlorobenzene	mg/L	0.008	<0.0010	<0.0010	<0.0010	<0.0010
1,2,4-Trichlorobenzene	mg/L	0.015	<0.0010	<0.0010	<0.0010	<0.0010
1,1,1-Trichloroethane	mg/L	-	<0.00050	<0.00050	<0.00050	<0.00050
1,1,2-Trichloroethane	mg/L	-	<0.00050	<0.00050	<0.00050	<0.00050
Trichloroethene	mg/L	0.005	<0.00050	<0.00050	<0.00050	<0.00050
Trichlorofluoromethane	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010
1,2,3-Trichloropropane	mg/L	-	<0.00050	<0.00050	<0.00050	<0.00050
1,2,4-Trimethylbenzene	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010
1,3,5-Trimethylbenzene	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010
Vinyl chloride	mg/L	0.0011	<0.00050	<0.00050	<0.00050	<0.00050

Notes:

[1] Alberta Environment and Parks (AEP). 2019. Alberta Tier 1 Soil and Groundwater Remediation Guidelines. Land Policy Branch, Policy and Planning Division. 198 pp.

[2] Alberta Environment and Parks (AEP). Environmental Quality Guidelines for Alberta Surface Waters. March 2018. Table 1 Surface water quality guidelines for the

[3] Guideline varies with hardness. Values shown based on site hardness range of 658 mg/L to 881 mg/L.

[4] Guideline varies with chloride. Values shown based on site chloride range of 106 mg/L to 168 mg/L.

[5] Guideline varies with pH. Values shown based on site pH range of 7.50 to 8.35.

[6] Guideline varies with pH and temperature. Values shown based on pH range of 7.50 to 8.35 and temperature range of 5.77°C to 7.36°C.

"-" No applicable guideline or not analyzed.

"ND" Non-detected.

BOLD - Greater than Tier 1 Guideline.

N/A - Not applicable.

Table 3: Soil Vapour Monitoring Results

Parameter	Gas Well					
	VW-01			VW-02		
	Aug-13	Jun-19	Dec-19	Aug-13	Jun-19	Dec-19
Pressure (kPa)[1]		0.01	0.0		0.02	0.0
CH_4 (%)	27.4	11.3	0.0	17.6	17.1	1.4
CO (ppm)[2]	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 (%)	19.8	9.9	0.2	10.4	10.4	1.7
O_2 (%)	2.0	9.4	20.3	5.0	0.4	17.9
Balance (% v/v)	50.9	69.5	79.5	67.0	72.0	78.8
Static Water Level (mbtoc)[3]		Dry	Dry		Dry	Dry
Depth to Bottom (m)	4.60	4.15	3.16	6.10	4.90	5.02
Stick up (m)		-0.12	-0.07		-0.10	-0.01

Notes:

[1] Kpa - Kilopascal.

[2] ppm - Parts per million.

[3] mbtoc - Metres below top of casing.

N/A - Not applicable - well can not be accessed to obtain measurement or has a submerged screen (blinded).

Table 4: Soil Vapour Analytical Results

Location Code		Generic Soil Vapour Criteria - Residential Coarse-Grained ($\mu g/m^3$)[1]	VW-01				VW-02		
Field ID			MW-01 (S/W 3504)	VP13-01 / 2756	VW-01	19DUP01	MW-02 (S/W 2495)	VP13-02 / 2816	VW-02
Sample Date			26-Mar-2013	23-Apr-2013	5-Dec-2019	5-Dec-2019	26-Mar-2013	23-Apr-2013	5-Dec-2019
Lab Report Number			L1283558-5	B361785	L2393570	L2393570	L1283558-4	B361785	L2393570
Laboratory ID			L1283558	RH1183	L2393570-1 / L2393570-4	L2393570-3	L1283558	RH1184	L2393570-2 / L2393570-5
Parameter	**Unit**	**$\mu g/m^3$**							
Field Tests									
Air Volume	L		-	-	0.06	-	-	-	0.06
Initial Pressure	in Hg		-	-	0	-10.2	-	-	-6.7
Aliphatic/Aromatic PHC Sub-Fractionation									
Aliphatic (>C_5-C_6)	$\mu g/m^3$	NG	-	ND	-	-	-	5.7	-
Aliphatics (C_6-C_8)	$\mu g/m^3$	740,737	-	ND	56	31	-	ND	59
Aliphatics (>C_8-C_{10})	$\mu g/m^3$	40,257	-	ND	83	152	-	12.0	50
Aliphatics (>C_{10}-C_{12})	$\mu g/m^3$	40,257	-	ND	70	145	-	ND	32
Aliphatics (>C_{12}-C_{16})	$\mu g/m^3$	40,257	-	75.3	<30	<30	-	28.6	<30
Aromatics (>C_7-C_8) (TEX Excluded)	$\mu g/m^3$	NG	-	ND	-	-	-	ND	-
Aromatics (>C_8-C_{10})	$\mu g/m^3$	805	-	ND	<15	<15	-	ND	<15
Aromatics (>C_{10}-C_{12})	$\mu g/m^3$	8,051	-	ND	<15	<15	-	ND	<15
Aromatics (>C_{12}-C_{16})	$\mu g/m^3$	8,051	-	ND	<30	<30	-	ND	<30
Linear & Cyclic Methyl Siloxanes									
Hexamethylcyclotrisiloxane, D3(CVMS)	$\mu g/m^3$	NG	450	-	<170	-	14	-	<170
Octamethylcyclotetrasiloxane, D4(CVMS)	$\mu g/m^3$	NG	-	-	<170	-	-	-	<170
Decamethylcyclopentasiloxane, D5(CVMS)	$\mu g/m^3$	NG	-	-	<170	-	-	-	<170
Dodecamethylcyclohexasiloxane, D6(CVMS)	$\mu g/m^3$	NG	-	-	<170	-	-	-	<170
Hexamethyldisiloxane, MM(LVMS)	$\mu g/m^3$	NG	-	-	<170	-	-	-	<170
Heptamethyltrisiloxane	$\mu g/m^3$	NG	-	-	-	-	12	-	-
Octamethyltrisiloxane, MDM(LVMS)	$\mu g/m^3$	NG	-	-	<170	-	-	-	<170
Decamethyltetrasiloxane, MD2M(LVMS)	$\mu g/m^3$	NG	-	-	<170	-	-	-	<170
Dodecamethylpentasiloxane, MD3M(LVMS)	$\mu g/m^3$	NG	-	-	<170	-	-	-	<170
Hydrocarbons									
Benzene	$\mu g/m^3$	195	-	ND	1.54	2.55	-	ND	2.11
Toluene	$\mu g/m^3$	124,220	-	ND	17.7	4.24	-	1.49	4.75
Ethylbenzene	$\mu g/m^3$	34,330	-	ND	<0.87	<0.87	-	ND	<0.87
Xylenes (m & p)	$\mu g/m^3$	NG	-	ND	2	3.2	-	3.78	2.4
Xylene (o)	$\mu g/m^3$	NG	-	ND	<0.87	1.31	-	1.48	0.92
Xylenes Total	$\mu g/m^3$	6,330	-	ND	2.0	4.5	-	5.26	3.3
Styrene	$\mu g/m^3$	3,220	-	ND	<0.85	<0.85	-	ND	<0.85
F1 (C_6-C_{10})	$\mu g/m^3$	867,383	-	-	146	199	-	-	76
F2 (C_{10}-C_{16})	$\mu g/m^3$	52,495	-	-	88	201	-	-	50
Alcohol									
Isopropanol	$\mu g/m^3$	6,219	-	ND	2.8	<2.5	-	ND	<2.5
High Level Fixed Gases									
Nitrogen	%	NG	-	77.9	80.3	80.2	-	77.0	80.7
Oxygen	%	NG	3.1	18.9	21.8	21.6	2.3	18.1	21.7
Carbon Dioxide	%	NG	18.1	3.2	0.150	0.205	19.0	4.9	0.246
Carbon Monoxide	%	NG	-	ND	<0.050	<0.050	-	ND	<0.050
Methane	%	NG	<2.5 ppm	ND	<0.050	<0.050	<2.5 ppm	ND	0.234
Polycyclic Aromatic Hydrocarbons (PAHs)									
Naphthalene	$\mu g/m^3$	112	-	-	<2.6	<2.6	-	-	<2.6
Hydrocarbon Gases (C_1-C_5)									
Methane	%	NG	-	-	0.00029	0.00116	-	-	-
Ethane	%	NG	-	-	<0.00020	<0.00020	-	-	<0.00020
Ethene	%	NG	-	-	<0.00020	<0.00020	-	-	<0.00020
Propane	%	NG	-	-	<0.00020	<0.00020	-	-	<0.00020
Propene	%	NG	-	-	<0.00020	<0.00020	-	-	<0.00020
Butane	%	NG	-	-	<0.00020	<0.00020	-	-	<0.00020
Pentane	%	NG	-	-	<0.00020	<0.00020	-	-	<0.00020

Notes:

[1] Canadian Council of Ministers of the Environment (CCME). 2014. A Protocol for the Derivation of Soil Vapour Quality Guidelines for Protection of Human Exposures via Inhalation of Vapours. Refer to Table 6 to Table 9 for further information.

NG - No applicable guideline.

ND - Not detected, less than the limit of method detection

BOLD - Greater than Guideline.

Table 4: Soil Vapour Analytical Results

Location Code		Generic Soil Vapour Criteria - Residential Coarse-Grained ($\mu g/m^3$)[1]	VW-01				VW-02		
Field ID			MW-01 (S/W 3504)	VP13-01 / 2756	VW-01	19DUP01	MW-02 (S/W 2495)	VP13-02 / 2816	VW-02
Sample Date			26-Mar-2013	23-Apr-2013	5-Dec-2019	5-Dec-2019	26-Mar-2013	23-Apr-2013	5-Dec-2019
Lab Report Number			L1283558-5	B361785	L2393570	L2393570	L1283558-4	B361785	L2393570
Laboratory ID			L1283558	RH1183	L2393570-1 / L2393570-4	L2393570-3	L1283558	RH1184	L2393570-2 / L2393570-5
Parameter	**Unit**	**$\mu g/m^3$**							
Volatile Organic Compounds (VOCs)									
1,1,1-Trichloroethane	$\mu g/m^3$	1,693,510	-	ND	<1.1	<1.1	-	ND	<1.1
1,1,2,2-Tetrachloroethane	$\mu g/m^3$	11	-	ND	<1.4	<1.4	-	ND	<1.4
1,1,2-Trichloroethane	$\mu g/m^3$	7	-	ND	<1.1	<1.1	-	ND	<1.1
1,1-Dichloroethane	$\mu g/m^3$	430	-	ND	<0.81	<0.81	-	5.24	<0.81
1,1-Dichloroethene	$\mu g/m^3$	6,470	-	ND	<0.79	<0.79	-	ND	<0.79
1,2,4-Trichlorobenzene	$\mu g/m^3$	365	-	ND	<1.5	<1.5	-	ND	<1.5
1,2,4-Trimethylbenzene	$\mu g/m^3$	2,235	-	ND	<0.98	<0.98	-	2.47	<0.98
1,2-Dibromoethane	$\mu g/m^3$	590	-	ND	<1.5	<1.5	-	ND	<1.5
1,2-Dichlorobenzene	$\mu g/m^3$	7,072	-	ND	<1.2	<1.2	-	ND	<1.2
1,2-Dichloroethane	$\mu g/m^3$	24	-	ND	<0.81	<0.81	-	ND	<0.81
1,2-Dichloroethene (cis)	$\mu g/m^3$	242	-	ND	<0.79	<0.79	-	ND	<0.79
1,2-Dichloroethene (trans)	$\mu g/m^3$	245	-	ND	<0.79	<0.79	-	ND	<0.79
1,2-Dichloropropane	$\mu g/m^3$	135	-	ND	<0.92	<0.92	-	ND	<0.92
1,2-Dichlorotetrafluoroethane	$\mu g/m^3$	566,335	-	ND	<1.4	<1.4	-	ND	<1.4
1,3,5-Trimethylbenzene	$\mu g/m^3$	2,235	-	ND	<0.98	<0.98	-	ND	<0.98
1,3-Butadiene	$\mu g/m^3$	17	-	ND	<0.44	<0.44	-	ND	<0.44
1,3-Dichlorobenzene	$\mu g/m^3$	64	-	ND	<1.2	<1.2	-	ND	<1.2
1,3-Dichloropropene [cis]	$\mu g/m^3$	163	-	ND	<0.91	<0.91	-	ND	<0.91
1,3-Dichloropropene [trans]	$\mu g/m^3$	149	-	ND	<0.91	<0.91	-	ND	<0.91
1,4-Dichlorobenzene	$\mu g/m^3$	64	-	ND	<1.2	<1.2	-	ND	<1.2
1,4-Dioxane	$\mu g/m^3$	105	-	ND	<0.72	<0.72	-	ND	<0.72
1-Methyl-4 ethyl benzene	$\mu g/m^3$	14,461	-	ND	<0.98	<0.98	-	ND	<0.98
2-Butanone (MEK)	$\mu g/m^3$	167,364	-	ND	1.12	1.23	-	ND	1.15
2-Hexanone (MBK)	$\mu g/m^3$	1,053	-	ND	<4.1	<4.1	-	ND	<4.1
4-Methyl-2-pentanone (MIBK)	$\mu g/m^3$	103	-	ND	<0.82	<0.82	-	ND	<0.82
Acetone	$\mu g/m^3$	918,788	-	5.19	16.3	12.6	-	ND	13.1
Allyl chloride	$\mu g/m^3$	32	-	-	<0.63	<0.63	-	-	<0.63
Benzyl chloride	$\mu g/m^3$	34	-	ND	<1.0	<1.0	-	ND	<1.0
Bromodichloromethane	$\mu g/m^3$	28	-	ND	<1.3	<1.3	-	ND	<1.3
Bromoform	$\mu g/m^3$	1,494	-	ND	<2.1	<2.1	-	ND	<2.1
Bromomethane	$\mu g/m^3$	173	-	ND	<0.78	<0.78	-	ND	<0.78
C_4 Alkene	$\mu g/m^3$	NG	-	-	-	-	17	-	-
Carbon disulfide	$\mu g/m^3$	21,713	8.1	34.5	<0.62	<0.62	-	7.09	11.7
Carbon tetrachloride	$\mu g/m^3$	113	-	ND	<1.3	<1.3	-	ND	<1.3
Chlorobenzene	$\mu g/m^3$	347	-	ND	<0.92	<0.92	-	ND	<0.92
Chlorodifluoroethane	$\mu g/m^3$	NG	19	-	-	-	10	-	-
Chloroethane	$\mu g/m^3$	31,019	-	ND	<0.53	<0.53	-	ND	<0.53
Chloroform	$\mu g/m^3$	27	-	ND	<0.98	<0.98	-	9.83	<0.98
Chloromethane	$\mu g/m^3$	2,657	-	ND	1.05	1.04	-	ND	1.7
Cyclohexane	$\mu g/m^3$	201,510	-	ND	<0.69	<0.69	-	ND	1.2
Decane	$\mu g/m^3$	NG	5.8	-	-	-	8.2	-	-
Dibromochloromethane	$\mu g/m^3$	4,750	-	ND	<1.7	<1.7	-	ND	<1.7
Dichlorodifluoromethane	$\mu g/m^3$	3,584	-	30.2	2.76	2.75	-	3.30	23.8
Ethanol (ethyl alcohol)	$\mu g/m^3$	NG	-	ND	-	-	-	ND	-
Ethyl acetate	$\mu g/m^3$	2,509	-	ND	11.9	0.76	-	ND	<0.72
Freon 113	$\mu g/m^3$	230,627	-	ND	<1.5	<1.5	-	ND	<1.5
Heptane	$\mu g/m^3$	14,461	-	ND	<0.82	0.99	-	7.80	1.35
Hexachlorobutadiene	$\mu g/m^3$	51	-	ND	<2.1	<2.1	-	ND	<2.1
Hexane	$\mu g/m^3$	18,839	-	ND	20.1	2.25	6.7	2.93	2.42
Isooctane	$\mu g/m^3$	14,917	-	ND	<0.93	1.05	-	ND	1.92
iso-Propylbenzene (cumene)	$\mu g/m^3$	14,461	-	-	<0.98	<0.98	-	-	<0.98
Methyl t-Butyl Ether (MTBE)	$\mu g/m^3$	1,153	-	ND	18.9	<0.72	-	ND	<0.72
Methylbutane	$\mu g/m^3$	NG	-	-	-	-	5.7	-	-
Methylene Chloride	$\mu g/m^3$	18,764	-	ND	4.00	<0.69	-	ND	<0.69
Propene	$\mu g/m^3$	91,723	-	ND	<0.34	<0.34	-	ND	<0.34
Tetrachloroethene	$\mu g/m^3$	2,679	-	ND	<1.4	<1.4	-	ND	<1.4
Tetrahydrofuran	$\mu g/m^3$	62,828	-	ND	0.80	0.60	-	ND	<0.59
Trichloroethene	$\mu g/m^3$	153	-	ND	<1.1	1.4	-	ND	<1.1
Trichlorofluoromethane	$\mu g/m^3$	34,325	-	1.75	1.3	1.3	-	1.25	1.6
Trimethylsilanol	$\mu g/m^3$	NG	11	-	-	-	7.8	-	-
Vinyl acetate	$\mu g/m^3$	6,586	-	ND	<1.8	<1.8	-	ND	<1.8
Vinyl bromide (bromoethene)	$\mu g/m^3$	94	-	ND	<0.87	<0.87	-	ND	<0.87
Vinyl chloride	$\mu g/m^3$	140	-	ND	<0.51	<0.51	-	ND	<0.51
Total VOC's	$\mu g/m^3$	NG	4,200	-	-	-	3,100	-	-

Notes:

[1] Canadian Council of Ministers of the Environment (CCME). 2014. A Protocol for the Derivation of Soil Vapour Quality Guidelines for Protection of Human Exposures via Inhalation of Vapours. Refer to Table 6 to Table 9 for further information.

NG - No applicable guideline.

ND - Not detected, less than the limit of method detection

BOLD - Greater than Guideline.

Table 5: Soil Vapor Quality Assurance/Quality Control Analytical Results

		Field ID	VW-01	19DUP01	RPD (%)
		Sample Date	5-Dec-2019	5-Dec-2019	
		Lab Report Number	L2393570	L2393570	
		Laboratory ID	L2393570-1 / L2393570-4	L2393570-3	
Parameter	**Unit**	**RDL**			
Field Tests					
Air Volume	L	0.01	0.06	-	-
Initial Pressure	in Hg	-30	0	-10.2	-
Aliphatic/Aromatic PHC Sub-Fractionation					
Aliphatics (C_6-C_8)	µg/m^3	15	56	31	45
Aliphatics (>C_8-C_{10})	µg/m^3	15	83	152	83
Aliphatics (>C_{10}-C_{12})	µg/m^3	15	70	145	107
Aliphatics (>C_{12}-C_{16})	µg/m^3	30	<30	<30	-
Aromatics (>C_8-C_{10})	µg/m^3	15	<15	<15	-
Aromatics (>C_{10}-C_{12})	µg/m^3	15	<15	<15	-
Aromatics (>C_{12}-C_{16})	µg/m^3	30	<30	<30	-
Linear & Cyclic Methyl Siloxanes					
Hexamethylcyclotrisiloxane, D3(CVMS)	µg/m^3	170	<170	-	-
Octamethylcyclotetrasiloxane, D4(CVMS)	µg/m^3	170	<170	-	-
Decamethylcyclopentasiloxane, D5(CVMS)	µg/m^3	170	<170	-	-
Dodecamethylcyclohexasiloxane, D6(CVMS)	µg/m^3	170	<170	-	-
Hexamethyldisiloxane, MM(LVMS)	µg/m^3	170	<170	-	-
Octamethyltrisiloxane, MDM(LVMS)	µg/m^3	170	<170	-	-
Decamethyltetrasiloxane, MD2M(LVMS)	µg/m^3	170	<170	-	-
Dodecamethylpentasiloxane, MD3M(LVMS)	µg/m^3	170	<170	-	-
Hydrocarbons					
Benzene	µg/m^3	0.64	1.54	2.55	49
Toluene	µg/m^3	0.75	17.7	4.24	123
Ethylbenzene	µg/m^3	0.87	<0.87	<0.87	-
Xylenes (m & p)	µg/m^3	1.7	2	3.2	46
Xylene (o)	µg/m^3	0.87	<0.87	1.31	-
Xylenes Total	µg/m^3	2	2.0	4.5	125
Styrene	µg/m^3	0.85	<0.85	<0.85	-
F1 (C_6-C_{10})	µg/m^3	15	146	199	36
F2 (C_{10}-C_{16})	µg/m^3	15	88	201	128
Alcohol					
Isopropanol	µg/m^3	2.5	2.8	<2.5	-
High Level Fixed Gases					
Nitrogen	%	1	80.3	80.2	0.1
Oxygen	%	0.1	21.8	21.6	1
Carbon Dioxide	%	0.05	0.150	0.205	37
Carbon Monoxide	%	0.05	<0.050	<0.050	-
Methane	%	0.05	<0.050	<0.050	-
Polycyclic Aromatic Hydrocarbons (PAHs)					
Naphthalene	µg/m^3	2.6	<2.6	<2.6	-
Hydrocarbon Gases (C_1-C_5)					
Methane	%	0.0001	0.00029	0.00116	300
Ethane	%	0.0002	<0.00020	<0.00020	-
Ethene	%	0.0002	<0.00020	<0.00020	-
Propane	%	0.0002	<0.00020	<0.00020	-
Propene	%	0.0002	<0.00020	<0.00020	-
Butane	%	0.0002	<0.00020	<0.00020	-
Pentane	%	0.0002	<0.00020	<0.00020	-
Volatile Organic Compounds (VOCs)					
1,1,1-Trichloroethane	µg/m^3	1.1	<1.1	<1.1	-
1,1,2,2-Tetrachloroethane	µg/m^3	1.4	<1.4	<1.4	-
1,1,2-Trichloroethane	µg/m^3	1.1	<1.1	<1.1	-
1,1-Dichloroethane	µg/m^3	0.81	<0.81	<0.81	-
1,1-Dichloroethene	µg/m^3	0.79	<0.79	<0.79	-
1,2,4-Trichlorobenzene	µg/m^3	1.5	<1.5	<1.5	-
1,2,4-Trimethylbenzene	µg/m^3	0.98	<0.98	<0.98	-
1,2-Dibromoethane	µg/m^3	1.5	<1.5	<1.5	-
1,2-Dichlorobenzene	µg/m^3	1.2	<1.2	<1.2	-
1,2-Dichloroethane	µg/m^3	0.81	<0.81	<0.81	-
1,2-Dichloroethene (cis)	µg/m^3	0.79	<0.79	<0.79	-
1,2-Dichloroethene (trans)	µg/m^3	0.79	<0.79	<0.79	-
1,2-Dichloropropane	µg/m^3	0.92	<0.92	<0.92	-
1,2-Dichlorotetrafluoroethane	µg/m^3	1.4	<1.4	<1.4	-
1,3,5-Trimethylbenzene	µg/m^3	0.98	<0.98	<0.98	-
1,3-Butadiene	µg/m^3	0.44	<0.44	<0.44	-
1,3-Dichlorobenzene	µg/m^3	1.2	<1.2	<1.2	-
1,3-Dichloropropene [cis]	µg/m^3	0.91	<0.91	<0.91	-
1,3-Dichloropropene [trans]	µg/m^3	0.91	<0.91	<0.91	-
1,4-Dichlorobenzene	µg/m^3	1.2	<1.2	<1.2	-
1,4-Dioxane	µg/m^3	0.72	<0.72	<0.72	-
1-Methyl-4 ethyl benzene	µg/m^3	0.98	<0.98	<0.98	-
2-Butanone (MEK)	µg/m^3	0.59	1.12	1.23	9
2-Hexanone (MBK)	µg/m^3	4.1	<4.1	<4.1	-
4-Methyl-2-pentanone (MIBK)	µg/m^3	0.82	<0.82	<0.82	-
Acetone	µg/m^3	5.9	16.3	12.6	26
Allyl chloride	µg/m^3	0.63	<0.63	<0.63	-
Benzyl chloride	µg/m^3	1	<1.0	<1.0	-
Bromodichloromethane	µg/m^3	1.3	<1.3	<1.3	-
Bromoform	µg/m^3	2.1	<2.1	<2.1	-
Bromomethane	µg/m^3	0.78	<0.78	<0.78	-
Carbon disulfide	µg/m^3	0.62	<0.62	<0.62	-
Carbon tetrachloride	µg/m^3	1.3	<1.3	<1.3	-
Chlorobenzene	µg/m^3	0.92	<0.92	<0.92	-
Chloroethane	µg/m^3	0.53	<0.53	<0.53	-
Chloroform	µg/m^3	0.98	<0.98	<0.98	-
Chloromethane	µg/m^3	0.41	1.05	1.04	1
Cyclohexane	µg/m^3	0.69	<0.69	<0.69	-
Dibromochloromethane	µg/m^3	1.7	<1.7	<1.7	-
Dichlorodifluoromethane	µg/m^3	0.99	2.76	2.75	0
Ethyl acetate	µg/m^3	0.72	11.9	0.76	176
Freon 113	µg/m^3	1.5	<1.5	<1.5	-

Notes:

-	Not analyzed or RPD not calculated.
<	Concentration is less than the laboratory detection limit indicated.
RDL	Laboratory Reportable Detection Limit.
RPD	RPD is Relative Percentage Difference calculated as RPD(%)=(|V1-V2|)/[(V1+V2)/2])*100 where V1,V2 = concentrations of parent and duplicate sample, respectively. RPDs have only been calculated where a concentration is greater than 5 times the RDL.

Table 5: Soil Vapor Quality Assurance/Quality Control Analytical Results

		Field ID	VW-01	19DUP01	RPD (%)
		Sample Date	5-Dec-2019	5-Dec-2019	
		Lab Report Number	L2393570	L2393570	
		Laboratory ID	L2393570-1 / L2393570-4	L2393570-3	
Parameter	**Unit**	**RDL**			
Volatile Organic Compounds (VOCs)					
Heptane	µg/m^3	0.82	<0.82	0.99	-
Hexachlorobutadiene	µg/m^3	2.1	<2.1	<2.1	-
Hexane	µg/m^3	0.7	20.1	2.25	160
Isooctane	µg/m^3	0.93	<0.93	1.05	-
iso-Propylbenzene (cumene)	µg/m^3	0.98	<0.98	<0.98	-
Methyl t-Butyl Ether (MTBE)	µg/m^3	0.72	18.9	<0.72	-
Methylene Chloride	µg/m^3	0.69	4.00	<0.69	-
Propene	µg/m^3	0.34	<0.34	<0.34	-
Tetrachloroethene	µg/m^3	1.4	<1.4	<1.4	-
Tetrahydrofuran	µg/m^3	0.59	0.80	0.60	-
Trichloroethene	µg/m^3	1.1	<1.1	1.4	-
Trichlorofluoromethane	µg/m^3	1.1	1.3	1.3	0
Vinyl acetate	µg/m^3	1.8	<1.8	<1.8	-
Vinyl bromide (bromoethene)	µg/m^3	0.87	<0.87	<0.87	-
Vinyl chloride	µg/m^3	0.51	<0.51	<0.51	-

Notes:

-	Not analyzed or RPD not calculated.
<	Concentration is less than the laboratory detection limit indicated.
RDL	Laboratory Reportable Detection Limit.
RPD	RPD is Relative Percentage Difference calculated as RPD(%)=(|V1-V2|)/[(V1+V2)/2])*100 where V1,V2 = concentrations of parent and duplicate sample, respectively. RPDs have only been calculated where a concentration is greater than 5 times the RDL.

Table 6: Chemical, Physical, and Toxicological Properties

Parameter		TC	RsC	H'	D_{air}	D_{water}	BAF	MF		
		Tolerable Concentration	Risk-specific concentration	Unitless Henry's Law Constant	Pure component molecular diffusivity in air	Pure component molecular diffusivity in water	Bioattenuation Factor	Mass Fraction in Soil (Coarse and Fine)	Mass Fraction in Soil Vapour - Coarse Soil	Mass Fraction in Soil Vapour - Fine Soil
Units		mg/m^3	mg/m^3	unitless	cm^2/s	cm^2/s	unitless	unitless	unitless	unitless
Benzene		--	0.003	0.225	0.088	1.00E-05	10	--	--	--
Toluene		3.8	--	0.274	0.087	9.20E-06	10	--	--	--
Ethylbenzene		1	--	0.358	0.075	8.50E-06	10	--	--	--
Xylenes		0.18	--	0.252	0.078	9.90E-06	10	--	--	--
Naphthalene		0.003	--	0.017	0.059	7.50E-06	10	--	--	--
F1	Aliphatic C>6-C8	18.4	--	50	0.05	0.00001	10	0.55	0.854	0.842
	Aliphatic C>8-C10	1	--	80	0.05	0.00001	10	0.36	0.141	0.153
	Aromatic C>8-C10	0.2	--	0.48	0.05	0.00001	10	0.09	0.005	0.005
F2	Aliphatic C>10-C12	1	--	120	0.05	0.00001	10	0.36	0.767	0.766
	Aliphatic C>12-C16	1	--	520	0.05	0.00001	10	0.44	0.205	0.206
	Aromatic C>10-C12	0.2	--	0.14	0.05	0.00001	10	0.09	0.023	0.023
	Aromatic C>12-C16	0.2	--	0.053	0.05	0.00001	10	0.11	0.005	0.005
1,1,1-Trichloroethane		5	--	0.688	0.078	0.000009	10	--	--	--
1,1,2,2-Tetrachloroethane		--	0.000172	0.019	0.071	0.000008	10	--	--	--
1,1,2-Trichloroethane		0.0002	0.000625	0.038	0.078	0.000009	10	--	--	--
1,1-Dichloroethane		--	0.006250	0.240	0.074	0.000011	10	--	--	--
1,1-Dichloroethene		0.2	--	0.942	0.090	0.000010	10	--	--	--
1,2,4-Trichlorobenzene		0.007	--	0.112	0.030	0.000008	10	--	--	--
1,2,4-Trimethylbenzene		0.06	--	0.230	0.061	0.000008	10	--	--	--
1,2-Dibromoethane		0.0093	0.016700	0.027	0.022	0.000012	10	--	--	--
1,2-Dichlorobenzene		0.2	--	0.072	0.069	0.000008	10	--	--	--
1,2-Dichloroethane		0.007	0.000385	0.049	0.104	0.000010	10	--	--	--
1,2-Dichloropropane		0.004	0.002703	0.110	0.078	0.000009	10	--	--	--
1,3,5-Trimethylbenzene		0.06	--	0.359	0.060	0.000008	10	--	--	--
1,3-Butadiene		0.002	0.000333	3.009	0.249	0.000011	10	--	--	--
1,3-Dichlorobenzene		0.095	0.000909	0.128	0.069	0.000008	10	--	--	--
1,4-Dichlorobenzene		0.095	0.000909	0.098	0.069	0.000008	10	--	--	--
1,4-Dioxane		0.03	0.002000	0.000	0.229	0.000010	10	--	--	--
2-Hexanone		0.03	--	0.004	0.070	0.000008	10	--	--	--
Acetone		31	--	0.002	0.124	0.000011	10	--	--	--
Allyl chloride		0.001	--	0.450	0.094	0.000011	10	--	--	--
Benzyl chloride		0.001	--	0.017	0.075	0.000008	10	--	--	--
Bromodichloromethane		--	0.000270	0.098	0.030	0.000011	10	--	--	--
Bromoform		--	0.009091	0.024	0.015	0.000010	10	--	--	--
Bromomethane		0.005	--	0.255	0.073	0.000012	10	--	--	--
Carbon Disulfide		0.7	--	0.705	0.104	0.000010	10	--	--	--
Carbon Tetrachloride		0.1	0.001667	1.183	0.078	0.000009	10	--	--	--
Chlorobenzene		0.01	--	0.148	0.073	0.000009	10	--	--	--
Chloroethane		1	--	0.073	0.271	0.000012	10	--	--	--
Chloroform		0.098	0.000435	0.154	0.104	0.000010	10	--	--	--
Chloromethane		0.09	--	0.388	0.126	0.000007	10	--	--	--
cis-1,2-Dichloroethene		0.007	--	0.302	0.074	0.000011	10	--	--	--
cis-1,3-Dichloropropene		0.02	0.002500	0.053	0.087	0.000010	10	--	--	--
Cyclohexane		6	--	7.618	0.080	0.000009	10	--	--	--
Dibromochloromethane		0.07	--	0.040	0.020	0.000011	10	--	--	--
Dichlorodifluoromethane		0.1	--	16.475	0.067	0.000010	10	--	--	--
4-Ethyltoluene		0.40	--	0.205	0.065	0.000007	10	--	--	--
Ethyl acetate		0.07	--	0.006	0.067	0.000010	10	--	--	--
Freon 113		5	--	21.500	0.038	0.000009	10	--	--	--
Freon 114		17	--	115.000	0.082	0.000009	10	--	--	--
Heptane		0.4	--	83.709	0.065	0.000007	10	--	--	--
Hexachlorobutadiene		--	0.000455	0.421	0.027	0.000007	10	--	--	--
Isooctane		0.4	--	30.500	0.060	0.000007	10	--	--	--
Isopropyl alcohol		0.2	--	0.000331	0.103	0.000011	10	--	--	--
Isopropylbenzene		0.4	--	0.591	0.065	0.000007	10	--	--	--
Methyl ethyl ketone		5	--	0.001	0.081	0.000010	10	--	--	--
Methyl isobutyl ketone		0.003	--	0.006	0.075	0.000008	10	--	--	--
Methylene chloride		0.6	1	0.151	0.101	0.000012	10	--	--	--
MTBE		0.037	--	0.028	0.102	0.000011	10	--	--	--
n-Hexane		0.7	--	73.916	0.200	0.000008	10	--	--	--
Propylene		3	--	8.013	0.110	0.000011	10	--	--	--
Styrene		0.092	--	0.130	0.071	0.000008	10	--	--	--
Tetrachloroethylene		0.36	0.038462	1.077	0.072	0.000008	10	--	--	--
Tetrahydrofuran		2	--	0.003	0.099	0.000011	10	--	--	--
trans-1,2-Dichloroethene		--	--	0.277	0.071	0.000012	10	--	--	--
trans-1,3-Dichloropropene		0.02	0.002500	0.053	0.087	0.000010	10	--	--	--
Trichloroethylene		0.04	0.002439	0.477	0.079	0.000009	10	--	--	--
Trichlorofluoromethane		1.05	--	5.200	0.087	0.000010	10	--	--	--
Vinyl acetate		0.2	--	0.024	0.085	0.000009	10	--	--	--
Vinyl bromide		0.003	--	0.260	0.100	0.000012	10	--	--	--
Vinyl chloride		0.1	0.002273	3.236	0.106	0.000012	10	--	--	--
Hydrogen Sulfide		0.002	--	0.350	0.188	0.000022	10	--	--	--

Notes:

cm^2/s Square centimetres per second.
F1 Fraction 1 (C6-C10).
F2 Fraction 2 (C>10-C16).
mg/m^3 Milligrams per cubic metre.
PHC Petroleum hydrocarbon.
-- Not applicable.

References: Canadian Council of Ministers of the Environment (CCME). 2014. A Protocol for the Derivation of Soil Vapour Quality Guidelines for Protection of Human Exposures via Inhalation of Vapours.

Table 7: Soil Properties for Evaluation of Vapour Transport

Parameter		Units	Coarse-Grained Soil	Fine-Grained Soil
θ_a	Vapour-filled porosity	unitless	0.31	0.303
ρ_b	Dry bulk density	g/cm^3	1.7	1.4
n	Total soil porosity	unitless	0.36	0.47
θ_w	Moisture-filled porosity	unitless	0.05	0.167
Q_{soil}	Soil gas flow rate	cm^3/s	167	16.7

Notes:

Values from CCME (2014).

cm Centimetre.

cm^2 Square centimetre.

g/cm^3 Grams per cubic centimetre.

PHC Petroleum hydrocarbon.

References: Canadian Council of Ministers of the Environment (CCME). 2014. A Protocol for the Derivation of Soil Vapour Quality Guidelines for Protection of Human Exposures via Inhalation of Vapours.

Table 8: Building Properties for Evaluation of Vapour Transport

Parameter		Units	Residential Land Use
			Basement
L_B	Building length	cm	1,225
W_B	Building width	cm	1,225
A_B	Building area exposed to soil, including basement wall area	cm^2	2.7E+06
H_B	Building height	cm	360
L_{crack}	Thickness of the foundation	cm	11.25
A_{crack}	Area of cracks through which contaminant vapours enter the building	cm^2	994.5
ACH	Air exchanges per hour	h^{-1}	0.5

Notes:

Values taken from CCME (2014).

cm Centimetre.

cm^2 Square centimetre.

h^{-1} Per hour.

References: Canadian Council of Ministers of the Environment (CCME). 2014. A Protocol for the Derivation of Soil Vapour Quality Guidelines for Protection of Human Exposures via Inhalation of Vapours.

Table 9: Generic Soil Vapour Criteria

Parameter	Residential Land Use Basement and Slab-on-Grade			
	Units	Coarse-Grained	Units	Coarse-Grained
Benzene	mg/m^3	0.195	µg/m^3	195
Toluene		124		124,220
Ethylbenzene		34		34,330
Xylenes		6		6,330
PHC F1		867		867,380
PHC F2		53		52,500
Naphthalene		0.112		112
Isopropanol		6.22		6,219
1,1,1-Trichloroethane		1,694		1,693,510
1,1,2,2-Tetrachloroethane		0.01		11
1,1,2-Trichloroethane		0.01		7
1,1-Dichloroethane		0.43		430
1,1-Dichloroethene		6.47		6,470
1,2,4-Trichlorobenzene		0.36		365
1,2,4-Trimethylbenzene		2.23		2,235
1,2-Dibromoethane		0.59		590
1,2-Dichlorobenzene		7.07		7,072
1,2-Dichloroethane		0.02		24
1,2-Dichloroethene (cis)		0.24		242
1,2-Dichloroethene (trans)		NG		NG
1,2-Dichloropropane		0.14		135
1,3,5-Trimethylbenzene		2.23		2,235
1,3-Butadiene		0.02		17
1,3-Dichlorobenzene		0.06		64
1,3-Dichloropropene [cis]		0.16		163
1,3-Dichloropropene [trans]		0.15		149
1,4-Dichlorobenzene		0.06		64
1,4-Dioxane		0.11		105
1-Methyl-4 ethyl benzene		14.46		14,461
2-Butanone (MEK)		167		167,364
2-Hexanone (MBK)		1.05		1,053
4-Methyl-2-pentanone (MIBK)		0.1		103
Acetone		919		918,788
Allyl chloride		0.03		32
Benzyl chloride		0.03		34
Bromodichloromethane		0.03		28
Bromoform		1.49		1,494
Bromomethane		0.17		173
Carbon disulfide		21.71		21,713
Carbon tetrachloride		0.11		113
Chlorobenzene		0.35		347
Chloroethane		31		31,019
Chloroform		0.03		27
Chloromethane		2.66		2,657
Cyclohexane		202		201,510
Dibromochloromethane		4.75		4,750
Dichlorodifluoromethane		3.58		3,584
Ethyl acetate		2.51		2,509
Freon 113		231		230,627
Freon 114		566.00		566,335
Heptane		14.46		14,461
Hexachlorobutadiene		0.05		51
Hexane		18.84		18,839
Isooctane		14.92		14,917
iso-Propylbenzene (cumene)		14.46		14,461
Methyl t-Butyl Ether (MTBE)		1.15		1,153
Methylene Chloride		18.76		18,764
Propylene		92		91,723
Styrene		3.22		3,220
Tetrachloroethene		2.68		2,679
Tetrahydrofuran		62.83		62,828
Trichloroethene		0.15		153
Trichlorofluoromethane		34.32		34,325
Vinyl acetate		6.59		6,586
Vinyl bromide (bromoethene)		0.09		94
Vinyl chloride		0.14		140

Notes:

mg/m^3 Milligrams per cubic metre.
µg/m^3 Micrograms per cubic metre.

Table 10: Soil Vapour Risk Evaluation

Parameter	Unit	Soil Vapour Screening Criteria [a]	Soil Vapour Results (µg/m^3)					Comparisons of Soil Vapour Measurements to Soil Vapour Criteria									
								Estimated Cancer Risk [b]					Estimated Hazard Quotients [c]				
			VP13-01	VW-01	19DUP-01	VP13-02	VW-02	VP13-01	VW-01	19DUP-01	VP13-02	VW-02	VP13-01	VW-01	19DUP-01	VP13-02	VW-02
Benzene	µg/m^3	195	ND	1.54	2.55	ND	2.11	ND	7.9E-08	1.3E-07	ND	1.1E-07	--	--	--	--	--
Toluene	µg/m^3	124,220	ND	17.7	4.24	1.49	4.75	-	-	-	-	-	ND	1.42E-04	3.41E-05	1.20E-05	3.82E-05
Xylenes Total	µg/m^3	6,330	ND	2.0	4.5	5.26	3.3	-	-	-	-	-	ND	3.16E-04	7.11E-04	8.31E-04	5.21E-04
F1 (C_6-C_{10})	µg/m^3	867,383	ND	146	199	ND	76	-	-	-	-	-	ND	1.68E-04	2.29E-04	ND	8.76E-05
F2 (C_{10}-C_{16})	µg/m^3	52,495	ND	88	201	12	50	-	-	-	-	-	ND	1.68E-03	3.83E-03	2.29E-04	9.52E-04
Aliphatics (C_6-C_8)	µg/m^3	7,208,479	ND	56	31	ND	59	-	-	-	-	-	ND	7.77E-06	4.30E-06	ND	8.18E-06
Aliphatics (>C_8-C_{10})	µg/m^3	391,765	ND	83	152	ND	50	-	-	-	-	-	ND	2.12E-04	3.88E-04	ND	1.28E-04
Aliphatics (>C_{10}-C_{12})	µg/m^3	391,765	ND	70	145	ND	32	-	-	-	-	-	ND	1.79E-04	3.70E-04	ND	8.17E-05
Aliphatics (>C_{12}-C_{16})	µg/m^3	40,257	75.30	<30	<30	28.6	<30	-	-	-	-	-	1.87E-03	ND	ND	7.10E-04	ND
Isopropanol	µg/m^3	6,219	ND	2.8	<2.5	ND	<2.5	-	-	-	-	-	ND	4.50E-04	ND	ND	ND
1,1-Dichloroethane	µg/m^3	430	ND	<0.81	<0.81	5.24	<0.81	-	-	-	-	-	ND	ND	ND	1.22E-02	ND
1,2,4-Trimethylbenzene	µg/m^3	2,235	ND	<0.98	<0.98	2.47	<0.98	-	-	-	-	-	ND	ND	ND	1.11E-03	ND
2-Butanone (MEK)	µg/m^3	167,364	ND	1.12	1.23	ND	1.15	-	-	-	-	-	ND	6.69E-06	7.35E-06	ND	6.87E-06
Acetone	µg/m^3	918,788	5.19	16.3	12.6	ND	13.1	-	-	-	-	-	5.65E-06	1.77E-05	1.37E-05	ND	1.43E-05
Carbon disulfide	µg/m^3	21,713	34.50	<0.62	<0.62	7.09	11.7	-	-	-	-	-	1.59E-03	ND	ND	3.27E-04	5.39E-04
Chloroform	µg/m^3	27 / 3040 [e]	ND	<0.98	<0.98	9.83	<0.98	ND	ND	ND	3.6E-06	ND	ND	ND	ND	3.23E-03	ND
Chloromethane	µg/m^3	2,657	ND	1.05	1.04	ND	1.7	-	-	-	-	-	ND	3.95E-04	3.91E-04	ND	6.40E-04
Cyclohexane	µg/m^3	201,510	ND	<0.69	<0.69	ND	1.2	-	-	-	-	-	ND	ND	ND	ND	5.96E-06
Dichlorodifluoromethane	µg/m^3	3,584	30.20	2.76	2.75	3.3	23.8	-	-	-	-	-	8.43E-03	7.70E-04	7.67E-04	9.21E-04	6.64E-03
Ethyl acetate	µg/m^3	2,509	ND	11.9	0.76	ND	<0.72	-	-	-	-	-	ND	4.74E-03	3.03E-04	ND	ND
Heptane	µg/m^3	14,461	ND	<0.82	0.99	7.8	1.35	-	-	-	-	-	ND	ND	6.85E-05	5.39E-04	9.34E-05
Hexane	µg/m^3	18,839	ND	20.1	2.25	2.93	2.42	-	-	-	-	-	ND	1.07E-03	1.19E-04	1.56E-04	1.28E-04
Isooctane	µg/m^3	14,917	ND	<0.93	1.05	ND	1.92	-	-	-	-	-	ND	ND	7.04E-05	ND	1.29E-04
Methyl t-Butyl Ether (MTBE)	µg/m^3	1,153	ND	18.9	<0.72	ND	<0.72	-	-	-	-	-	ND	1.64E-02	ND	ND	ND
Methylene Chloride	µg/m^3	18,764 / 908,698[e]	ND	4.00	<0.69	ND	<0.69	ND	2.1E-10	ND	ND	ND	ND	4.40E-06	ND	ND	ND
Tetrahydrofuran	µg/m^3	62,828	ND	0.80	0.60	ND	<0.59	-	-	-	-	-	ND	1.27E-05	9.55E-06	ND	ND
Trichloroethene	µg/m^3	153 / 13,527[e]	ND	<1.1	1.4	ND	<1.1	ND	ND	6.4E-09	ND	ND	ND	ND	1.03E-04	ND	ND
Trichlorofluoromethane	µg/m^3	34,325	1.75	1.3	1.3	1.25	1.6	-	-	-	-	-	5.10E-05	3.79E-05	3.79E-05	3.64E-05	4.66E-05
Cumulative Risk and Hazard Index [d]								**ND**	7.9E-08	1.4E-07	3.6E-06	1.1E-07	0.012	0.027	0.007	0.020	0.010
Target Risk and Hazard Levels										**1.0 x 10^{-5}**					**1.00**		

Notes:

< – not detected. Listed value is the corresponding detection limit.

- = screening criteria not calculated as appropriate toxicity data not available.

Bold = identifies estimated risks and hazards that exceed the target risk level of 1 x 10^{-5} or target hazard level of 1.

[a] Listed soil vapour screening criteria derived in accordance with CCME, 2014.

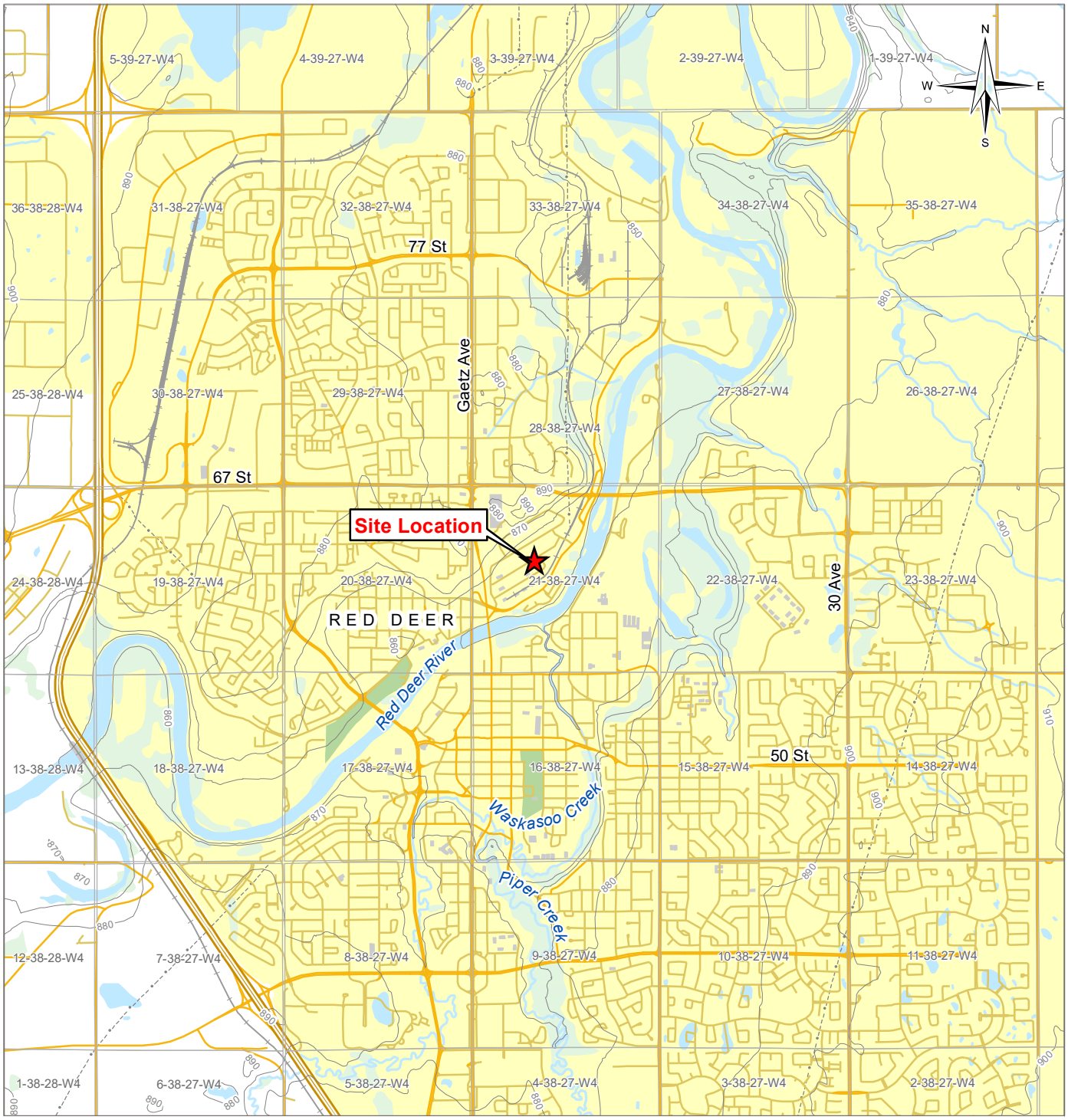
[b] Estimated cancer risk = (soil vapour concentration/cancer soil vapour screening level) x 10^{-5}.

[c] Estimated hazard quotient = (soil vapour concentration/non-cancer soil vapour screening level).

[d] Cumulative risk and hazard index represent the sum of chemical-specific cancer risks and hazard quotients.

[e] Soil vapour screening criteria shows both the threshold criteria and non-threshold criteria. Target risk and hazard levels are calculated with the appropriate criteria.

FIGURES



LEGEND

- Site Location
- Highway
- Main Road
- Local Road
- Resource/Recreational Road
- Railway
- Power Line
- Building
- Park
- Residential Area
- Contour (10 m)
- Watercourse
- Waterbody
- Wooded Area
- Urban Area

NOTES
Base data source: CanVec 1:50,000.

STATUS
ISSUED FOR USE

2019 GROUNDWATER AND SOIL VAPOUR MONITORING REPORT RIVERSIDE LIGHT INDUSTRIAL PARK

Site Location Plan

PROJECTION	DATUM	CLIENT
3TM 114	NAD83	The City of Red Deer

Scale: 1:50,000
1 0.5 0 1
Kilometres

FILE NO. SWOP04071-01_Figure1_SiteLocation.mxd

OFFICE	DWN	CKD	APVD	REV
Tt-EDM	DS	MV	MR	0

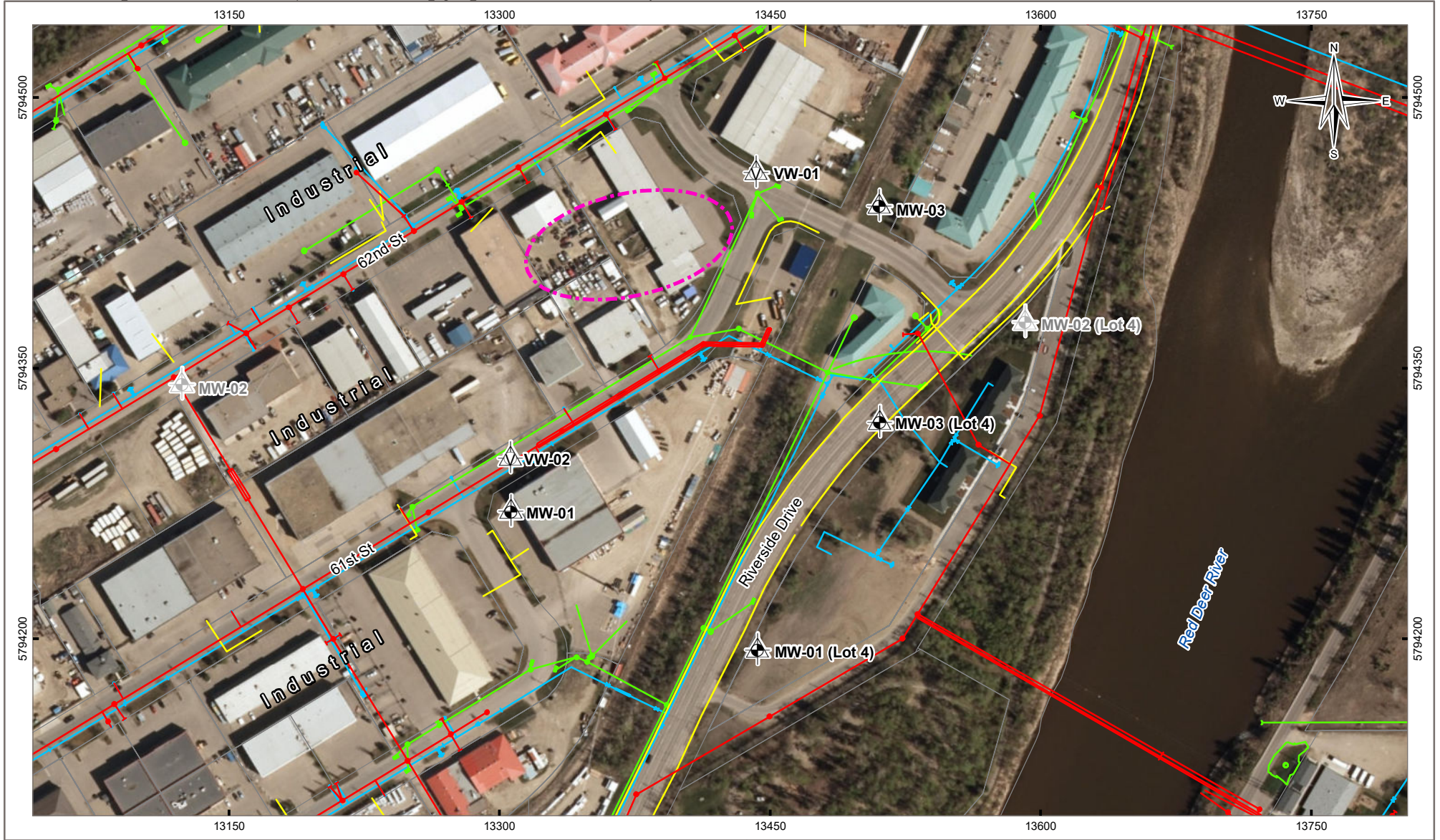
DATE October 1, 2020
PROJECT NO. SWM.SWOP04071-01.008

TETRA TECH

Figure 1

Q:\Edmonton\GIS\SOLID_WASTE\SWOP\SWOP04071-01\Maps\Task008\SWOP04071-01_Figure1_SiteLocation.mxd modified 2020-10-01 by Darren.Schouls

Q:\Edmonton\GIS\SOLID_WASTE\SWOP\SWOP04071-01\Maps\Task008\SWOP04071-01_Figure2_LandUse.mxd modified 2020-10-02 by Darren.Schouls



LEGEND

- Monitoring Well
- Destroyed Monitoring Well
- Vapour Well
- Historic Waste Disposal (Provided by Tiamat, 2014)
- Lot Boundary

Utilities

- Electrical
- Sanitary
- Storm
- Water

NOTES

Base data source: Imagery provided by ESRI; Red Deer County (2018)
Roads from City of Red Deer Open Data, 2018
Utilities provided by City of Red Deer. Locations have not been field verified, and should not be used for construction or other intrusive field activities.

STATUS
ISSUED FOR USE

Scale: 1:3,000

60 30 0 60

Metres

PROJECTION	DATUM
3TM 114	NAD83

FILE NO.
SWOP04071-01_Figure2_LandUse.mxd

CLIENT
The City of Red Deer

TETRA TECH

2019 GROUNDWATER AND SOIL VAPOUR MONITORING REPORT RIVERSIDE LIGHT INDUSTRIAL PARK

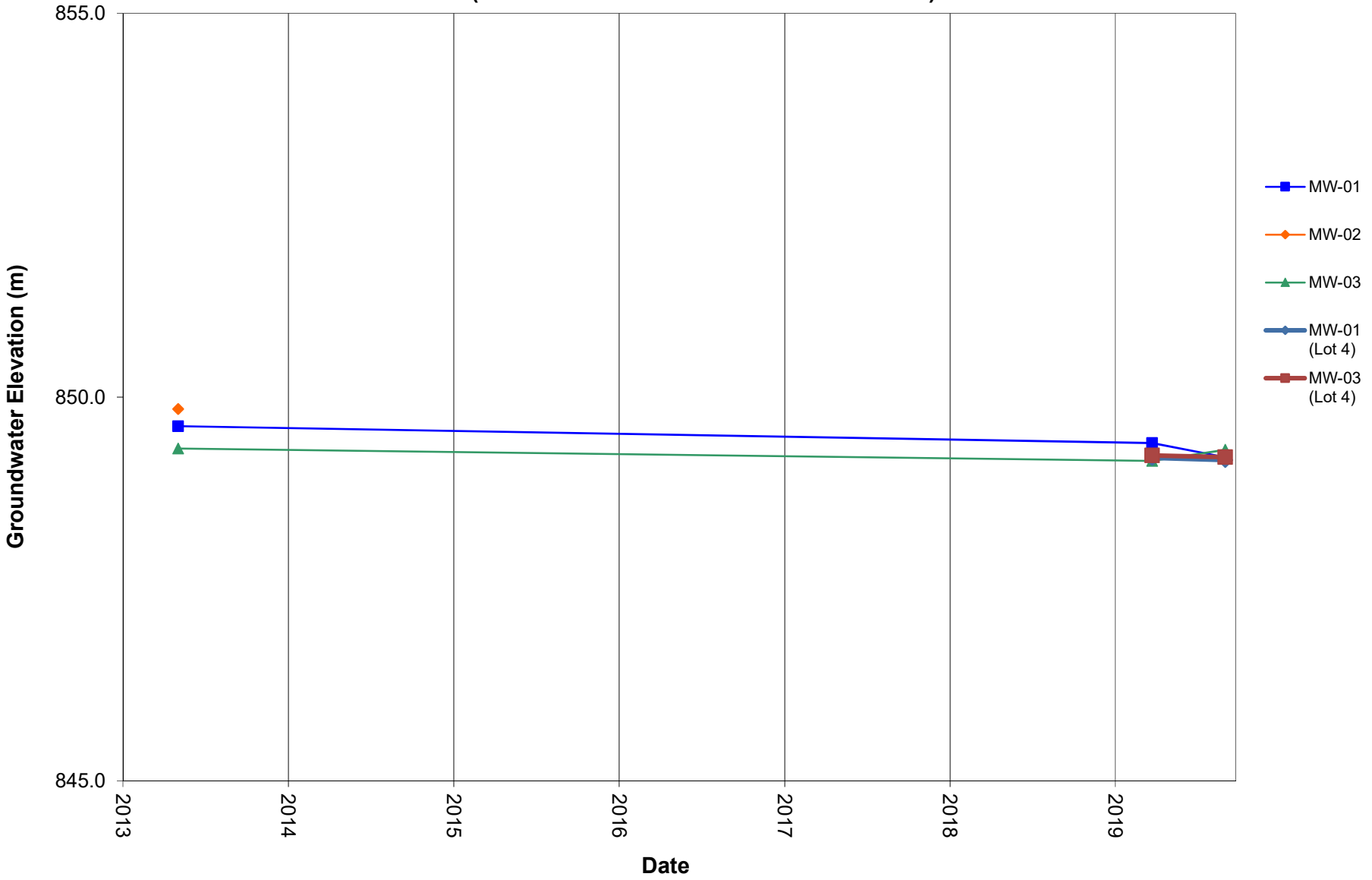
Site Plan and Surrounding Land Use

OFFICE	DWN	CKD	APVD	REV
Tt-EDM	DS	MV	MR	0

DATE	PROJECT NO.
October 2, 2020	SWM.SWOP04071-01.008

Figure 2

FIGURE 3
HISTORICAL GROUNDWATER ELEVATIONS
(GROUNDWATER MONITORING WELLS)



TETRA TECH

Q:\Edmonton\GIS\SOLID_WASTE\SWOP\SWOP04071-01\Maps\Task008\SWOP04071-01_Figure4_GW_June2019.mxd modified 2020-10-02 by Darren.Schouls

LEGEND

- Monitoring Well
- Destroyed Monitoring Well
- Vapour Well
- (###.##) Groundwater Elevation (masl)
- Historic Waste Disposal
- Road

NOTES
Base data source: Imagery provided by ESRI; Red Deer County (2018)
Roads from City of Red Deer Open Data, 2018
masl - metres above sea level
* - not measured

STATUS
ISSUED FOR USE

Scale: 1:2,500
50 25 0 50
Metres

PROJECTION	DATUM
3TM 114	NAD83

FILE NO.
SWOP04071-01_Figure4_GW_June2019.mxd

CLIENT
The City of Red Deer

TETRA TECH

2019 GROUNDWATER AND SOIL VAPOUR MONITORING REPORT RIVERSIDE LIGHT INDUSTRIAL PARK

Groundwater Elevations June 2019

OFFICE	DWN	CKD	APVD	REV
Tt-EDM	DS	MV	MR	0

DATE	PROJECT NO.
October 2, 2020	SWM.SWOP04071-01.008

Figure 4

Q:\Edmonton\GIS\SOLID_WASTE\SWOP\SWOP04071-01\Maps\Task008\SWOP04071-01_Figure5_GW_Dec2019.mxd modified 2020-10-02 by Darren.Schouls

LEGEND

- Monitoring Well
- Destroyed Monitoring Well
- Vapour Well
- (###.##) Groundwater Elevation (masl)
- Historic Waste Disposal
- Road

NOTES
Base data source: Imagery provided by ESRI; Red Deer County (2018)
Roads from City of Red Deer Open Data, 2018
masl - metres above sea level
* - not measured

STATUS
ISSUED FOR USE

Scale: 1:2,500
50 25 0 50
Metres

PROJECTION	DATUM
3TM 114	NAD83

FILE NO. SWOP04071-01_Figure5_GW_Dec2019.mxd

CLIENT The City of Red Deer

TETRA TECH

2019 GROUNDWATER AND SOIL VAPOUR MONITORING REPORT RIVERSIDE LIGHT INDUSTRIAL PARK

Groundwater Elevations December 2019

OFFICE	DWN	CKD	APVD	REV
Tt-EDM	DS	MV	MR	0

DATE	PROJECT NO.
October 2, 2020	SWM.SWOP04071-01.008

Figure 5

APPENDIX A

TETRA TECH'S LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

GEOENVIRONMENTAL

1.1 USE OF DOCUMENT AND OWNERSHIP

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Where TETRA TECH submits electronic file and/or hard copy versions of the Professional Document or any drawings or 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. The original signed and/or sealed electronic file and/or hard copy version archived by TETRA TECH shall be deemed to be the original. TETRA TECH will archive a protected digital copy of the original signed and/or sealed version for a period of 10 years.

Both electronic file and/or hard copy versions of TETRA TECH's Instruments of Professional Service shall not, under any circumstances, be altered by any party except TETRA TECH. TETRA TECH's Instruments of Professional Service will be used only and exactly as submitted by TETRA TECH.

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1.3 STANDARD OF CARE

Services performed by TETRA TECH for the Professional Document have been conducted in accordance with the Contract, in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Professional Document. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of the Professional Document.

If any error or omission is detected by the Client or an Authorized Party, the error or omission must be immediately brought to the attention of TETRA TECH.

1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with TETRA TECH with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for TETRA TECH to properly provide the services contracted for in the Contract, TETRA TECH has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

1.5 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of this Professional Document, TETRA TECH may have relied on information provided by persons other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

1.6 GENERAL LIMITATIONS OF DOCUMENT

This Professional Document is based solely on the conditions presented and the data available to TETRA TECH at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document 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 conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this report, at or on the development proposed as of the date of the Professional Document requires a supplementary investigation and assessment.

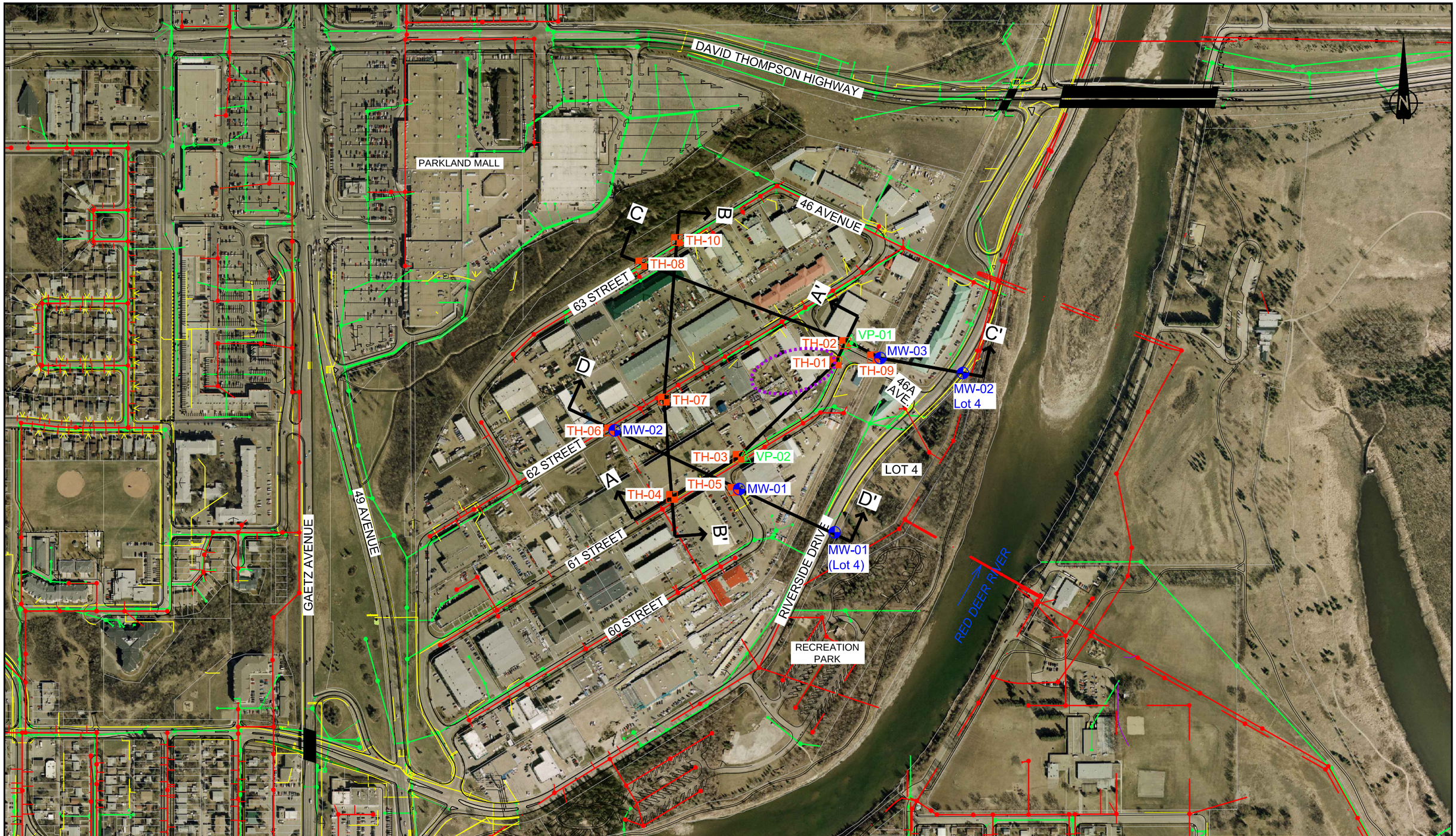
TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 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.

APPENDIX B

CROSS-SECTIONS (TIAMAT 2014A)



SOURCE
2010 ORTHOGRAPHIC IMAGE © COPYRIGHT WITH PERMISSION FROM THE CITY OF RED DEER.

0 50 100 200m
Scale 1:5000

PHASE II TEST LOCATIONS
MW-## GROUNDWATER MONITORING WELL (3)
TH-## TESTHOLE (10)
VW-## SOIL VAPOUR MONITORING WELL (2)

LEGEND
HISTORIC WASTE DISPOSAL
LOT BOUNDARY
CROSS SECTION LOCATION
ELECTRICAL
SANITARY
STORM
WATER

NOTE:
LOCATION OF BURIED UTILITIES ARE APPROXIMATE, ACTUAL LOCATIONS OF THE SHALLOW UTILITIES AND ANY OTHER UTILITIES SHOULD BE VERIFIED PRIOR TO ANY GROUND DISTURBANCE ACTIVITY.

CLIENT: THE CITY OF RED DEER

PROJECT: ENVIRONMENTAL RISK MANAGEMENT PLAN
HISTORIC WASTE DISPOSAL SITE
RIVERSIDE LIGHT INDUSTRIAL PARK

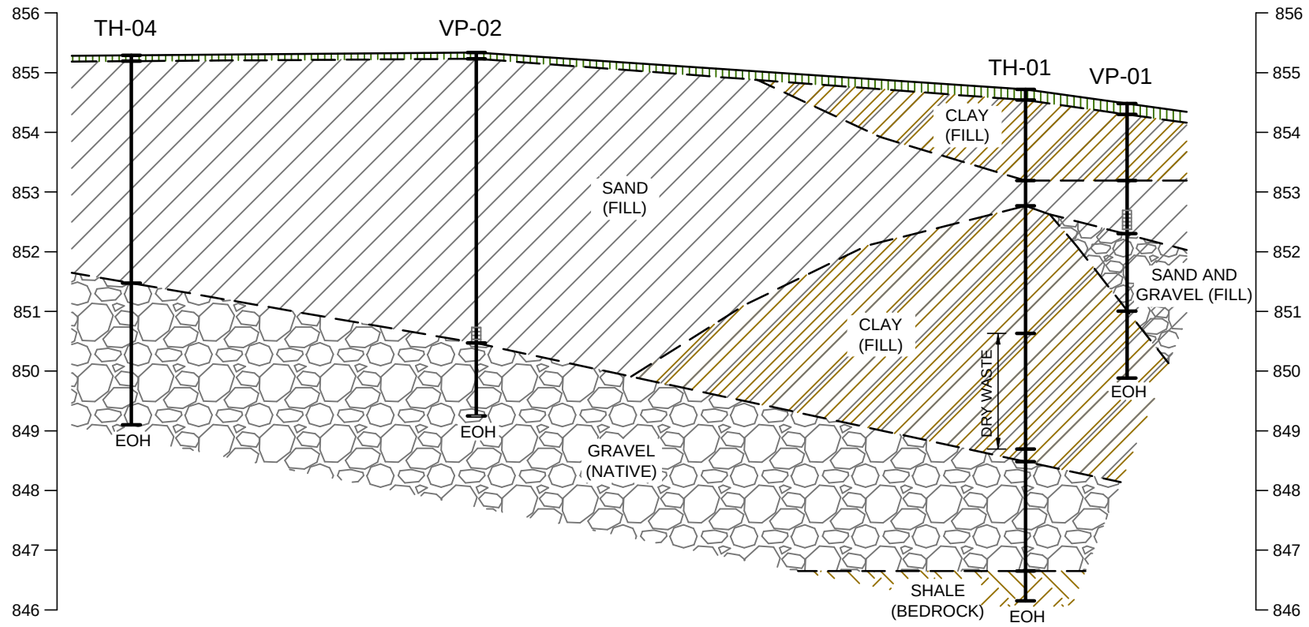
TITLE: SITE PLAN SHOWING INTERPRETED EXTENT OF WASTE

Tiamat Environmental Consultants Ltd.

SCALE:	DATE:	PROJECT NO.:	FIGURE NO.:
1 : 5000	June 1/14	12-435	FIGURE 2
DRAWN BY: LCH	CHECKED BY: LTM	CAD FILE NO.: ERMP v1.02.dwg	

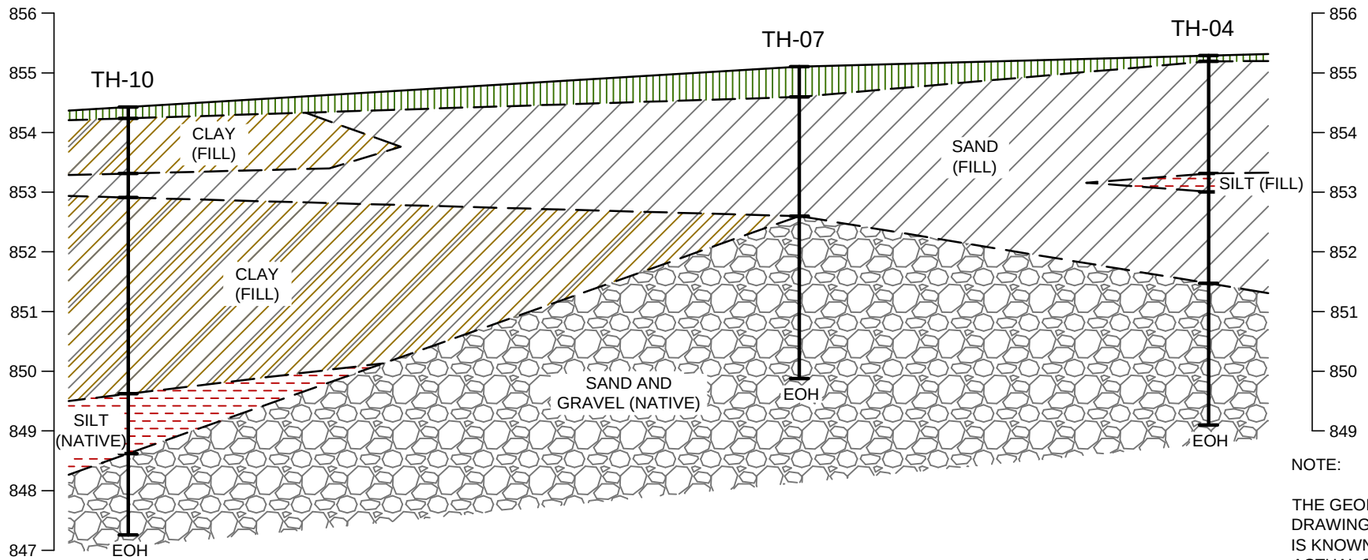
A
SOUTHWEST

A'
NORTHEAST



B
NORTH

B'
SOUTH



NOTE:

THE GEOLOGIC AND STRATIGRAPHIC SECTIONS SHOWN ON THIS DRAWING ARE INTERPRETED FROM BOREHOLE LOGS. STRATIGRAPHY IS KNOWN WITH CERTAINTY ONLY AT THE BOREHOLE LOCATIONS. ACTUAL STRATIGRAPHY AND GEOLOGIC CONDITIONS BETWEEN BOREHOLES MAY VARY FROM THAT INDICATED ON THIS DRAWING.

0 2 5 10m
Vertical Scale 1:200

0 20 50 100m
Horizontal Scale 1:2000

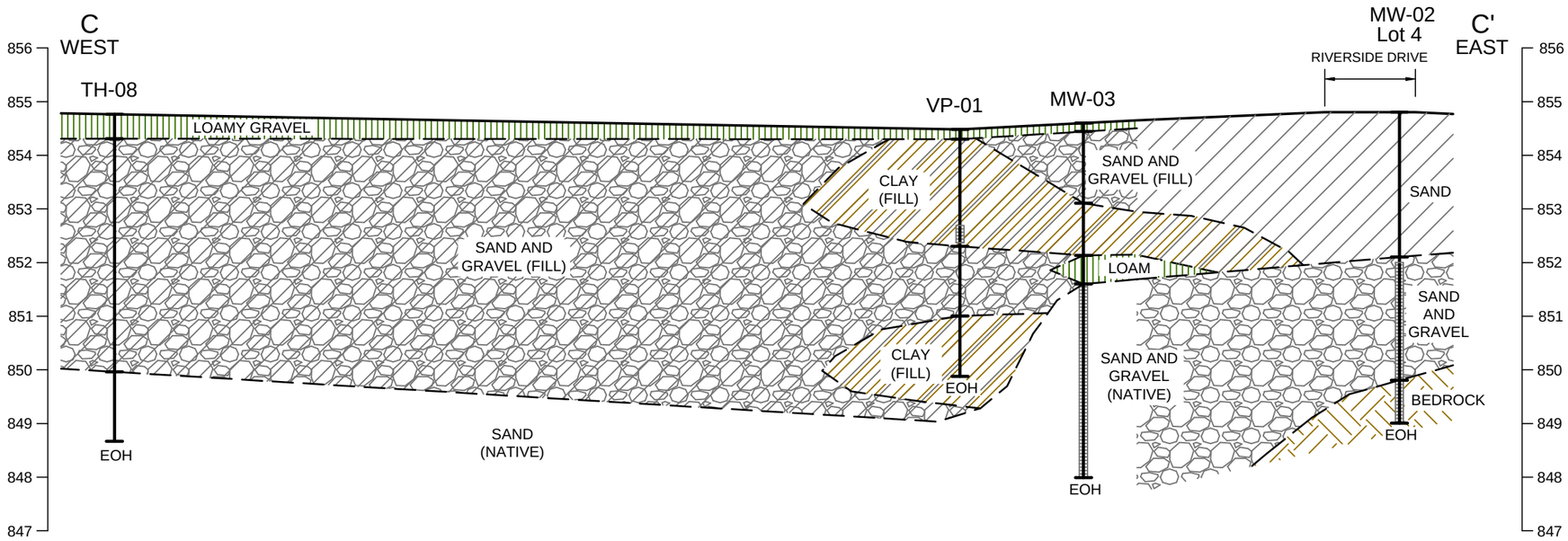
CLIENT: THE CITY OF RED DEER

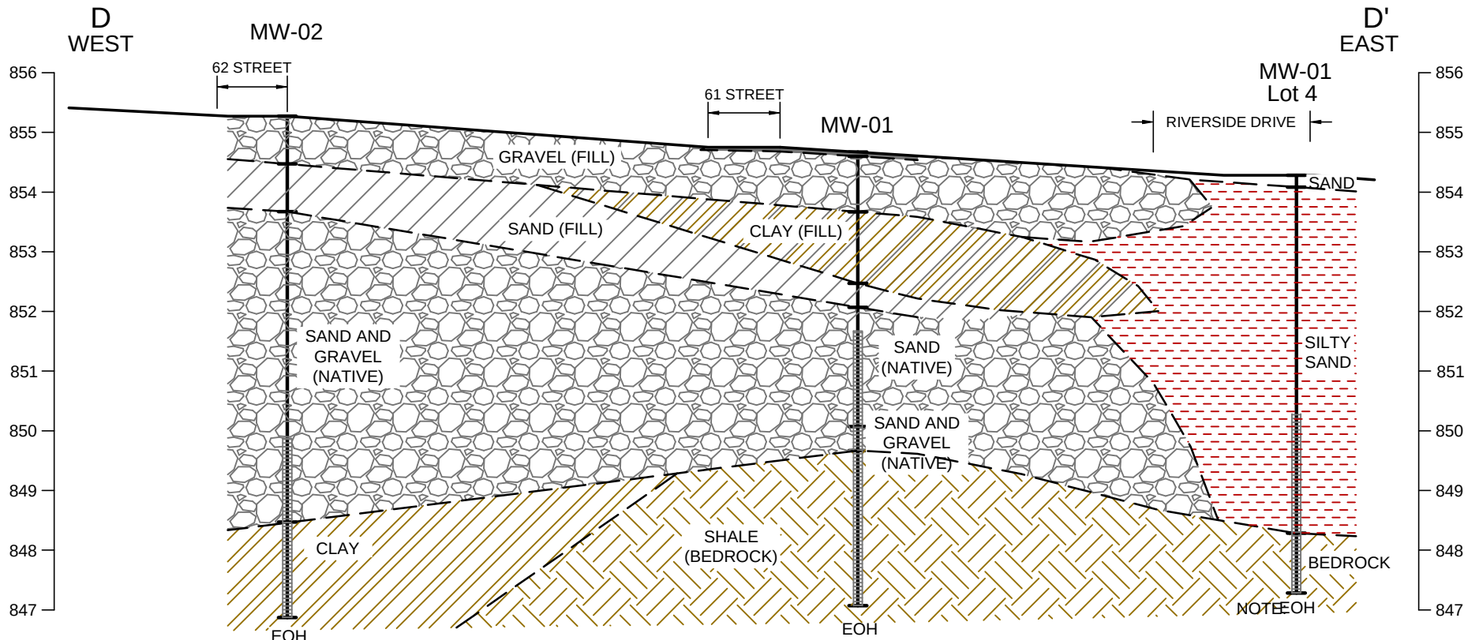
PROJECT: ENVIRONMENTAL RISK MANAGEMENT PLAN
HISTORIC WASTE DISPOSAL SITE
RIVERSIDE LIGHT INDUSTRIAL PARK

TITLE: CROSS SECTION A - A` AND B - B'

Tiamat Environmental Consultants Ltd.

SCALE:	DATE:	PROJECT NO.:	FIGURE NO.:
AS SHOWN	June 1/14	12-435	FIGURE 3A
DRAWN BY: LCH	CHECKED BY: LTM	CAD FILE NO.: ERMP Sections v1.02	





THE GEOLOGIC AND STRATIGRAPHIC SECTIONS SHOWN ON THIS DRAWING ARE INTERPRETED FROM BOREHOLE LOGS. STRATIGRAPHY IS KNOWN WITH CERTAINTY ONLY AT THE BOREHOLE LOCATIONS. ACTUAL STRATIGRAPHY AND GEOLOGIC CONDITIONS BETWEEN BOREHOLES MAY VARY FROM THAT INDICATED ON THIS DRAWING.

0 2 5 10m
Vertical Scale 1:200

0 20 50 100m
Horizontal Scale 1:2000

CLIENT: THE CITY OF RED DEER

PROJECT: ENVIRONMENTAL RISK MANAGEMENT PLAN
HISTORIC WASTE DISPOSAL SITE
RIVERSIDE LIGHT INDUSTRIAL PARK

TITLE: CROSS SECTIONS C - C` AND D - D`

Tiamat Environmental Consultants Ltd.

SCALE:	DATE:	PROJECT NO.:	FIGURE NO.:
AS SHOWN	Feb. 5/15	12-435	FIGURE 3B
DRAWN BY: LCH	CHECKED BY: LTM	CAD FILE NO.: ERMP Sections v1.04	

APPENDIX C

WATER WELL DATA

Reconnaissance Report

View in Metric

Export to Excel

Groundwater Wells

Please click the water Well ID to generate the Water Well Drilling Report.

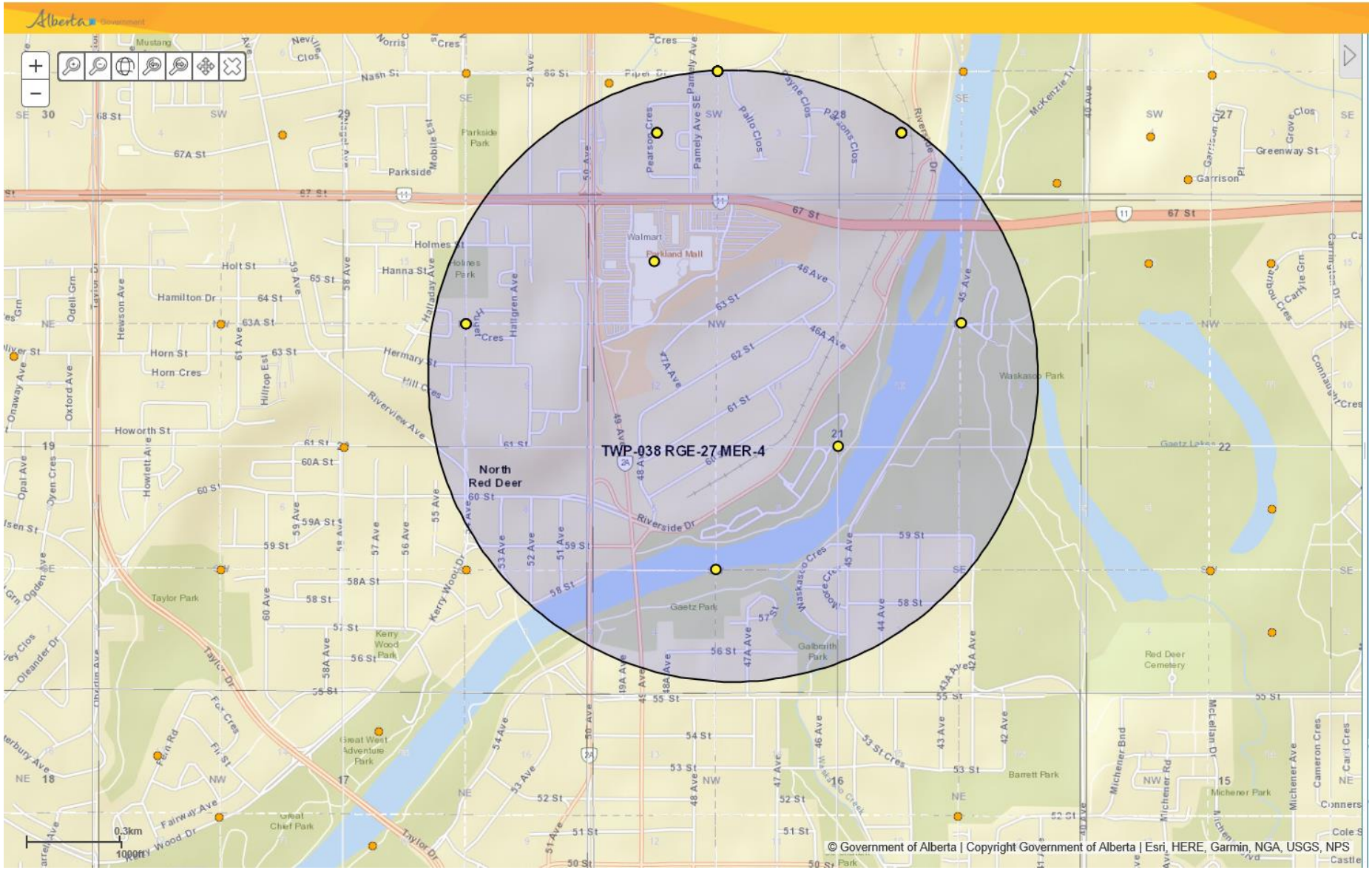
GIC Well ID	LSD	SEC	TWP	RGE	M	DRILLING COMPANY	DATE COMPLETED	DEPTH (ft)	TYPE OF WORK	USE	CHM	LT	PT	WELL OWNER	STATIC LEVEL (ft)	TEST RATE (igpm)	SC_DIA (in)
96275	NE	20	38	27	4	UNKNOWN DRILLER		0.00	Spring	Domestic	1			HERMARY, G.H.			0.00
96277	SW	21	38	27	4	UNKNOWN DRILLER		0.00	Chemistry	Domestic				ROTARY PARK			0.00
96278	13	21	38	27	4	FORRESTER DRILLING	1961-03-08	85.00	Test Hole	Investigation		4		RED DEER, CITY OF #TH 5,SITE 1	10.30		0.00
96279	NE	21	38	27	4	COMFORT DRLG	1979-05-02	160.00	New Well	Domestic		7		MARSHALL, PHILLIP	36.00	10.00	5.00
96281		21	38	27	4	FORRESTER DRILLING	1960-03-22	15.00	Test Hole	Investigation		3		RED DEER, CITY OF# TH 6			0.00
96380	2	28	38	27	4	HI-RATE DRILLING COMPANY LTD.	1969-11-18	180.00	Test Hole	Investigation		21		RED DEER, CITY OF# TH2 -28			5.50
96380	2	28	38	27	4	UNKNOWNDRILLINGCOMP11		180.00	Old Well-Yield	Unknown		1	22	RED DEER	48.78	11.00	
96381	2	28	38	27	4	FORRESTER DRILLING	1961-03-09	44.00	Test Hole	Investigation	1	4		RED DEER, CITY OF# TH1, SITE1			0.00
96382	2	28	38	27	4	FORRESTER DRILLING	1961-03-08	53.00	Test Hole	Investigation	1	5		RED DEER, CITY OF# TH2 SITE 1			0.00
96383	2	28	38	27	4	FORRESTER DRILLING	1961-03-08	85.00	Test Hole	Investigation		4		RED DEER, CITY OF# TH5, SITE 1			0.00
96670	SW	28	38	27	4	COMFORT DRLG	1965-09-17	200.00	New Well	Industrial		7		SAF-SRA CARWASH	0.00	25.00	7.00
96671	SW	28	38	27	4	FORRESTER DRILLING	1964-03-17	180.00	New Well	Domestic	1	5		BRYANT, K.J.	75.00	15.00	7.00
96672	SW	28	38	27	4	COMFORT DRLG	1968-05-17	190.00	New Well	Industrial		6		SOFSPRA CARWASH	120.00	20.00	7.00
96673	SW	28	38	27	4	FORRESTER DRILLING	1959-05-20	182.00	New Well	Domestic & Industrial		9		A&W DRIVE INN	90.00	2.00	7.00
96673	SW	28	38	27	4	FORRESTER DRILLING	1959-05-20	182.00	New Well	Domestic & Industrial		9	1	A&W DRIVE INN	90.00	16.00	7.00
96674	4	28	38	27	4	FORRESTER DRILLING	1962-03-26	188.00	New Well	Domestic & Industrial		5		DOG & SUDS LTD	91.00	20.00	5.50
96675	4	28	38	27	4	UNKNOWN DRILLER	1952-11-21	720.00	Structure Test Hole	Industrial				CALIFORNIA STANDARD #STH E-340			0.00
96677	4	28	38	27	4	FORRESTER WATER WELL DRILLING (1981) LTD.	1968-10-24	235.00	Deepened	Domestic & Industrial		4		RAY HANNIGAN RESTAURANTS LTD	111.20	16.00	5.50
96678	4	28	38	27	4	UNKNOWN DRILLER	1953-01-07	780.00	Structure Test Hole	Industrial				CALIFORNIA STANDARD#STH E320			0.00
158884	SW	28	38	27	4	ALKEN BASIN DRILLING LTD.	1991-08-28	160.00	New Well	Domestic		20		MACBETH, GARNETT	60.00	20.00	5.56

Reconnaissance Report

View in Metric

Export to Excel

GIC Well ID	LSD	SEC	TWP	RGE	M	DRILLING COMPANY	DATE COMPLETED	DEPTH (ft)	TYPE OF WORK	USE	CHM	LT	PT	WELL OWNER	STATIC LEVEL (ft)	TEST RATE (igpm)	SC_DIA (in)
158884	SW	28	38	27	4	ALKEN BASIN DRILLING LTD.	1991-08-28	160.00	New Well	Domestic		20		MACBETH, GARNETT	60.00	15.00	5.56
258627	NE	20	38	27	4	FORRESTER DRILLING	1969-05-06	190.00	New Well	Domestic	1	9		AGT TOWER BUILDING			7.00


TWP-038 RGE-27 MER-4
North Red Deer
67 St
Riverside Dr
Parkland Mall
Walmart
Waskasoo Park
Gaetz Park
Gaetz Lakes
Taylor Park
Kerry Wood Park
Great West Adventure Park
Great Chief Park
Galbraith Park
Barrett Park
Michener Park
Red Deer Cemetery
Parkside
Garrison
Holmes Park
Parkside Park
Taylor Dr
Riverview Ave
Hermary St
Hanna St
Holt St
Howorth St
Horn Cres
Hamilton Dr
Nash St
Greenway St
0.3km
1000ft
© Government of Alberta | Copyright Government of Alberta | Esri, HERE, Garmin, NGA, USGS, NPS

APPENDIX D

LABORATORY ANALYTICAL REPORTS

TETRA TECH CANADA INC.
ATTN: Darby Madalena
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3

Date Received: 06-DEC-19
Report Date: 30-DEC-19 12:55 (MT)
Version: FINAL

Client Phone: 403-203-3355

Certificate of Analysis

Lab Work Order #: L2393428

Project P.O. #: SWOP04071-01.008
Job Reference: SWOP04071-01.008
C of C Numbers: RIVERSIDE LIGHT
Legal Site Desc:

Dhaliwal

Inayat Dhaliwal
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393428-1 MW-01							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 12:55							
Matrix: WATER							
F1 (C6-C10) and F2 (>C10-C16)							
CCME F2-4 Hydrocarbons							
F2: (C10-C16)	<0.10		0.10	mg/L	16-DEC-19	17-DEC-19	R4944846
Surrogate: 2-Bromobenzotrifluoride	63.3		60-140	%	16-DEC-19	17-DEC-19	R4944846
F1 (C6-C10)							
F1(C6-C10)	<0.10		0.10	mg/L		13-DEC-19	R4944123
F1-BTEX	<0.10		0.10	mg/L		13-DEC-19	R4944123
Surrogate: 3,4-Dichlorotoluene	96.3		70-130	%		13-DEC-19	R4944123
Miscellaneous Parameters							
AOX	ND U		10	mg/L		12-DEC-19	R4955245
Ammonia, Total (as N)	<0.050		0.050	mg/L		16-DEC-19	R4943991
Dissolved Organic Carbon	7.5		1.0	mg/L		13-DEC-19	R4943303
Xylenes	<0.00071		0.00071	mg/L		16-DEC-19	
Total Kjeldahl Nitrogen	<0.20		0.20	mg/L		12-DEC-19	R4943090
Phosphorus (P)-Total	0.0997		0.0050	mg/L		13-DEC-19	R4943276
Volatile fatty/carboxylic acids							
Formic Acid	<50	DLM	50	mg/L		14-DEC-19	R4943956
Acetic Acid	<10		10	mg/L		14-DEC-19	R4943956
Propionic Acid	<5.0		5.0	mg/L		14-DEC-19	R4943956
Butyric Acid	<1.0		1.0	mg/L		14-DEC-19	R4943956
Isobutyric Acid	<1.0		1.0	mg/L		14-DEC-19	R4943956
Valeric Acid	<1.0		1.0	mg/L		14-DEC-19	R4943956
Isovaleric Acid	<1.0		1.0	mg/L		14-DEC-19	R4943956
Caproic (Hexanoic) Acid	<1.0		1.0	mg/L		14-DEC-19	R4943956
Major Ions & Trace Dissolved Metals							
Chloride in Water by IC							
Chloride (Cl)	125	DLDS	2.5	mg/L		07-DEC-19	R4938288
Dissolved Mercury in Water by CVAAS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L		13-DEC-19	R4943011
Dissolved Mercury Filtration Location	FIELD					13-DEC-19	R4942998
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					09-DEC-19	R4938487
Aluminum (Al)-Dissolved	0.305	DLDS	0.0050	mg/L		09-DEC-19	R4937828
Antimony (Sb)-Dissolved	<0.00050	DLDS	0.00050	mg/L		09-DEC-19	R4937828
Arsenic (As)-Dissolved	0.00053	DLDS	0.00050	mg/L		09-DEC-19	R4937828
Barium (Ba)-Dissolved	0.168	DLDS	0.00050	mg/L		09-DEC-19	R4937828
Boron (B)-Dissolved	0.114	DLDS	0.050	mg/L		09-DEC-19	R4937828
Cadmium (Cd)-Dissolved	0.000407	DLDS	0.000025	mg/L		09-DEC-19	R4937828
Calcium (Ca)-Dissolved	229	DLDS	0.25	mg/L		09-DEC-19	R4937828
Chromium (Cr)-Dissolved	<0.00050	DLDS	0.00050	mg/L		09-DEC-19	R4937828
Copper (Cu)-Dissolved	0.0021	DLDS	0.0010	mg/L		09-DEC-19	R4937828
Iron (Fe)-Dissolved	0.379	DLDS	0.050	mg/L		09-DEC-19	R4937828
Lead (Pb)-Dissolved	0.00062	DLDS	0.00025	mg/L		09-DEC-19	R4937828
Magnesium (Mg)-Dissolved	75.2	DLDS	0.025	mg/L		09-DEC-19	R4937828
Manganese (Mn)-Dissolved	0.0950	DLDS	0.00050	mg/L		09-DEC-19	R4937828
Nickel (Ni)-Dissolved	0.0061	DLDS	0.0025	mg/L		09-DEC-19	R4937828
Potassium (K)-Dissolved	8.78	DLDS	0.25	mg/L		09-DEC-19	R4937828
Selenium (Se)-Dissolved	0.00056	DLDS	0.00025	mg/L		09-DEC-19	R4937828
Silver (Ag)-Dissolved	<0.000050	DLDS	0.000050	mg/L		09-DEC-19	R4937828
Sodium (Na)-Dissolved	69.7	DLDS	0.25	mg/L		09-DEC-19	R4937828
Uranium (U)-Dissolved	0.00766	DLDS	0.000050	mg/L		09-DEC-19	R4937828
Zinc (Zn)-Dissolved	0.0266	DLDS	0.0050	mg/L		09-DEC-19	R4937828

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393428-1 MW-01							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 12:55							
Matrix: WATER							
Fluoride in Water by IC							
Fluoride (F)	<0.10	DLDS	0.10	mg/L		07-DEC-19	R4938288
Ion Balance Calculation							
Ion Balance	93.7			%		16-DEC-19	
TDS (Calculated)	1190			mg/L		16-DEC-19	
Hardness (as CaCO3)	881			mg/L		16-DEC-19	
Nitrate in Water by IC							
Nitrate (as N)	29.6	DLDS	0.10	mg/L		07-DEC-19	R4938288
Nitrate+Nitrite							
Nitrate and Nitrite (as N)	29.6		0.11	mg/L		09-DEC-19	
Nitrite in Water by IC							
Nitrite (as N)	<0.050	DLDS	0.050	mg/L		07-DEC-19	R4938288
Sulfate in Water by IC							
Sulfate (SO4)	135	DLDS	1.5	mg/L		07-DEC-19	R4938288
pH, Conductivity and Total Alkalinity							
pH	7.32		0.10	pH		14-DEC-19	R4943994
Conductivity (EC)	1820		2.0	uS/cm		14-DEC-19	R4943994
Bicarbonate (HCO3)	844		5.0	mg/L		14-DEC-19	R4943994
Carbonate (CO3)	<5.0		5.0	mg/L		14-DEC-19	R4943994
Hydroxide (OH)	<5.0		5.0	mg/L		14-DEC-19	R4943994
Alkalinity, Total (as CaCO3)	692		2.0	mg/L		14-DEC-19	R4943994
EPA 8260 Volatile Organics							
VOCs in Water							
1,1,1,2-Tetrachloroethane	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
1,1,1-Trichloroethane	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
1,1,2,2-Tetrachloroethane	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
1,1,2-Trichloroethane	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
1,1-Dichloroethane	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
1,1-Dichloroethene	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
1,1-Dichloropropene	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
1,2,3-Trichlorobenzene	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
1,2,3-Trichloropropane	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
1,2,4-Trichlorobenzene	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
1,2,4-Trimethylbenzene	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
1,2-Dibromo-3-chloropropane	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
1,2-Dichlorobenzene	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
1,2-Dichloroethane	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
1,2-Dichloropropane	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
1,3,5-Trimethylbenzene	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
1,3-Dichlorobenzene	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
1,3-Dichloropropane	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
1,4-Dichlorobenzene	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
2,2-Dichloropropane	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
2-Chlorotoluene	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
4-Chlorotoluene	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
p-Isopropyltoluene	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
Benzene	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
Bromobenzene	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
Bromochloromethane	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
Bromodichloromethane	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
Bromoform	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
Bromomethane	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
Carbon tetrachloride	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393428-1 MW-01							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 12:55							
Matrix: WATER							
VOCs in Water							
Chlorobenzene	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
Chloroethane	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
Chloroform	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
Chloromethane	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
cis-1,2-Dichloroethene	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
cis-1,3-Dichloropropene	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
Dibromochloromethane	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
Dibromomethane	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
Dichlorodifluoromethane	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
Ethylbenzene	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
Ethylene dibromide	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
Hexachlorobutadiene	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
Isopropylbenzene	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
m+p-Xylenes	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
Methylene chloride	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
n-Butylbenzene	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
n-Propylbenzene	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
o-Xylene	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
sec-Butylbenzene	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
Styrene	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
tert-Butylbenzene	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
Tetrachloroethylene	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
Toluene	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
trans-1,2-Dichloroethene	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
trans-1,3-Dichloropropene	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
Trichloroethene	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
Trichlorofluoromethane	<0.0010		0.0010	mg/L	12-DEC-19	12-DEC-19	R4942751
Vinyl chloride	<0.00050		0.00050	mg/L	12-DEC-19	12-DEC-19	R4942751
Surrogate: 1,4-Difluorobenzene	98.3		70-130	%	12-DEC-19	12-DEC-19	R4942751
Surrogate: 4-Bromofluorobenzene	79.4		70-130	%	12-DEC-19	12-DEC-19	R4942751

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393428-2 MW-03							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 12:30							
Matrix: WATER							
F1 (C6-C10) and F2 (>C10-C16)							
CCME F2-4 Hydrocarbons							
F2: (C10-C16)	<0.10		0.10	mg/L	16-DEC-19	17-DEC-19	R4944846
Surrogate: 2-Bromobenzotrifluoride	66.5		60-140	%	16-DEC-19	17-DEC-19	R4944846
F1 (C6-C10)							
F1(C6-C10)	<0.10		0.10	mg/L		13-DEC-19	R4944123
F1-BTEX	<0.10		0.10	mg/L		13-DEC-19	R4944123
Surrogate: 3,4-Dichlorotoluene	99.0		70-130	%		13-DEC-19	R4944123
Miscellaneous Parameters							
AOX	ND U		10	mg/L		12-DEC-19	R4955245
Ammonia, Total (as N)	19.1	DLHC	5.0	mg/L		16-DEC-19	R4943991
Dissolved Organic Carbon	17.5		1.0	mg/L		13-DEC-19	R4943303
Xylenes	<0.00071		0.00071	mg/L		16-DEC-19	
Total Kjeldahl Nitrogen	22.7	DLHC	2.0	mg/L		12-DEC-19	R4943090
Phosphorus (P)-Total	0.129	DLHC	0.010	mg/L		13-DEC-19	R4943276
Volatile fatty/carboxylic acids							
Formic Acid	<50	DLM	50	mg/L		14-DEC-19	R4943956
Acetic Acid	<10		10	mg/L		14-DEC-19	R4943956
Propionic Acid	<5.0		5.0	mg/L		14-DEC-19	R4943956
Butyric Acid	<1.0		1.0	mg/L		14-DEC-19	R4943956
Isobutyric Acid	<1.0		1.0	mg/L		14-DEC-19	R4943956
Valeric Acid	<1.0		1.0	mg/L		14-DEC-19	R4943956
Isovaleric Acid	<1.0		1.0	mg/L		14-DEC-19	R4943956
Caproic (Hexanoic) Acid	<1.0		1.0	mg/L		14-DEC-19	R4943956
Major Ions & Trace Dissolved Metals							
Chloride in Water by IC							
Chloride (Cl)	168	DLDS	2.5	mg/L		07-DEC-19	R4938288
Dissolved Mercury in Water by CVAAS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L		13-DEC-19	R4943011
Dissolved Mercury Filtration Location	FIELD					13-DEC-19	R4942998
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					09-DEC-19	R4938487
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L		14-DEC-19	R4943365
Antimony (Sb)-Dissolved	<0.00050		0.00050	mg/L		14-DEC-19	R4943365
Arsenic (As)-Dissolved	0.00123		0.00050	mg/L		14-DEC-19	R4943365
Barium (Ba)-Dissolved	0.599		0.00050	mg/L		14-DEC-19	R4943365
Boron (B)-Dissolved	0.176		0.050	mg/L		14-DEC-19	R4943365
Cadmium (Cd)-Dissolved	0.000033		0.000025	mg/L		14-DEC-19	R4943365
Calcium (Ca)-Dissolved	190		0.25	mg/L		14-DEC-19	R4943365
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L		14-DEC-19	R4943365
Copper (Cu)-Dissolved	<0.0010		0.0010	mg/L		14-DEC-19	R4943365
Iron (Fe)-Dissolved	<0.050		0.050	mg/L		14-DEC-19	R4943365
Lead (Pb)-Dissolved	<0.00025		0.00025	mg/L		14-DEC-19	R4943365
Magnesium (Mg)-Dissolved	86.5		0.025	mg/L		14-DEC-19	R4943365
Manganese (Mn)-Dissolved	0.727		0.00050	mg/L		14-DEC-19	R4943365
Nickel (Ni)-Dissolved	0.0108		0.0025	mg/L		14-DEC-19	R4943365
Potassium (K)-Dissolved	32.2		0.25	mg/L		14-DEC-19	R4943365
Selenium (Se)-Dissolved	<0.00025		0.00025	mg/L		14-DEC-19	R4943365
Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L		14-DEC-19	R4943365
Sodium (Na)-Dissolved	154		0.25	mg/L		14-DEC-19	R4943365
Uranium (U)-Dissolved	0.00539		0.000050	mg/L		14-DEC-19	R4943365
Zinc (Zn)-Dissolved	0.0125		0.0050	mg/L		14-DEC-19	R4943365

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393428-2 MW-03							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 12:30							
Matrix: WATER							
Fluoride in Water by IC							
Fluoride (F)	<0.10	DLDS	0.10	mg/L		07-DEC-19	R4938288
Ion Balance Calculation							
Ion Balance	97.9			%		16-DEC-19	
TDS (Calculated)	654			mg/L		16-DEC-19	
Hardness (as CaCO3)	831			mg/L		16-DEC-19	
Nitrate in Water by IC							
Nitrate (as N)	0.44	DLDS	0.10	mg/L		07-DEC-19	R4938288
Nitrate+Nitrite							
Nitrate and Nitrite (as N)	0.44		0.11	mg/L		09-DEC-19	
Nitrite in Water by IC							
Nitrite (as N)	<0.050	DLDS	0.050	mg/L		07-DEC-19	R4938288
Sulfate in Water by IC							
Sulfate (SO4)	21.7	DLDS	1.5	mg/L		07-DEC-19	R4938288
pH, Conductivity and Total Alkalinity							
pH	7.42		0.10	pH		14-DEC-19	R4943994
Conductivity (EC)	2100		2.0	uS/cm		14-DEC-19	R4943994
Bicarbonate (HCO3)	1270		5.0	mg/L		14-DEC-19	R4943994
Carbonate (CO3)	<5.0		5.0	mg/L		14-DEC-19	R4943994
Hydroxide (OH)	<5.0		5.0	mg/L		14-DEC-19	R4943994
Alkalinity, Total (as CaCO3)	1040		2.0	mg/L		14-DEC-19	R4943994
EPA 8260 Volatile Organics							
VOCs in Water							
1,1,1,2-Tetrachloroethane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,1,1-Trichloroethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,1,2,2-Tetrachloroethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,1,2-Trichloroethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,1-Dichloroethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,1-Dichloroethene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,1-Dichloropropene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2,3-Trichlorobenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2,3-Trichloropropane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2,4-Trichlorobenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2,4-Trimethylbenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2-Dibromo-3-chloropropane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2-Dichlorobenzene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2-Dichloroethane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2-Dichloropropane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,3,5-Trimethylbenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,3-Dichlorobenzene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,3-Dichloropropane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,4-Dichlorobenzene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
2,2-Dichloropropane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
2-Chlorotoluene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
4-Chlorotoluene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
p-Isopropyltoluene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Benzene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Bromobenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Bromochloromethane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Bromodichloromethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Bromoform	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Bromomethane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Carbon tetrachloride	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393428-2 MW-03							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 12:30							
Matrix: WATER							
VOCs in Water							
Chlorobenzene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Chloroethane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Chloroform	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Chloromethane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
cis-1,2-Dichloroethene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
cis-1,3-Dichloropropene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Dibromochloromethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Dibromomethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Dichlorodifluoromethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Ethylbenzene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Ethylene dibromide	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Hexachlorobutadiene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Isopropylbenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
m+p-Xylenes	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Methylene chloride	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
n-Butylbenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
n-Propylbenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
o-Xylene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
sec-Butylbenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Styrene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
tert-Butylbenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Tetrachloroethylene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Toluene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
trans-1,2-Dichloroethene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
trans-1,3-Dichloropropene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Trichloroethene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Trichlorofluoromethane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Vinyl chloride	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Surrogate: 1,4-Difluorobenzene	98.5		70-130	%	13-DEC-19	13-DEC-19	R4942751
Surrogate: 4-Bromofluorobenzene	78.2		70-130	%	13-DEC-19	13-DEC-19	R4942751

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393428-3 MW-01 (LOT 4)							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 13:10							
Matrix: WATER							
F1 (C6-C10) and F2 (>C10-C16)							
CCME F2-4 Hydrocarbons							
F2: (C10-C16)	<0.10		0.10	mg/L	16-DEC-19	17-DEC-19	R4944846
Surrogate: 2-Bromobenzotrifluoride	61.4		60-140	%	16-DEC-19	17-DEC-19	R4944846
F1 (C6-C10)							
F1(C6-C10)	<0.10		0.10	mg/L		13-DEC-19	R4944123
F1-BTEX	<0.10		0.10	mg/L		13-DEC-19	R4944123
Surrogate: 3,4-Dichlorotoluene	103.6		70-130	%		13-DEC-19	R4944123
Miscellaneous Parameters							
AOX	ND U		10	mg/L		12-DEC-19	R4955245
Ammonia, Total (as N)	<0.050		0.050	mg/L		16-DEC-19	R4943991
Dissolved Organic Carbon	6.0		1.0	mg/L		13-DEC-19	R4943303
Xylenes	<0.00071		0.00071	mg/L		16-DEC-19	
Total Kjeldahl Nitrogen	3.6	DLM	1.0	mg/L		12-DEC-19	R4943090
Phosphorus (P)-Total	2.40	DLHC	0.25	mg/L		13-DEC-19	R4943276
Volatile fatty/carboxylic acids							
Formic Acid	<50	DLM	50	mg/L		14-DEC-19	R4943956
Acetic Acid	<10		10	mg/L		14-DEC-19	R4943956
Propionic Acid	<5.0		5.0	mg/L		14-DEC-19	R4943956
Butyric Acid	<1.0		1.0	mg/L		14-DEC-19	R4943956
Isobutyric Acid	<1.0		1.0	mg/L		14-DEC-19	R4943956
Valeric Acid	<1.0		1.0	mg/L		14-DEC-19	R4943956
Isovaleric Acid	<1.0		1.0	mg/L		14-DEC-19	R4943956
Caproic (Hexanoic) Acid	<1.0		1.0	mg/L		14-DEC-19	R4943956
Major Ions & Trace Dissolved Metals							
Chloride in Water by IC							
Chloride (Cl)	113	DLDS	2.5	mg/L		07-DEC-19	R4938288
Dissolved Mercury in Water by CVAAS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L		13-DEC-19	R4943011
Dissolved Mercury Filtration Location	FIELD					13-DEC-19	R4942998
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					09-DEC-19	R4938487
Aluminum (Al)-Dissolved	0.0187		0.0010	mg/L		09-DEC-19	R4937828
Antimony (Sb)-Dissolved	0.00014		0.00010	mg/L		09-DEC-19	R4937828
Arsenic (As)-Dissolved	0.00030		0.00010	mg/L		09-DEC-19	R4937828
Barium (Ba)-Dissolved	0.187		0.00010	mg/L		09-DEC-19	R4937828
Boron (B)-Dissolved	0.078		0.010	mg/L		09-DEC-19	R4937828
Cadmium (Cd)-Dissolved	0.000155		0.0000050	mg/L		09-DEC-19	R4937828
Calcium (Ca)-Dissolved	220		0.050	mg/L		09-DEC-19	R4937828
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L		09-DEC-19	R4937828
Copper (Cu)-Dissolved	0.00139		0.00020	mg/L		09-DEC-19	R4937828
Iron (Fe)-Dissolved	0.023		0.010	mg/L		09-DEC-19	R4937828
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L		09-DEC-19	R4937828
Magnesium (Mg)-Dissolved	78.8		0.0050	mg/L		09-DEC-19	R4937828
Manganese (Mn)-Dissolved	1.22		0.00010	mg/L		09-DEC-19	R4937828
Nickel (Ni)-Dissolved	0.0102		0.00050	mg/L		09-DEC-19	R4937828
Potassium (K)-Dissolved	8.55		0.050	mg/L		09-DEC-19	R4937828
Selenium (Se)-Dissolved	0.000106		0.000050	mg/L		09-DEC-19	R4937828
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L		09-DEC-19	R4937828
Sodium (Na)-Dissolved	65.0		0.050	mg/L		09-DEC-19	R4937828
Uranium (U)-Dissolved	0.00967		0.000010	mg/L		09-DEC-19	R4937828
Zinc (Zn)-Dissolved	0.0019		0.0010	mg/L		09-DEC-19	R4937828

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393428-3 MW-01 (LOT 4)							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 13:10							
Matrix: WATER							
Fluoride in Water by IC							
Fluoride (F)	<0.10	DLDS	0.10	mg/L		07-DEC-19	R4938288
Ion Balance Calculation							
Ion Balance	120	BL:INT		%		16-DEC-19	
TDS (Calculated)	963			mg/L		16-DEC-19	
Hardness (as CaCO3)	874			mg/L		16-DEC-19	
Nitrate in Water by IC							
Nitrate (as N)	8.05	DLDS	0.10	mg/L		07-DEC-19	R4938288
Nitrate+Nitrite							
Nitrate and Nitrite (as N)	8.05		0.11	mg/L		09-DEC-19	
Nitrite in Water by IC							
Nitrite (as N)	<0.050	DLDS	0.050	mg/L		07-DEC-19	R4938288
Sulfate in Water by IC							
Sulfate (SO4)	107	DLDS	1.5	mg/L		07-DEC-19	R4938288
pH, Conductivity and Total Alkalinity							
pH	7.59		0.10	pH		14-DEC-19	R4943994
Conductivity (EC)	1460		2.0	uS/cm		14-DEC-19	R4943994
Bicarbonate (HCO3)	681		5.0	mg/L		14-DEC-19	R4943994
Carbonate (CO3)	<5.0		5.0	mg/L		14-DEC-19	R4943994
Hydroxide (OH)	<5.0		5.0	mg/L		14-DEC-19	R4943994
Alkalinity, Total (as CaCO3)	559		2.0	mg/L		14-DEC-19	R4943994
EPA 8260 Volatile Organics							
VOCs in Water							
1,1,1,2-Tetrachloroethane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,1,1-Trichloroethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,1,2,2-Tetrachloroethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,1,2-Trichloroethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,1-Dichloroethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,1-Dichloroethene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,1-Dichloropropene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2,3-Trichlorobenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2,3-Trichloropropane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2,4-Trichlorobenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2,4-Trimethylbenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2-Dibromo-3-chloropropane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2-Dichlorobenzene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2-Dichloroethane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2-Dichloropropane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,3,5-Trimethylbenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,3-Dichlorobenzene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,3-Dichloropropane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,4-Dichlorobenzene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
2,2-Dichloropropane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
2-Chlorotoluene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
4-Chlorotoluene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
p-Isopropyltoluene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Benzene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Bromobenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Bromochloromethane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Bromodichloromethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Bromoform	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Bromomethane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Carbon tetrachloride	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393428-3 MW-01 (LOT 4)							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 13:10							
Matrix: WATER							
VOCs in Water							
Chlorobenzene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Chloroethane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Chloroform	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Chloromethane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
cis-1,2-Dichloroethene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
cis-1,3-Dichloropropene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Dibromochloromethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Dibromomethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Dichlorodifluoromethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Ethylbenzene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Ethylene dibromide	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Hexachlorobutadiene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Isopropylbenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
m+p-Xylenes	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Methylene chloride	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
n-Butylbenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
n-Propylbenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
o-Xylene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
sec-Butylbenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Styrene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
tert-Butylbenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Tetrachloroethylene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Toluene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
trans-1,2-Dichloroethene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
trans-1,3-Dichloropropene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Trichloroethene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Trichlorofluoromethane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Vinyl chloride	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Surrogate: 1,4-Difluorobenzene	98.9		70-130	%	13-DEC-19	13-DEC-19	R4942751
Surrogate: 4-Bromofluorobenzene	80.9		70-130	%	13-DEC-19	13-DEC-19	R4942751

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393428-4 MW-03 (LOT 4)							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 13:20							
Matrix: WATER							
F1 (C6-C10) and F2 (>C10-C16)							
CCME F2-4 Hydrocarbons							
F2: (C10-C16)	<0.10		0.10	mg/L	16-DEC-19	17-DEC-19	R4944846
Surrogate: 2-Bromobenzotrifluoride	71.0		60-140	%	16-DEC-19	17-DEC-19	R4944846
F1 (C6-C10)							
F1(C6-C10)	<0.10		0.10	mg/L		13-DEC-19	R4944123
F1-BTEX	<0.10		0.10	mg/L		13-DEC-19	R4944123
Surrogate: 3,4-Dichlorotoluene	93.0		70-130	%		13-DEC-19	R4944123
Miscellaneous Parameters							
AOX	ND U		10	mg/L		12-DEC-19	R4955245
Ammonia, Total (as N)	2.06	DLHC	0.50	mg/L		16-DEC-19	R4943991
Dissolved Organic Carbon	7.8		1.0	mg/L		13-DEC-19	R4943303
Xylenes	<0.00071		0.00071	mg/L		16-DEC-19	
Total Kjeldahl Nitrogen	2.3	DLM	1.0	mg/L		12-DEC-19	R4943090
Phosphorus (P)-Total	0.399	DLHC	0.025	mg/L		13-DEC-19	R4943276
Volatile fatty/carboxylic acids							
Formic Acid	<50	DLM	50	mg/L		14-DEC-19	R4943956
Acetic Acid	<10		10	mg/L		14-DEC-19	R4943956
Propionic Acid	<5.0		5.0	mg/L		14-DEC-19	R4943956
Butyric Acid	<1.0		1.0	mg/L		14-DEC-19	R4943956
Isobutyric Acid	<1.0		1.0	mg/L		14-DEC-19	R4943956
Valeric Acid	<1.0		1.0	mg/L		14-DEC-19	R4943956
Isovaleric Acid	<1.0		1.0	mg/L		14-DEC-19	R4943956
Caproic (Hexanoic) Acid	<1.0		1.0	mg/L		14-DEC-19	R4943956
Major Ions & Trace Dissolved Metals							
Chloride in Water by IC							
Chloride (Cl)	106	DLDS	2.5	mg/L		07-DEC-19	R4938288
Dissolved Mercury in Water by CVAAS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L		13-DEC-19	R4943011
Dissolved Mercury Filtration Location	FIELD					13-DEC-19	R4942998
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					09-DEC-19	R4938487
Aluminum (Al)-Dissolved	0.0040		0.0010	mg/L		09-DEC-19	R4937828
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L		09-DEC-19	R4937828
Arsenic (As)-Dissolved	0.00046		0.00010	mg/L		09-DEC-19	R4937828
Barium (Ba)-Dissolved	0.272		0.00010	mg/L		09-DEC-19	R4937828
Boron (B)-Dissolved	0.070		0.010	mg/L		09-DEC-19	R4937828
Cadmium (Cd)-Dissolved	0.0000707		0.0000050	mg/L		09-DEC-19	R4937828
Calcium (Ca)-Dissolved	157		0.050	mg/L		09-DEC-19	R4937828
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L		09-DEC-19	R4937828
Copper (Cu)-Dissolved	0.00055		0.00020	mg/L		09-DEC-19	R4937828
Iron (Fe)-Dissolved	0.106		0.010	mg/L		09-DEC-19	R4937828
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L		09-DEC-19	R4937828
Magnesium (Mg)-Dissolved	64.7		0.0050	mg/L		09-DEC-19	R4937828
Manganese (Mn)-Dissolved	1.03		0.00010	mg/L		09-DEC-19	R4937828
Nickel (Ni)-Dissolved	0.00519		0.00050	mg/L		09-DEC-19	R4937828
Potassium (K)-Dissolved	10.1		0.050	mg/L		09-DEC-19	R4937828
Selenium (Se)-Dissolved	0.000088		0.000050	mg/L		09-DEC-19	R4937828
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L		09-DEC-19	R4937828
Sodium (Na)-Dissolved	57.5		0.050	mg/L		09-DEC-19	R4937828
Uranium (U)-Dissolved	0.00551		0.000010	mg/L		09-DEC-19	R4937828
Zinc (Zn)-Dissolved	0.0015		0.0010	mg/L		09-DEC-19	R4937828

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393428-4 MW-03 (LOT 4)							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 13:20							
Matrix: WATER							
Fluoride in Water by IC							
Fluoride (F)	<0.10	DLDS	0.10	mg/L		07-DEC-19	R4938288
Ion Balance Calculation							
Ion Balance	98.8			%		16-DEC-19	
TDS (Calculated)	820			mg/L		16-DEC-19	
Hardness (as CaCO3)	658			mg/L		16-DEC-19	
Nitrate in Water by IC							
Nitrate (as N)	<0.10	DLDS	0.10	mg/L		07-DEC-19	R4938288
Nitrate+Nitrite							
Nitrate and Nitrite (as N)	<0.11		0.11	mg/L		09-DEC-19	
Nitrite in Water by IC							
Nitrite (as N)	<0.050	DLDS	0.050	mg/L		07-DEC-19	R4938288
Sulfate in Water by IC							
Sulfate (SO4)	70.1	DLDS	1.5	mg/L		07-DEC-19	R4938288
pH, Conductivity and Total Alkalinity							
pH	7.61		0.10	pH		14-DEC-19	R4943994
Conductivity (EC)	1370		2.0	uS/cm		14-DEC-19	R4943994
Bicarbonate (HCO3)	721		5.0	mg/L		14-DEC-19	R4943994
Carbonate (CO3)	<5.0		5.0	mg/L		14-DEC-19	R4943994
Hydroxide (OH)	<5.0		5.0	mg/L		14-DEC-19	R4943994
Alkalinity, Total (as CaCO3)	591		2.0	mg/L		14-DEC-19	R4943994
EPA 8260 Volatile Organics							
VOCs in Water							
1,1,1,2-Tetrachloroethane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,1,1-Trichloroethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,1,2,2-Tetrachloroethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,1,2-Trichloroethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,1-Dichloroethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,1-Dichloroethene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,1-Dichloropropene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2,3-Trichlorobenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2,3-Trichloropropane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2,4-Trichlorobenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2,4-Trimethylbenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2-Dibromo-3-chloropropane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2-Dichlorobenzene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2-Dichloroethane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,2-Dichloropropane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,3,5-Trimethylbenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,3-Dichlorobenzene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
1,3-Dichloropropane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
1,4-Dichlorobenzene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
2,2-Dichloropropane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
2-Chlorotoluene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
4-Chlorotoluene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
p-Isopropyltoluene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Benzene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Bromobenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Bromochloromethane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Bromodichloromethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Bromoform	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Bromomethane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Carbon tetrachloride	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393428-4 MW-03 (LOT 4)							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 13:20							
Matrix: WATER							
VOCs in Water							
Chlorobenzene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Chloroethane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Chloroform	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Chloromethane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
cis-1,2-Dichloroethene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
cis-1,3-Dichloropropene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Dibromochloromethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Dibromomethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Dichlorodifluoromethane	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Ethylbenzene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Ethylene dibromide	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Hexachlorobutadiene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Isopropylbenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
m+p-Xylenes	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Methylene chloride	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
n-Butylbenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
n-Propylbenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
o-Xylene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
sec-Butylbenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Styrene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
tert-Butylbenzene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Tetrachloroethylene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Toluene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
trans-1,2-Dichloroethene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
trans-1,3-Dichloropropene	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Trichloroethene	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Trichlorofluoromethane	<0.0010		0.0010	mg/L	13-DEC-19	13-DEC-19	R4942751
Vinyl chloride	<0.00050		0.00050	mg/L	13-DEC-19	13-DEC-19	R4942751
Surrogate: 1,4-Difluorobenzene	98.9		70-130	%	13-DEC-19	13-DEC-19	R4942751
Surrogate: 4-Bromofluorobenzene	78.1		70-130	%	13-DEC-19	13-DEC-19	R4942751

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
BL:INT	Balance Reviewed: Interference Or Non-Measured Component
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
AOX-MISA-KL	Water	Adsorbable Organic Halides	EPA 1650
BTXS-HS-MS-CL	Water	BTEX and Styrene	EPA 8260C/5021A

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. BTEX Target compound concentrations are measured using mass spectrometry detection.

C-DIS-ORG-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental

Filtered (0.45 um) sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.

CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

F1-HS-FID-CL	Water	F1 (C6-C10)	EPA 5021A / CWS PHC Tier 1

This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2001." For F1 (C6-C10) analysis, the water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a GC-FID for analysis.

F2-4-ME-FID-CL	Water	CCME F2-4 Hydrocarbons	EPA 3511/ CCME PHC CWS GC-FID

Water samples are spiked with 2-BBTF surrogate, and extracted by reciprocal action shaker for 30 minutes using a single micro-extraction with hexane. Instrumental analysis is by GC-FID, as per the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil, Tier 1 Method, CCME, December 2001.

HG-D-CVAA-CL	Water	Dissolved Mercury in Water by CVAAS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

IONBALANCE-CL	Water	Ion Balance Calculation	APHA 1030E
MET-D-CCMS-CL	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

N2N3-CALC-CL	Water	Nitrate+Nitrite	CALCULATION
NH3-F-CL	Water	Ammonia by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-IC-N-CL	Water	Nitrite in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-N-CL	Water	Nitrate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-COL-CL	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PH/EC/ALK-CL	Water	pH, Conductivity and Total Alkalinity	APHA 4500H,2510,2320

All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
recommended for pH where highly accurate results are needed) pH measurement is determined from the activity of the hydrogen ions using a hydrogen electrode and a reference electrode. Alkalinity measurement is based on the sample's capacity to neutralize acid Conductivity measurement is based on the sample's capacity to convey an electric current			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
TKN-F-CL	Water	Total Kjeldahl Nitrogen by Fluorescence	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
VFA-WP	Water	Volatile fatty/carboxylic acids	ASTM D2908-91
In the field, water and soil samples are collected in certified clean glass jars. In the laboratory, water samples are filtered and transferred to an autosampler vial for analysis. Soil samples are extracted with water and an aliquot of water is filtered. All extracts have internal standard added prior to injection. Analysis is performed by GC/MS in the selected ion monitoring (SIM) mode.			
VOC-HS-MS-CL	Water	VOCs in Water	EPA 8260C/5021A
The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. VOC Target compound concentrations are measured using mass spectrometry detection.			
XYLENES-CALC-CL	Water	Sum of Xylene Isomer Concentrations	CALCULATION
Calculation of Total Xylenes Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA
KL	ALS ENVIRONMENTAL - KELSO, WASHINGTON, USA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

RIVERSIDE LIGHT

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Routine Water Chemistry Report

L2393428

Lab ID	Sample ID	Result	UNITS	MEQ/L	MEQ %
L2393428-1	MW-01				
Sample Date:	05-DEC-19				
Matrix:	WATER				
Ion Balance		93.7	%		
Routine Anions					
Bicarbonate		844	mg/L	13.83	32
Carbonate		<5.0	mg/L	0	0
Hydroxide		<5.0	mg/L	0	0
Chloride		125	mg/L	3.53	8
Sulfate		135	mg/L	2.81	7
Nitrate+Nitrite-N			mg/L	2.11	5
Anion Sum				22.28	52
Routine Cations					
Calcium		229	mg/L	11.43	26
Magnesium		75.2	mg/L	6.19	14
Sodium		69.7	mg/L	3.03	7
Potassium		8.78	mg/L	0.22	1
Ammonium		<0.050	mg/L	0	0
Cation Sum				20.87	48

Lab ID	Sample ID	Result	UNITS	MEQ/L	MEQ %
L2393428-2	MW-03				
Sample Date:	05-DEC-19				
Matrix:	WATER				
Ion Balance		97.9	%		
Routine Anions					
Bicarbonate		1270	mg/L	20.81	40
Carbonate		<5.0	mg/L	0	0
Hydroxide		<5.0	mg/L	0	0
Chloride		168	mg/L	4.74	9
Sulfate		21.7	mg/L	0.45	1
Nitrate+Nitrite-N			mg/L	0.03	0
Anion Sum				26.04	51
Routine Cations					
Calcium		190	mg/L	9.48	18
Magnesium		86.5	mg/L	7.12	14
Sodium		154	mg/L	6.70	13
Potassium		32.2	mg/L	0.82	2
Ammonium		19.1	mg/L	1.36	3
Cation Sum				25.49	49

Lab ID	Sample ID	Result	UNITS	MEQ/L	MEQ %
L2393428-3	MW-01 (LOT 4)				
Sample Date:	05-DEC-19				
Matrix:	WATER				
Ion Balance		120	%		
Routine Anions					
Bicarbonate		681	mg/L	11.16	30
Carbonate		<5.0	mg/L	0	0
Hydroxide		<5.0	mg/L	0	0
Chloride		113	mg/L	3.19	8
Sulfate		107	mg/L	2.23	6
Nitrate+Nitrite-N			mg/L	0.57	2
Anion Sum				17.15	46
Routine Cations					
Calcium		220	mg/L	10.98	29
Magnesium		78.8	mg/L	6.49	17
Sodium		65.0	mg/L	2.83	8
Potassium		8.55	mg/L	0.22	1
Ammonium		<0.050	mg/L	0	0
Cation Sum				20.51	54

Lab ID	Sample ID	Result	UNITS	MEQ/L	MEQ %
L2393428-4	MW-03 (LOT 4)				
Sample Date:	05-DEC-19				
Matrix:	WATER				
Ion Balance		98.8	%		
Routine Anions					
Bicarbonate		721	mg/L	11.82	37
Carbonate		<5.0	mg/L	0	0
Hydroxide		<5.0	mg/L	0	0
Chloride		106	mg/L	2.99	9
Sulfate		70.1	mg/L	1.46	5
Nitrate+Nitrite-N			mg/L	0	0
Anion Sum				16.27	50
Routine Cations					
Calcium		157	mg/L	7.83	24
Magnesium		64.7	mg/L	5.33	16
Sodium		57.5	mg/L	2.50	8
Potassium		10.1	mg/L	0.26	1
Ammonium		2.06	mg/L	0.15	0
Cation Sum				16.07	50

ALS LABORATORY GROUP SOIL SALINITY CONVERSION

L2393428

Lab ID	Sample ID					Lab ID	Sample ID				

"Calculations are as per:
Methods of Analysis for Soils, Plants and Waters
Homer D. Chapman and Parker F. Pratt
University of California, Riverside, CI.
August, 1961."

Quality Control Report

Workorder: L2393428 Report Date: 30-DEC-19

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-CL	**Water**							
Batch R4943303								
WG3242660-2 LCS								
Dissolved Organic Carbon			82.5		%		80-120	13-DEC-19
WG3242660-1 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	13-DEC-19
CL-IC-N-CL	**Water**							
Batch R4938288								
WG3238491-11 DUP		**L2393349-3**						
Chloride (Cl)		3.25	3.17		mg/L	2.7	20	07-DEC-19
WG3238491-10 LCS								
Chloride (Cl)			100.1		%		90-110	07-DEC-19
WG3238491-9 MB								
Chloride (Cl)			<0.50		mg/L		0.5	07-DEC-19
WG3238491-12 MS		**L2393349-3**						
Chloride (Cl)			112.2		%		75-125	07-DEC-19
F-IC-N-CL	**Water**							
Batch R4938288								
WG3238491-11 DUP		**L2393349-3**						
Fluoride (F)		0.177	0.188		mg/L	5.7	20	07-DEC-19
WG3238491-10 LCS								
Fluoride (F)			104.9		%		90-110	07-DEC-19
WG3238491-9 MB								
Fluoride (F)			<0.020		mg/L		0.02	07-DEC-19
WG3238491-12 MS		**L2393349-3**						
Fluoride (F)			116.0		%		75-125	07-DEC-19
F1-HS-FID-CL	**Water**							
Batch R4944123								
WG3243605-1 MB								
F1(C6-C10)			<0.10		mg/L		0.1	13-DEC-19
Surrogate: 3,4-Dichlorotoluene			125.7		%		70-130	13-DEC-19
F2-4-ME-FID-CL	**Water**							
Batch R4944846								
WG3243467-1 MB								
F2: (C10-C16)			<0.10		mg/L		0.1	17-DEC-19
Surrogate: 2-Bromobenzotrifluoride			70.9		%		60-140	17-DEC-19
HG-D-CVAA-CL	**Water**							

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-CL	**Water**							
Batch R4943011								
WG3242289-6 LCS								
Mercury (Hg)-Dissolved			118.0		%		80-120	13-DEC-19
WG3242289-5 MB								
Mercury (Hg)-Dissolved			<0.000005(		mg/L		0.000005	13-DEC-19
MET-D-CCMS-CL	**Water**							
Batch R4937828								
WG3238594-7 DUP		**L2393428-4**						
Aluminum (Al)-Dissolved		0.0040	0.0040		mg/L	0.9	20	13-DEC-19
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-DEC-19
Arsenic (As)-Dissolved		0.00046	0.00042		mg/L	9.4	20	13-DEC-19
Barium (Ba)-Dissolved		0.272	0.288		mg/L	5.6	20	13-DEC-19
Boron (B)-Dissolved		0.070	0.088	J	mg/L	0.018	0.02	13-DEC-19
Cadmium (Cd)-Dissolved		0.0000707	0.0000799		mg/L	12	20	13-DEC-19
Calcium (Ca)-Dissolved		157	168		mg/L	6.4	20	13-DEC-19
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-DEC-19
Copper (Cu)-Dissolved		0.00055	0.00061		mg/L	9.8	20	13-DEC-19
Iron (Fe)-Dissolved		0.106	0.118		mg/L	11	20	13-DEC-19
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-DEC-19
Magnesium (Mg)-Dissolved		64.7	72.3		mg/L	11	20	13-DEC-19
Manganese (Mn)-Dissolved		1.03	1.12		mg/L	8.4	20	13-DEC-19
Nickel (Ni)-Dissolved		0.00519	0.00553		mg/L	6.3	20	13-DEC-19
Potassium (K)-Dissolved		10.1	9.80		mg/L	3.5	20	13-DEC-19
Selenium (Se)-Dissolved		0.000088	0.000068	J	mg/L	0.000020	0.0001	13-DEC-19
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	13-DEC-19
Sodium (Na)-Dissolved		57.5	67.8		mg/L	16	20	13-DEC-19
Uranium (U)-Dissolved		0.00551	0.00604		mg/L	9.2	20	13-DEC-19
Zinc (Zn)-Dissolved		0.0015	0.0015		mg/L	2.8	20	13-DEC-19
WG3238594-6 LCS								
Aluminum (Al)-Dissolved			98.2		%		80-120	09-DEC-19
Antimony (Sb)-Dissolved			92.9		%		80-120	09-DEC-19
Arsenic (As)-Dissolved			94.2		%		80-120	09-DEC-19
Barium (Ba)-Dissolved			90.9		%		80-120	09-DEC-19
Boron (B)-Dissolved			93.0		%		80-120	09-DEC-19
Cadmium (Cd)-Dissolved			92.2		%		80-120	09-DEC-19

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R4937828								
WG3238594-6 LCS								
Calcium (Ca)-Dissolved			106.7		%		80-120	09-DEC-19
Chromium (Cr)-Dissolved			93.7		%		80-120	09-DEC-19
Copper (Cu)-Dissolved			93.4		%		80-120	09-DEC-19
Iron (Fe)-Dissolved			97.2		%		80-120	09-DEC-19
Lead (Pb)-Dissolved			93.4		%		80-120	09-DEC-19
Magnesium (Mg)-Dissolved			91.2		%		80-120	09-DEC-19
Manganese (Mn)-Dissolved			95.8		%		80-120	09-DEC-19
Nickel (Ni)-Dissolved			92.9		%		80-120	09-DEC-19
Potassium (K)-Dissolved			94.9		%		80-120	09-DEC-19
Selenium (Se)-Dissolved			111.2		%		80-120	09-DEC-19
Silver (Ag)-Dissolved			103.0		%		80-120	09-DEC-19
Sodium (Na)-Dissolved			86.0		%		80-120	09-DEC-19
Uranium (U)-Dissolved			103.0		%		80-120	09-DEC-19
Zinc (Zn)-Dissolved			93.6		%		80-120	09-DEC-19
WG3238594-5 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	09-DEC-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	09-DEC-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	09-DEC-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	09-DEC-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	09-DEC-19
Cadmium (Cd)-Dissolved			<0.000005(		mg/L		0.000005	09-DEC-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	09-DEC-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	09-DEC-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	09-DEC-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	09-DEC-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	09-DEC-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	09-DEC-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	09-DEC-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	09-DEC-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	09-DEC-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	09-DEC-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	09-DEC-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	09-DEC-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	09-DEC-19

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R4937828								
WG3238594-5 MB								
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	09-DEC-19
WG3238594-8 MS		**L2393428-4**						
Aluminum (Al)-Dissolved			120.8		%		70-130	14-DEC-19
Antimony (Sb)-Dissolved			103.8		%		70-130	14-DEC-19
Arsenic (As)-Dissolved			120.6		%		70-130	14-DEC-19
Barium (Ba)-Dissolved			N/A	MS-B	%		-	14-DEC-19
Boron (B)-Dissolved			111.5		%		70-130	14-DEC-19
Cadmium (Cd)-Dissolved			121.0		%		70-130	14-DEC-19
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	14-DEC-19
Chromium (Cr)-Dissolved			117.2		%		70-130	14-DEC-19
Copper (Cu)-Dissolved			117.4		%		70-130	14-DEC-19
Iron (Fe)-Dissolved			103.6		%		70-130	14-DEC-19
Lead (Pb)-Dissolved			108.0		%		70-130	14-DEC-19
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	14-DEC-19
Manganese (Mn)-Dissolved			N/A	MS-B	%		-	14-DEC-19
Nickel (Ni)-Dissolved			119.6		%		70-130	14-DEC-19
Potassium (K)-Dissolved			127.0		%		70-130	14-DEC-19
Selenium (Se)-Dissolved			110.4		%		70-130	14-DEC-19
Silver (Ag)-Dissolved			92.2		%		70-130	14-DEC-19
Sodium (Na)-Dissolved			N/A	MS-B	%		-	14-DEC-19
Uranium (U)-Dissolved			110.8		%		70-130	14-DEC-19
Zinc (Zn)-Dissolved			117.1		%		70-130	14-DEC-19
NH3-F-CL	**Water**							
Batch R4943991								
WG3242302-14 LCS								
Ammonia, Total (as N)			94.7		%		85-115	16-DEC-19
WG3242302-13 MB								
Ammonia, Total (as N)			<0.050		mg/L		0.05	16-DEC-19
NO2-IC-N-CL	**Water**							
Batch R4938288								
WG3238491-10 LCS								
Nitrite (as N)			99.7		%		90-110	07-DEC-19
WG3238491-9 MB								
Nitrite (as N)			<0.010		mg/L		0.01	07-DEC-19

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-N-CL	**Water**							
Batch R4938288								
WG3238491-10 LCS								
Nitrate (as N)			101.1		%		90-110	07-DEC-19
WG3238491-9 MB								
Nitrate (as N)			<0.020		mg/L		0.02	07-DEC-19
P-T-COL-CL	**Water**							
Batch R4943276								
WG3242072-10 LCS								
Phosphorus (P)-Total			92.6		%		80-120	13-DEC-19
WG3242072-9 MB								
Phosphorus (P)-Total			<0.0050		mg/L		0.005	13-DEC-19
PH/EC/ALK-CL	**Water**							
Batch R4943994								
WG3243425-11 LCS								
Conductivity (EC)			99.3		%		90-110	14-DEC-19
Alkalinity, Total (as CaCO3)			104.4		%		85-115	14-DEC-19
WG3243425-10 MB								
Conductivity (EC)			<2.0		uS/cm		2	14-DEC-19
Bicarbonate (HCO3)			<5.0		mg/L		5	14-DEC-19
Carbonate (CO3)			<5.0		mg/L		5	14-DEC-19
Hydroxide (OH)			<5.0		mg/L		5	14-DEC-19
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	14-DEC-19
SO4-IC-N-CL	**Water**							
Batch R4938288								
WG3238491-11 DUP		**L2393349-3**						
Sulfate (SO4)		50.1	49.8		mg/L	0.6	20	07-DEC-19
WG3238491-10 LCS								
Sulfate (SO4)			105.1		%		90-110	07-DEC-19
WG3238491-9 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	07-DEC-19
WG3238491-12 MS		**L2393349-3**						
Sulfate (SO4)			113.5		%		75-125	07-DEC-19
TKN-F-CL	**Water**							
Batch R4943090								
WG3242367-15 DUP		**L2393430-1**						
Total Kjeldahl Nitrogen		0.69	0.64		mg/L	8.0	20	12-DEC-19
WG3242367-17 DUP		**L2393876-2**						

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-F-CL	**Water**							
Batch R4943090								
WG3242367-17 DUP		**L2393876-2**						
Total Kjeldahl Nitrogen		18	17		mg/L	0.5	20	12-DEC-19
WG3242367-18 DUP		**L2393879-1**						
Total Kjeldahl Nitrogen		74	71		mg/L	4.4	20	12-DEC-19
WG3242367-3 DUP		**L2394735-1**						
Total Kjeldahl Nitrogen		3.93	3.82		mg/L	2.8	20	12-DEC-19
WG3242367-10 LCS								
Total Kjeldahl Nitrogen			102.0		%		75-125	12-DEC-19
WG3242367-14 LCS								
Total Kjeldahl Nitrogen			102.0		%		75-125	12-DEC-19
WG3242367-2 LCS								
Total Kjeldahl Nitrogen			98.4		%		75-125	12-DEC-19
WG3242367-6 LCS								
Total Kjeldahl Nitrogen			100.2		%		75-125	12-DEC-19
WG3242367-1 MB								
Total Kjeldahl Nitrogen			<0.20		mg/L		0.2	12-DEC-19
WG3242367-13 MB								
Total Kjeldahl Nitrogen			<0.20		mg/L		0.2	12-DEC-19
WG3242367-5 MB								
Total Kjeldahl Nitrogen			<0.20		mg/L		0.2	12-DEC-19
WG3242367-9 MB								
Total Kjeldahl Nitrogen			<0.20		mg/L		0.2	12-DEC-19
WG3242367-16 MS		**L2393430-1**						
Total Kjeldahl Nitrogen			99.9		%		70-130	12-DEC-19
WG3242367-4 MS		**L2394735-1**						
Total Kjeldahl Nitrogen			107.0		%		70-130	12-DEC-19
VFA-WP	**Water**							
Batch R4943956								
WG3243150-3 DUP		**L2393425-3**						
Formic Acid		<50	<50	RPD-NA	mg/L	N/A	30	14-DEC-19
Acetic Acid		<10	<10	RPD-NA	mg/L	N/A	30	14-DEC-19
Propionic Acid		<5.0	<5.0	RPD-NA	mg/L	N/A	30	14-DEC-19
Butyric Acid		<1.0	<1.0	RPD-NA	mg/L	N/A	30	14-DEC-19
Isobutyric Acid		<1.0	<1.0	RPD-NA	mg/L	N/A	30	14-DEC-19
Valeric Acid		<1.0	<1.0	RPD-NA	mg/L	N/A	30	14-DEC-19
Isovaleric Acid		<1.0	<1.0	RPD-NA	mg/L	N/A	30	14-DEC-19
Caproic (Hexanoic) Acid		<1.0	<1.0	RPD-NA	mg/L	N/A	30	14-DEC-19

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VFA-WP	**Water**							
Batch R4943956								
WG3243154-3 DUP		**L2393428-2**						
Formic Acid		<50	<50	RPD-NA	mg/L	N/A	30	14-DEC-19
Acetic Acid		<10	<10	RPD-NA	mg/L	N/A	30	14-DEC-19
Propionic Acid		<5.0	<5.0	RPD-NA	mg/L	N/A	30	14-DEC-19
Butyric Acid		<1.0	<1.0	RPD-NA	mg/L	N/A	30	14-DEC-19
Isobutyric Acid		<1.0	<1.0	RPD-NA	mg/L	N/A	30	14-DEC-19
Valeric Acid		<1.0	<1.0	RPD-NA	mg/L	N/A	30	14-DEC-19
Isovaleric Acid		<1.0	<1.0	RPD-NA	mg/L	N/A	30	14-DEC-19
Caproic (Hexanoic) Acid		<1.0	<1.0	RPD-NA	mg/L	N/A	30	14-DEC-19
WG3243150-2 LCS								
Formic Acid			126.9		%		70-130	16-DEC-19
Acetic Acid			79.8		%		70-130	16-DEC-19
Propionic Acid			82.0		%		70-130	16-DEC-19
Butyric Acid			72.2		%		70-130	16-DEC-19
Isobutyric Acid			78.9		%		70-130	16-DEC-19
Valeric Acid			73.7		%		70-130	16-DEC-19
Isovaleric Acid			70.0		%		70-130	16-DEC-19
Caproic (Hexanoic) Acid			82.3		%		70-130	16-DEC-19
WG3243154-2 LCS								
Formic Acid			124.7		%		70-130	16-DEC-19
Acetic Acid			73.5		%		70-130	16-DEC-19
Propionic Acid			87.7		%		70-130	16-DEC-19
Butyric Acid			70.6		%		70-130	16-DEC-19
Isobutyric Acid			76.8		%		70-130	16-DEC-19
Valeric Acid			75.6		%		70-130	16-DEC-19
Isovaleric Acid			71.7		%		70-130	16-DEC-19
Caproic (Hexanoic) Acid			85.2		%		70-130	16-DEC-19
WG3243150-1 MB								
Formic Acid			<30		mg/L		30	13-DEC-19
Acetic Acid			<10		mg/L		10	13-DEC-19
Propionic Acid			<5.0		mg/L		5	13-DEC-19
Butyric Acid			<1.0		mg/L		1	13-DEC-19
Isobutyric Acid			<1.0		mg/L		1	13-DEC-19
Valeric Acid			<1.0		mg/L		1	13-DEC-19
Isovaleric Acid			<1.0		mg/L		1	13-DEC-19

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VFA-WP	**Water**							
Batch R4943956								
WG3243150-1 MB								
Caproic (Hexanoic) Acid			<1.0		mg/L		1	13-DEC-19
WG3243154-1 MB								
Formic Acid			<30		mg/L		30	13-DEC-19
Acetic Acid			<10		mg/L		10	13-DEC-19
Propionic Acid			<5.0		mg/L		5	13-DEC-19
Butyric Acid			<1.0		mg/L		1	13-DEC-19
Isobutyric Acid			<1.0		mg/L		1	13-DEC-19
Valeric Acid			<1.0		mg/L		1	13-DEC-19
Isovaleric Acid			<1.0		mg/L		1	13-DEC-19
Caproic (Hexanoic) Acid			<1.0		mg/L		1	13-DEC-19
WG3243150-4 MS		**L2393410-5**						
Formic Acid			89.8		%		70-130	13-DEC-19
Acetic Acid			82.9		%		70-130	13-DEC-19
Propionic Acid			79.8		%		70-130	13-DEC-19
Butyric Acid			79.4		%		70-130	13-DEC-19
Isobutyric Acid			80.4		%		70-130	13-DEC-19
Valeric Acid			85.5		%		70-130	13-DEC-19
Isovaleric Acid			75.3		%		70-130	13-DEC-19
Caproic (Hexanoic) Acid			97.3		%		70-130	13-DEC-19
WG3243154-4 MS		**L2393423-2**						
Formic Acid			92.1		%		70-130	13-DEC-19
Acetic Acid			78.9		%		70-130	13-DEC-19
Propionic Acid			74.4		%		70-130	13-DEC-19
Butyric Acid			72.4		%		70-130	13-DEC-19
Isobutyric Acid			80.5		%		70-130	13-DEC-19
Valeric Acid			72.6		%		70-130	13-DEC-19
Isovaleric Acid			70.3		%		70-130	13-DEC-19
Caproic (Hexanoic) Acid			91.8		%		70-130	13-DEC-19
VOC-HS-MS-CL	**Water**							
Batch R4942751								
WG3242018-2 DUP		**L2393184-1**						
1,1,1,2-Tetrachloroethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
1,1,1-Trichloroethane		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
1,1,2,2-Tetrachloroethane		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-HS-MS-CL	**Water**							
Batch R4942751								
WG3242018-2 DUP		**L2393184-1**						
1,1,2-Trichloroethane		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
1,1-Dichloroethane		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
1,1-Dichloroethene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
1,1-Dichloropropene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
1,2,3-Trichlorobenzene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
1,2,3-Trichloropropane		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
1,2,4-Trichlorobenzene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
1,2,4-Trimethylbenzene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
1,2-Dibromo-3-chloropropane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
1,2-Dichlorobenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
1,2-Dichloroethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
1,2-Dichloropropane		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
1,3,5-Trimethylbenzene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
1,3-Dichlorobenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
1,3-Dichloropropane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
1,4-Dichlorobenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
2,2-Dichloropropane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
2-Chlorotoluene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
4-Chlorotoluene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
p-Isopropyltoluene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	50	12-DEC-19
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Bromobenzene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
Bromochloromethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
Bromodichloromethane		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Bromoform		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Bromomethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
Carbon tetrachloride		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Chlorobenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Chloroethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
Chloroform		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Chloromethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
cis-1,2-Dichloroethene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
cis-1,3-Dichloropropene		<0.00050	<0.00050		mg/L			12-DEC-19

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-HS-MS-CL	**Water**							
Batch R4942751								
WG3242018-2 DUP		**L2393184-1**						
cis-1,3-Dichloropropene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Dibromochloromethane		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Dibromomethane		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Dichlorodifluoromethane		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Ethylbenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Ethylene dibromide		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Hexachlorobutadiene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
Isopropylbenzene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
m+p-Xylenes		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Methylene chloride		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
n-Butylbenzene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
n-Propylbenzene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
o-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
sec-Butylbenzene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
Styrene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
tert-Butylbenzene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
Tetrachloroethylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
trans-1,2-Dichloroethene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
trans-1,3-Dichloropropene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
Trichloroethene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Trichlorofluoromethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
Vinyl chloride		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
WG3242018-3 DUP		**L2393424-1**						
1,1,1,2-Tetrachloroethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
1,1,1-Trichloroethane		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
1,1,2,2-Tetrachloroethane		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
1,1,2-Trichloroethane		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
1,1-Dichloroethane		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
1,1-Dichloroethene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
1,1-Dichloropropene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
1,2,3-Trichlorobenzene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
1,2,3-Trichloropropane		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-HS-MS-CL	**Water**							
Batch R4942751								
WG3242018-3 DUP		**L2393424-1**						
1,2,4-Trichlorobenzene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
1,2,4-Trimethylbenzene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
1,2-Dibromo-3-chloropropane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
1,2-Dichlorobenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
1,2-Dichloroethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
1,2-Dichloropropane		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
1,3,5-Trimethylbenzene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
1,3-Dichlorobenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
1,3-Dichloropropane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
1,4-Dichlorobenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
2,2-Dichloropropane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
2-Chlorotoluene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
4-Chlorotoluene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
p-Isopropyltoluene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	50	12-DEC-19
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Bromobenzene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
Bromochloromethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
Bromodichloromethane		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Bromoform		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Bromomethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
Carbon tetrachloride		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Chlorobenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Chloroethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
Chloroform		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Chloromethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
cis-1,2-Dichloroethene		0.0084	0.0075		mg/L	12	30	12-DEC-19
cis-1,3-Dichloropropene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Dibromochloromethane		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Dibromomethane		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Dichlorodifluoromethane		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Ethylbenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Ethylene dibromide		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Hexachlorobutadiene		<0.0010	<0.0010		mg/L			12-DEC-19

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-HS-MS-CL	**Water**							
Batch R4942751								
WG3242018-3 DUP		**L2393424-1**						
Hexachlorobutadiene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
Isopropylbenzene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
m+p-Xylenes		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Methylene chloride		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
n-Butylbenzene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
n-Propylbenzene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
o-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
sec-Butylbenzene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
Styrene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
tert-Butylbenzene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
Tetrachloroethylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
trans-1,2-Dichloroethene		0.00067	0.00059		mg/L	13	30	12-DEC-19
trans-1,3-Dichloropropene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
Trichloroethene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
Trichlorofluoromethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-DEC-19
Vinyl chloride		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-DEC-19
WG3242018-1 MB								
1,1,1,2-Tetrachloroethane			<0.0010		mg/L		0.001	12-DEC-19
1,1,1-Trichloroethane			<0.00050		mg/L		0.0005	12-DEC-19
1,1,2,2-Tetrachloroethane			<0.00050		mg/L		0.0005	12-DEC-19
1,1,2-Trichloroethane			<0.00050		mg/L		0.0005	12-DEC-19
1,1-Dichloroethane			<0.00050		mg/L		0.0005	12-DEC-19
1,1-Dichloroethene			<0.00050		mg/L		0.0005	12-DEC-19
1,1-Dichloropropene			<0.0010		mg/L		0.001	12-DEC-19
1,2,3-Trichlorobenzene			<0.0010		mg/L		0.001	12-DEC-19
1,2,3-Trichloropropane			<0.00050		mg/L		0.0005	12-DEC-19
1,2,4-Trichlorobenzene			<0.0010		mg/L		0.001	12-DEC-19
1,2,4-Trimethylbenzene			<0.0010		mg/L		0.001	12-DEC-19
1,2-Dibromo-3-chloropropane			<0.0010		mg/L		0.001	12-DEC-19
1,2-Dichlorobenzene			<0.00050		mg/L		0.0005	12-DEC-19
1,2-Dichloroethane			<0.0010		mg/L		0.001	12-DEC-19
1,2-Dichloropropane			<0.00050		mg/L		0.0005	12-DEC-19

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-HS-MS-CL	**Water**							
Batch R4942751								
WG3242018-1 MB								
1,3,5-Trimethylbenzene			<0.0010		mg/L		0.001	12-DEC-19
1,3-Dichlorobenzene			<0.00050		mg/L		0.0005	12-DEC-19
1,3-Dichloropropane			<0.0010		mg/L		0.001	12-DEC-19
1,4-Dichlorobenzene			<0.00050		mg/L		0.0005	12-DEC-19
2,2-Dichloropropane			<0.0010		mg/L		0.001	12-DEC-19
2-Chlorotoluene			<0.0010		mg/L		0.001	12-DEC-19
4-Chlorotoluene			<0.0010		mg/L		0.001	12-DEC-19
p-Isopropyltoluene			<0.0010		mg/L		0.001	12-DEC-19
Benzene			<0.00050		mg/L		0.0005	12-DEC-19
Bromobenzene			<0.0010		mg/L		0.001	12-DEC-19
Bromochloromethane			<0.0010		mg/L		0.001	12-DEC-19
Bromodichloromethane			<0.00050		mg/L		0.0005	12-DEC-19
Bromoform			<0.00050		mg/L		0.0005	12-DEC-19
Bromomethane			<0.0010		mg/L		0.001	12-DEC-19
Carbon tetrachloride			<0.00050		mg/L		0.0005	12-DEC-19
Chlorobenzene			<0.00050		mg/L		0.0005	12-DEC-19
Chloroethane			<0.0010		mg/L		0.001	12-DEC-19
Chloroform			<0.00050		mg/L		0.0005	12-DEC-19
Chloromethane			<0.0010		mg/L		0.001	12-DEC-19
cis-1,2-Dichloroethene			<0.0010		mg/L		0.001	12-DEC-19
cis-1,3-Dichloropropene			<0.00050		mg/L		0.0005	12-DEC-19
Dibromochloromethane			<0.00050		mg/L		0.0005	12-DEC-19
Dibromomethane			<0.00050		mg/L		0.0005	12-DEC-19
Dichlorodifluoromethane			<0.00050		mg/L		0.0005	12-DEC-19
Ethylbenzene			<0.00050		mg/L		0.0005	12-DEC-19
Ethylene dibromide			<0.00050		mg/L		0.0005	12-DEC-19
Hexachlorobutadiene			<0.0010		mg/L		0.001	12-DEC-19
Isopropylbenzene			<0.0010		mg/L		0.001	12-DEC-19
m+p-Xylenes			<0.00050		mg/L		0.0005	12-DEC-19
Methylene chloride			<0.0010		mg/L		0.001	12-DEC-19
n-Butylbenzene			<0.0010		mg/L		0.001	12-DEC-19
n-Propylbenzene			<0.0010		mg/L		0.001	12-DEC-19
o-Xylene			<0.00050		mg/L		0.0005	12-DEC-19

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-HS-MS-CL	**Water**							
Batch R4942751								
WG3242018-1 MB								
sec-Butylbenzene			<0.0010		mg/L		0.001	12-DEC-19
Styrene			<0.00050		mg/L		0.0005	12-DEC-19
tert-Butylbenzene			<0.0010		mg/L		0.001	12-DEC-19
Tetrachloroethylene			<0.00050		mg/L		0.0005	12-DEC-19
Toluene			<0.00050		mg/L		0.0005	12-DEC-19
trans-1,2-Dichloroethene			<0.00050		mg/L		0.0005	12-DEC-19
trans-1,3-Dichloropropene			<0.0010		mg/L		0.001	12-DEC-19
Trichloroethene			<0.00050		mg/L		0.0005	12-DEC-19
Trichlorofluoromethane			<0.0010		mg/L		0.001	12-DEC-19
Vinyl chloride			<0.00050		mg/L		0.0005	12-DEC-19
Surrogate: 1,4-Difluorobenzene			100.5		%		70-130	12-DEC-19
Surrogate: 4-Bromofluorobenzene			88.1		%		70-130	12-DEC-19

Quality Control Report

Workorder: L2393428 Report Date: 30-DEC-19

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

December 26, 2019 Service Request No:K1911636

Inayat Dhaliwal
ALS Environmental - Canada
2559 29 Street NE
Calgary, AB T1Y 7B5

Laboratory Results for: L2393428

Dear Inayat,

Enclosed are the results of the sample(s) submitted to our laboratory December 12, 2019
For your reference, these analyses have been assigned our service request number **K1911636.**

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3293. You may also contact me via email at Elizabeth.Harris@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Elizabeth Harris
Project Manager

ADDRESS 1317 S. 13th Avenue, Kelso, WA 98626
PHONE +1 360 577 7222 | FAX +1 360 636 1068
ALS Group USA, Corp.
dba ALS Environmental

Narrative Documents

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360) 577-7222 Fax (360) 425-9096
www.alsglobal.com

Client: ALS Environmental - Canada
Project: L2393428
Sample Matrix: Water

Service Request: K1911636
Date Received: 12/12/2019

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples for the Tier II level requested by the client.

Sample Receipt:

Four water samples were received for analysis at ALS Environmental on 12/12/2019. Any discrepancies upon initial sample inspection are annotated on the sample receipt and preservation form included within this report. The samples were stored at minimum in accordance with the analytical method requirements.

General Chemistry:

No significant anomalies were noted with this analysis.

Approved by _____ Date 12/26/2019

Sample Receipt Information

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360) 577-7222 Fax (360) 425-9096
www.alsglobal.com

Client: ALS Environmental - Canada **Service Request:**K1911636
Project: L2393428

SAMPLE CROSS-REFERENCE

SAMPLE #	CLIENT SAMPLE ID	DATE	TIME
K1911636-001	L2393428-1	12/5/2019	
K1911636-002	L2393428-2	12/5/2019	
K1911636-003	L2393428-3	12/5/2019	
K1911636-004	L2393428-4	12/5/2019	

KL911636

L2393428

CALGARY

ALS Environmental

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - KELSO, WASHINGTON, USA
1317 S. 13TH AVE
KELSO,WA 98626

NOTES: Please reference on final report and invoice: PO# *L2393428*
ALS requires QC data to be provided with your final results.

Please see enclosed 4 **sample(s) in** 4 **Container(s)**

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
L2393428-1 MW-01	Adsorbable Organic Halides (AOX-MISA-KL 1)	12/ 5/ 2019 12/30/2019	
L2393428-2 MW-03	Adsorbable Organic Halides (AOX-MISA-KL 1)	12/ 5/ 2019 12/30/2019	
L2393428-3 MW-01 (LOT 4)	Adsorbable Organic Halides (AOX-MISA-KL 1)	12/ 5/ 2019 12/30/2019	
L2393428-4 MW-03 (LOT 4)	Adsorbable Organic Halides (AOX-MISA-KL 1)	12/ 5/ 2019 12/30/2019	

Subcontract Info Contact: John Forbes (403) 291-9897
Analysis and reporting info contact: Inayat Dhaliwal
2559 29 STREET NE
CALGARY,AB T1Y 7B5
Phone: (403) 291-9897 Email: inayat.dhaliwal@alsglobal.com

Please email confirmation of receipt to: **inayat.dhaliwal@alsglobal.com**

Shipped By: _____ Date Shipped: _____

Received By: _____ Date Received: 12/12/19 1000

Verified By: _____ Date Verified: _____

Temperature: _____

Sample Integrity Issues: _____

PC EH

Cooler Receipt and Preservation Form

Client ALS CANADA Service Request K1911636

Received: 12/12/19 Opened: 12/12/19 By: CG Unloaded: 12/12/19 By: CG

1. Samples were received via? *USPS* (*Fed Ex*) *UPS* *DHL* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) (*Cooler*) *Box* *Envelope* *Other* _____ *NA*
3. Were custody seals on coolers? NA Y (N) If yes, how many and where? _____
   If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID (NA)	Tracking Number NA	Filed
0.1	0.4	/	/	+0.3	403		777200688607	

4. Packing material: *Inserts* *Baggies* (*Bubble Wrap*) (*Gel Packs*) *Wet Ice* *Dry Ice* *Sleeves* _____
5. Were custody papers properly filled out (ink, signed, etc.)? NA (Y) N
6. Were samples received in good condition (temperature, unbroken)? *Indicate in the table below.* NA (Y) N
   If applicable, tissue samples were received: *Frozen* *Partially Thawed* *Thawed*
7. Were all sample labels complete (i.e analysis, preservation, etc.)? NA (Y) N
8. Did all sample labels and tags agree with custody papers? *Indicate major discrepancies in the table on page 2.* NA (Y) N
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA (Y) N
10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* NA (Y) N
11. Were VOA vials received without headspace? *Indicate in the table below.* (NA) Y N
12. Was C12/Res negative? (NA) Y N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Out of Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, & Resolutions: _____

Miscellaneous Forms

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Inorganic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated value.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.
H	The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

#	The control limit criteria is not applicable. See case narrative.
J	The result is an estimated value.
E	The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
M	The duplicate injection precision was not met.
N	The Matrix Spike sample recovery is not within control limits. See case narrative.
S	The reported value was determined by the Method of Standard Additions (MSA).
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
W	The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
+	The correlation coefficient for the MSA is less than 0.995.
Q	See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
A	A tentatively identified compound, a suspected aldol-condensation product.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
C	The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
D	The reported result is from a dilution.
E	The result is an estimated value.
J	The result is an estimated value.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
P	The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

F	The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
L	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
H	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
O	The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
Y	The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
Z	The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2795
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjlabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water-	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.ALSGlobal.com or at the accreditation bodies web site.
Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Client: ALS Environmental - Canada
Project: L2393428/
Service Request: K1911636

Sample Name: L2393428-1
Lab Code: K1911636-001
Sample Matrix: Water
Date Collected: 12/5/19
Date Received: 12/12/19

Analysis Method	Extracted/Digested By	Analyzed By
1650C		ESCHLOSS

Sample Name: L2393428-2
Lab Code: K1911636-002
Sample Matrix: Water
Date Collected: 12/5/19
Date Received: 12/12/19

Analysis Method	Extracted/Digested By	Analyzed By
1650C		ESCHLOSS

Sample Name: L2393428-3
Lab Code: K1911636-003
Sample Matrix: Water
Date Collected: 12/5/19
Date Received: 12/12/19

Analysis Method	Extracted/Digested By	Analyzed By
1650C		ESCHLOSS

Sample Name: L2393428-4
Lab Code: K1911636-004
Sample Matrix: Water
Date Collected: 12/5/19
Date Received: 12/12/19

Analysis Method	Extracted/Digested By	Analyzed By
1650C		ESCHLOSS

Sample Results

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General Chemistry

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Client:	ALS Environmental - Canada	**Service Request:**	K1911636
Project:	L2393428	**Date Collected:**	12/05/19
Sample Matrix:	Water	**Date Received:**	12/12/19 10:00
Sample Name:	L2393428-1	**Basis:**	NA
Lab Code:	K1911636-001		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Q
Halides, Adsorbable Organic (AOX)	1650C	ND U	mg/L	0.10	10	12/19/19 09:58	

Client:	ALS Environmental - Canada	**Service Request:**	K1911636
Project:	L2393428	**Date Collected:**	12/05/19
Sample Matrix:	Water	**Date Received:**	12/12/19 10:00
Sample Name:	L2393428-2	**Basis:**	NA
Lab Code:	K1911636-002		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Q
Halides, Adsorbable Organic (AOX)	1650C	ND U	mg/L	0.10	10	12/19/19 09:58	

Client:	ALS Environmental - Canada	**Service Request:**	K1911636
Project:	L2393428	**Date Collected:**	12/05/19
Sample Matrix:	Water	**Date Received:**	12/12/19 10:00
Sample Name:	L2393428-3	**Basis:**	NA
Lab Code:	K1911636-003		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Q
Halides, Adsorbable Organic (AOX)	1650C	ND U	mg/L	0.10	10	12/19/19 09:58	

Analytical Report

Client:	ALS Environmental - Canada	**Service Request:**	K1911636
Project:	L2393428	**Date Collected:**	12/05/19
Sample Matrix:	Water	**Date Received:**	12/12/19 10:00
Sample Name:	L2393428-4	**Basis:**	NA
Lab Code:	K1911636-004		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Q
Halides, Adsorbable Organic (AOX)	1650C	ND U	mg/L	0.025	2.5	12/19/19 09:58	

QC Summary Forms

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General Chemistry

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
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www.alsglobal.com

Analytical Report

Client:	ALS Environmental - Canada	**Service Request:**	K1911636
Project:	L2393428	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	NA
Lab Code:	K1911636-MB		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Q
Halides, Adsorbable Organic (AOX)	1650C	ND U	mg/L	0.010	1	12/19/19 09:58	

Client:	ALS Environmental - Canada	**Service Request:**	K1911636
Project:	L2393428/	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
		Date Analyzed:	12/19/2019
		Analysis Lot:	663925

Calibration and Method Blank Summary
Halides, Adsorbable Organic (AOX)
1650C

	Halide Check Standard (ug)	**Instrument Calibration Standard** (ug)	**PAR Standard** (ug/L)
True Value	3.64	10.0	0.100
Run A	3.70	10.4	0.099
Percent Recovery A	102	104	99
Run B	3.75	10.3	
Percent Recovery B	103	103	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - Canada	**Service Request:**	K1911636
Project:	L2393428	**Date Collected:**	N/A
Sample Matrix:	Water	**Date Received:**	N/A
		Date Analyzed:	12/19/19
		Date Extracted:	NA

Duplicate Matrix Spike Summary
Halides, Adsorbable Organic (AOX)

Sample Name:	Batch QC	**Units:**	mg/L
Lab Code:	K1911637-002	**Basis:**	NA
Analysis Method:	1650C		
Prep Method:	None		

		Matrix Spike K1911637-002MS			Duplicate Matrix Spike K1911637-002DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Halides, Adsorbable Organic (AOX)	0.039	0.289	0.250	100	0.302	0.250	105	90-110	4	20

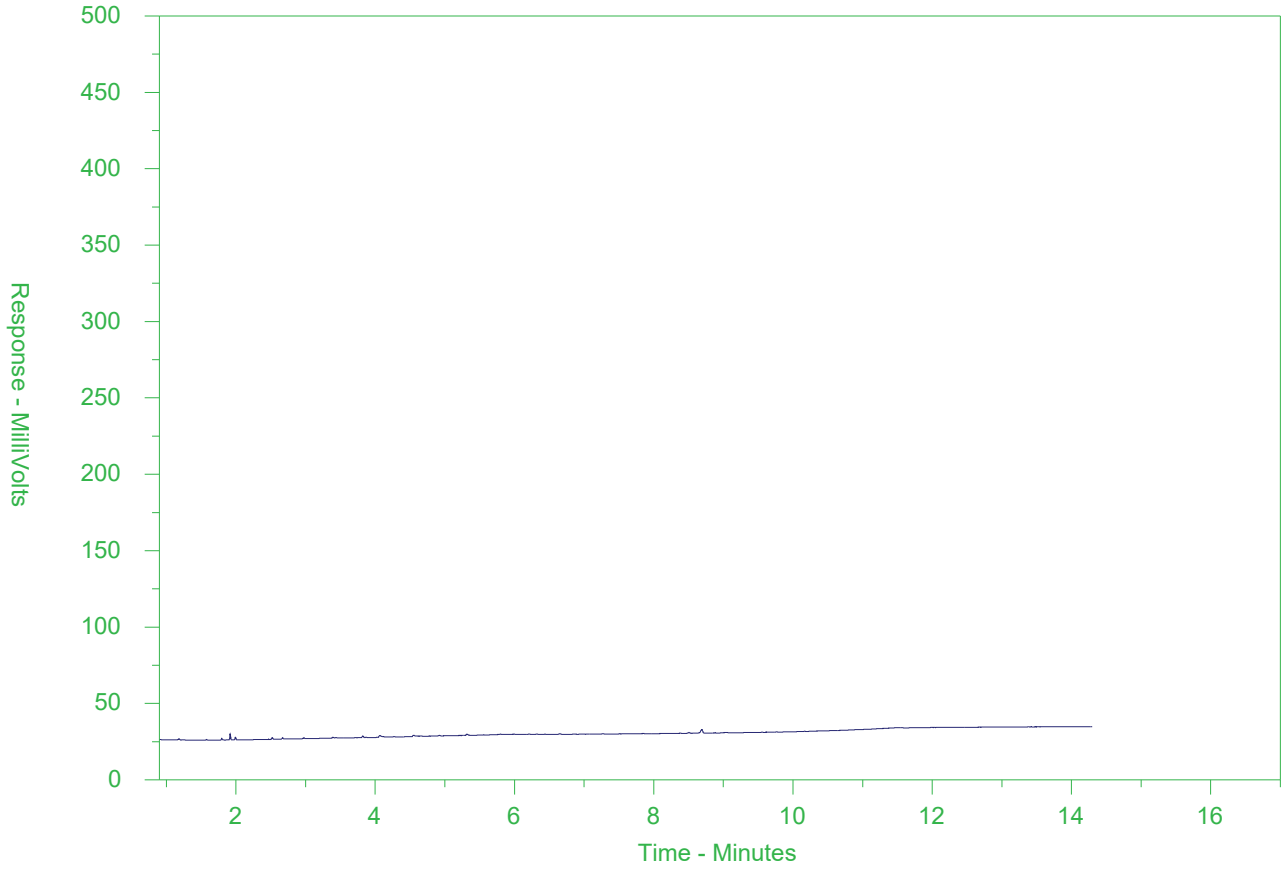
Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2393428-1
Client Sample ID: MW-01



← F2 →	← F3 →	← F4 →	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
← Gasoline →		← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

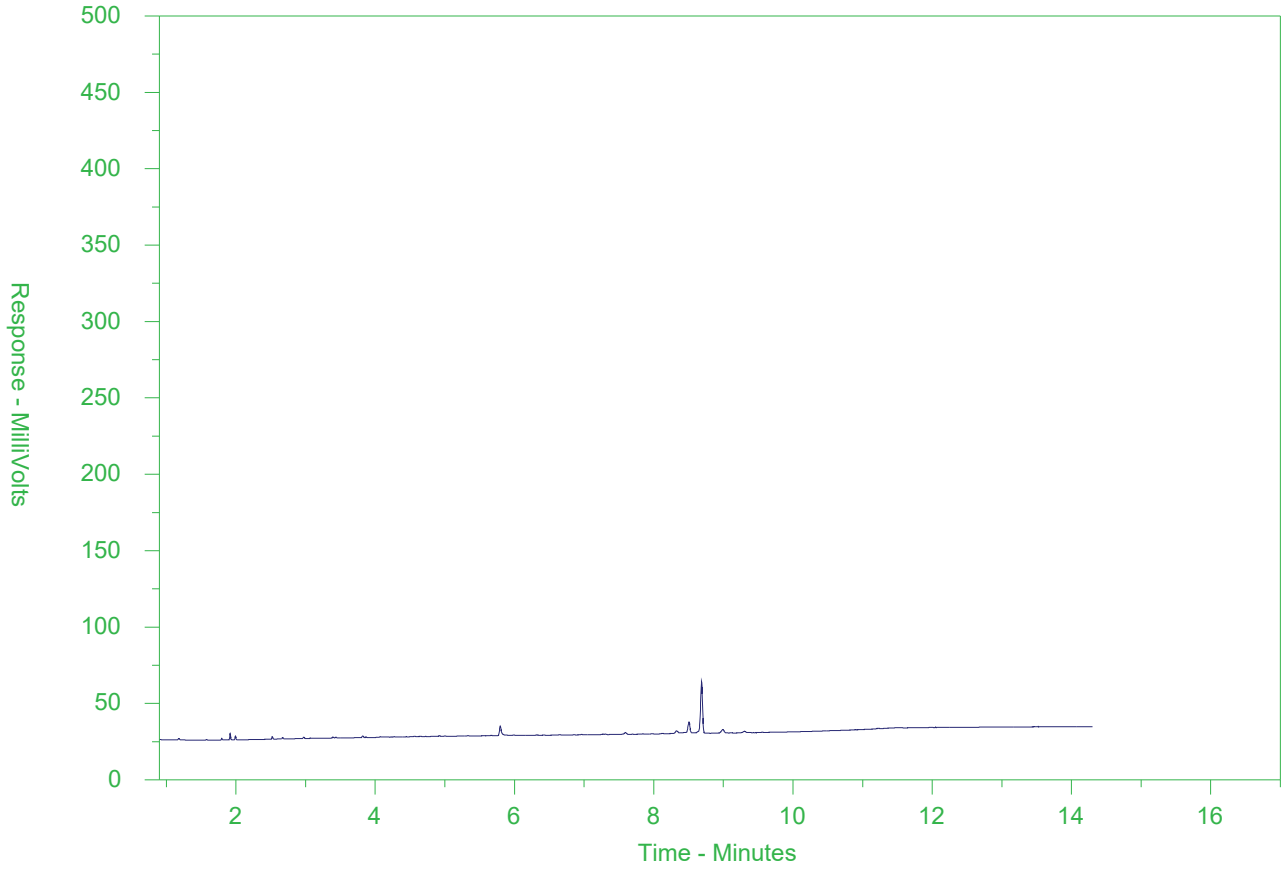
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2393428-2
Client Sample ID: MW-03



← F2 →	← F3 →	← F4 →	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
← Gasoline →		← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

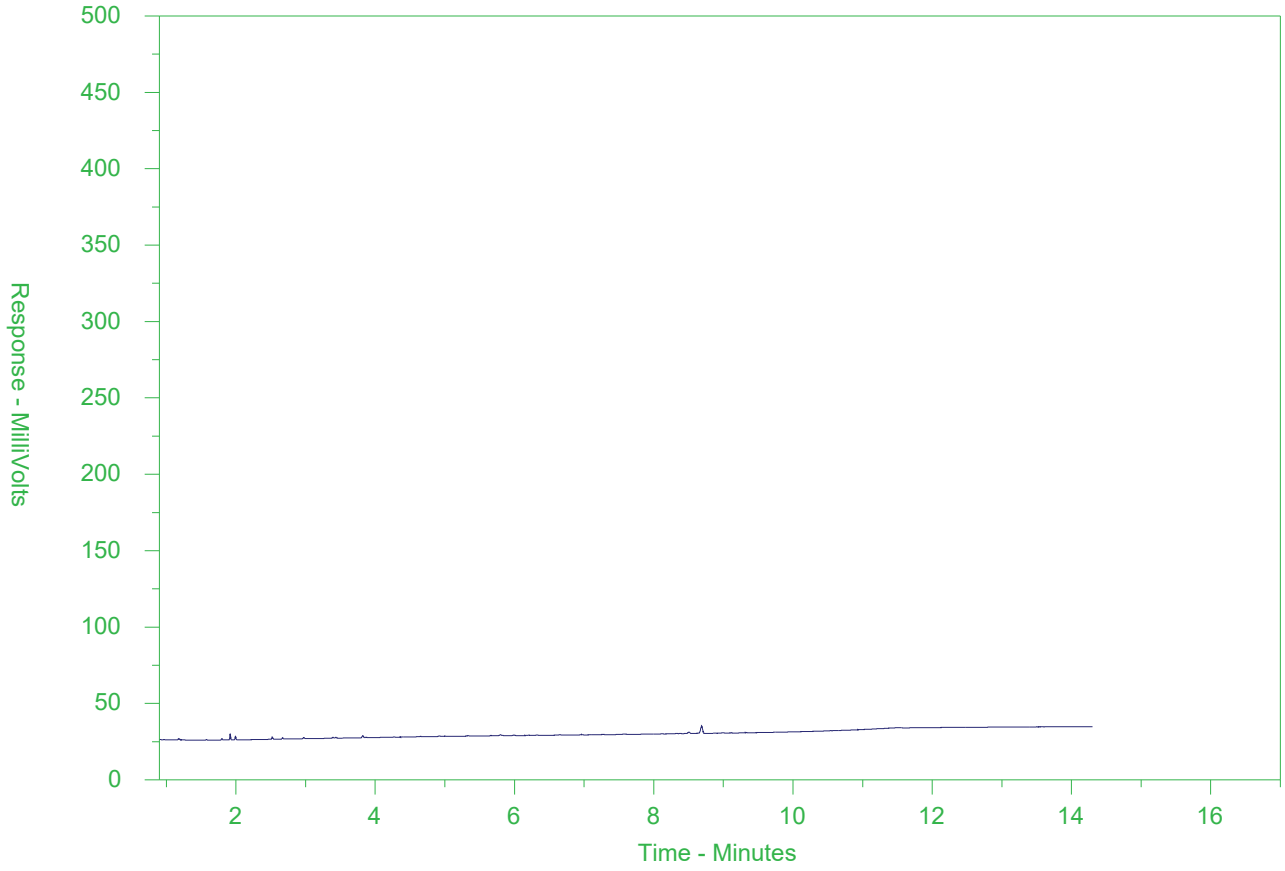
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2393428-3
Client Sample ID: MW-01 (LOT 4)



← F2 →	← F3 →	← F4 →	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
← Gasoline →		← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

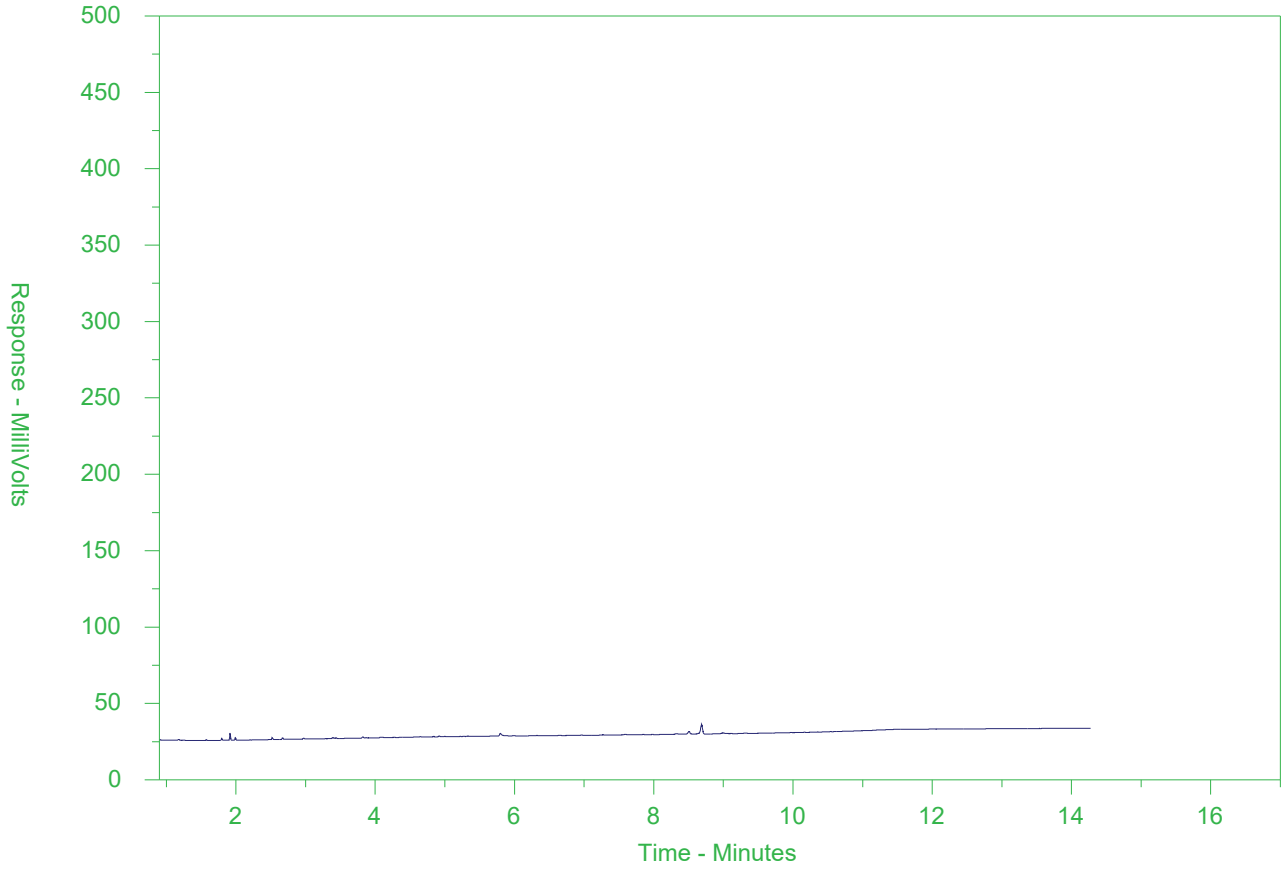
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2393428-4R
Client Sample ID: MW-03 (LOT 4)



← F2 →	← F3 →	← F4 →	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
← Gasoline →		← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

L2393428-COFC

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES
Environmental Division

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC # CORD Riverside Light

Page 1 of 1

Report to:		**Report Format / Distribution**		**Service Requested:**	
Company:	Tetra Tech Canada Inc.	☐ Standard ☐ Other		☑	Regular Service (Default)
Contact:	Darby Madalena	☑ PDF ☑ Excel ☐ Fax		☐	Rush Service (2-3 Days)
Address:	110, 140 Quarry Park Blvd SE, Calgary, AB T2C 3G3	Email 1: darby.madalena@tetratech.com		☐	Priority Service (1 Day or ASAP)
		Email 2:		☐	Emergency Service (<1 Day / Wkend) - Contact ALS
Phone:	403-723-6867 Fax: 403-203-3301	ALS Digital Crosstab results		**Analysis Request**	
Invoice To:	☑ Same as Report	Indicate Bottles: Filtered / Preserved (F/P) →			
Company:	SAME AS REPORT	**Client / Project Information:**			
Contact:		Job #:	SWOP04071-01.008		
Address:		PO/AFE:	SWOP04071-01.008		
Sample		Legal Site Description:			
Phone:	Fax:	Quote #:	Q71650		
Lab Work Order # (lab use only)		**ALS Contact:**	Wendy Sears	**Sampler** (Initials):	Megan Pouw

Sample #	Sample Identification (This description will appear on the report)	Date dd-mmm-yy	Time hh:mm	Sample Type (Select from drop-down list)	BTX,F1,F2-CL	VOC-8260-CL	TKN-F-CL	ROU-MET_D-ABT1-CL	C-DIS-ORG-CL	NH3-F-CL	P-T-COL-CL	AOX-MISA-KL	VFA-WP		Hazardous?	Highly Contaminated?	Number of Containers
	MW-01	05-dec-19	1255	Water	X	X	X	X	X	X	X	X	X				12
	~~MW-02~~ CNL			~~Water~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~				~~12~~
	MW-03	05-dec-19	1230	Water	X	X	X	X	X	X	X	X	X				12
	MW-01 (Lot 4)	↓	1310	Water	X	X	X	X	X	X	X	X	X				12
	~~MW-02 (Lot 4)~~ CNL			~~Water~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~				~~12~~
	MW-03 (Lot 4)	05-dec-19	1320	Water	X	X	X	X	X	X	X	X	X				12

Guidelines / Regulations

Special Instructions / Hazardous Details

Metals + Hg + DOC F/P

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the adjacent worksheet.

Relinquished By:	Date & Time:	Received By:	Date & Time:
Megan Pouw	Dec 6/19 1600		

Relinquished By:	Date & Time:	Received By:	Date & Time:

Sample Condition (lab use only)

Temperature	Samples Received in Good Condition? Y / N (if no provided details)

TETRA TECH CANADA INC.
ATTN: Darby Madalena
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3

Date Received: 06-DEC-19
Report Date: 24-DEC-19 13:22 (MT)
Version: FINAL

Client Phone: 403-203-3355

Certificate of Analysis

Lab Work Order #: L2393570

Project P.O. #: SWM.SWOP04071-01.008
Job Reference: SWM.SWOP04071-01.008 (RIVERSIDE LIGH INDUSTRIAL PARK)
C of C Numbers:
Legal Site Desc:

Inayat Dhaliwal
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393570-1 VW-01							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 09:20							
Matrix: SG							
Total F1 and F2+ Sub Fractionation							
Aliphatic/Aromatic PHC Sub-Fractionation							
Aliphatic C6-C8	56		15	ug/m3		23-DEC-19	R4953011
Aliphatic C>8-C10	83		15	ug/m3		23-DEC-19	R4953011
Aliphatic C>10-C12	70		15	ug/m3		23-DEC-19	R4953011
Aliphatic C>12-C16	<30		30	ug/m3		23-DEC-19	R4953011
Aromatic C>8-C10	<15		15	ug/m3		23-DEC-19	R4953011
Aromatic C>10-C12	<15		15	ug/m3		23-DEC-19	R4953011
Aromatic C>12-C16	<30		30	ug/m3		23-DEC-19	R4953011
Total F1and F2 fractions (not corrected)							
F1 (C6-C10)	146		15	ug/m3		23-DEC-19	R4953011
F2 (C10-C16)	88		15	ug/m3		23-DEC-19	R4953011
Surrogate: 4-Bromofluorobenzene	103.0		50-150	%		23-DEC-19	R4953011
High Level Fixed Gases by TCD							
Nitrogen	80.3		1.0	%		13-DEC-19	R4944389
Oxygen	21.8		0.10	%		13-DEC-19	R4944389
Carbon Dioxide	0.150		0.050	%		13-DEC-19	R4944389
Carbon Monoxide	<0.050		0.050	%		13-DEC-19	R4944389
Methane	<0.050		0.050	%		13-DEC-19	R4944389
BTEX and Naphthalene							
Naphthalene	<2.6		2.6	ug/m3		20-DEC-19	R4952666
Naphthalene	<0.50		0.50	ppb(V)		20-DEC-19	R4952666
Surrogate: 4-Bromofluorobenzene	93.1		50-150	%		20-DEC-19	R4952666
Canister EPA TO-15							
1,1,1-Trichloroethane	<1.1		1.1	ug/m3		20-DEC-19	R4952666
1,1,1-Trichloroethane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,1,2,2-Tetrachloroethane	<1.4		1.4	ug/m3		20-DEC-19	R4952666
1,1,2,2-Tetrachloroethane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,1,2-Trichloroethane	<1.1		1.1	ug/m3		20-DEC-19	R4952666
1,1,2-Trichloroethane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,1-Dichloroethane	<0.81		0.81	ug/m3		20-DEC-19	R4952666
1,1-Dichloroethane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,1-Dichloroethene	<0.79		0.79	ug/m3		20-DEC-19	R4952666
1,1-Dichloroethene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,2,4-Trichlorobenzene	<1.5		1.5	ug/m3		20-DEC-19	R4952666
1,2,4-Trichlorobenzene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,2,4-Trimethylbenzene	<0.98		0.98	ug/m3		20-DEC-19	R4952666
1,2,4-Trimethylbenzene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,2-Dibromoethane	<1.5		1.5	ug/m3		20-DEC-19	R4952666
1,2-Dibromoethane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,2-Dichlorobenzene	<1.2		1.2	ug/m3		20-DEC-19	R4952666
1,2-Dichlorobenzene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,2-Dichloroethane	<0.81		0.81	ug/m3		20-DEC-19	R4952666
1,2-Dichloroethane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,2-Dichloropropane	<0.92		0.92	ug/m3		20-DEC-19	R4952666
1,2-Dichloropropane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,3,5-Trimethylbenzene	<0.98		0.98	ug/m3		20-DEC-19	R4952666
1,3,5-Trimethylbenzene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,3-Butadiene	<0.44		0.44	ug/m3		20-DEC-19	R4952666
1,3-Butadiene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,3-Dichlorobenzene	<1.2		1.2	ug/m3		20-DEC-19	R4952666
1,3-Dichlorobenzene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393570-1 VW-01							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 09:20							
Matrix: SG							
Canister EPA TO-15							
1,4-Dichlorobenzene	<1.2		1.2	ug/m3		20-DEC-19	R4952666
1,4-Dichlorobenzene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,4-Dioxane	<0.72		0.72	ug/m3		20-DEC-19	R4952666
1,4-Dioxane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
2-Hexanone	<4.1		4.1	ug/m3		20-DEC-19	R4952666
2-Hexanone	<1.0		1.0	ppb(V)		20-DEC-19	R4952666
4-Ethyltoluene	<0.98		0.98	ug/m3		20-DEC-19	R4952666
4-Ethyltoluene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Acetone	16.3	DLA	5.9	ug/m3		23-DEC-19	R4952666
Acetone	6.9	DLA	2.5	ppb(V)		23-DEC-19	R4952666
Allyl chloride	<0.63		0.63	ug/m3		20-DEC-19	R4952666
Allyl chloride	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Benzene	1.54		0.64	ug/m3		20-DEC-19	R4952666
Benzene	0.48		0.20	ppb(V)		20-DEC-19	R4952666
Benzyl chloride	<1.0		1.0	ug/m3		20-DEC-19	R4952666
Benzyl chloride	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Bromodichloromethane	<1.3		1.3	ug/m3		20-DEC-19	R4952666
Bromodichloromethane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Bromoform	<2.1		2.1	ug/m3		20-DEC-19	R4952666
Bromoform	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Bromomethane	<0.78		0.78	ug/m3		20-DEC-19	R4952666
Bromomethane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Carbon Disulfide	<0.62		0.62	ug/m3		20-DEC-19	R4952666
Carbon Disulfide	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Carbon Tetrachloride	<1.3		1.3	ug/m3		20-DEC-19	R4952666
Carbon Tetrachloride	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Chlorobenzene	<0.92		0.92	ug/m3		20-DEC-19	R4952666
Chlorobenzene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Chloroethane	<0.53		0.53	ug/m3		20-DEC-19	R4952666
Chloroethane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Chloroform	<0.98		0.98	ug/m3		20-DEC-19	R4952666
Chloroform	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Chloromethane	1.05		0.41	ug/m3		20-DEC-19	R4952666
Chloromethane	0.51		0.20	ppb(V)		20-DEC-19	R4952666
cis-1,2-Dichloroethene	<0.79		0.79	ug/m3		20-DEC-19	R4952666
cis-1,2-Dichloroethene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
cis-1,3-Dichloropropene	<0.91		0.91	ug/m3		20-DEC-19	R4952666
cis-1,3-Dichloropropene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Cyclohexane	<0.69		0.69	ug/m3		20-DEC-19	R4952666
Cyclohexane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Dibromochloromethane	<1.7		1.7	ug/m3		20-DEC-19	R4952666
Dibromochloromethane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Dichlorodifluoromethane	2.76		0.99	ug/m3		20-DEC-19	R4952666
Dichlorodifluoromethane	0.56		0.20	ppb(V)		20-DEC-19	R4952666
Ethyl acetate	11.9		0.72	ug/m3		20-DEC-19	R4952666
Ethyl acetate	3.31		0.20	ppb(V)		20-DEC-19	R4952666
Ethylbenzene	<0.87		0.87	ug/m3		20-DEC-19	R4952666
Ethylbenzene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Freon 113	<1.5		1.5	ug/m3		20-DEC-19	R4952666
Freon 113	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Freon 114	<1.4		1.4	ug/m3		20-DEC-19	R4952666

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393570-1 VW-01							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 09:20							
Matrix: SG							
Canister EPA TO-15							
Freon 114	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Hexachlorobutadiene	<2.1		2.1	ug/m3		20-DEC-19	R4952666
Hexachlorobutadiene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Isooctane	<0.93		0.93	ug/m3		20-DEC-19	R4952666
Isooctane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Isopropyl alcohol	2.8		2.5	ug/m3		20-DEC-19	R4952666
Isopropyl alcohol	1.1		1.0	ppb(V)		20-DEC-19	R4952666
Isopropylbenzene	<0.98		0.98	ug/m3		20-DEC-19	R4952666
Isopropylbenzene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
m&p-Xylene	2.0		1.7	ug/m3		20-DEC-19	R4952666
m&p-Xylene	0.47		0.40	ppb(V)		20-DEC-19	R4952666
Methyl ethyl ketone	1.12		0.59	ug/m3		20-DEC-19	R4952666
Methyl ethyl ketone	0.38		0.20	ppb(V)		20-DEC-19	R4952666
Methyl isobutyl ketone	<0.82		0.82	ug/m3		20-DEC-19	R4952666
Methyl isobutyl ketone	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Methylene chloride	4.00		0.69	ug/m3		20-DEC-19	R4952666
Methylene chloride	1.15		0.20	ppb(V)		20-DEC-19	R4952666
MTBE	18.9	DLA	3.6	ug/m3		23-DEC-19	R4952666
MTBE	5.3	DLA	1.0	ppb(V)		23-DEC-19	R4952666
n-Heptane	<0.82		0.82	ug/m3		20-DEC-19	R4952666
n-Heptane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
n-Hexane	20.1	DLA	3.5	ug/m3		23-DEC-19	R4952666
n-Hexane	5.7	DLA	1.0	ppb(V)		23-DEC-19	R4952666
o-Xylene	<0.87		0.87	ug/m3		20-DEC-19	R4952666
o-Xylene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Propylene	<0.34		0.34	ug/m3		20-DEC-19	R4952666
Propylene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Styrene	<0.85		0.85	ug/m3		20-DEC-19	R4952666
Styrene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Tetrachloroethylene	<1.4		1.4	ug/m3		20-DEC-19	R4952666
Tetrachloroethylene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Tetrahydrofuran	0.80		0.59	ug/m3		20-DEC-19	R4952666
Tetrahydrofuran	0.27		0.20	ppb(V)		20-DEC-19	R4952666
Toluene	17.7	DLA	3.8	ug/m3		23-DEC-19	R4952666
Toluene	4.7	DLA	1.0	ppb(V)		23-DEC-19	R4952666
trans-1,2-Dichloroethene	<0.79		0.79	ug/m3		20-DEC-19	R4952666
trans-1,2-Dichloroethene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
trans-1,3-Dichloropropene	<0.91		0.91	ug/m3		20-DEC-19	R4952666
trans-1,3-Dichloropropene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Trichloroethylene	<1.1		1.1	ug/m3		20-DEC-19	R4952666
Trichloroethylene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Trichlorofluoromethane	1.3		1.1	ug/m3		20-DEC-19	R4952666
Trichlorofluoromethane	0.22		0.20	ppb(V)		20-DEC-19	R4952666
Vinyl acetate	<1.8		1.8	ug/m3		20-DEC-19	R4952666
Vinyl acetate	<0.50		0.50	ppb(V)		20-DEC-19	R4952666
Vinyl bromide	<0.87		0.87	ug/m3		20-DEC-19	R4952666
Vinyl bromide	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Vinyl chloride	<0.51		0.51	ug/m3		20-DEC-19	R4952666
Vinyl chloride	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Surrogate: 4-Bromofluorobenzene	93.1		50-150	%		20-DEC-19	R4952666
Sum of Xylene Isomer Concentrations							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393570-1 VW-01							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 09:20							
Matrix: SG							
Sum of Xylene Isomer Concentrations							
Xylenes (Total)	0.47		0.45	ppb(V)		23-DEC-19	
Xylenes (Total)	2.0		2.0	ug/m3		23-DEC-19	
Select list of 7 C1-C5 hydrocarbon gases							
Methane	0.00029		0.00010	%		10-DEC-19	R4944650
Ethane	<0.00020		0.00020	%		10-DEC-19	R4944650
Ethene	<0.00020		0.00020	%		10-DEC-19	R4944650
Propane	<0.00020		0.00020	%		10-DEC-19	R4944650
Propene	<0.00020		0.00020	%		10-DEC-19	R4944650
Butane	<0.00020		0.00020	%		10-DEC-19	R4944650
Pentane	<0.00020		0.00020	%		10-DEC-19	R4944650
Canister Information							
Pressure on Receipt	0.0		-30	in Hg	17-DEC-19	17-DEC-19	R4944737
Canister ID	01400-0339				17-DEC-19	17-DEC-19	R4944737
Regulator ID	G101				17-DEC-19	17-DEC-19	R4944737
Batch Proof ID	191119.129				17-DEC-19	17-DEC-19	R4944737

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393570-2 VW-02							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 09:50							
Matrix: SG							
Total F1 and F2+ Sub Fractionation							
Aliphatic/Aromatic PHC Sub-Fractionation							
Aliphatic C6-C8	59		15	ug/m3		23-DEC-19	R4953011
Aliphatic C>8-C10	50		15	ug/m3		23-DEC-19	R4953011
Aliphatic C>10-C12	32		15	ug/m3		23-DEC-19	R4953011
Aliphatic C>12-C16	<30		30	ug/m3		23-DEC-19	R4953011
Aromatic C>8-C10	<15		15	ug/m3		23-DEC-19	R4953011
Aromatic C>10-C12	<15		15	ug/m3		23-DEC-19	R4953011
Aromatic C>12-C16	<30		30	ug/m3		23-DEC-19	R4953011
Total F1and F2 fractions (not corrected)							
F1 (C6-C10)	76		15	ug/m3		23-DEC-19	R4953011
F2 (C10-C16)	50		15	ug/m3		23-DEC-19	R4953011
Surrogate: 4-Bromofluorobenzene	96.8		50-150	%		23-DEC-19	R4953011
High Level Fixed Gases by TCD							
Nitrogen	80.7		1.0	%		13-DEC-19	R4944389
Oxygen	21.7		0.10	%		13-DEC-19	R4944389
Carbon Dioxide	0.246		0.050	%		13-DEC-19	R4944389
Carbon Monoxide	<0.050		0.050	%		13-DEC-19	R4944389
Methane	0.234		0.050	%		13-DEC-19	R4944389
BTEX and Naphthalene							
Naphthalene	<2.6		2.6	ug/m3		23-DEC-19	R4952666
Naphthalene	<0.50		0.50	ppb(V)		23-DEC-19	R4952666
Surrogate: 4-Bromofluorobenzene	88.3		50-150	%		23-DEC-19	R4952666
Canister EPA TO-15							
1,1,1-Trichloroethane	<1.1		1.1	ug/m3		20-DEC-19	R4952666
1,1,1-Trichloroethane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,1,2,2-Tetrachloroethane	<1.4		1.4	ug/m3		20-DEC-19	R4952666
1,1,2,2-Tetrachloroethane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,1,2-Trichloroethane	<1.1		1.1	ug/m3		20-DEC-19	R4952666
1,1,2-Trichloroethane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,1-Dichloroethane	<0.81		0.81	ug/m3		20-DEC-19	R4952666
1,1-Dichloroethane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,1-Dichloroethene	<0.79		0.79	ug/m3		20-DEC-19	R4952666
1,1-Dichloroethene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,2,4-Trichlorobenzene	<1.5		1.5	ug/m3		20-DEC-19	R4952666
1,2,4-Trichlorobenzene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,2,4-Trimethylbenzene	<0.98		0.98	ug/m3		20-DEC-19	R4952666
1,2,4-Trimethylbenzene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,2-Dibromoethane	<1.5		1.5	ug/m3		20-DEC-19	R4952666
1,2-Dibromoethane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,2-Dichlorobenzene	<1.2		1.2	ug/m3		20-DEC-19	R4952666
1,2-Dichlorobenzene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,2-Dichloroethane	<0.81		0.81	ug/m3		20-DEC-19	R4952666
1,2-Dichloroethane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,2-Dichloropropane	<0.92		0.92	ug/m3		20-DEC-19	R4952666
1,2-Dichloropropane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,3,5-Trimethylbenzene	<0.98		0.98	ug/m3		20-DEC-19	R4952666
1,3,5-Trimethylbenzene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,3-Butadiene	<0.44		0.44	ug/m3		20-DEC-19	R4952666
1,3-Butadiene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,3-Dichlorobenzene	<1.2		1.2	ug/m3		20-DEC-19	R4952666
1,3-Dichlorobenzene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393570-2 VW-02							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 09:50							
Matrix: SG							
Canister EPA TO-15							
1,4-Dichlorobenzene	<1.2		1.2	ug/m3		20-DEC-19	R4952666
1,4-Dichlorobenzene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
1,4-Dioxane	<0.72		0.72	ug/m3		20-DEC-19	R4952666
1,4-Dioxane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
2-Hexanone	<4.1		4.1	ug/m3		20-DEC-19	R4952666
2-Hexanone	<1.0		1.0	ppb(V)		20-DEC-19	R4952666
4-Ethyltoluene	<0.98		0.98	ug/m3		20-DEC-19	R4952666
4-Ethyltoluene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Acetone	13.1	DLA	5.9	ug/m3		23-DEC-19	R4952666
Acetone	5.5	DLA	2.5	ppb(V)		23-DEC-19	R4952666
Allyl chloride	<0.63		0.63	ug/m3		20-DEC-19	R4952666
Allyl chloride	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Benzene	2.11		0.64	ug/m3		20-DEC-19	R4952666
Benzene	0.66		0.20	ppb(V)		20-DEC-19	R4952666
Benzyl chloride	<1.0		1.0	ug/m3		20-DEC-19	R4952666
Benzyl chloride	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Bromodichloromethane	<1.3		1.3	ug/m3		20-DEC-19	R4952666
Bromodichloromethane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Bromoform	<2.1		2.1	ug/m3		20-DEC-19	R4952666
Bromoform	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Bromomethane	<0.78		0.78	ug/m3		20-DEC-19	R4952666
Bromomethane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Carbon Disulfide	11.7		0.62	ug/m3		20-DEC-19	R4952666
Carbon Disulfide	3.74		0.20	ppb(V)		20-DEC-19	R4952666
Carbon Tetrachloride	<1.3		1.3	ug/m3		20-DEC-19	R4952666
Carbon Tetrachloride	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Chlorobenzene	<0.92		0.92	ug/m3		20-DEC-19	R4952666
Chlorobenzene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Chloroethane	<0.53		0.53	ug/m3		20-DEC-19	R4952666
Chloroethane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Chloroform	<0.98		0.98	ug/m3		20-DEC-19	R4952666
Chloroform	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Chloromethane	1.70		0.41	ug/m3		20-DEC-19	R4952666
Chloromethane	0.82		0.20	ppb(V)		20-DEC-19	R4952666
cis-1,2-Dichloroethene	<0.79		0.79	ug/m3		20-DEC-19	R4952666
cis-1,2-Dichloroethene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
cis-1,3-Dichloropropene	<0.91		0.91	ug/m3		20-DEC-19	R4952666
cis-1,3-Dichloropropene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Cyclohexane	1.20		0.69	ug/m3		20-DEC-19	R4952666
Cyclohexane	0.35		0.20	ppb(V)		20-DEC-19	R4952666
Dibromochloromethane	<1.7		1.7	ug/m3		20-DEC-19	R4952666
Dibromochloromethane	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Dichlorodifluoromethane	23.8	DLA	4.9	ug/m3		23-DEC-19	R4952666
Dichlorodifluoromethane	4.8	DLA	1.0	ppb(V)		23-DEC-19	R4952666
Ethyl acetate	<0.72		0.72	ug/m3		20-DEC-19	R4952666
Ethyl acetate	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Ethylbenzene	<0.87		0.87	ug/m3		20-DEC-19	R4952666
Ethylbenzene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Freon 113	<1.5		1.5	ug/m3		20-DEC-19	R4952666
Freon 113	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Freon 114	<1.4		1.4	ug/m3		20-DEC-19	R4952666

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393570-2 VW-02							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 09:50							
Matrix: SG							
Canister EPA TO-15							
Freon 114	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Hexachlorobutadiene	<2.1		2.1	ug/m3		20-DEC-19	R4952666
Hexachlorobutadiene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Isooctane	1.92		0.93	ug/m3		20-DEC-19	R4952666
Isooctane	0.41		0.20	ppb(V)		20-DEC-19	R4952666
Isopropyl alcohol	<2.5		2.5	ug/m3		20-DEC-19	R4952666
Isopropyl alcohol	<1.0		1.0	ppb(V)		20-DEC-19	R4952666
Isopropylbenzene	<0.98		0.98	ug/m3		20-DEC-19	R4952666
Isopropylbenzene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
m&p-Xylene	2.4		1.7	ug/m3		20-DEC-19	R4952666
m&p-Xylene	0.55		0.40	ppb(V)		20-DEC-19	R4952666
Methyl ethyl ketone	1.15		0.59	ug/m3		20-DEC-19	R4952666
Methyl ethyl ketone	0.39		0.20	ppb(V)		20-DEC-19	R4952666
Methyl isobutyl ketone	<0.82		0.82	ug/m3		20-DEC-19	R4952666
Methyl isobutyl ketone	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Methylene chloride	<0.69		0.69	ug/m3		20-DEC-19	R4952666
Methylene chloride	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
MTBE	<0.72		0.72	ug/m3		20-DEC-19	R4952666
MTBE	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
n-Heptane	1.35		0.82	ug/m3		20-DEC-19	R4952666
n-Heptane	0.33		0.20	ppb(V)		20-DEC-19	R4952666
n-Hexane	2.42		0.70	ug/m3		20-DEC-19	R4952666
n-Hexane	0.69		0.20	ppb(V)		20-DEC-19	R4952666
o-Xylene	0.92		0.87	ug/m3		20-DEC-19	R4952666
o-Xylene	0.21		0.20	ppb(V)		20-DEC-19	R4952666
Propylene	<0.34		0.34	ug/m3		20-DEC-19	R4952666
Propylene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Styrene	<0.85		0.85	ug/m3		20-DEC-19	R4952666
Styrene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Tetrachloroethylene	<1.4		1.4	ug/m3		20-DEC-19	R4952666
Tetrachloroethylene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Tetrahydrofuran	<0.59		0.59	ug/m3		20-DEC-19	R4952666
Tetrahydrofuran	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Toluene	4.75		0.75	ug/m3		20-DEC-19	R4952666
Toluene	1.26		0.20	ppb(V)		20-DEC-19	R4952666
trans-1,2-Dichloroethene	<0.79		0.79	ug/m3		20-DEC-19	R4952666
trans-1,2-Dichloroethene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
trans-1,3-Dichloropropene	<0.91		0.91	ug/m3		20-DEC-19	R4952666
trans-1,3-Dichloropropene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Trichloroethylene	<1.1		1.1	ug/m3		20-DEC-19	R4952666
Trichloroethylene	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Trichlorofluoromethane	1.6		1.1	ug/m3		20-DEC-19	R4952666
Trichlorofluoromethane	0.28		0.20	ppb(V)		20-DEC-19	R4952666
Vinyl acetate	<1.8		1.8	ug/m3		20-DEC-19	R4952666
Vinyl acetate	<0.50		0.50	ppb(V)		20-DEC-19	R4952666
Vinyl bromide	<0.87		0.87	ug/m3		20-DEC-19	R4952666
Vinyl bromide	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Vinyl chloride	<0.51		0.51	ug/m3		20-DEC-19	R4952666
Vinyl chloride	<0.20		0.20	ppb(V)		20-DEC-19	R4952666
Surrogate: 4-Bromofluorobenzene	88.4		50-150	%		20-DEC-19	R4952666
Sum of Xylene Isomer Concentrations							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393570-2 VW-02							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 09:50							
Matrix: SG							
Sum of Xylene Isomer Concentrations							
Xylenes (Total)	0.77		0.45	ppb(V)		23-DEC-19	
Xylenes (Total)	3.3		2.0	ug/m3		23-DEC-19	
Select list of 7 C1-C5 hydrocarbon gases							
Methane	N/A		0.00010	%		10-DEC-19	R4944650
Ethane	<0.00020		0.00020	%		10-DEC-19	R4944650
Ethene	<0.00020		0.00020	%		10-DEC-19	R4944650
Propane	<0.00020		0.00020	%		10-DEC-19	R4944650
Propene	<0.00020		0.00020	%		10-DEC-19	R4944650
Butane	<0.00020		0.00020	%		10-DEC-19	R4944650
Pentane	<0.00020		0.00020	%		10-DEC-19	R4944650
Canister Information							
Pressure on Receipt	-6.7		-30	in Hg	17-DEC-19	17-DEC-19	R4944737
Canister ID	01400-0252				17-DEC-19	17-DEC-19	R4944737
Regulator ID	G18				17-DEC-19	17-DEC-19	R4944737
Batch Proof ID	191108.332				17-DEC-19	17-DEC-19	R4944737

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393570-3 19DUP01							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 12:00							
Matrix: SG							
Total F1 and F2+ Sub Fractionation							
Aliphatic/Aromatic PHC Sub-Fractionation							
Aliphatic C6-C8	31		15	ug/m3		23-DEC-19	R4953011
Aliphatic C>8-C10	152		15	ug/m3		23-DEC-19	R4953011
Aliphatic C>10-C12	145		15	ug/m3		23-DEC-19	R4953011
Aliphatic C>12-C16	<30		30	ug/m3		23-DEC-19	R4953011
Aromatic C>8-C10	<15		15	ug/m3		23-DEC-19	R4953011
Aromatic C>10-C12	<15		15	ug/m3		23-DEC-19	R4953011
Aromatic C>12-C16	<30		30	ug/m3		23-DEC-19	R4953011
Total F1and F2 fractions (not corrected)							
F1 (C6-C10)	199		15	ug/m3		23-DEC-19	R4953011
F2 (C10-C16)	201		15	ug/m3		23-DEC-19	R4953011
Surrogate: 4-Bromofluorobenzene	100.3		50-150	%		23-DEC-19	R4953011
High Level Fixed Gases by TCD							
Nitrogen	80.2		1.0	%		13-DEC-19	R4944389
Oxygen	21.6		0.10	%		13-DEC-19	R4944389
Carbon Dioxide	0.205		0.050	%		13-DEC-19	R4944389
Carbon Monoxide	<0.050		0.050	%		13-DEC-19	R4944389
Methane	<0.050		0.050	%		13-DEC-19	R4944389
BTEX and Naphthalene							
Naphthalene	<2.6		2.6	ug/m3		22-DEC-19	R4952666
Naphthalene	<0.50		0.50	ppb(V)		22-DEC-19	R4952666
Surrogate: 4-Bromofluorobenzene	95.8		50-150	%		22-DEC-19	R4952666
Canister EPA TO-15							
1,1,1-Trichloroethane	<1.1		1.1	ug/m3		22-DEC-19	R4952666
1,1,1-Trichloroethane	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
1,1,2,2-Tetrachloroethane	<1.4		1.4	ug/m3		22-DEC-19	R4952666
1,1,2,2-Tetrachloroethane	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
1,1,2-Trichloroethane	<1.1		1.1	ug/m3		22-DEC-19	R4952666
1,1,2-Trichloroethane	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
1,1-Dichloroethane	<0.81		0.81	ug/m3		22-DEC-19	R4952666
1,1-Dichloroethane	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
1,1-Dichloroethene	<0.79		0.79	ug/m3		22-DEC-19	R4952666
1,1-Dichloroethene	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
1,2,4-Trichlorobenzene	<1.5		1.5	ug/m3		22-DEC-19	R4952666
1,2,4-Trichlorobenzene	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
1,2,4-Trimethylbenzene	<0.98		0.98	ug/m3		22-DEC-19	R4952666
1,2,4-Trimethylbenzene	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
1,2-Dibromoethane	<1.5		1.5	ug/m3		22-DEC-19	R4952666
1,2-Dibromoethane	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
1,2-Dichlorobenzene	<1.2		1.2	ug/m3		22-DEC-19	R4952666
1,2-Dichlorobenzene	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
1,2-Dichloroethane	<0.81		0.81	ug/m3		22-DEC-19	R4952666
1,2-Dichloroethane	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
1,2-Dichloropropane	<0.92		0.92	ug/m3		22-DEC-19	R4952666
1,2-Dichloropropane	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
1,3,5-Trimethylbenzene	<0.98		0.98	ug/m3		22-DEC-19	R4952666
1,3,5-Trimethylbenzene	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
1,3-Butadiene	<0.44		0.44	ug/m3		22-DEC-19	R4952666
1,3-Butadiene	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
1,3-Dichlorobenzene	<1.2		1.2	ug/m3		22-DEC-19	R4952666
1,3-Dichlorobenzene	<0.20		0.20	ppb(V)		22-DEC-19	R4952666

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393570-3 19DUP01							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 12:00							
Matrix: SG							
Canister EPA TO-15							
1,4-Dichlorobenzene	<1.2		1.2	ug/m3		22-DEC-19	R4952666
1,4-Dichlorobenzene	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
1,4-Dioxane	<0.72		0.72	ug/m3		22-DEC-19	R4952666
1,4-Dioxane	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
2-Hexanone	<4.1		4.1	ug/m3		22-DEC-19	R4952666
2-Hexanone	<1.0		1.0	ppb(V)		22-DEC-19	R4952666
4-Ethyltoluene	<0.98		0.98	ug/m3		22-DEC-19	R4952666
4-Ethyltoluene	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Acetone	12.6	DLA	5.9	ug/m3		23-DEC-19	R4952666
Acetone	5.3	DLA	2.5	ppb(V)		23-DEC-19	R4952666
Allyl chloride	<0.63		0.63	ug/m3		22-DEC-19	R4952666
Allyl chloride	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Benzene	2.55		0.64	ug/m3		22-DEC-19	R4952666
Benzene	0.80		0.20	ppb(V)		22-DEC-19	R4952666
Benzyl chloride	<1.0		1.0	ug/m3		22-DEC-19	R4952666
Benzyl chloride	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Bromodichloromethane	<1.3		1.3	ug/m3		22-DEC-19	R4952666
Bromodichloromethane	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Bromoform	<2.1		2.1	ug/m3		22-DEC-19	R4952666
Bromoform	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Bromomethane	<0.78		0.78	ug/m3		22-DEC-19	R4952666
Bromomethane	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Carbon Disulfide	<0.62		0.62	ug/m3		22-DEC-19	R4952666
Carbon Disulfide	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Carbon Tetrachloride	<1.3		1.3	ug/m3		22-DEC-19	R4952666
Carbon Tetrachloride	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Chlorobenzene	<0.92		0.92	ug/m3		22-DEC-19	R4952666
Chlorobenzene	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Chloroethane	<0.53		0.53	ug/m3		22-DEC-19	R4952666
Chloroethane	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Chloroform	<0.98		0.98	ug/m3		22-DEC-19	R4952666
Chloroform	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Chloromethane	1.04		0.41	ug/m3		22-DEC-19	R4952666
Chloromethane	0.50		0.20	ppb(V)		22-DEC-19	R4952666
cis-1,2-Dichloroethene	<0.79		0.79	ug/m3		22-DEC-19	R4952666
cis-1,2-Dichloroethene	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
cis-1,3-Dichloropropene	<0.91		0.91	ug/m3		22-DEC-19	R4952666
cis-1,3-Dichloropropene	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Cyclohexane	<0.69		0.69	ug/m3		22-DEC-19	R4952666
Cyclohexane	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Dibromochloromethane	<1.7		1.7	ug/m3		22-DEC-19	R4952666
Dibromochloromethane	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Dichlorodifluoromethane	2.75		0.99	ug/m3		22-DEC-19	R4952666
Dichlorodifluoromethane	0.56		0.20	ppb(V)		22-DEC-19	R4952666
Ethyl acetate	0.76		0.72	ug/m3		22-DEC-19	R4952666
Ethyl acetate	0.21		0.20	ppb(V)		22-DEC-19	R4952666
Ethylbenzene	<0.87		0.87	ug/m3		22-DEC-19	R4952666
Ethylbenzene	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Freon 113	<1.5		1.5	ug/m3		22-DEC-19	R4952666
Freon 113	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Freon 114	<1.4		1.4	ug/m3		22-DEC-19	R4952666

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393570-3 19DUP01							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 12:00							
Matrix: SG							
Canister EPA TO-15							
Freon 114	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Hexachlorobutadiene	<2.1		2.1	ug/m3		22-DEC-19	R4952666
Hexachlorobutadiene	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Isooctane	1.05		0.93	ug/m3		22-DEC-19	R4952666
Isooctane	0.22		0.20	ppb(V)		22-DEC-19	R4952666
Isopropyl alcohol	<2.5		2.5	ug/m3		22-DEC-19	R4952666
Isopropyl alcohol	<1.0		1.0	ppb(V)		22-DEC-19	R4952666
Isopropylbenzene	<0.98		0.98	ug/m3		22-DEC-19	R4952666
Isopropylbenzene	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
m&p-Xylene	3.2		1.7	ug/m3		22-DEC-19	R4952666
m&p-Xylene	0.74		0.40	ppb(V)		22-DEC-19	R4952666
Methyl ethyl ketone	1.23		0.59	ug/m3		22-DEC-19	R4952666
Methyl ethyl ketone	0.42		0.20	ppb(V)		22-DEC-19	R4952666
Methyl isobutyl ketone	<0.82		0.82	ug/m3		22-DEC-19	R4952666
Methyl isobutyl ketone	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Methylene chloride	<0.69		0.69	ug/m3		22-DEC-19	R4952666
Methylene chloride	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
MTBE	<0.72		0.72	ug/m3		22-DEC-19	R4952666
MTBE	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
n-Heptane	0.99		0.82	ug/m3		22-DEC-19	R4952666
n-Heptane	0.24		0.20	ppb(V)		22-DEC-19	R4952666
n-Hexane	2.25		0.70	ug/m3		22-DEC-19	R4952666
n-Hexane	0.64		0.20	ppb(V)		22-DEC-19	R4952666
o-Xylene	1.31		0.87	ug/m3		22-DEC-19	R4952666
o-Xylene	0.30		0.20	ppb(V)		22-DEC-19	R4952666
Propylene	<0.34		0.34	ug/m3		22-DEC-19	R4952666
Propylene	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Styrene	<0.85		0.85	ug/m3		22-DEC-19	R4952666
Styrene	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Tetrachloroethylene	<1.4		1.4	ug/m3		22-DEC-19	R4952666
Tetrachloroethylene	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Tetrahydrofuran	0.60		0.59	ug/m3		22-DEC-19	R4952666
Tetrahydrofuran	0.20		0.20	ppb(V)		22-DEC-19	R4952666
Toluene	4.24		0.75	ug/m3		22-DEC-19	R4952666
Toluene	1.12		0.20	ppb(V)		22-DEC-19	R4952666
trans-1,2-Dichloroethene	<0.79		0.79	ug/m3		22-DEC-19	R4952666
trans-1,2-Dichloroethene	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
trans-1,3-Dichloropropene	<0.91		0.91	ug/m3		22-DEC-19	R4952666
trans-1,3-Dichloropropene	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Trichloroethylene	1.4		1.1	ug/m3		22-DEC-19	R4952666
Trichloroethylene	0.27		0.20	ppb(V)		22-DEC-19	R4952666
Trichlorofluoromethane	1.3		1.1	ug/m3		22-DEC-19	R4952666
Trichlorofluoromethane	0.23		0.20	ppb(V)		22-DEC-19	R4952666
Vinyl acetate	<1.8		1.8	ug/m3		22-DEC-19	R4952666
Vinyl acetate	<0.50		0.50	ppb(V)		22-DEC-19	R4952666
Vinyl bromide	<0.87		0.87	ug/m3		22-DEC-19	R4952666
Vinyl bromide	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Vinyl chloride	<0.51		0.51	ug/m3		22-DEC-19	R4952666
Vinyl chloride	<0.20		0.20	ppb(V)		22-DEC-19	R4952666
Surrogate: 4-Bromofluorobenzene	95.8		50-150	%		22-DEC-19	R4952666
Sum of Xylene Isomer Concentrations							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393570-3 19DUP01							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 12:00							
Matrix: SG							
Sum of Xylene Isomer Concentrations							
Xylenes (Total)	1.04		0.45	ppb(V)		23-DEC-19	
Xylenes (Total)	4.5		2.0	ug/m3		23-DEC-19	
Select list of 7 C1-C5 hydrocarbon gases							
Methane	0.00116		0.00010	%		10-DEC-19	R4944650
Ethane	<0.00020		0.00020	%		10-DEC-19	R4944650
Ethene	<0.00020		0.00020	%		10-DEC-19	R4944650
Propane	<0.00020		0.00020	%		10-DEC-19	R4944650
Propene	<0.00020		0.00020	%		10-DEC-19	R4944650
Butane	<0.00020		0.00020	%		10-DEC-19	R4944650
Pentane	<0.00020		0.00020	%		10-DEC-19	R4944650
Canister Information							
Pressure on Receipt	-10.2		-30	in Hg	17-DEC-19	17-DEC-19	R4944737
Canister ID	01400-0245				17-DEC-19	17-DEC-19	R4944737
Regulator ID	G101				17-DEC-19	17-DEC-19	R4944737
Batch Proof ID	191119.119				17-DEC-19	17-DEC-19	R4944737

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393570-4 VW-01							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 12:00							
Matrix: SG							
Miscellaneous Parameters							
Air volume	.06			L		19-DEC-19	R4939247
Linear & Cyclic Methyl Siloxanes							
D3(CVMS)	<170		170	ug/m3		18-DEC-19	R4945277
D3(CVMS)	<10		10	ng		18-DEC-19	R4945277
D4(CVMS)	<170		170	ug/m3		18-DEC-19	R4945277
D4(CVMS)	<10		10	ng		18-DEC-19	R4945277
D5(CVMS)	<170		170	ug/m3		18-DEC-19	R4945277
D5(CVMS)	<10		10	ng		18-DEC-19	R4945277
D6(CVMS)	<170		170	ug/m3		18-DEC-19	R4945277
D6(CVMS)	<10		10	ng		18-DEC-19	R4945277
MM(LVMS)	<170		170	ug/m3		18-DEC-19	R4945277
MM(LVMS)	<10		10	ng		18-DEC-19	R4945277
MDM(LVMS)	<170		170	ug/m3		18-DEC-19	R4945277
MDM(LVMS)	<10		10	ng		18-DEC-19	R4945277
MD2M(LVMS)	<170		170	ug/m3		18-DEC-19	R4945277
MD2M(LVMS)	<10		10	ng		18-DEC-19	R4945277
MD3M(LVMS)	<170		170	ug/m3		18-DEC-19	R4945277
MD3M(LVMS)	<10		10	ng		18-DEC-19	R4945277
Surrogate: 4-Bromofluorobenzene	99.7		50-150	%		18-DEC-19	R4945277
Tube Information							
Tube ID	G0150603SVI					13-DEC-19	R4942791
Batch Proof ID	13-Nov-19					13-DEC-19	R4942791
Tube Usage Number	N/A					13-DEC-19	R4942791
Tube Manufacturer Date	N/A					13-DEC-19	R4942791

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2393570-5 VW-02							
Sampled By: MEGAN ROUSE on 05-DEC-19 @ 11:40							
Matrix: SG							
Miscellaneous Parameters							
Air volume	.06			L		19-DEC-19	R4939247
Linear & Cyclic Methyl Siloxanes							
D3(CVMS)	<170		170	ug/m3		18-DEC-19	R4945277
D3(CVMS)	<10		10	ng		18-DEC-19	R4945277
D4(CVMS)	<170		170	ug/m3		18-DEC-19	R4945277
D4(CVMS)	<10		10	ng		18-DEC-19	R4945277
D5(CVMS)	<170		170	ug/m3		18-DEC-19	R4945277
D5(CVMS)	<10		10	ng		18-DEC-19	R4945277
D6(CVMS)	<170		170	ug/m3		18-DEC-19	R4945277
D6(CVMS)	<10		10	ng		18-DEC-19	R4945277
MM(LVMS)	<170		170	ug/m3		18-DEC-19	R4945277
MM(LVMS)	<10		10	ng		18-DEC-19	R4945277
MDM(LVMS)	<170		170	ug/m3		18-DEC-19	R4945277
MDM(LVMS)	<10		10	ng		18-DEC-19	R4945277
MD2M(LVMS)	<170		170	ug/m3		18-DEC-19	R4945277
MD2M(LVMS)	<10		10	ng		18-DEC-19	R4945277
MD3M(LVMS)	<170		170	ug/m3		18-DEC-19	R4945277
MD3M(LVMS)	<10		10	ng		18-DEC-19	R4945277
Surrogate: 4-Bromofluorobenzene	102.1		50-150	%		18-DEC-19	R4945277
Tube Information							
Tube ID	G0150170SVI					13-DEC-19	R4942791
Batch Proof ID	19-Nov-19					13-DEC-19	R4942791
Tube Usage Number	N/A					13-DEC-19	R4942791
Tube Manufacturer Date	N/A					13-DEC-19	R4942791

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
AIR VOLUME-WT	Misc.	Air volume (L)	DATA ENTRY
ALIPH/AROM-GCMS-WT	Canister	Aliphatic/Aromatic PHC Sub-Fractionation	EPA TO-15, Atlantic RBCA

This analysis is performed using procedures adapted from EPA TO-15 & Atlantic RBCA. A volume of air is removed from a canister & injected into a GCMS with preconcentrator for analysis. The concentrations of the hydrocarbon aliphatic & aromatic sub-fractions are calculated using gas standards. The canister samples will be retained for 7 calendar days after final report.

BTEX+NAPH-GCMS-WT	Canister	BTEX and Naphthalene	EPA TO-15

This analysis is performed using procedures adapted from EPA Method TO-15. Air samples are collected into cleaned evacuated canisters. A volume of air sample is transferred from the canister to a preconcentrator system where the analytes are trapped & focused. The analytes are then thermally desorbed into a GC-MSD for analysis. Test results are not blank corrected unless indicated by a qualifier.

Canister samples will be retained for 7 calendar days after final report. If you require a longer canister storage time, please contact your account manager.

C1-C5-FID-WT	Canister	Select list of 7 C1-C5 hydrocarbon gases	EPA Method 3C & ASTM D1946

This analysis is performed using procedures adapted from ASTM D1946/EPA Method 3C. Air samples are collected into cleaned evaculated canisters. A volume of air is removed from the canister & injected into a GC-FID for analysis. Hydrocarbon gas concentrations are calculated against a gas standard. Test results are not blank corrected unless indicated by a qualifier.

Canister samples will be retained for 7 calendar days after final report. If you require longer canister storage time, please contact your account manager.

CAN-DATA-WT	Canister	Canister Information	EPA TO-15

Batch Proof ID, Canister ID, Pressure on Receipt, Regulator ID.

F1-F2-GCMS-WT	Canister	Total F1and F2 fractions (not corrected)	EPATO-15

This analysis is performed using procedures adapted from EPA Method TO-15. Air samples are collected into cleaned evacuated canisters. A volume of air sample is transferred from the canister to a preconcentrator system where the analytes are trapped & focused. The analytes are then thermally desorbed into a GC-MSD for analysis. Test results are not blank corrected unless indicated by a qualifier.

Canister samples will be retained for 7 calendar days after final report. If you require a longer canister storage time, please contact your account manager.

FIXED GASES-TCD-WT	Canister	High Level Fixed Gases by TCD	EPA Method 3C & ASTM D1946

This analysis is performed using procedures adapted from EPA Method 3C & ASTM D1946. Air samples are collected into cleaned evacuated canisters. A volume of air is removed from the canister and injected by means of a gas-sampling/backflush valve onto a series of packed GC columns and measured using a thermal conductivity detector (TCD).

Oxygen is not separated from Argon.

Canister samples will be retained for 7 calendar days after final report. If you require a longer canister storage time, please contact your account manager.

SILOXANES-GCMS-WT	Tube	Linear & Cyclic Methyl Siloxanes	EPA TO-17

This analysis is performed using procedures adapted from EPA Method TO-17, ISO Method 16017 & NIOSH Method 2549. Air samples actively collected on PE VI TD tubes are thermally stripped & the analytes are re-collected on trapping material of a focusing trap in the thermal desorber. The analytes are then thermally desorbed into a GC-MSD for analysis. Test results are not blank corrected unless indicated by a qualifier.

This analysis was performed under AIHA-IHLAP Scope of Accreditation, GC/MS Field of Testing which is compliant with AIHA-LAP, LLC Accreditation Policy Modules & ISO/IEC 17025:2005 Standard.

TD tube samples will be retained for 7 calendar days after final report. If you require a longer TD tube storage time, please contact your account manager.

TO15-GCMS-WT	Canister	Canister EPA TO-15	EPA TO-15

This analysis is performed using procedures adapted from EPA Method TO-15. Air samples are collected into cleaned evacuated canisters. A volume of air sample is transferred from the canister to a preconcentrator system where the analytes are trapped & focused. The analytes are then thermally desorbed into a GC-MSD for analysis. Test results are not blank corrected unless indicated by a qualifier.

Canister samples will be retained for 7 calendar days after final report. If you require a longer canister storage time, please contact your account manager.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
XYLENES-SUM-CALC-WT	Canister	Sum of Xylene Isomer Concentrations	CALCULATION

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Routine Water Chemistry Report

L2393570

Lab ID	Sample ID				Lab ID	Sample ID			

ALS LABORATORY GROUP SOIL SALINITY CONVERSION

L2393570

Lab ID	Sample ID					Lab ID	Sample ID				

"Calculations are as per:
Methods of Analysis for Soils, Plants and Waters
Homer D. Chapman and Parker F. Pratt
University of California, Riverside, CI.
August, 1961."

Quality Control Report

Workorder: L2393570 Report Date: 24-DEC-19

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALIPH/AROM-GCMS-WT	**Canister**							
Batch R4953011								
WG3247105-2 LCS								
Aliphatic C6-C8			121.6		%		50-150	23-DEC-19
Aliphatic C>8-C10			101.0		%		50-150	23-DEC-19
Aliphatic C>10-C12			117.1		%		50-150	23-DEC-19
Aliphatic C>12-C16			128.7		%		50-150	23-DEC-19
Aromatic C>8-C10			105.7		%		50-150	23-DEC-19
Aromatic C>10-C12			101.0		%		50-150	23-DEC-19
Aromatic C>12-C16			87.2		%		50-150	23-DEC-19
WG3247105-3 LCSD		**WG3247105-2**						
Aliphatic C6-C8		121.6	128.6		%	5.6	50	23-DEC-19
Aliphatic C>8-C10		101.0	103.8		%	2.8	50	23-DEC-19
Aliphatic C>10-C12		117.1	119.5		%	2.0	50	23-DEC-19
Aliphatic C>12-C16		128.7	136.9		%	6.2	50	23-DEC-19
Aromatic C>8-C10		105.7	108.2		%	2.3	50	23-DEC-19
Aromatic C>10-C12		101.0	104.3		%	3.2	50	23-DEC-19
Aromatic C>12-C16		87.2	95.6		%	9.2	50	23-DEC-19
WG3247105-1 MB								
Aliphatic C6-C8			<15		ug/m3		15	23-DEC-19
Aliphatic C>8-C10			<15		ug/m3		15	23-DEC-19
Aliphatic C>10-C12			<15		ug/m3		15	23-DEC-19
Aliphatic C>12-C16			<30		ug/m3		30	23-DEC-19
Aromatic C>8-C10			<15		ug/m3		15	23-DEC-19
Aromatic C>10-C12			<15		ug/m3		15	23-DEC-19
Aromatic C>12-C16			<30		ug/m3		30	23-DEC-19
BTEX+NAPH-GCMS-WT	**Canister**							
Batch R4952666								
WG3246686-4 DUP		**L2393570-2**						
Naphthalene		<0.50	<0.50	RPD-NA	ppb(V)	N/A	30	20-DEC-19
WG3246686-2 LCS								
Naphthalene			128.8		%		70-130	20-DEC-19
WG3246686-3 LCSD		**WG3246686-2**						
Naphthalene		128.8	128.3		%	0.4	50	23-DEC-19
WG3246686-1 MB								
Naphthalene			<0.50		ppb(V)		0.5	20-DEC-19
Surrogate: 4-Bromofluorobenzene			94.7		%		50-150	20-DEC-19

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C1-C5-FID-WT	**Canister**							
Batch R4944650								
WG3239341-4 DUP		**L2393570-1**						
Methane		0.00029	0.00027		%	7.3	20	10-DEC-19
Ethane		<0.00020	<0.00020	RPD-NA	%	N/A	20	10-DEC-19
Ethene		<0.00020	<0.00020	RPD-NA	%	N/A	20	10-DEC-19
Propane		<0.00020	<0.00020	RPD-NA	%	N/A	20	10-DEC-19
Propene		<0.00020	<0.00020	RPD-NA	%	N/A	20	10-DEC-19
Butane		<0.00020	<0.00020	RPD-NA	%	N/A	20	10-DEC-19
Pentane		<0.00020	<0.00020	RPD-NA	%	N/A	20	10-DEC-19
WG3239341-1 LCS								
Methane			78.8		%		70-130	10-DEC-19
Ethane			88.3		%		70-130	10-DEC-19
Ethene			84.4		%		70-130	10-DEC-19
Propane			88.8		%		70-130	10-DEC-19
Propene			96.7		%		70-130	10-DEC-19
Pentane			92.4		%		70-130	10-DEC-19
WG3239341-2 LCSD		**WG3239341-1**						
Methane		78.8	82.3		%	4.4	50	10-DEC-19
Ethane		88.3	89.4		%	1.2	50	10-DEC-19
Ethene		84.4	84.6		%	0.1	50	10-DEC-19
Propane		88.8	88.5		%	0.4	50	10-DEC-19
Propene		96.7	96.9		%	0.2	50	10-DEC-19
Pentane		92.4	92.2		%	0.2	50	10-DEC-19
WG3239341-3 MB								
Methane			<0.00010		%		0.0001	10-DEC-19
Ethane			<0.00020		%		0.0002	10-DEC-19
Ethene			<0.00020		%		0.0002	10-DEC-19
Propane			<0.00020		%		0.0002	10-DEC-19
Propene			<0.00020		%		0.0002	10-DEC-19
Butane			<0.00020		%		0.0002	10-DEC-19
Pentane			<0.00020		%		0.0002	10-DEC-19
CAN-DATA-WT	**Canister**							
Batch R4944737								
WG3244055-1 MB								
Pressure on Receipt			-29.8		in Hg			17-DEC-19

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F1-F2-GCMS-WT	**Canister**							
Batch R4953011								
WG3247105-2 LCS								
F1 (C6-C10)			110.1		%		50-150	23-DEC-19
WG3247105-3 LCSD		**WG3247105-2**						
F1 (C6-C10)		110.1	108.4		%	1.5	50	23-DEC-19
WG3247105-1 MB								
F1 (C6-C10)			<15		ug/m3		15	23-DEC-19
F2 (C10-C16)			<15		ug/m3		15	23-DEC-19
Surrogate: 4-Bromofluorobenzene			98.3		%		50-150	23-DEC-19
FIXED GASES-TCD-WT	**Canister**							
Batch R4944389								
WG3236065-3 DUP		**L2391113-1**						
Nitrogen		75.0	75.1		%	0.2	30	12-DEC-19
Oxygen		20.4	20.4		%	0.4	30	12-DEC-19
Carbon Dioxide		0.202	0.206		%	2.2	30	12-DEC-19
Carbon Monoxide		<0.050	<0.050	RPD-NA	%	N/A	30	12-DEC-19
Methane		<0.050	<0.050	RPD-NA	%	N/A	30	12-DEC-19
WG3236065-1 LCS								
Nitrogen			99.4		%		70-130	12-DEC-19
Oxygen			98.2		%		70-130	12-DEC-19
Carbon Dioxide			93.9		%		70-130	12-DEC-19
Carbon Monoxide			96.3		%		70-130	12-DEC-19
Methane			100.1		%		70-130	12-DEC-19
WG3236065-2 LCSD		**WG3236065-1**						
Nitrogen		99.4	98.5		%	0.9	25	12-DEC-19
Oxygen		98.2	97.2		%	1.0	25	12-DEC-19
Carbon Dioxide		93.9	95.6		%	1.8	25	12-DEC-19
Carbon Monoxide		96.3	95.9		%	0.4	25	12-DEC-19
Methane		100.1	99.1		%	1.0	25	12-DEC-19
WG3236065-4 MB								
Nitrogen			<1.0		%		1	12-DEC-19
Oxygen			<0.10		%		0.1	12-DEC-19
Carbon Dioxide			<0.050		%		0.05	12-DEC-19
Carbon Monoxide			<0.050		%		0.05	12-DEC-19
Methane			<0.050		%		0.05	12-DEC-19
TO15-GCMS-WT	**Canister**							

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TO15-GCMS-WT	**Canister**							
Batch R4952666								
WG3246686-4 DUP		**L2393570-2**						
1,1,1-Trichloroethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
1,1,2,2-Tetrachloroethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
1,1,2-Trichloroethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
1,1-Dichloroethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
1,1-Dichloroethene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
1,2,4-Trichlorobenzene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
1,2,4-Trimethylbenzene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
1,2-Dichlorobenzene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
1,2-Dichloroethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
1,2-Dichloropropane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
1,3,5-Trimethylbenzene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
1,3-Butadiene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
1,3-Dichlorobenzene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
1,4-Dichlorobenzene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
1,4-Dioxane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
2-Hexanone		<1.0	<1.0	RPD-NA	ppb(V)	N/A	30	20-DEC-19
4-Ethyltoluene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Acetone		5.5	5.1		ppb(V)	8.0	30	23-DEC-19
Allyl chloride		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Benzene		0.66	0.58		ppb(V)	12	30	20-DEC-19
Benzyl chloride		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Bromodichloromethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Bromoform		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Bromomethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Carbon Disulfide		3.74	3.37		ppb(V)	11	30	20-DEC-19
Carbon Tetrachloride		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Chlorobenzene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Chloroethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Chloroform		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Chloromethane		0.82	0.74		ppb(V)	11	30	20-DEC-19
cis-1,2-Dichloroethene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
cis-1,3-Dichloropropene		<0.20	<0.20		ppb(V)			20-DEC-19

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TO15-GCMS-WT	**Canister**							
Batch R4952666								
WG3246686-4 DUP		**L2393570-2**						
cis-1,3-Dichloropropene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Cyclohexane		0.35	0.33		ppb(V)	4.9	30	20-DEC-19
Dibromochloromethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Dichlorodifluoromethane		4.8	4.5		ppb(V)	6.5	30	23-DEC-19
Ethyl acetate		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Ethylbenzene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Freon 113		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Freon 114		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Hexachlorobutadiene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Isooctane		0.41	0.36		ppb(V)	13	30	20-DEC-19
Isopropyl alcohol		<1.0	<1.0	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Isopropylbenzene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	50	20-DEC-19
m&p-Xylene		0.55	0.54		ppb(V)	2.3	30	20-DEC-19
Methyl ethyl ketone		0.39	0.36		ppb(V)	8.8	30	20-DEC-19
Methyl isobutyl ketone		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Methylene chloride		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
MTBE		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
n-Heptane		0.33	0.28		ppb(V)	17	30	20-DEC-19
n-Hexane		0.69	0.61		ppb(V)	12	30	20-DEC-19
o-Xylene		0.21	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Propylene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Styrene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Tetrachloroethylene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Tetrahydrofuran		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Toluene		1.26	1.15		ppb(V)	9.3	30	20-DEC-19
trans-1,2-Dichloroethene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
trans-1,3-Dichloropropene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Trichloroethylene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Trichlorofluoromethane		0.28	0.26		ppb(V)	5.3	30	20-DEC-19
Vinyl acetate		<0.50	<0.50	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Vinyl bromide		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
Vinyl chloride		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	20-DEC-19
WG3246686-2 LCS								

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TO15-GCMS-WT	**Canister**							
Batch R4952666								
WG3246686-2 LCS								
1,1,1-Trichloroethane			96.6		%		70-130	20-DEC-19
1,1,2,2-Tetrachloroethane			98.8		%		70-130	20-DEC-19
1,1,2-Trichloroethane			100.9		%		70-130	20-DEC-19
1,1-Dichloroethane			99.4		%		70-130	20-DEC-19
1,1-Dichloroethene			98.5		%		70-130	20-DEC-19
1,2,4-Trichlorobenzene			122.1		%		70-130	20-DEC-19
1,2,4-Trimethylbenzene			106.2		%		70-130	20-DEC-19
1,2-Dibromoethane			98.4		%		70-130	20-DEC-19
1,2-Dichlorobenzene			101.1		%		70-130	20-DEC-19
1,2-Dichloroethane			97.9		%		70-130	20-DEC-19
1,2-Dichloropropane			104.1		%		70-130	20-DEC-19
1,3,5-Trimethylbenzene			103.8		%		70-130	20-DEC-19
1,3-Butadiene			93.2		%		70-130	20-DEC-19
1,3-Dichlorobenzene			95.9		%		70-130	20-DEC-19
1,4-Dichlorobenzene			105.4		%		70-130	20-DEC-19
1,4-Dioxane			102.7		%		70-130	20-DEC-19
2-Hexanone			106.1		%		70-130	20-DEC-19
4-Ethyltoluene			102.7		%		70-130	20-DEC-19
Acetone			100.3		%		70-130	20-DEC-19
Allyl chloride			100.0		%		70-130	20-DEC-19
Benzene			94.9		%		70-130	20-DEC-19
Benzyl chloride			101.8		%		70-130	20-DEC-19
Bromodichloromethane			101.8		%		70-130	20-DEC-19
Bromoform			98.7		%		70-130	20-DEC-19
Bromomethane			101.8		%		70-130	20-DEC-19
Carbon Disulfide			91.0		%		70-130	20-DEC-19
Carbon Tetrachloride			98.5		%		70-130	20-DEC-19
Chlorobenzene			98.6		%		70-130	20-DEC-19
Chloroethane			103.2		%		70-130	20-DEC-19
Chloroform			99.8		%		70-130	20-DEC-19
Chloromethane			105.4		%		70-130	20-DEC-19
cis-1,2-Dichloroethene			96.6		%		70-130	20-DEC-19
cis-1,3-Dichloropropene			95.1		%		70-130	20-DEC-19

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TO15-GCMS-WT	**Canister**							
Batch R4952666								
WG3246686-2 LCS								
Cyclohexane			101.3		%		70-130	20-DEC-19
Dibromochloromethane			93.6		%		70-130	20-DEC-19
Dichlorodifluoromethane			100.7		%		70-130	20-DEC-19
Ethyl acetate			98.0		%		70-130	20-DEC-19
Ethylbenzene			96.1		%		70-130	20-DEC-19
Freon 113			98.1		%		70-130	20-DEC-19
Freon 114			105.6		%		70-130	20-DEC-19
Hexachlorobutadiene			109.1		%		70-130	20-DEC-19
Isooctane			97.2		%		70-130	20-DEC-19
Isopropyl alcohol			90.0		%		70-130	20-DEC-19
Isopropylbenzene			99.4		%		50-150	20-DEC-19
m&p-Xylene			102.0		%		70-130	20-DEC-19
Methyl ethyl ketone			97.7		%		70-130	20-DEC-19
Methyl isobutyl ketone			96.6		%		70-130	20-DEC-19
Methylene chloride			97.1		%		70-130	20-DEC-19
MTBE			95.2		%		70-130	20-DEC-19
n-Heptane			99.0		%		70-130	20-DEC-19
n-Hexane			95.1		%		70-130	20-DEC-19
o-Xylene			102.7		%		70-130	20-DEC-19
Propylene			94.6		%		70-130	20-DEC-19
Styrene			102.4		%		70-130	20-DEC-19
Tetrachloroethylene			97.7		%		70-130	20-DEC-19
Tetrahydrofuran			98.3		%		70-130	20-DEC-19
Toluene			95.4		%		70-130	20-DEC-19
trans-1,2-Dichloroethene			96.8		%		70-130	20-DEC-19
trans-1,3-Dichloropropene			102.5		%		70-130	20-DEC-19
Trichloroethylene			98.8		%		70-130	20-DEC-19
Trichlorofluoromethane			98.7		%		70-130	20-DEC-19
Vinyl acetate			101.3		%		70-130	20-DEC-19
Vinyl bromide			97.4		%		70-130	20-DEC-19
Vinyl chloride			98.8		%		70-130	20-DEC-19
WG3246686-3 LCSD		**WG3246686-2**						
1,1,1-Trichloroethane		96.6	100.2		%	3.6	25	23-DEC-19
1,1,2,2-Tetrachloroethane		98.8	104.5		%	5.6	25	23-DEC-19

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TO15-GCMS-WT	**Canister**							
Batch R4952666								
WG3246686-3 LCSD		**WG3246686-2**						
1,1,2-Trichloroethane		100.9	101.4		%	0.6	25	23-DEC-19
1,1-Dichloroethane		99.4	102.6		%	3.2	25	23-DEC-19
1,1-Dichloroethene		98.5	103.7		%	5.1	25	23-DEC-19
1,2,4-Trichlorobenzene		122.1	123.0		%	0.7	25	23-DEC-19
1,2,4-Trimethylbenzene		106.2	110.5		%	4.0	25	23-DEC-19
1,2-Dibromoethane		98.4	101.7		%	3.3	25	23-DEC-19
1,2-Dichlorobenzene		101.1	103.0		%	1.8	25	23-DEC-19
1,2-Dichloroethane		97.9	96.9		%	1.1	25	23-DEC-19
1,2-Dichloropropane		104.1	102.1		%	1.9	25	23-DEC-19
1,3,5-Trimethylbenzene		103.8	107.0		%	3.0	25	23-DEC-19
1,3-Butadiene		93.2	97.4		%	4.4	25	23-DEC-19
1,3-Dichlorobenzene		95.9	101.0		%	5.1	25	23-DEC-19
1,4-Dichlorobenzene		105.4	107.8		%	2.2	25	23-DEC-19
1,4-Dioxane		102.7	104.4		%	1.7	25	23-DEC-19
2-Hexanone		106.1	108.2		%	1.9	25	23-DEC-19
4-Ethyltoluene		102.7	107.4		%	4.5	25	23-DEC-19
Acetone		100.3	98.9		%	1.4	25	23-DEC-19
Allyl chloride		100.0	99.7		%	0.3	25	23-DEC-19
Benzene		94.9	102.2		%	7.4	25	23-DEC-19
Benzyl chloride		101.8	102.5		%	0.8	25	23-DEC-19
Bromodichloromethane		101.8	103.5		%	1.6	25	23-DEC-19
Bromoform		98.7	106.0		%	7.2	25	23-DEC-19
Bromomethane		101.8	105.0		%	3.1	25	23-DEC-19
Carbon Disulfide		91.0	93.7		%	3.0	25	23-DEC-19
Carbon Tetrachloride		98.5	99.1		%	0.6	25	23-DEC-19
Chlorobenzene		98.6	105.5		%	6.8	25	23-DEC-19
Chloroethane		103.2	104.0		%	0.8	25	23-DEC-19
Chloroform		99.8	103.7		%	3.9	25	23-DEC-19
Chloromethane		105.4	104.9		%	0.5	25	23-DEC-19
cis-1,2-Dichloroethene		96.6	104.0		%	7.4	25	23-DEC-19
cis-1,3-Dichloropropene		95.1	97.1		%	2.1	25	23-DEC-19
Cyclohexane		101.3	102.6		%	1.3	25	23-DEC-19
Dibromochloromethane		93.6	97.7		%			23-DEC-19

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TO15-GCMS-WT	**Canister**							
Batch R4952666								
WG3246686-3 LCSD		**WG3246686-2**						
Dibromochloromethane		93.6	97.7		%	4.3	25	23-DEC-19
Dichlorodifluoromethane		100.7	102.8		%	2.0	25	23-DEC-19
Ethyl acetate		98.0	109.1		%	11	25	23-DEC-19
Ethylbenzene		96.1	97.9		%	1.8	25	23-DEC-19
Freon 113		98.1	99.7		%	1.6	25	23-DEC-19
Freon 114		105.6	109.3		%	3.5	25	23-DEC-19
Hexachlorobutadiene		109.1	116.7		%	6.8	25	23-DEC-19
Isooctane		97.2	100.1		%	3.0	25	23-DEC-19
Isopropyl alcohol		90.0	91.5		%	1.7	25	23-DEC-19
Isopropylbenzene		99.4	104.0		%	4.5	50	23-DEC-19
m&p-Xylene		102.0	107.6		%	5.4	25	23-DEC-19
Methyl ethyl ketone		97.7	100.8		%	3.1	25	23-DEC-19
Methyl isobutyl ketone		96.6	100.3		%	3.8	25	23-DEC-19
Methylene chloride		97.1	99.6		%	2.6	25	23-DEC-19
MTBE		95.2	101.4		%	6.3	25	23-DEC-19
n-Heptane		99.0	101.3		%	2.3	25	23-DEC-19
n-Hexane		95.1	98.1		%	3.1	25	23-DEC-19
o-Xylene		102.7	106.2		%	3.4	25	23-DEC-19
Propylene		94.6	103.0		%	8.4	25	23-DEC-19
Styrene		102.4	104.9		%	2.4	25	23-DEC-19
Tetrachloroethylene		97.7	101.7		%	4.0	25	23-DEC-19
Tetrahydrofuran		98.3	101.9		%	3.6	25	23-DEC-19
Toluene		95.4	99.7		%	4.4	25	23-DEC-19
trans-1,2-Dichloroethene		96.8	99.0		%	2.2	25	23-DEC-19
trans-1,3-Dichloropropene		102.5	106.6		%	3.9	25	23-DEC-19
Trichloroethylene		98.8	103.1		%	4.3	25	23-DEC-19
Trichlorofluoromethane		98.7	101.1		%	2.4	25	23-DEC-19
Vinyl acetate		101.3	100.9		%	0.5	25	23-DEC-19
Vinyl bromide		97.4	101.2		%	3.8	25	23-DEC-19
Vinyl chloride		98.8	97.4		%	1.5	25	23-DEC-19
WG3246686-1 MB								
1,1,1-Trichloroethane			<0.20		ppb(V)		0.2	20-DEC-19
1,1,2,2-Tetrachloroethane			<0.20		ppb(V)		0.2	20-DEC-19

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TO15-GCMS-WT	**Canister**							
Batch R4952666								
WG3246686-1 MB								
1,1,2-Trichloroethane			<0.20		ppb(V)		0.2	20-DEC-19
1,1-Dichloroethane			<0.20		ppb(V)		0.2	20-DEC-19
1,1-Dichloroethene			<0.20		ppb(V)		0.2	20-DEC-19
1,2,4-Trichlorobenzene			<0.20		ppb(V)		0.2	20-DEC-19
1,2,4-Trimethylbenzene			<0.20		ppb(V)		0.2	20-DEC-19
1,2-Dibromoethane			<0.20		ppb(V)		0.2	20-DEC-19
1,2-Dichlorobenzene			<0.20		ppb(V)		0.2	20-DEC-19
1,2-Dichloroethane			<0.20		ppb(V)		0.2	20-DEC-19
1,2-Dichloropropane			<0.20		ppb(V)		0.2	20-DEC-19
1,3,5-Trimethylbenzene			<0.20		ppb(V)		0.2	20-DEC-19
1,3-Butadiene			<0.20		ppb(V)		0.2	20-DEC-19
1,3-Dichlorobenzene			<0.20		ppb(V)		0.2	20-DEC-19
1,4-Dichlorobenzene			<0.20		ppb(V)		0.2	20-DEC-19
1,4-Dioxane			<0.20		ppb(V)		0.2	20-DEC-19
2-Hexanone			<1.0		ppb(V)		1	20-DEC-19
4-Ethyltoluene			<0.20		ppb(V)		0.2	20-DEC-19
Acetone			<0.50		ppb(V)		0.5	20-DEC-19
Allyl chloride			<0.20		ppb(V)		0.2	20-DEC-19
Benzene			<0.20		ppb(V)		0.2	20-DEC-19
Benzyl chloride			<0.20		ppb(V)		0.2	20-DEC-19
Bromodichloromethane			<0.20		ppb(V)		0.2	20-DEC-19
Bromoform			<0.20		ppb(V)		0.2	20-DEC-19
Bromomethane			<0.20		ppb(V)		0.2	20-DEC-19
Carbon Disulfide			<0.20		ppb(V)		0.2	20-DEC-19
Carbon Tetrachloride			<0.20		ppb(V)		0.2	20-DEC-19
Chlorobenzene			<0.20		ppb(V)		0.2	20-DEC-19
Chloroethane			<0.20		ppb(V)		0.2	20-DEC-19
Chloroform			<0.20		ppb(V)		0.2	20-DEC-19
Chloromethane			<0.20		ppb(V)		0.2	20-DEC-19
cis-1,2-Dichloroethene			<0.20		ppb(V)		0.2	20-DEC-19
cis-1,3-Dichloropropene			<0.20		ppb(V)		0.2	20-DEC-19
Cyclohexane			<0.20		ppb(V)		0.2	20-DEC-19
Dibromochloromethane			<0.20		ppb(V)		0.2	20-DEC-19

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TO15-GCMS-WT	**Canister**							
Batch R4952666								
WG3246686-1 MB								
Dichlorodifluoromethane			<0.20		ppb(V)		0.2	20-DEC-19
Ethyl acetate			<0.20		ppb(V)		0.2	20-DEC-19
Ethylbenzene			<0.20		ppb(V)		0.2	20-DEC-19
Freon 113			<0.20		ppb(V)		0.2	20-DEC-19
Freon 114			<0.20		ppb(V)		0.2	20-DEC-19
Hexachlorobutadiene			<0.20		ppb(V)		0.2	20-DEC-19
Isooctane			<0.20		ppb(V)		0.2	20-DEC-19
Isopropyl alcohol			<1.0		ppb(V)		1	20-DEC-19
Isopropylbenzene			<0.20		ppb(V)		0.2	20-DEC-19
m&p-Xylene			<0.40		ppb(V)		0.4	20-DEC-19
Methyl ethyl ketone			<0.20		ppb(V)		0.2	20-DEC-19
Methyl isobutyl ketone			<0.20		ppb(V)		0.2	20-DEC-19
Methylene chloride			<0.20		ppb(V)		0.2	20-DEC-19
MTBE			<0.20		ppb(V)		0.2	20-DEC-19
n-Heptane			<0.20		ppb(V)		0.2	20-DEC-19
n-Hexane			<0.20		ppb(V)		0.2	20-DEC-19
o-Xylene			<0.20		ppb(V)		0.2	20-DEC-19
Propylene			<0.20		ppb(V)		0.2	20-DEC-19
Styrene			<0.20		ppb(V)		0.2	20-DEC-19
Tetrachloroethylene			<0.20		ppb(V)		0.2	20-DEC-19
Tetrahydrofuran			<0.20		ppb(V)		0.2	20-DEC-19
Toluene			<0.20		ppb(V)		0.2	20-DEC-19
trans-1,2-Dichloroethene			<0.20		ppb(V)		0.2	20-DEC-19
trans-1,3-Dichloropropene			<0.20		ppb(V)		0.2	20-DEC-19
Trichloroethylene			<0.20		ppb(V)		0.2	20-DEC-19
Trichlorofluoromethane			<0.20		ppb(V)		0.2	20-DEC-19
Vinyl acetate			<0.50		ppb(V)		0.5	20-DEC-19
Vinyl bromide			<0.20		ppb(V)		0.2	20-DEC-19
Vinyl chloride			<0.20		ppb(V)		0.2	20-DEC-19
Surrogate: 4-Bromofluorobenzene			94.7		%		50-150	20-DEC-19
SILOXANES-GCMS-WT	**Tube**							

Quality Control Report

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SILOXANES-GCMS-WT	**Tube**							
Batch R4945277								
WG3242059-2 LCS								
D3(CVMS)			116.0		%		70-130	18-DEC-19
D4(CVMS)			117.6		%		70-130	18-DEC-19
D5(CVMS)			127.7		%		70-130	18-DEC-19
D6(CVMS)			121.6		%		70-130	18-DEC-19
MM(LVMS)			122.0		%		70-130	18-DEC-19
MDM(LVMS)			124.9		%		70-130	18-DEC-19
MD2M(LVMS)			118.9		%		70-130	18-DEC-19
MD3M(LVMS)			114.1		%		70-130	18-DEC-19
WG3242059-3 LCSD		**WG3242059-2**						
D3(CVMS)		116.0	118.1		%	1.7	50	18-DEC-19
D4(CVMS)		117.6	121.2		%	3.0	50	18-DEC-19
D5(CVMS)		127.7	131.7		%	3.1	50	18-DEC-19
D6(CVMS)		121.6	125.5		%	3.2	50	18-DEC-19
MM(LVMS)		122.0	94.5		%	25	50	18-DEC-19
MDM(LVMS)		124.9	123.7		%	0.9	50	18-DEC-19
MD2M(LVMS)		118.9	116.5		%	2.0	50	18-DEC-19
MD3M(LVMS)		114.1	106.2		%	7.2	50	18-DEC-19
WG3242059-1 MB								
D3(CVMS)			<10		ng		10	18-DEC-19
D4(CVMS)			<10		ng		10	18-DEC-19
D5(CVMS)			<10		ng		10	18-DEC-19
D6(CVMS)			<10		ng		10	18-DEC-19
MM(LVMS)			<10		ng		10	18-DEC-19
MDM(LVMS)			<10		ng		10	18-DEC-19
MD2M(LVMS)			<10		ng		10	18-DEC-19
MD3M(LVMS)			<10		ng		10	18-DEC-19
Surrogate: 4-Bromofluorobenzene			100.4		%		50-150	18-DEC-19

Quality Control Report

Workorder: L2393570 Report Date: 24-DEC-19

Client: TETRA TECH CANADA INC.
110, 140 Quarry Park Blvd SE
Calgary AB T2C 3G3
Contact: Darby Madalena

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Batch Proof Report

Batch ID	Canister ID	Parameters	Value	Units	Date	Analyst
B191108.330	01400-0184	1,1,1-Trichloroethane	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	1,1,1,2-Tetrachloroethane	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	1,1,2,2-Tetrachloroethane	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	1,1,2-Trichloroethane	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	1,1-Dichloroethane	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	1,1-Dichloroethene	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	1,2,4-Trichlorobenzene	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	1,2,4-Trimethylbenzene	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	1,2-Dibromoethane	<0.01	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	1,2-Dichlorobenzene	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	1,2-Dichloroethane	<0.01	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	1,2-Dichloropropane	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	1,3,5-Trimethylbenzene	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	1,3-Butadiene	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	1,3-Dichlorobenzene	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	1,4-Dichlorobenzene	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	1,4-Dioxane	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	2-Chlorophenol	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	2-Hexanone	<1.0	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	4-Ethyltoluene	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Acetone	<0.50	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Allyl Chloride	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Benzene	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Benzyl Chloride	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Bromodichloromethane	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Bromobenzene	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Bromoform	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Bromomethane	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Carbon Disulfide	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Carbon Tetrachloride	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Chlorobenzene	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Chloroethane	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Chloroform	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Chloromethane	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	cis-1,2-Dichloroethene	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	cis-1,3-Dichloropropene	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Cyclohexane	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Dibromochloromethane	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Dichlorodifluoromethane	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Ethyl Acetate	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Ethyl Benzene	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Freon 113	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Freon 114	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Hexachlorobutadiene	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Isooctane	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Isopropyl Alcohol	<1.0	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Isopropylbenzene	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	m&p-Xylene	<0.04	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Methyl Ethyl Ketone	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Methylcyclohexane	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Methyl Isobutyl Ketone	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Methylene Chloride	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	MTBE	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Naphthalene	<0.05	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	n-Decane	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	n-Heptane	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	n-Hexane	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	o-Xylene	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Propylene	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Styrene	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Tetrachloroethylene	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Tetrahydrofuran	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Toluene	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	trans-1,2-Dichloroethene	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	trans-1,3-Dichloropropene	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Trichloroethylene	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Trichlorofluoromethane	<0.20	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Vinyl Acetate	<0.50	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	Vinyl Bromide	<0.20	ppb(V)	15-Nov-19	DT1

B191108.330	01400-0184	Vinyl Chloride	<0.02	ppb(V)	15-Nov-19	DT1
B191108.330	01400-0184	4-Bromofluorobenzene	99.2	%	15-Nov-19	DT1

Batch Proof Report

Batch ID	Canister ID	Parameters	Value	Units	Date	Analyst
B191119.112	01400-0480	1,1,1-Trichloroethane	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	1,1,1,2-Tetrachloroethane	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	1,1,2,2-Tetrachloroethane	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	1,1,2-Trichloroethane	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	1,1-Dichloroethane	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	1,1-Dichloroethene	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	1,2,4-Trichlorobenzene	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	1,2,4-Trimethylbenzene	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	1,2-Dibromoethane	<0.01	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	1,2-Dichlorobenzene	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	1,2-Dichloroethane	<0.01	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	1,2-Dichloropropane	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	1,3,5-Trimethylbenzene	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	1,3-Butadiene	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	1,3-Dichlorobenzene	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	1,4-Dichlorobenzene	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	1,4-Dioxane	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	2-Chlorophenol	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	2-Hexanone	<1.0	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	4-Ethyltoluene	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Acetone	<0.50	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Allyl Chloride	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Benzene	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Benzyl Chloride	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Bromodichloromethane	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Bromobenzene	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Bromoform	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Bromomethane	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Carbon Disulfide	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Carbon Tetrachloride	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Chlorobenzene	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Chloroethane	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Chloroform	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Chloromethane	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	cis-1,2-Dichloroethene	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	cis-1,3-Dichloropropene	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Cyclohexane	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Dibromochloromethane	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Dichlorodifluoromethane	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Ethyl Acetate	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Ethyl Benzene	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Freon 113	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Freon 114	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Hexachlorobutadiene	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Isooctane	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Isopropyl Alcohol	<1.0	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Isopropylbenzene	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	m&p-Xylene	<0.04	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Methyl Ethyl Ketone	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Methylcyclohexane	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Methyl Isobutyl Ketone	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Methylene Chloride	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	MTBE	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Naphthalene	<0.05	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	n-Decane	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	n-Heptane	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	n-Hexane	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	o-Xylene	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Propylene	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Styrene	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Tetrachloroethylene	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Tetrahydrofuran	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Toluene	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	trans-1,2-Dichloroethene	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	trans-1,3-Dichloropropene	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Trichloroethylene	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Trichlorofluoromethane	<0.20	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Vinyl Acetate	<0.50	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	Vinyl Bromide	<0.20	ppb(V)	21-Nov-19	DT1

B191119.112	01400-0480	Vinyl Chloride	<0.02	ppb(V)	21-Nov-19	DT1
B191119.112	01400-0480	4-Bromofluorobenzene	103.1	%	21-Nov-19	DT1

L2393570-COFC

43570

60 NORTHLAND ROAD, UNIT 1
WATERLOO, ON N2V 2B8
Phone: (519) 886-6910
Fax: (519) 886-9047
Toll Free: 1-800-668-9878

ALS Environmental

AIR Q[illegible]ter/Tube/Gas Bag

Note: all TAT Quoted material is in business days which exclude statutory holidays and weekends. TAT of samples received past 3:00 pm or Saturday / Sunday begin the next day.

Specify date required

Service Requested		
10 day (regular)	☑	Rush 3 day (100%) ☐
Rush 5 day (50%)	☐	Rush 2 day (200%) ☐
		Rush 1 day (300%)- Enquire ☐

COMPANY NAME	Tetra Tech Canada Inc.
OFFICE	110, 140 Quarry Park Blvd SE, Calgary, AB T2C 3G3
PROJECT MANAGER	Darby Madalena
PROJECT #	SWM.SWOP04071-01.008 (Riverside Ligh Industrial Park)
PHONE 403-723-6867	FAX 403-203-3301
ACCOUNT #	
QUOTATION # Q71650	PO # SWM.SWOP04071-01.008

SAMPLE TYPE/REGULATION

Reg 419/05 ☐ Soil Vapor Intrusion ☐

OTHER ☐ Please List _____

REPORT FORMAT/DISTRIBUTION

EMAIL____FAX____BOTH ____
SELECT: PDF____DIGITAL____BOTH __
EMAIL 1 _____
EMAIL 2 _____

ANALYSIS REQUEST

All rush work requires lab approval before sample submission

SUBMISSION #:

ENTERED BY:

DATE/TIME ENTERED:

BIN #:

SAMPLING INFORMATION

Sample Date/Time: Date (dd-mmm-yy)	Time (24hr) (hh:mm)	Canister or Tube ID# (e.g. 060000-XXXX or G0XXXXXX SVI)	Regulator Serial # CS1200-XXXX or GXX	Matrix Type	SAMPLE DESCRIPTION TO APPEAR ON REPORT	TUBE AIR VOLUME - L ☐ m³ ☐	C1-C5-FID-WT	FIXED GASES-TCD-WT	TO15,F1F2SFRA+NAP-WT	Siloxanes-GCMS-WT			STARTING PRESSURE - Pre-Sampling ("Hg)	ENDING PRESSURE - Post Sampling ("Hg)	COLLECTION TIME (HRS)	Field Conditions (Rain/Wind/Dust/Odour) Field PID Reading	LAB ID
06-Dec-19	0920	G101	277	SG	VW-01	1.4	x	x	x				-8	-26	2		
	0950	G18	3636	SG	VW-02	1.4	x	x	x				-6	-27	1		
	—	DS30	363+	SG	19DUP01	1.4	X	X	X				-7	-26	2		
		G01506035VI	—	SG	VW-01	✓				X			/	/	/		
↓	1140	G01501705VI	—	SG	VW-02	✓				X			/	/	/		

SPECIAL INSTRUCTIONS/COMMENTS

This Chain of Custody Form is only to be used for Air Quality Samples

Matrix Type: Soil Gas Vapour = SG; Indoor Air = IA; Ambient Air = AA; Industrial Hygiene = IH

SAMPLE CONDITION AS RECEIVED

FROZEN ☐ COLD ☑ COOLING INITIATED ☑ AMBIENT ☐

MEAN TEMP 2

OBSERVATIONS Yes ☐ No ☐ If yes add SIF

INIT

SAMPLED BY: Megan Rouse	DATE & TIME: Dec 6/19 (5:00)	RECEIVED BY:	DATE & TIME
RELINQUISHED BY: Megan Rouse	DATE & TIME: Dec 6/19 16:00	RECEIVED AT LAB BY:	DATE & TIME: 12/6/19 4:50 pm

Notes

1. Quote number must be provided to ensure proper pricing

2. TAT may vary dependent on complexity of analysis and lab workload at time of submission. Please contact the lab to confirm TATs.

3. Any known or suspected hazards relating to a sample must be noted on the chain of custody in comments section.

REV4-2012

APPENDIX E

HISTORICAL ANALYTICAL RESULTS

Table 1
Groundwater Monitoring and Soil Vapour Well Elevations

Test Location	Well Depth (m)	Elevations				Screen Length (m)
		Ground (m)	Top of Pipe (m)	Screen Interval		
				Bottom	Top	
MW-01	7.6	854.669	854.539	847.069	851.669	4.6
MW-02	8.4	855.257	855.097	846.857	851.457	4.6
MW-03	7.6	854.551	854.461	846.951	851.551	4.6
VW-01	4.6	854.444	854.243	849.844	850.144	0.3
VW-02	6.1	855.329	854.429	849.229	849.529	0.3
TH-01	NA	854.665	- -	- -	- -	- -
TH-04	NA	855.279	- -	- -	- -	- -
TH-07	NA	855.058	- -	- -	- -	- -
TH-08	NA	854.759	- -	- -	- -	- -
TH-10	NA	854.418	- -	- -	- -	- -

Notes:

1) Geodetic elevations are determined from multiple datums, ASCM Nos. 36574 and 124339.
2) MW - Monitoring Well.
3) VW - Soil Vapour Well.
4) TH - Testhole.
5) NA - Not Applicable.
6) - - No value established.

Table 2
Site Monitoring Results

Test Location	Elevations		Groundwater Elevation (m)		Headspace Vapour				Notes
					01/08/13				
	Ground (m)	Top of Pipe (m)	01/08/13		Combustible	Volatile	Combustible	Volatile	
MW-01	854.669	854.539	849.752		510	ND			
MW-02	855.257	855.097	850.004		155	ND			
MW-03	854.551	854.461	849.421		460	ND			
VW-01	854.444	- -	- -	- -	1,750	ND			
VW-02	855.329	- -	- -	- -	1,300	1			
TH-01	854.665	- -	- -	- -	- -	- -	- -	- -	- -
TH-04	855.279	- -	- -	- -	- -	- -	- -	- -	- -
TH-07	855.058	- -	- -	- -	- -	- -	- -	- -	- -
TH-08	854.759	- -	- -	- -	- -	- -	- -	- -	- -
TH-10	854.418	- -	- -	- -	- -	- -	- -	- -	- -

Notes:

1) Measurement of combustible and volatile vapours by RKI Eagle 2. Units ppmv.
   Combustible vapour sensor calibrated to hexane and photoionization detector calibrated to isobutylene.
2) ND - Not Detected, less than the limit of instrument detection.
3) - - No value established.

Table 3
Analytical Results - Soil - Drill Cuttings (Soil Bag)

Parameter	Detection Limit	Soil Bag		Class II Landfill Acceptance Criteria
		1 of 2	2 of 2	
pH	0.10	8.47	8.80	2-12.5
Flash Point (°C)	30.0	>75	>75	>61
Paint Filter Test	-	PASS	PASS	PASS
Total Organic Carbon	0.10	0.85	0.36	- -
Hydrocarbons				
Benzene	0.0050	ND	ND	0.5
Toluene	0.0050	ND	ND	0.5
Ethylbenzene	0.0050	ND	ND	0.5
Xylenes	0.0050	ND	ND	0.5
Leachable Metals				
Antimony (Sb)	5.0	ND	ND	500
Arsenic (As)	0.20	ND	ND	5
Barium (Ba)	5.0	ND	ND	100
Beryllium (Be)	0.50	ND	ND	5
Boron (B)	5.0	ND	ND	500
Cadmium (Cd)	0.050	ND	ND	1
Chromium (Cr)	0.50	ND	ND	5
Cobalt (Co)	5.0	ND	ND	100
Copper (Cu)	5.0	ND	ND	100
Iron (Fe)	5.0	ND	ND	1,000
Lead (Pb)	0.50	ND	ND	5
Mercury (Hg)	0.010	ND	ND	0.2
Nickel (Ni)	0.50	ND	ND	5
Selenium (Se)	0.20	ND	ND	1
Silver (Ag)	0.50	ND	ND	5
Thallium (Tl)	0.50	ND	ND	5
Uranium (U)	1.0	ND	ND	2
Vanadium (V)	5.0	ND	ND	100
Zinc (Zn)	5.0	ND	ND	500
Zirconium (Zr)	5.0	ND	ND	500

Notes:

1) Class II Landfill Acceptance Criteria - per Table 2, Part 4 Schedule to the Alberta User Guide for Waste Managers 3/95. Applicable waste screening for The City of Red Deer Class II Waste Managment Facility.
2) All units are mg/L unless otherwise stated.
3) ND - Not Detected
4) Soil Bags were sampled July 14, 2013.
5) For further laboratory information, refer to the specific laboratory report in Appendix A.

Table 4A
Groundwater Indices Measured Time of Sampling

Monitoring Well	pH	Electrical Conductivity (µS/cm)	Temperature (°C)	Dissolved Oxygen (mg/L)	Total Dissolved Solids (mg/L)	Redox (±mV)
MW-01	8.22	1,025	8.8	0.92	968.50	-11.9
MW-02	7.64	584	9.4	3.47	539.50	+45.1
MW-03	8.35	1,378	8.7	2.29	1,287.00	-68.1

Notes:

1) Samples collected on August 01, 2013.
2) Groundwater indices measured by YSI Pro Plus multi-meter.

Table 4B
Analytical Results - Groundwater - General Water Quality

Parameter	Unit	Detection Limit	MW-01	MW-02	MW-03	Tier 1 Guideline
			08/01/13			
General Water Quality						
Biochemical Oxygen Demand	mg/L	2.0	2.2	ND	2.2	- -
Chemical Oxygen Demand	mg/L	5.0	210	130	190	- -
Conductivity	µS/cm	1.0	1,800	910	2,300	- -
pH	Unitless	NA	7.07	7.48	7.23	6.5-8.5
Total Organic Carbon (C)	mg/L	0.50	5.2	2.9	16	- -
Dissolved Cadmium (Cd)	µg/L	0.0050	0.080	0.040	0.047	- -
Total Cadmium (Cd)	µg/L	0.0050	**0.810**	**0.470**	**0.460**	0.060*
Alkalinity ($CaCO_3$)	mg/L	0.50	620	350	940	- -
Bicarbonate (HCO_3)	mg/L	0.50	750	430	1,100	- -
Carbonate (CO_3)	mg/L	0.50	ND	ND	ND	- -
Hydroxide (OH)	mg/L	0.50	ND	ND	ND	- -
Sulphates (SO_4)	mg/L	1.0	160	39	34	- -
Chlorides (Cl)	mg/L	1.0	110	59	190	- -
Total Ammonia (NH_3-N)	mg/L	0.050 - 0.50	ND	ND	**16**	1.37*
Total Phosphorus (P)	mg/L	0.1	1.8	0.63	0.69	- -
Total Nitrogen (N)	mg/L	0.050	23	2.1	14	- -
Total Kjeldahl Nitrogen (TKN)	mg/L	0.050 - 0.50	2.4	0.86	14	- -
Nitrite (NO_2)	mg/L	0.0030	0.91	ND	ND	- -
Nitrate (NO_3)	mg/L	0.0030 - 0.030	19	1.3	ND	- -
Nitrate plus Nitrite (N)	mg/L	0.0030 - 0.030	20	1.3	ND	- -
Trace Organics						
Acetic Acid	mg/L	50	ND	ND	ND	- -
Formic Acid	mg/L	50	ND	ND	ND	- -
Propionic Acid	mg/L	50	ND	ND	ND	- -
Adsorbable Organic Halogen	mg/L	0.004 - 0.02	0.075	0.055	0.05	- -

Notes:

1) Tier 1 Guideline - Alberta Tier 1 Soil and Groundwater Remediation Guidelines, December 2010 and amendments. Coarse-grained criteria for commercial/industrial land use.
2) * Surface Water Quality Guidelines for Use in Alberta (AENV, 1999) on aquatic life pathway. Canadian Council of Ministers of the Environment (CCME) guidelines are referenced.
3) ND - Not Detected, less than the limit of method detection.
4) - - No value established in the reference criteria.
5) Bold & Shaded - Exceeds the referenced Alberta Tier 1 Guidelines and CCME guidelines.
6) For further laboratory information, refer to the specific laboratory report in Appendix A.

Table 4C
Analytical Results - Groundwater - Metals

Parameter	Detection Limit	MW-01	MW-02	MW-03	Tier 1 Guideline
		01/08/13			
Total Metals					
Aluminum (Al)	0.0030	**21**	**9.3**	**8.7**	0.1*
Antimony (Sb)	0.00060	0.00098	0.00079	0.00087	0.006
Arsenic (As)	0.00020	**0.035**	**0.018**	**0.017**	0.005
Barium (Ba)	0.010	**1.4**	0.53	0.95	1
Beryllium (Be)	0.0010	0.0018	ND	ND	- -
Boron (B)	0.020	0.12	0.061	0.17	1.5
Calcium (Ca)	0.30	350	150	250	- -
Chromium (Cr)	0.0010	**0.049**	**0.019**	**0.021**	0.001*
Cobalt (Co)	0.00030	0.019	0.010	0.017	- -
Copper (Cu)	0.00020	**0.072**	**0.031**	**0.025**	0.003*
Iron (Fe)	0.060	**62**	**24**	**30**	0.3
Lead (Pb)	0.00020	**0.034**	**0.014**	**0.015**	0.004*
Lithium (Li)	0.020	0.075	0.036	0.051	- -
Magnesium (Mg)	0.20	110	48	96	- -
Manganese (Mn)	0.0040	**1.6**	**0.68**	**2.2**	0.05
Molybdenum (Mo)	0.00020	0.0035	0.0030	0.0049	0.073*
Nickel (Ni)	0.00050	0.071	0.032	0.035	0.11*
Phosphorus (P)	0.10	1.8	0.63	0.69	- -
Potassium (K)	0.30	13	7.3	29	- -
Selenium (Se)	0.00020	**0.0020**	**0.0028**	0.00077	0.001
Silicon (Si)	0.10 - 0.50	59	27	31	- -
Silver (Ag)	0.00010	**0.00066**	**0.00031**	**0.00021**	0.0001*
Sodium (Na)	0.50	70	36	150	- -
Strontium (Sr)	0.020	1.2	0.63	1.7	- -
Sulphur (S)	0.20	47	10	11	- -
Thallium (Tl)	0.00020	0.0004	ND	ND	0.0008*
Tin (Sn)	0.0010	0.0012	ND	0.0015	- -
Titanium (Ti)	0.0010	0.29	0.15	0.16	- -
Uranium (U)	0.00010	0.0099	0.0040	0.0047	0.02
Vanadium (V)	0.0010	0.07	0.03	0.025	- -
Zinc (Zn)	0.0030	**0.19**	**0.094**	**0.1**	0.03
Dissolved Metals					
Aluminum (Al)	0.0030	ND	ND	ND	- -
Antimony (Sb)	0.00060	ND	ND	ND	- -
Arsenic (As)	0.00020	0.00033	0.00051	0.0059	- -
Barium (Ba)	0.010	0.15	0.20	0.55	- -
Beryllium (Be)	0.0010	ND	ND	ND	- -
Boron (B)	0.020	0.11	0.057	0.16	- -
Calcium (Ca)	0.30	230	110	210	- -
Chromium (Cr)	0.0010	ND	ND	ND	- -
Cobalt (Co)	0.00030	0.0015	0.00073	0.0092	- -
Copper (Cu)	0.00020	0.0019	0.0021	0.0012	- -
Iron (Fe)	0.060	0.08	ND	4.1	- -
Lead (Pb)	0.00020	ND	ND	ND	- -
Lithium (Li)	0.020	0.035	0.021	0.035	- -
Magnesium (Mg)	0.20	73	35	80	- -
Manganese (Mn)	0.0040	0.22	0.14	1.8	- -
Molybdenum (Mo)	0.00020	0.0013	0.0017	0.0039	- -
Nickel (Ni)	0.00050	0.0086	0.0022	0.012	- -
Phosphorus (P)	0.10	ND	ND	0.13	- -
Potassium (K)	0.30	7.5	4.7	26	- -
Selenium (Se)	0.00020	0.00047	0.0016	0.00028	- -
Silicon (Si)	0.10	6.8	5.2	8.1	- -
Silver (Ag)	0.00010	ND	ND	ND	- -
Sodium (Na)	0.50	68	36	140	- -
Strontium (Sr)	0.020	1.1	0.58	1.7	- -
Sulphur (S)	0.20	44	9.3	9.0	- -
Thallium (Tl)	0.00020	ND	ND	ND	- -
Tin (Sn)	0.0010	ND	ND	ND	- -
Titanium (Ti)	0.0010	ND	ND	ND	- -
Uranium (U)	0.00010	0.0078	0.0028	0.0035	- -
Vanadium (V)	0.0010	ND	ND	ND	- -
Zinc (Zn)	0.0030	ND	ND	0.0077	- -

Notes:

1) Tier 1 Guideline - Alberta Tier 1 Soil and Groundwater Remediation Guidelines, December 2010 and amendments. Coarse-grained criteria for commercial/industrial land use.
2) * Surface Water Quality Guidelines for Use in Alberta (AENV, 1999) on aquatic life pathway. Canadian Council of Ministers of the Environment (CCME) guidelines are referenced.
3) ND - Not Detected, less than the limit of method detection.
4) Unless specified all units are mg/L.
5) - - No value established in the reference criteria.
6) Bold & Shaded - Exceeds the referenced Alberta Tier 1 and CCME guidelines.
7) For further laboratory information, refer to the specific laboratory report in Appendix A.

Table 4D
Analytical Results - Groundwater - VOCs

Parameter	Detection Limit	MW-01	MW-02	MW-03	Tier 1 Guideline
		01/08/13			
Volatile Organic Compounds					
Benzene	0.00040	ND	ND	ND	0.005
Toluene	0.00040	ND	ND	ND	0.024
Ethylbenzene	0.00040	ND	ND	ND	0.0024
Xylenes (Total)	0.00080	ND	ND	ND	0.3
F1 (C_6-C_{10})	0.10	ND	ND	ND	2.2
F2 (C_{10}-C_{16})	0.10	ND	ND	ND	1.1
Trihalomethanes (THMs)	0.0020	ND	ND	ND	0.1
Bromodichloromethane	0.00050	ND	ND	ND	- -
Bromoform	0.00050	ND	ND	ND	- -
Bromomethane	0.0020	ND	ND	ND	- -
Carbon tetrachloride	0.00050	ND	ND	ND	0.005
Chlorobenzene	0.00050	ND	ND	ND	0.0013
Chlorodibromomethane	0.0010	ND	ND	ND	- -
Chloroethane	0.0010	ND	ND	ND	- -
Chloroform	0.00050	ND	ND	ND	0.0018
Chloromethane	0.0020	ND	ND	ND	- -
1,2-dibromoethane	0.00050	ND	ND	ND	- -
1,2-dichlorobenzene	0.00050	ND	ND	ND	0.0007
1,3-dichlorobenzene	0.00050	ND	ND	ND	- -
1,4-dichlorobenzene	0.00050	ND	ND	ND	0.001
1,1-dichloroethane	0.00050	ND	ND	ND	- -
1,2-dichloroethane	0.00050	ND	ND	ND	0.005
1,1-dichloroethene	0.00050	ND	ND	ND	0.014
cis-1,2-dichloroethene	0.00050	ND	ND	ND	- -
trans-1,2-dichloroethene	0.00050	ND	ND	ND	- -
Dichloromethane	0.0020	ND	ND	ND	0.05
1,2-dichloropropane	0.00050	ND	ND	ND	- -
cis-1,3-dichloropropene	0.00050	ND	ND	ND	- -
trans-1,3-dichloropropene	0.00050	ND	ND	ND	- -
Methyl methacrylate	0.00050	ND	ND	ND	0.47
Methyl-tert-butylether (MTBE)	0.00050	ND	ND	ND	0.015
Styrene	0.00050	ND	ND	ND	0.072
1,1,1,2-tetrachloroethane	0.0020	ND	ND	ND	- -
1,1,2,2-tetrachloroethane	0.0020	ND	ND	ND	- -
Tetrachloroethene	0.00050	ND	ND	ND	0.03
1,2,3-trichlorobenzene	0.0010	ND	ND	ND	0.008
1,2,4-trichlorobenzene	0.0010	ND	ND	ND	0.015
1,3,5-trichlorobenzene	0.00050	ND	ND	ND	0.014
1,1,1-trichloroethane	0.00050	ND	ND	ND	- -
1,1,2-trichloroethane	0.00050	ND	ND	ND	- -
Trichloroethene	0.00050	ND	ND	ND	0.005
Trichlorofluoromethane	0.00050	ND	ND	ND	- -
1,2,4-trimethylbenzene	0.00050	ND	ND	ND	- -
1,3,5-trimethylbenzene	0.00050	ND	ND	ND	- -
Vinyl chloride	0.00050	ND	ND	ND	0.002

Notes:

1) Tier 1 Guideline - Alberta Tier 1 Soil and Groundwater Remediation Guidelines, December 2010 and amendments. Coarse-grained criteria for commerical/industrial land use.
2) ND - Not Detected, less than the limit of method detection.
3) Unless specified all units are mg/L
4) - - No value established in the reference criteria.
5) Bold & Shaded - Exceeds the referenced Alberta Tier 1 Guidelines.
6) For further laboratory information, refer to the specific laboratory report in Appendix A.

Table 5A
Summary of Field Parameters Measured During Sampling of Soil Vapour

Parameter	Well Diameter (mm)	Screen Length (cm)	Well Depth (m)	Headspace Volume (cm^3)	Purge Rate (cm^3/min)	Purge Time (min)	Pressure (psi)	
							Ambient	Vapour Well
VW-01	25	30	4.6	2,558.02	943.3	3 min 7 sec	15.08	15.03
VW-02	25	30	6.1	2,994.33	943.3	3 min 36 sec	15.17	15.18

Notes:

1) Measurement of pressure by digital Cole-Parmer absolute pressure gauge.
2) Purge time is elapsed time prior to the collection of a soil vapour sample.
3) Screen set at base of well.
4) Soil vapour sampling was completed July 31, 2013.

Table 5B
Analytical Results - Soil Vapour - General Indices

Parameter	Unit	Detection Limit	VW-01	VW-02
Gauge Pressure				
Following sampling	psi	- -	-4.7	-5.0
Reported by laboratory	psi	- -	-3.6	-3.6
Fixed Gases				
Oxygen	% v/v	0.2 - 0.3	2	5
Nitrogen	% v/v	0.2 - 0.3	50.9	67.0
Carbon monoxide	% v/v	0.2 - 0.3	ND	ND
Methane	% v/v	0.2 - 0.3	27.4	17.6
Carbon dioxide	% v/v	0.2 - 0.3	19.8	10.4

Notes:

1) Soil vapour sample collected on Wednesday, July 31, 2013.
2) ND - Not Detected, less than the limit of method detection.
3) - - No value established in the detection limit and reference criteria.
4) For further information, the reader should refer to the laboratory report in Appendix A.

Table 5C
Analytical Results - Soil Vapour - VOCs

Parameter	Unit	Detection Limit	VW-01	VW-02
			07/31/2013	
Volatile Hydrocarbon Fractions				
Aliphatic >C_5-C_6	µg/m^3	5.0 - 13	205	2,530
Aliphatic >C_6-C_8	µg/m^3	5.0	483	651
Aliphatic >C_8-C_{10}	µg/m^3	5.0	176	106
Aliphatic >C_{10}-C_{12}	µg/m^3	5.0	412	185
Aliphatic >C_{12}-C_{16}	µg/m^3	5.0	125	91.1
Aromatic >C_7-C_8 (TEX Excluded)	µg/m^3	5.0	ND	ND
Aromatic >C_8-C_{10}	µg/m^3	5.0	86.0	47.5
Aromatic >C_{10}-C_{12}	µg/m^3	5.0	71.1	41.7
Aromatic >C_{12}-C_{16}	µg/m^3	5.0	ND	ND
Select Volatile Gases				
Acetylene	ppm	0.21 - 0.26	ND	ND
Ethane	ppm	0.21 - 0.26	1.7	1.3
Ethylene	ppm	0.21 - 0.26	ND	ND
n-Butane	ppm	0.41 - 0.51	ND	0.47
n-Pentane	ppm	0.21 - 0.26	ND	ND
Propane	ppm	0.21 - 0.26	1.1	0.69
Propene	ppm	0.21 - 0.26	ND	ND
Propyne	ppm	0.41 - 0.51	ND	ND
Volatile Organic Compounds				
Dichlorodifluoromethane (FREON 12)	ppbv	0.20 - 0.80	3.34	341
1,2-Dichlorotetrafluoroethane	ppbv	0.17	ND	ND
Chloromethane	ppbv	0.30	0.87	ND
Vinyl chloride	ppbv	0.18	0.60	ND
Chloroethane	ppbv	0.30	ND	ND
1,3-Butadiene	ppbv	0.50	ND	ND
Trichlorofluoromethane (FREON 11)	ppbv	0.20	ND	ND
Ethanol (ethyl alcohol)	ppbv	2.3	34.4	23.5
Trichlorotrifluoroethane	ppbv	0.15	ND	ND
2-Propanol	ppbv	3.0	11.5	6.1
2-Propanone	ppbv	0.80	32.0	19.8
Methyl ethyl ketone (MEK) (2-Butanone)	ppbv	3.0	16.8	12.2
Methyl isobutyl ketone	ppbv	3.2	ND	ND
Methyl butyl ketone (MBK) (2-Hexanone)	ppbv	2.0	ND	ND
Methyl t-butyl ether (MTBE)	ppbv	0.20	ND	ND
Ethyl acetate	ppbv	2.2	2.6	ND
1,1-Dichloroethylene	ppbv	0.25	ND	ND
cis-1,2-Dichloroethylene	ppbv	0.19	ND	ND
trans-1,2-Dichloroethylene	ppbv	0.20	ND	ND
Methylene chloride(Dichloromethane)	ppbv	0.80	ND	ND
Chloroform	ppbv	0.15	ND	ND
Carbon tetrachloride	ppbv	0.30	ND	ND
1,1-Dichloroethane	ppbv	0.20	ND	ND
1,2-Dichloroethane	**ppbv**	**0.20**	**ND**	**0.29**
Ethylene dibromide	ppbv	0.17	ND	ND
1,1,1-Trichloroethane	ppbv	0.30	ND	ND
1,1,2-Trichloroethane	ppbv	0.15	ND	ND
1,1,2,2-Tetrachloroethane	ppbv	0.20	ND	ND
cis-1,3-Dichloropropene	ppbv	0.18	ND	ND
trans-1,3-Dichloropropene	ppbv	0.17	ND	ND
1,2-Dichloropropane	ppbv	0.40	ND	ND
Bromomethane	ppbv	0.18	ND	ND
Bromoform	ppbv	0.20	ND	ND
Bromodichloromethane	ppbv	0.20	ND	ND
Dibromochloromethane	ppbv	0.20	ND	ND
Trichloroethylene (TCE)	ppbv	0.30	2.23	1.82
Tetrachloroethylene (PCE)	ppbv	0.20	0.64	ND
Benzene	ppbv	0.18	2.93	1.15
Toluene	ppbv	0.20	14.1	11.1
Ethylbenzene	ppbv	0.20	4.01	2.53
p+m-xylene	ppbv	0.37	11.6	7.03
o-xylene	ppbv	0.20	5.01	2.85
Styrene	ppbv	0.20	1.4	0.81
4-Ethyltoluene	ppbv	2.2	ND	ND
1,3,5-Trimethylbenzene	ppbv	3.6 - 8.3	ND	ND
1,2,4-Trimethylbenzene	ppbv	0.50	3.76	2.27
Chlorobenzene	ppbv	0.20	ND	ND
Benzyl chloride	ppbv	1.0	ND	ND
1,3-Dichlorobenzene	ppbv	0.40	ND	ND
1,4-Dichlorobenzene	ppbv	0.40	ND	ND
1,2-Dichlorobenzene	ppbv	0.40	ND	ND
1,2,4-Trichlorobenzene	ppbv	2.0	ND	ND
Hexachlorobutadiene	ppbv	3.0	ND	ND
Hexane	ppbv	0.30	11.4	7.70
Heptane	ppbv	0.30	3.79	1.87
Cyclohexane	ppbv	0.20	34.9	8.60
Tetrahydrofuran	ppbv	0.40	8.14	7.87
1,4-Dioxane	ppbv	2.0	ND	ND
Xylene (Total)	ppbv	0.60	16.6	9.88
Vinyl bromide	ppbv	0.20	ND	ND
Propene	ppbv	220 - 240	ND	ND
2,2,4-Trimethylpentane	ppbv	0.20	4.62	3.52
Carbon disulfide	ppbv	0.50	5.31	3.24
Vinyl acetate	ppbv	0.20	ND	ND

Notes:

1) Results are from sampling performed on Wednesday, July 31, 2013.
2) ND - Not Detected, less than the limit of method detection.
3) - - No value established in the detection limit and reference criteria.
4) For further information, the reader should refer to the laboratory report in Appendix A.

Table 5D
Analytics Results - Soil Vapour - Siloxanes

Parameter	Detection Limit		VW-01		VW-02	
			07/31/2013			
	mg/m³	ppm	mg/m³	ppm	mg/m³	ppm
Trimethylsilyl Fluoride	- -	- -	ND	ND	ND	ND
Tetramethylsilane	0.0001	0.0001	ND	ND	ND	ND
Methoxytrimethylsilane	0.0032	0.0007	ND	ND	ND	ND
Ethoxytrimethylsilane	0.0030 - 0.0031	0.0006	ND	ND	ND	ND
Trimethylsilanol	- -	- -	0.0243	0.0066	0.0172	0.0047
Isopropoxytrimethylsilane	0.0013	0.0002	ND	ND	ND	ND
Trimethoxymethyl Silane #	- -	- -	ND	ND	ND	ND
Hexamethyl Disiloxane - L2	0.0001	0.0001	ND	ND	ND	ND
Propoxytrimethylsilane	0.0035	0.0006	ND	ND	ND	ND
1-Methylbutoxytrimethylsilane *	- -	- -	ND	ND	ND	ND
Butoxytrimethylsilane *	- -	- -	ND	ND	ND	ND
Trimethoxyvinyl Silane #	- -	- -	ND	ND	ND	ND
Hexamethyl Cyclotrisiloxane - D3	- -	- -	0.0212	0.0023	0.0141	0.0016
Octamethyl Trisiloxane - L3	0.0002	0.0001	ND	ND	ND	ND
Triethoxyvinyl Silane #	- -	- -	ND	ND	ND	ND
Triethoxyethyl Silane #	- -	- -	ND	ND	ND	ND
Octamethyl Cyclotetrasiloxane - D4	- -	- -	0.0580	0.0048	0.0250	0.0021
Decamethyl Tetrasiloxane - L4	- -	- -	0.0022	0.0002	0.0009	0.0001
Tetraethylsilicate #	- -	- -	ND	ND	ND	ND
Decamethyl Cyclopentasiloxane - D5	- -	- -	0.8254	0.0545	0.5350	0.3530
Dodecamethyl Pentasiloxane - L5	0.0030	0.0002	ND	ND	ND	ND
Dodecamethyl Cyclohexasiloxane - D6	- -	- -	0.6919	0.0381	0.3017	0.0166
Sum	- -	- -	1.6375	0.1089	0.9083	0.0628

Notes:

1) Soil vapour samples collected on Wednesday, July 31, 2013.
2) ND - Not Detected, less than the limit of method detection.
3) - - No value established in the detection limit and reference criteria.
4) V=200 mL, where V is volume of air/gas sampled.
5) * - Semiquanititative (response factor set at 5).
6) # - Unstable, poor detectability, commercial standards tested.
7) For further information, the reader should refer to the laboratory report in Appendix A.