Soil Management Program
2022 Soil Remediation Report
Clean Harbors Ryley Industrial Waste Management Facility
EPEA Approval No. 10348-03-00
SE 09-050-17 W4M

PRESENTED TO

Clean Harbors Canada, Inc.

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Tetra Tech Canada Inc.
14940 - 123 Avenue
Edmonton, AB T5V 1B4 CANADA
Tel 780.451.2121 Fax 780.454.5688

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LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Clean Harbors Canada Inc. 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 Clean Harbors Canada Inc., 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

Clean Harbors Canada, Inc. (Clean Harbors) operates the Ryley Industrial Waste Management Facility (the facility) located in SE 09-050-17 W4M near Ryley, Alberta, under Environmental Protection and Enhancement Act (EPEA) Approval No. 10348-03-00 (the Approval) (Appendix B). While completing the required Soil Monitoring Program (SMP) in 2019[1], Clean Harbors detected exceedances for polycyclic aromatic hydrocarbons (PAHs), chloride, and various metals. In 2020, at the request of Alberta Environment and Protected Areas (AEPA, formerly Alberta Environment and Parks [AEP]), Clean Harbors prepared a detailed Soil Management Program (SMaP) Proposal[2] to assess and delineate the identified exceedances north of Cell 4 around boreholes 19-6 and 19-8, in the graveled area west of the process buildings, and along the drainage ditch around Cell 4 and between the facilities area and Cells 3D and 3E. Delineation activities were completed in August, September, and October 2020 after authorization to proceed with the proposed SMaP was provided to Clean Harbors by AEP in a letter dated September 18, 2020[3]. The 2020 SMaP report[4] detailed the results of the delineation sampling and recommended excavation and confirmatory sampling of the PAH and metals exceedances north of Cell 4 around boreholes 19-6 and 19-8 and of the metals exceedances in the gravelled area west of the process buildings. Chloride impacts identified by the 2019 soil monitoring event and subsequent delineation event will continue to be monitored as outlined in the Approval. In 2021, the area north of Cell 4 around boreholes 19-6 and 19-8 and the graveled area west of the process buildings were remediated[5], however, five confirmatory samples from the area north of Cell 4 around boreholes 19-6 and 19-8 had PAH concentrations greater than guideline values. Clean Harbors proposed additional confirmatory sampling for metals parameters and further remediation in the area north of Cell 4 around boreholes 19-6 and 19-8 in the 2021 Soil Management Program Remediation Report.

Tetra Tech Canada Inc. (Tetra Tech) was retained by Clean Harbors to provide direction on the excavation and removal of PAH and metals impacted materials, conduct confirmatory sampling to support that remediation was complete, and to provide this remediation report in accordance with the Approval and direction from AEPA. The objective of the 2022 Soil Remediation Program was to excavate and landfill surface clay and gravels with PAH and/or metals guideline exceedances north of Cell 4 around boreholes 19-6 and 19-8 in accordance with the Approval, the Tetra Tech 2019 Soil Management Program Proposal and 2020 Deficiency Response Letter[6], and the 2009 AEP Soil Monitoring Directive[7] (the Directive).

1.1 Scope of Work

The scope of work completed included the following:

- Coordinated fieldwork with Clean Harbors personnel.
- Completed a Tetra Tech safe work form to identify and mitigate on site hazards, with worker review and signoff.

[1] Tetra Tech EBA Inc. January 2020. 2019 Soil Monitoring Program, Clean Harbors Ryley Industrial Waste Management Facility, EPEA Approval No. 10348-03-00, SE 09-050-17 W4M. File: SWM.SWOP04076-02.

[2] Tetra Tech Canada Inc. 2020. 2019 Soil Management Program Proposal, Clean Harbors Ryley Industrial Waste Management Facility, EPEA Approval No. 10348-03-00, SE-09-050-17 W4M. File: SWM.SWOP04076-02.

[3] Alberta Environment and Parks. 2020. 2019 Soil Management Program - Authorization Letter, Clean Harbors Canada, Inc. Ryley Industrial Waste Management Facility, Environmental Protection and Enhancement Act Approval No. 10348-03-00. Letter dated September 18, 2020.

[4] Tetra Tech Canada Inc. 2021. 2020 Soil Management Program, Clean Harbors Ryley Industrial Waste Management Facility, EPEA Approval No. 10348-03-00, SE 09-050-17 W4M. File: SWM.SWOP04348-01.

[5] Tetra Tech Canada Inc. 2022. Soil Management Program, 2021 Remediation Report, Clean Harbors Ryley Industrial Waste Management Facility, AEPEA Approval No. 10348-03-00, SW 09-050-17 W4M. File: 704-SWM.SWOP04348-01.

[6] Tetra Tech Canada Inc. 2020. Response to Deficiency Letter, 2019 Soil Management Program Proposal, Clean Harbors Canada, Inc., Ryley Industrial Waste Management Facility, Environmental Protection and Enhancement Act Approval 10348-03-00. File: SWM.SWOP04348-01.

[7] Government of Alberta. 2009. Soil Monitoring Directive 2009. ISBN: 978-0-7785-8121-5 (On-line Edition).

- Reviewed line locate information to identify any underground utilities with the Prime Contractor in charge of the site.
- Conducted an on-site kick-off meeting with the Clean Harbors contractor in charge of the site to review expected extent of excavation and ground disturbance preparations for the excavation activity.
- Provided guidance to the Clean Harbors contractor in determining the depth of PAH and/or metals impacted material to be removed from north of Cell 4 around boreholes 19-6 and 19-8.
- Collected confirmatory soil samples from 48 locations north of Cell 4 along the access road north side slope around boreholes 19-6 and 19-8 and submitted them to an accredited laboratory (ALS Canada Ltd.) for analysis.
- Evaluated the laboratory data.
- Prepared this remediation report summarizing field activities and confirmatory analytical results.
- Completed a Record of Site Condition report.

The scope of work was based on the 2019 Soil Management Program Proposal, the 2019 Soil Management Program Proposal Response to Deficiency Letter, the 2020 SMaP report update, and the 2021 Soil Remediation Report.

2.0 REGIONAL AND SITE CHARACTERISTICS

2.1 Site Description

The Clean Harbors Ryley facility is located just north of the town of Ryley, Alberta, within the northeast and southeast quarters of Section 9, Township 50, Range 17, West of the Fourth Meridian (Figure 1 and Figure 2).

The facility is an Alberta Class I landfill, storage, and disposal facility, licensed to accept various hazardous waste liquids and solids for disposal and/or transfer to authorized treatment or disposal facilities in accordance with the EPEA.

2.1.1 Vegetation and Land Use

The surrounding land use is agricultural. Native vegetation in the area mainly consists of dominantly aspen with some balsam poplar and white birch with grasses and shrubs in the understory (Figure 3). The current land use is industrial.

2.1.2 Surficial Geology

Surficial geology around the Clean Harbors facility is fine loamy to fine clayey till, containing less than 5% coarse fragments, and is weakly calcareous and weakly saline, with the till layer ranging from 4 to 8 m in thickness (Figure 5 and Figures 8a to 8b).

The underlying bedrock is composed of sandstone, mudstones, and siltstones containing concretionary ironstone beds of the Bearpaw and Horseshoe Canyon formations. The Bearpaw formation is dominant and is characterized by marine deposited shales and clayey sandstone (Figure 3).

2.1.3 Topography and Drainage

Topography is undulating to gently rolling. Soils are predominantly well drained, with localized areas of poorly drained soils (Figures 4 and 6).

Local hydrology of the undeveloped NE 09-50-17 W4M indicates surface water flow is primarily to the north (Figure 7a).

The northwest corner of the developed facility in the SE 09-50-17 W4M is a local topographic high point for surface water. Perimeter ditches have been constructed around the waste cells to collect surface water and allow perimeter drainage to the retention pond, located on the east side of the facility. Surface water from the northwest corner drains south, through a perimeter ditch that collects water from the west base of Cells 2 and 3A. At the southwest corner of Cell 3A, the ditch turns east to collect perimeter drainage along the south toes of Cells 3A, 3B, 3C, 3D, and 3E, respectively. Surface water then drains east into the retention pond. All surface water runoff is collected and not discharged off site until it meets surface water quality discharge requirements. Surface water from outside of the facility is diverted from flowing into the facility (Figure 7b).

A ditch on the northern edge of the facility is sloped downward to the east along the north base of Cell 1 and Cell 2 and conveys surface water into a second perimeter ditch constructed around Cell 4 to collect and direct surface drainage water east into the retention pond. The perimeter ditch around Cell 4 also conveys surface water from the Cell 1 leachate tank area to the water retention pond on the east side of the facility (Figure 7b).

2.1.4 Surface Water and Groundwater

There is one water well located on the existing facility in SE 9-50-17 W4M behind the south end of the office building which is currently not in use due to low water yields. There is one dugout in the NE 9-50-17 W4M landfill expansion area and two borrow pits that hold water although the dugout and one of the borrow pits will be eliminated through development of the proposed landfill cells. Surface waterbodies in the area include numerous creeks, lakes, ponds, and wetlands in the NE 9-50-17 W4M and surrounding sections.

Regional groundwater flow is inferred to generally follow the surface topography in the area. Local groundwater flow direction at the site is characterized generally by radial flow away from Cells 3B and 3C.

Figures 9a through 9d show groundwater flow directions in four geologic units beneath the site including surficial material, upper bedrock, middle bedrock, and lower bedrock. The contours on each of these maps were created using wells screened across a similar unit, within a general depth range.

- Figure 9a shows the groundwater elevation contour map for the clay till (surficial) unit. The surficial soils have a discontinuous water table, with several of the monitoring wells being dry at the time of assessment. Flow direction was generally north to northwest in the southern portion of the site; however, a southwestern gradient is observed in the northeast portion of the site. At the time of assessment, the average groundwater elevation in the surficial clay till unit was 685.5 meters above sea level, or 1.15 m below ground level.
- Figure 9b shows the groundwater elevation contour map for the upper bedrock unit. The groundwater in the upper bedrock unit generally flows north to northeast. This unit is comprised of interbedded bedrock types (clayey sandstone and clay shale), and this is evident in apparently inconsistent water levels in the central and northeast portion of the site which suggest mounding and depressional areas.
- Figure 9c shows the groundwater elevation contour map for the middle bedrock clay shale unit. The groundwater in this unit generally flows north. At the north end of the site two wells exhibit notably lower groundwater elevations, approximately 8 m lower than the surrounding wells. These wells are screened approximately 5 m to 6 m deeper than the surrounding wells within the same clay shale unit and may suggest a downward hydraulic gradient within the clay shale.

- Figure 9d shows the deep groundwater elevation contour map, based on groundwater elevations monitored in four monitoring wells installed in the lower bedrock (Belly River Formation). The groundwater in the lower bedrock unit indicates a relatively uniform northwest gradient across the site.

The groundwater flow patterns shown on Figures 9a to 9d should be considered preliminary patterns and will be updated as part of the Baseline Groundwater Monitoring Program planned for the NE 9-50-17 W4M and the 2023 Groundwater Monitoring Program for the Facility.

2.1.5 Soils

Undisturbed upland soils around the facility are composed predominantly of Black Solodized Solonetz (Camrose soil series) developed in fine loamy textured tills[8]. These soils are naturally saline and sodic (Figure 6). Published soil series data[9] relating to salinity is provided in Table A.

Table A: Published Soils Data for Camrose Soil Series

Horizon	Depth (m)	pH	Electrical Conductivity (dS/m)	Sodium Absorption Ratio
Ap (Topsoil)	0.0-0.18	5.4-6.5	0.4-6.8	2.6-9.3
Bnt/Bntgj	0.18-0.36	7.0-7.5	0.5-6.9	6.3-40.4
Csk/Cskgj	0.36-1.8	7.8-8.2	0.8-12.9	7.3-35.1

2.2 Site History

The facility currently includes eight landfill cells. Facility operations were initiated in 1992. Landfill Cells 1, 2, 3A, 3B, and 3C are no longer active. Cells 1, 2, 3A, and 3B were capped in 1999, 2010, 2013, and 2013, respectively. Capping of Cell 3C is currently in progress. Cells 3D and 3E are currently active, but no longer accepting waste until the tipping pad located in Cell 3D is decommissioned. Construction of Cell 4 was completed in 2019. An access road, run-on diversion ditch, and run-off control ditch were constructed in 2012 along the south side of the facility. A water retention pond was constructed east of landfill Cell 3E in 2014.

Building facilities at the site include those required for waste transfer and vehicle maintenance, lab, and administration buildings. The building area is completely paved with the exception of two small grassed areas and one small gravelled area. Surface runoff waters from the paved areas are collected in the clay-lined surface water retention pond and tested before discharge. On occasion, minor adjustments for total suspected solids (TSS) and chemical oxygen demand (COD) have been required prior to discharge. In the drainage area to the south a now abandoned sewage lagoon was operated by the Village of Ryley from 1951 to 1985. The landfill cells are double lined with leak detection systems. Wash water from building drains and leachate from the landfill cells is collected in leachate holding tanks and disposed of off-site through deep well injection. The ground surface outside of the landfill cells is covered in gravel, grass, or trees. The Cells were designed to accept hazardous wastes.

[8] Howitt, R.W. 1988. Alberta Soil Survey Report No. 47, Soil Survey of the County of Beaver, Alberta.

[9] Pedocan Land Evaluation Ltd., 1993. Soil Series Information for Reclamation Planning in Alberta. Alberta Conservation and Reclamation Council Report No. RRTAC 93-7. ISBN 0-7732-6041-2.

The types of materials typically disposed in the landfill cells include[10]:

- Filters from gas plants
- Solids and debris from petrochemical and mining operations
- Hydrocarbon-contaminated soil from gas plants, refineries, and service stations
- Catalyst from petroleum processing such as vanadium pentoxide
- Treated wood from site clean-up
- Shot blast waste from industrial clean-up
- Activated carbon from petroleum processing
- Plant demolition waste
- Fibreglass insulation from manufacturing, site clean-ups
- Sulphur-contaminated soil from gas plants
- Spent flammable solvents
- Metal-contaminated soil from industrial clean-ups

Newalta Corporation, who operated this site in 1990 to 1991, had a pesticide container storage area in the current location of Cell 2. Laidlaw Environmental Services Ltd. (later Safety-Kleen, now Clean Harbors) decommissioned this storage area at the start of their operations[11].

Previous soil monitoring programs were completed in 1996[12], 2001, 2009, 2014, and 2019. During the 2001 monitoring event[13], a sample from the surface water retention pond was found to be above referenced guidelines for lindane and molybdenum. A delineation sampling event took place in 2002[14], two of the delineation samples also exceeded referenced guidelines for lindane, though it was concluded that since the lindane impacts were localized and slightly above applicable guidelines, no remediation of impacts was required.

During the 2009 monitoring event[15], three boreholes had samples exceeding applicable guidelines for various parameters. Ethylbenzene, polyaromatic hydrocarbons (PAHs), and various metal concentrations exceeding referenced guidelines were identified in borehole 09-6 east of the retention pond; PAHs were identified in borehole 09-10 northeast of landfill Cell 1, and a minor selenium exceedance was identified in borehole 09-11 west of the landfill Cell 3A. Borehole 09-6 was within a lined area and contained, and further delineation was not required. The selenium exceedance in borehole 09-11 was marginal and likely naturally occurring, requiring no delineation. The minor exceedances for PAHs in borehole 09-10 were recommended for further investigation during the next soil monitoring event to determine if impacts are present, as the PAH concentrations recorded did not correspond with hydrocarbon concentrations detected. Electrical conductivity (EC) values marginally exceeding background and published soils data were also encountered in samples to the west (09-11) and south (09-12 and 09-13) of the landfill cells. However, the majority of the soils encountered fall within the “unsuitable” category under the 2001 Salt Contamination Assessment and Remediation Guidelines[16] due to the naturally occurring salinity, including the samples exceeding for EC in these areas.

[10] Axys Environmental Consulting Ltd. 1995. An Assessment of Environmental and Socio-economic Impacts associated with an Amendment to the License to Operate for Laidlaw Environmental Services’ Hazardous Waste Facility Near Ryley, Alberta.

[11] Hardy BBT Limited. 1991. Pesticide Contaminant Site Investigation. Prepared for Laidlaw Environmental Services Ltd. December 1991.

[12] EBA Engineering Consultants Ltd. 1997. 1996 Soil Monitoring Program. Laidlaw Ryley. File: 0105-12380.

[13] EBA Engineering Consultants Ltd. 2002. 2001 Soil Monitoring Report, Safety-Kleen Ryley Facility. File: 0105-00-14423.001.

[14] EBA Engineering Consultants Ltd. March 2003. Summary of 2002 Follow-up Soil Sampling at Ryley, Alberta Facility. Clean Harbors Inc. File: 5100146.

[15] EBA Engineering Consultants Ltd. 2010. 2009 Soil Monitoring Report. Clean Harbors Class I Waste Management Facility, AEPEA Approval No. 10348-02-00, SE-09-050-17 W4M, Ryley, Alberta. File: E22101333.

[16] Alberta Environment. 2001. Salt Contamination Assessment and Remediation Guidelines. Pub. No.: T/606.

During the 2014 monitoring event[17], PAH and petroleum hydrocarbon (PHC) fraction F3 concentrations greater than the referenced guidelines were detected in surface soils of areas predominantly near landfill cells, and/or lined areas where waste processing equipment/vehicles were operating. These areas included: the gravelled area west of process building, west of the facilities area, north of the run-on diversion ditch (south of Cell 3C), old surface water detention pond/lugger area, north of Landfill Cell 3D, near the Landfill Cell 1 leachate holding tank and north of the waste container storage area. Similarly, metal concentrations greater than the referenced guidelines were detected adjacent to the old surface water detention pond/lugger area, west of the facilities area where waste processing equipment/vehicles were operating, and in the gravelled area west of the process building. The identified exceedances were restricted to the surface samples collected on site, and annual groundwater monitoring programs have failed to detect any impact on groundwater.

The detected concentrations of PAHs, PHCs, and most metals were considered likely to be associated with dust from landfill cells or waste tracking from vehicles that entered landfill cells, a likely effect of the landfill operation up to 2012. In 2012, Clean Harbors implemented improved dust management strategies, and eliminated vehicle contact with waste through the construction of a tipping pad, substantially reducing the potential for airborne and contact source introduction of PAHs. Selenium and hot water-soluble boron exceedances identified along the east and west sides of the facility were considered naturally occurring and no further investigation was recommended. The observed exceedances were only slightly above the referenced guideline values, the boron concentrations were comparable to typical background concentrations, and the selenium concentration was relatively unchanged from previous sampling events.

Exceedances of salinity (chloride) were considered comparable to typical background control concentrations, consistent with native undisturbed soils. Consequently, Tetra Tech recommended that no further investigation or delineation of salinity (chlorides) would be required.

In 2017, Tetra Tech prepared a SMaP Proposal for the Ryley Facility. The 2017 SMaP recommended the assessment and delineation of PAHs in the proposed Cell 4 construction area, remediation of salinity, metals, PHC, and PAH parameters during decommissioning of the old surface water detention pond followed by confirmatory sampling, delineation of metals and PAH parameters in the gravelled area west of the process building, delineation of salinity, metals, and PAH parameters west of the facilities area, and delineation of PAH parameters north of the surface water drainage ditch located along the south edge of Cell 3C. The proposed SMaP was approved by AEP in September 2017.

In November 2017, assessment and delineation of PAHs in the proposed Cell 4 construction area was completed[18], including one delineation sample (17-10A-A) located west of borehole 14-10A (northwest of the proposed Cell 4) where PAH guideline exceedances were identified in 2014. Four sample locations within the Cell 4 footprint area had PAH parameters exceeding the 2016 Alberta Tier 1 Guidelines. Delineation borehole 17-10A-A was below referenced guidelines for all PAH parameters analyzed.

In 2018, remediation and confirmatory sampling[19] was completed in the Cell 4 footprint construction area, including borehole 14-10 areas (PAHs), the old surface water detention pond (borehole 14-6, metals, hydrocarbons, and PAHs), the drainage ditch north of Cell 3D (borehole 14-8, PAHs) and west of the facilities area (borehole 14-4, salinity, metals, and PAHs). Confirmatory sample results indicated that all PAH parameters analyzed were below the 2016 Alberta Tier 1 Guidelines within the Cell 4 construction area

[17] Tetra Tech EBA Inc. 2015. 2014 Soil Monitoring Program, Clean Harbors Ryley Industrial Waste Management Facility, EPEA Approval 10348-02-00. File: E22203073.

[18] Tetra Tech Canada Inc. 2018. Soil Management Program, 2017 Cell 4 Soil Sampling, Clean Harbors Ryley Industrial Waste Management Facility, EPEA Approval 10348-02-00, SE-09-050-17 W4M. File: SWM.SWOP03758.

[19] Tetra Tech Canada Inc. 2019. Soil Management Program, 2018 Cell 4 Remediation Report, Clean Harbors Ryley Industrial Waste Management Facility, EPEA Approval 10348-03-00, SE-09-050-17 W4M. File: SWM.SWOP03798.

(final confirmatory sampling for PAH parameters was not completed in 2018 in one location north of Cell 4 due to safety concerns amid ongoing Cell 4 construction activities). All salinity, hydrocarbon, and PAH parameters analyzed were below the referenced guidelines within the decommissioned and remediated old surface water detention pond area. Arsenic, nickel, and selenium concentrations in the confirmatory samples analyzed were slightly above the referenced agricultural guidelines but were within the range of natural variability observed within Alberta for these metals and the observed concentrations were well below the referenced industrial guidelines. The material with metal exceedances was left in place and Cell 4 constructed. Confirmatory sample results indicated that all metals and PAH parameters analyzed from the remediation excavation west of the facilities area were below the referenced guidelines. Salinity analysis of the confirmatory samples indicated EC and chloride concentrations greater than the typical background concentrations for the Ryley Facility.

During the 2019 soil monitoring event[20], PAH and metals concentrations exceeding the 2019 Alberta Tier 1 Guidelines were detected in surface and subsoil samples from the access road sideslopes north of Cell 4 (boreholes 19-6 and 19-8) and additional assessment and remediation was recommended. pH and minor selenium exceedances in borehole 19-11 were considered naturally occurring. Metal concentrations exceeding referenced guidelines were detected in samples from the gravelled area west of the process buildings (boreholes 19-3 and 19-3A to 19-3D). The exceedances were restricted to the surface samples only and additional management activities were recommended. Chloride concentrations noted in boreholes 19-4, 19-4A to 19-4E, and 19-7 were greater than typical background concentrations and further monitoring and delineation of chlorides was recommended. The 2019 chloride concentrations were comparable to the 2014 and 2018 chloride concentrations and all EC and SAR concentrations in these boreholes were consistent with natural background control values and regional/published soil data. 2019 borehole locations and parameters exceeding referenced guidelines are shown on Figure 11.

In 2020, delineation sampling[21] was completed north of Cell 4 around boreholes 19-6 and 19-8, around the gravelled area west of the process building, and in the drainage ditch around Cell 4 and in the earthen ditch between the facilities area and Cells 3D and 3E. 2019 Alberta Tier 1 Guideline exceedances for one or more of cadmium, chromium, copper, lead, molybdenum, nickel, tin, vanadium, zinc, naphthalene, and phenanthrene were identified for approximately 180 m along the Cell 4 access road north side slope, from the edge of the access road to between 5 m and 10 m into the field north of the road. The estimated maximum depth of impact was 100 cm at borehole 19-6 and 30 cm at borehole 19-8. In all other areas, the depth of impact appeared restricted to the surface topsoil layer. Delineation samples collected around the gravelled area west of the process building were below referenced guidelines, indicating the 2019 metals exceedances were restricted to the surface 15 cm, with a small area of molybdenum exceedances to 30 cm. Delineation boreholes advanced within the drainage ditch around Cell 4 and in the earthen ditch between the facilities area and Cells 3D and 3E indicated EC and SAR values in all samples analysed were consistent with natural background values observed in the historical control samples analysed for the site. Chloride concentrations greater than typical background concentrations were identified in subsoil fill samples along the east and west sides of Cell 4 and in the topsoil samples analysed north of Cells 3D and 3E. Chloride concentrations along the north side of Cell 4 and in the subsoil samples analysed north of Cells 3D and 3E were less than typical background concentrations. 2020 borehole locations and parameters exceeding referenced guidelines are shown on Figure 12.

In 2021, remediation was completed north of Cell 4 around boreholes 19-6 and 19-8 and in the gravelled area west of the process building around borehole 19-3 [22].

[20] Tetra Tech Canada Inc. 2020. 2019 Soil Monitoring Program, Clean Harbors Industrial Waste Management Facility, AEPEA Approval No. 10348-03-00, SE-09-050-17 W4M. File: SWM.SWOP04076-02.

[21] Tetra Tech Canada Inc. 2021. 2020 Soil Management Program, Clean Harbors Industrial Waste Management Facility, AEPEA Approval No. 10348-03-00, SE-09-050-17 W4M. File: SWM.SWOP04348-01.

[22] Tetra Tech Canada Inc. 2022. Soil Management Program, 2021 Soil Remediation Report, Clean Harbors Ryley Industrial Waste Management Facility, EPEA Approval 10348-03-00, SE-09-050-17 W4M. File: SWM.SWOP04348-01.

Approximately 1,000 m^3 of material, including metals impacted material and material deemed unsuitable for base compaction, was excavated and landfilled from the gravelled area (borehole 19-3 area) west of the process building. Twenty (20) confirmatory samples were collected and analysed for metals. All parameters analysed were below the 2019 Alberta Tier 1 Guidelines and consistent with natural background conditions. The excavated area was backfilled with approximately 1,000 m^3 of clean fill from a borrow pit in the landfill expansion area in NE 9-50-17 W4M and recontoured to support appropriate site drainage patterns, then capped with approximately 180 m^3 of clean gravel to ensure trafficability of the remediated area.

During excavation of the graveled area, potentially impacted material was identified in the excavation wall between the southeast corner of the loading dock ramp and northwest corner of the process building. One characterization soil sample was collected and submitted for salinity, metals, PHC, PAH, and VOC analysis. All analysed parameters were below the 2019 Alberta Tier 1 Guidelines except for molybdenum.

Approximately 550m^3 of PAH and metals impacted material from north of Cell 4 around boreholes 19-6 and 19-8 was excavated and landfilled. A total of 26 confirmatory sample locations were sampled north of Cell 4. Laboratory analytical results were below the 2019 Alberta Tier 1 Guidelines in all but five samples. Confirmatory samples 21-6N, AR-CS4, AR-CS7, AR-CS14, and AR-CS16 exceeded referenced guidelines for naphthalene. Two of the locations (AR-CS4 and AR-CS14) also had phenanthrene guideline exceedances. At one location (AR-CS14), the Index of Additive Cancer Risk (IACR) was greater than the referenced guideline. 2021 confirmatory sample locations north of Cell 4 and parameters exceeding guidelines are shown on Figure 13. Due to a communication error with the laboratory, all confirmatory samples from north of Cell 4 were disposed before metals or particle size analysis could be completed.

2.3 Historical Background Control Boreholes

Historical control data for salinity, sulphur, CEC, TOC, organic matter, nitrates, metals, grain size, and texture parameters from previous soil monitoring events in 1996, 2001, 2009, 2014, and 2019 is provided in Table 6. Historical background control sample locations are shown on Figure 10.

Sample point 96-S1 was located southwest of Cells 1 and 2 and represented, at the time, an off-site control. Sample points 96-S3, 96-S4, and 09-1 were located approximately 300 to 400 m south of the facility and represent off-site controls. Sample points 96-S2 and 09-2 were located in the current locations of Cells 3C, 3D, and 3E, and represented on-site controls. Sample point 14-1 was located approximately 50 m north of the facility area as an off-site control, and sample point 14-2 was located south of the run-on diversion ditch near the south boundary fence as an on-site control. Sample point 19-1 was located approximately 40 m north of Cell 1 and sample point 19-2 was located approximately 300 m north of Cell 4 (30 m south of the abandoned rail bed in NE 09-050-17 W4M).

Several topsoil and upper subsoil background samples have had pH values below the reference guideline range of 6-8.5 but were comparable to the published soils data for the Camrose soil series (Table A) and are considered to be representative of natural background conditions for the area. All other background control sample concentrations were below referenced guideline values for all parameters analyzed, with the exception of lead.

One control sample from the 1996 soil monitoring program (96-S1 35-65 cm) had a reported lead concentration of 100 mg/kg, double the 2019 Alberta Tier 1 agricultural guideline value of 45 mg/kg and greater than the 2019 Alberta Tier 1 industrial guideline value of 89 mg/kg. Subsequent follow-up sampling in 2002 reported a lead concentration of 11 mg/kg in the same location.

Topsoil EC values ranged from 0.24 dS/m to 7.38 dS/m, indicating 'good' to 'poor' quality topsoil. Subsoil EC values ranged from 0.19 dS/m to 10.8 dS/m, indicating 'good' to 'unsuitable' subsoil quality. The historical background EC values observed are consistent with the published soils data for the Camrose soil series (Table A) and are considered to be representative of natural background conditions for the area.

Topsoil SAR results ranged from 1.1 to 14.7, indicating 'good' to 'unsuitable' quality topsoil. Subsoil SAR values ranged from 3.4 to 37.2, indicating 'good' to 'unsuitable' subsoil quality. The historical background SAR values observed are consistent with the published soils data for the Camrose soil series (Table A) and are considered to be representative of natural background conditions for the area.

The historical chloride concentrations observed in the off-site background control sample points ranged from <1 mg/kg (14-1 23-45 cm) to 61 mg/kg (14-1 60-100 cm). The on-site historical background locations had chloride concentrations ranging from 1 mg/kg (14-2 60-85 cm) to 276 mg/kg (09-2 0-15 cm).

Based on the historical background control sampling results, background chloride concentrations are typically less than 100 mg/kg (maximum off-site reported concentration 61 mg/kg). While background control chloride concentrations greater than 100 mg/kg have been reported, they are not typical and likely represent an anomaly.

3.0 METHODS

3.1 Soil Sampling Locations

Confirmatory sampling locations around boreholes 19-6 and 19-8 were based on the 2019 SMaP proposal approved by AEP and the sampling locations identified as having PAHs or metals exceedances by the 2020 SMaP and the 2021 Remediation Report. In 2022, soil samples were collected from 48 locations on an approximate 10 m spacing within the excavated area around boreholes 19-6 and 19-8 and along the Cell 4 access road north side slopes (Figure 11).

The general strategy used to select confirmatory sampling locations was based on the following information:

- Previous sample locations;
- Utility locations (above or underground);
- Accessibility; and
- The AEP 2016 Alberta Environmental Site Assessment Standard[23].

3.2 Safe Work Procedures

Standard oilfield personal-protective equipment (hard hat, steel-toed boots, safety glasses, and fire-retardant coveralls) and nitrile gloves were used when handling soil.

All personnel on-site had copies of safety certification (Ground Disturbance Level II, H_2S Alive, Transportation of Dangerous Goods, Workplace Hazardous Material Information System and Standard Level First Aid) and had signed off on the Clean Harbors safety policy.

[23] Alberta Environment and Parks (AEP). 2016. Alberta Environmental Site Assessment Standard.

Prior to performing the fieldwork, the Tetra Tech Work Hazard Assessment and Pre-Job Meetings were completed. Private utility locate were conducted by the Prime Contractor prior to ground disturbance activities.

3.3 Remediation Methods

Tetra Tech conducted a 2022 remediation kickoff meeting with Clean Harbor's selected contractor on May 19, 2022. The estimated extent of contamination was identified to the contractor and the planned remediation extent staked in the field.

Additional delineation samples were collected on May 19, 2022, and the final remediation extent was confirmed to the contractor after the confirmation sample results were received.

The Clean Harbors contractor excavated, and landfilled PAH and metals impacted material from along the north edge of the access road north of Cell 4 between May 30, 2022, and June 3, 2022. Material was excavated using a track hoe and hauled to the Clean Harbors landfill using rock trucks. Tetra Tech did not monitor the excavation of contaminated material.

Excavation depths varied between 0.20 m on the access road sideslope to a maximum 0.50 m in the areas immediately adjacent to the side slope. Excavation depths greater than 0.20 m were completed for final site grading and construction purposes.

3.4 Assessment Methods

Confirmatory samples were collected using a hand auger or a hand shovel to a maximum depth of 0.50 metres below ground surface (mbgs). At each sample location, the surface 5 cm of soil was removed, and the confirmatory sample was collected from the 5 cm to 20 cm interval perpendicular to the excavation surface in accordance with the Alberta Site Assessment Standard. All equipment was cleaned before it was taken on site. Each sample was shaved with a knife to remove smeared or remnant soil. Nitrile gloves were worn while handling soil and were changed between samples to prevent cross-contamination of samples.

Field collection and preservation of samples was completed as per the Canadian Council of Ministers of the Environment (CCME) 2016 Guidance Manual of Environmental Site Characterization, Volume 4[24] and/or the table of Exceptions and Clarifications to CCME Analytical Methods published by AEP[25]. At least 500 g of soil was collected into a plastic bag for inorganic analysis. For BTEX and PHC fraction F1 analysis, soil was collected in laboratory supplied containers and field preserved with methanol. For other organic analysis, soil was collected in 125 mL jars with Teflon™-lined lids. These samples were tightly packed to have minimum headspace. The samples for volatile and/or organic analysis will be kept on ice in a cooler during storage and transported to the laboratory for analysis.

[24] Canadian Council of Ministers of the Environment. 2016. Guidance Manual of Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment, Volume 4: Analytical Methods. ISBN: 978-1-77202-032-8 PDF.

[25] Alberta Environment and Parks. 2016. Adoption of CCME Analytical Methods Manual in Alberta, Table 1. Received via email, November 17, 2016.

3.5 Laboratory Methods

The analytical methods for each parameter followed the 2019 Alberta Tier 1 Soil and Groundwater Remediation Guidelines[26] (Alberta Tier 1 Guidelines) and/or the table of Exceptions and Clarifications to CCME Analytical Methods published by AEP.

3.6 Quality Assurance and Quality Control Protocols

The QA/QC protocols used to ensure the quality of field and laboratory data included but were not limited to the following:

- Soil sample containers were supplied by an accredited laboratory.
- All jars were packed tightly with soil to minimize air pockets and headspace losses.
- All jars and vials were kept in coolers with ice.
- All soil sampling equipment was cleaned between sample locations.
- Nitrile gloves were used during sampling and were changed between holes, or as required, between sample depths to avoid cross-contamination.
- Samples were collected directly from the shovel or hand auger and shaved with a knife to remove smeared or remnant soil.
- Samples submitted to the laboratory were accompanied by chain-of-custody (COC) forms and were analyzed within acceptable holding times.

3.7 Comparative Guidelines

Analytical data was evaluated and compared against background control data and the Alberta Tier 1 Guidelines, based on current and future end land use, as proposed in the SMaP.

Due to the Ryley facility's proximity to adjacent agricultural land, analytical results are compared to Alberta Tier 1 Guidelines for agricultural and industrial land uses, fine-textured soil for the analyzed parameters.

4.0 RESULTS

4.1 Remediation and Confirmatory Sampling

Laboratory analytical results are summarized on Tables 1 and 2. Laboratory analytical reports, including analytical methods and laboratory quality control results, are provided as Appendix C. The 2021 and 2022 confirmatory sampling locations are shown on Figures 13 and 14, respectively. Historical PAH and metals sampling results from the remediation area north of Cell 4 around boreholes 19-6 and 19-8 are summarized in Tables 3, 4, and 5. A completed Record of Site Condition form is included as Appendix D.

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

Confirmatory soil samples were collected from 20 sampling locations on April 18, 2022, along the access road sideslope north of Cell 4 for metals and/or PAH analysis. Laboratory analytical results indicated that select metals were greater than the Alberta Tier 1 Guidelines at sampling locations AR-CS3, AR-CS10, AR-CS14, and AR-CS18. Analytical results from the other 16 confirmatory sample locations were all less than the Alberta Tier 1 Guidelines.

Additional remediation delineation soil samples were collected from 9 sampling locations on May 19, 2022, to provide lateral and vertical delineation of previously identified PAH and metal exceedances. Laboratory analytical results indicated that selenium was greater than the 2019 Alberta Tier 1 Guideline at sampling location AR-CS10.N4 (approximately 4 m north of sampling location AR-CS10). Analytical results from the other eight sampling locations were all less than the Alberta Tier 1 Guidelines.

Approximately 530 m^3 of compacted gravel and clay material from around boreholes 19-6 and 19-8 and on the north side slope of the access road north of Cell 4 with PAH and metals concentrations exceeding the Alberta Tier 1 Guidelines was excavated between May 30, 2022 and June 3, 2022 and placed into the Ryley landfill.

The 2021 initial excavation depths were based on impact depths identified in the 2019 SMP boreholes 19-6 and 19-8 (Table 6), the 2020 SMaP delineation boreholes 20-8 and 20-8A to 20-8F (Table 4), and the 2020 SMaP delineation boreholes 20-6 and 20-6A to 20-6E (Table 3).

The 2022 excavation depths were based on impact depths identified in the remediation confirmatory samples collected November 1, 2021 (21-6N, AR-CS4, AR-CS14, and AR-CS16) and April 18, 2022 (AR-CS13, AR-CS10, AR-CS14, and AR-CS18), and the remediation delineation samples collected May 19, 2022 (AR-CS10.N4). At each identified exceedance location, a minimum 0.20 m of material between the edge of the access road and the northern extent of the 2022 excavation boundary shown on Figure 14 and for 10 m on either side of the exceedance location. In selected exceedance areas, up to 0.50 m of material was removed for final site grading and construction purposes.

Additional confirmatory soil samples were collected from 36 sampling locations on June 9 and 10, 2022, following excavation, including the access road sideslope north of Cell 4 and along the northern extent of the excavated area as shown on Figure 14.

Analytical results for all final confirmatory sampling locations were less than the Alberta Tier 1 Guidelines for all parameters analysed. A total of 47 final confirmatory sampling locations were sampled in 2022.

4.2 Landfill Disposal and Backfilling

Landfill disposal was managed directly by Clean Harbors. Excavated material was removed and placed into Cell 4 at the Clean Harbors Ryley landfill.

Approximately 530 m^3 of PAH and metals impacted material was excavated and landfilled from the north sideslope of the access road north of Cell 4 around boreholes 19-6 and 19-8 in 2022. Approximately 550 m^3 of PAH and metals impacted material was previously excavated and landfilled from the north sideslope of the access road north of Cell 4 in 2021.

The excavated area will be backfilled and regraded as part of ongoing construction activities associated with the approved expansion of the Facility. Fill material from the borrow area characterized during the 2021 remediation program will be used for backfilling and regrading.

5.0 CONCLUSIONS

In 2022, a total of 47 final confirmatory sample locations were sampled north of Cell 4 around boreholes 19-6 and 19-8. Analytical results for all final confirmatory sampling locations were less than the 2019 Alberta Tier 1 Guidelines.

A total of approximately 530 m^3 of PAH and metals impacted material from north of Cell 4 around boreholes 19-6 and 19-8 was excavated and landfilled at the Clean Harbors Ryley facility and will be backfilled and regraded as part of ongoing construction activities with material from the borrow area characterized during the 2021 remediation program.

6.0 RECOMMENDATIONS

Based on the remediation and confirmatory sampling results described above, no further assessment or remediation is recommended.

7.0 SOIL MANAGEMENT PLAN UPDATE

The proposed scope of work provided in the 2019 Soil Management Program Proposal, Deficiency Response Letter, and 2020 Soil Management Plan Update included the following components:

1. Delineation of metals and PAH exceedances around boreholes 20-6 and 20-8 in 2020 and remediation and confirmatory sampling of the area around 2020 delineation boreholes 20-6, 20-6B, 20-6C, 20-6E, 20-8, 20-8B, and 20-8F (Figure 10, dark pink shaded area) in 2021.

2. Delineation of metals around the graveled area adjacent to the process building and waste handling area in 2020 and remediation and confirmatory sampling of the graveled area (Figure 10, blue shaded area) in 2021.

3. Delineation of chlorides in the drainage ditch around Cell 4 and in the earthen ditch between the facilities area and Cells 3D and 3E, including in the building and waste handling area in 2020 and continued monitoring of chloride concentrations within the ditch around Cell 4 and earthen ditch between the facilities area and Cells 3D and 3E will continue as per the Approval in both soil and groundwater.

Based on the results of the 2020 SMaP delineation sampling, the 2021 remediation and confirmatory sampling results, the 2022 remediation and confirmatory sampling results, and the approved Clean Harbors Facility expansion plans including a new waste receiving pad, the following updated SMaP Proposal is provided to AEP for Approval.

1. All 2022 final confirmatory samples from the remediation area along the north sideslope of the access road north of Cell 4 (Figure 14 and Figure 12, pink shaded area) are below the Alberta Tier 1 Guidelines and natural background concentrations for all parameters analyzed, indicating that remediation is complete. The excavated area will be backfilled with clean fill from the borrow pit and regraded as part of ongoing construction activities. All SMaP activities are complete in this area. Continued future monitoring programs as per the Approval will include sampling and analysis for one or more parameters of concern, including salinity, metals, hydrocarbons (BTEX, PHCs F1-F4), and PAHs.

2. All 2021 remediation confirmatory samples from the graveled area (Figure 12, blue shaded area) were below the Alberta Tier 1 Guidelines and natural background concentrations, indicating that remediation was complete. The excavated area was backfilled with clean fill from the borrow pit and recontoured to support appropriate site drainage patterns. All SMaP activities are complete in this area. Continued future monitoring programs as per the Approval will include sampling and analysis for one or more parameters of concern, including salinity, metals, hydrocarbons (BTEX, PHCs F1-F4), PAHs, VOCs, PCBs, herbicides, and pesticides.

3. During excavation of the graveled area west of the process building, potentially impacted material was identified beneath the asphalt between the loading dock and process building. Laboratory analytical results indicated that molybdenum was greater than the Alberta Tier 1 Guideline values for both agricultural and industrial land uses. All other metals, salinity, PHC, PAH, and VOC parameters were either less than the Alberta Tier 1 Guidelines or less than the maximum background value parameters. Clean Harbors proposes continued future monitoring of the loading dock area as per the Approval, including sampling and analysis for one or more parameters of concern, including salinity, metals, hydrocarbons (BTEX, PHCs F1-F4), PAHs, VOCs, PCBs, herbicides, and pesticides, The next soil monitoring event, scheduled for 2024, will also include delineation of the molybdenum exceedance.

4. Remediation of soil materials with elevated chloride concentrations in the drainage ditches (Figure 12, yellow shaded areas) was not warranted. Continued monitoring of chloride concentrations within the ditch around Cell 4 and earthen ditch between the facilities area and Cells 3D and 3E will continue as per the Approval in both soil and groundwater. The soil EC and SAR values are consistent with natural background values observed in the historical background control samples analysed for the site, Clean Harbors no longer stores snow containing road salts in the ditches (providing functional source control), and chloride concentrations in the nearby groundwater monitoring wells screened in the surficial clay till materials are well below referenced guidelines and have remained stable since monitoring began. If future soil or groundwater monitoring programs indicate an increase in chloride concentrations or vertical and lateral expansion of the area with chloride concentrations greater than typical background concentrations, Clean Harbors will evaluate the data available and prepare an updated soil management plan for the drainage ditch. The next groundwater monitoring event is planned for May/June 2023 and the next soil monitoring event is scheduled for 2024.

8.0 CLOSURE

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

Respectfully Submitted,
Tetra Tech Canada Inc.

March 27, 2023

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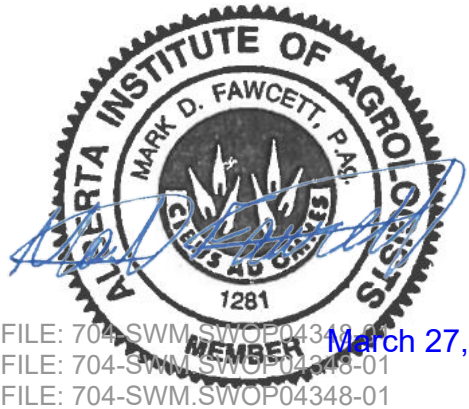
Prepared by:
Brent Finnestad, P.Ag.
Project Manager
Environment & Water Practice
Direct Line: 780.718.9317
Brent.Finnestad@tetratech.com



March 27, 2023

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Reviewed by:
Mark Fawcett, P.Ag.
Senior Soil Scientist
Environment & Water Practice
Direct Line: 780.818.6352
Mark.Fawcett@tetratech.com

/jmt/cee

TABLES

Table 1: 2021 and 2022 Soil Analytical Results - North of Cell 4 Around Boreholes 19-6 and 19-8 - South Sample Locations

Parameter	Unit	Tier 1 Fine Guideline[1]		Location[2]	21-6B	21-6E	21-6N	22-6N		21-6S		21-6S	21-6W	21-8	21-8	22-8	AR-CS1	AR-CS1	22AR-CS1	AR-CS2	AR-CS2		22AR-CS2
				Sample Depth (m)	0.05-0.20	0.30-0.60	0.05-0.20	0.05-0.20	0.30-0.50	0.30-0.60	1.0-1.5	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.30-0.50	0.05-0.20
				Sample Date	01-Nov-2021	01-Nov-2021	01-Nov-2021	09-Jun-2022	09-Jun-2022 [3]	01-Nov-2021	01-Nov-2021	18-Apr-2022	01-Nov-2021	01-Nov-2021	18-Apr-2022	09-Jun-2022	01-Nov-2021	18-Apr-2022	09-Jun-2022	01-Nov-2021	18-Apr-2022	18-Apr-2022	09-Jun-2022
				Laboratory Sample ID	L2658660-5	L2658660-4	L2658660-1	EO2204388-001	EO2204388-002	L2658660-7	L2658660-8	EO2202581-036	L2658660-10	L2658660-27	EO2202581-038	EO2204388-016	L2658660-12	EO2202581-001	EO2204388-024	L2658660-13	EO2202581-003	EO2202581-004	EO2204388-026
		Agricultural	Industrial				Material Removed																
Salinity																							
Moisture	%	-	-	23.2	20.9	27.6	24.6	-	10.9	19.7	-	20.5	7.96	-	11.6	15.4	-	19.3	8.96	-	-	-
Metals																							
Antimony	mg/kg	20	40	-	-	-	0.32	0.44	-	-	0.39	-	-	0.38	0.39	-	0.32	0.42	-	0.45	0.58	0.37
Arsenic	mg/kg	17	26	-	-	-	6.78	8.92	-	-	7.11	-	-	9.39	7.94	-	7.08	9.91	-	7.64	8.83	7.71
Barium	mg/kg	750	2000	-	-	-	185	382	-	-	159	-	-	213	198	-	194	326	-	195	191	192
Beryllium	mg/kg	5	8	-	-	-	0.79	0.78	-	-	0.5	-	-	0.66	0.64	-	0.54	0.75	-	0.56	0.58	0.64
Cadmium	mg/kg	1.4	22	-	-	-	0.371	0.188	-	-	0.254	-	-	0.252	0.233	-	0.236	0.254	-	0.413	0.187	0.193
Chromium	mg/kg	64	87	-	-	-	28.6	29.3	-	-	38.1	-	-	32.8	21.7	-	20.6	27.9	-	25.8	24.4	20.3
Cobalt	mg/kg	20	300	-	-	-	9.17	9.34	-	-	8.95	-	-	10	8.41	-	9.13	11	-	9.27	8.72	8.26
Copper	mg/kg	63	91	-	-	-	20.2	24.2	-	-	16.6	-	-	19.5	17.6	-	14.6	20.7	-	19.3	18	16.9
Lead	mg/kg	70	600	-	-	-	13.4	11.1	-	-	13	-	-	12.5	12.1	-	10.1	12	-	20.8	9.42	8.3
Molybdenum	mg/kg	4	40	-	-	-	0.29	1.23	-	-	3.75	-	-	1.37	1.37	-	1.53	0.74	-	4.73	0.9	0.83
Nickel	mg/kg	45	89	-	-	-	25.1	29.5	-	-	29.9	-	-	32	24.9	-	20.5	26.9	-	25.1	24.8	24.2
Selenium	mg/kg	1	2.9	-	-	-	0.41	0.42	-	-	0.44	-	-	0.32	0.36	-	0.7	0.6	-	0.71	0.33	0.29
Silver	mg/kg	20	40	-	-	-	0.13	0.13	-	-	<0.10	-	-	0.11	0.11	-	<0.10	0.14	-	0.12	0.1	<0.10
Thallium	mg/kg	1	1	-	-	-	0.256	0.22	-	-	0.151	-	-	0.186	0.162	-	0.174	0.205	-	0.164	0.186	0.178
Tin	mg/kg	5	300	-	-	-	<2.0	<2.0	-	-	<2.0	-	-	<2.0	<2.0	-	<2.0	<2.0	-	<2.0	<2.0	<2.0
Uranium	mg/kg	23	300	-	-	-	1.03	1.08	-	-	0.765	-	-	1.18	1.22	-	0.924	0.766	-	0.844	1.08	1.04
Vanadium	mg/kg	130	130	-	-	-	42.6	43.4	-	-	33.8	-	-	34.6	33.4	-	35.7	48.7	-	48.1	31.7	32.3
Zinc	mg/kg	250	410	-	-	-	80.2	73.9	-	-	84.2	-	-	89.6	86.2	-	74	49.7	-	145	58.6	58.7
Particle Size																							
>75 µm	%	-	-	-	-	-	-	-	-	-	-	-	-	-	38.4	-	-	-	-	-	-	-
Fines (<0.075mm)	%	-	-	-	-	-	-	-	-	-	-	-	-	-	61.5	-	-	-	-	-	-	-
Soil Texture																							
Texture	N/A	-	-	-	-	-	-	-	-	-	-	-	-	-	Coarse	-	-	-	-	-	-	-
Polycyclic Aromatic Hydrocarbons (PAHs)																							
IACR (CCME)	N/A	-	-	<0.15	<0.15	2.78	-	-	<0.15	<0.15	-	<0.15	<0.15	-	-	<0.15	-	-	0.39	-	-	-
Index of Additive Cancer Risk -Fine	N/A	1	1	<0.050	<0.050	0.228	-	-	<0.050	<0.050	-	<0.050	<0.050	-	-	<0.050	-	-	<0.050	-	-	-
Index of Additive Cancer Risk-Coarse	N/A	1	1	<0.050	<0.050	0.12	<0.10	-	<0.050	<0.050	-	<0.050	<0.050	-	<0.10	<0.050	-	<0.10	<0.050	-	-	-
B(a)P Total Potency Equivalent	mg/kg	5.3	8	<0.020	<0.020	0.233	<0.020	-	<0.020	<0.020	-	<0.020	<0.020	-	0.055	<0.020	-	<0.020	0.031	-	-	-
Benzo(b&j)fluoranthene	mg/kg	6.2	-	<0.010	<0.010	0.213	<0.010	-	<0.010	<0.010	-	<0.010	<0.010	-	0.05	<0.010	-	<0.010	0.031	-	-	-
Acenaphthene	mg/kg	0.33	0.33	<0.0050	<0.0050	0.0158	<0.0050	-	<0.0050	<0.0050	-	<0.0050	<0.0050	-	<0.0050	<0.0050	-	<0.0050	<0.0050	-	-	-
Acenaphthylene	mg/kg	-	-	<0.0050	<0.0050	0.0058	<0.0050	-	<0.0050	<0.0050	-	<0.0050	<0.0050	-	<0.0050	<0.0050	-	<0.0050	<0.0050	-	-	-
Acridine	mg/kg	-	-	<0.010	<0.010	<0.010	-	-	<0.010	<0.010	-	<0.010	<0.010	-	-	<0.010	-	-	<0.010	-	-	-
Anthracene	mg/kg	1.3	1.3	<0.0040	<0.0040	0.0221	<0.0040	-	<0.0040	<0.0040	-	<0.0040	<0.0040	-	<0.0040	<0.0040	-	<0.0040	<0.0040	-	-	-
Benz(a)anthracene	mg/kg	6.2	-	<0.010	<0.010	0.125	<0.010	-	<0.010	<0.010	-	<0.010	<0.010	-	0.026	<0.010	-	<0.010	0.012	-	-	-
Benzo(a) pyrene	mg/kg	0.6	72	<0.010	<0.010	0.146	<0.010	-	<0.010	<0.010	-	<0.010	<0.010	-	0.038	<0.010	-	<0.010	0.021	-	-	-
Benzo(b,j,k) fluoranthene	mg/kg	-	-	<0.015	<0.015	0.279	-	-	<0.015	<0.015	-	<0.015	<0.015	-	-	<0.015	-	-	0.042	-	-	-
Benzo(e)pyrene	mg/kg	-	-	<0.010	<0.010	0.115	-	-	<0.010	<0.010	-	<0.010	<0.010	-	-	<0.010	-	-	0.021	-	-	-
Benzo(g,h,i)perylene	mg/kg	-	-	<0.010	<0.010	0.129	<0.010	-	<0.010	<0.010	-	<0.010	<0.010	-	0.029	<0.010	-	<0.010	0.027	-	-	-
Benzo(k)fluoranthene	mg/kg	6.2	-	<0.010	<0.010	0.066	<0.010	-	<0.010	<0.010	-	<0.010	<0.010	-	0.018	<0.010	-	<0.010	0.011	-	-	-
Chrysene	mg/kg	6.2	-	<0.010	<0.010	0.138	<0.010	-	<0.010	<0.010	-	<0.010	<0.010	-	0.031	<0.010	-	<0.010	0.022	-	-	-
Dibenz(a,h)anthracene	mg/kg	-	-	<0.0050	<0.0050	0.0306	<0.0050	-	<0.0050	<0.0050	-	<0.0050	<0.0050	-	<0.0083	<0.0050	-	<0.0050	<0.0050	-	-	-
Fluoranthene	mg/kg	15.4	180	<0.010	<0.010	0.182	<0.010	-	<0.010	<0.010	-	<0.010	<0.010	-	0.036	<0.010	-	<0.010	0.028	-	-	-
Fluorene	mg/kg	0.4	0.4	<0.010	<0.010	0.011	<0.010	-	<0.010	<0.010	-	<0.010	<0.010	-	<0.010	<0.010	-	<0.010	<0.010	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg	-	-	<0.010	<0.010	0.129	<0.010	-	<0.010	<0.010	-	<0.010	<0.010	-	0.032	<0.010	-	<0.010	0.024	-	-	-
1-Methylnaphthalene	mg/kg	-	-	<0.010	<0.010	<0.010	-	-	<0.010	<0.010	-	<0.010	<0.010	-	-	<0.010	-	-	<0.010	-	-	-
2-Methylnaphthalene	mg/kg	-	-	<0.010	<0.010	0.011	-	-	<0.010	<0.010	-	<0.010	<0.010	-	-	<0.010	-	-	<0.010	-	-	-
Naphthalene	mg/kg	0.014	0.014	<0.010	<0.010	**0.025**	<0.010	-	<0.010	<0.010	-	<0.010	<0.010	-	<0.010	<0.010	-	<0.010	0.011	-	-	-
Perylene	mg/kg	-	-	<0.010	<0.010	0.046	-	-	<0.010	<0.010	-	<0.010	<0.010	-	-	<0.010	-	-	0.016	-	-	-
Phenanthrene	mg/kg	0.11	0.11	<0.010	<0.010	0.099	<0.010	-	<0.010	<0.010	-	0.015	<0.010	-	0.011	<0.010	-	<0.010	0.018	-	-	-
Pyrene	mg/kg	7.7	30,000	<0.010	<0.010	0.178	<0.010	-	<0.010	<0.010	-	<0.010	<0.010	-	0.039	<0.010	-	<0.010	0.032	-	-	-
Quinoline	mg/kg	-	-	<0.010	<0.010	<0.010	-	-	<0.010	<0.010	-	<0.010	<0.010	-	-	<0.010	-	-	<0.010	-	-	-

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. Referenced guidelines are for fine textured soils under Agricultural and Industrial land uses.

[2] AR-CS12 and AR-CS17 sample numbers were not used.

[3] The laboratory Certificate of Analysis sample date is shown as 06-Jun-2022. The correct sample date is 09-Jun-2022

"-" No applicable guideline

BOLD - Greater than Tier 1 Agricultural Guideline

BOLD - Greater than Tier 1 Industrial Guideline

N/A - Not applicable

Material Removed - Impacted material was excavated and landfilled. Additional material at other confirmatory sample locations may also have been removed, but not highlighted as there were no guideline exceedances.

TETRA TECH

Table 1: 2021 and 2022 Soil Analytical Results - North of Cell 4 Around

Parameter	Unit	Tier 1 Fine Guideline[1]		Location[2]	AR-CS3	AR-CS3	AR-CS3	22AR-CS3	AR-CS4	AR-CS4		22AR-CS4	AR-CS5	AR-CS5	22AR-CS5	AR-CS6	AR-CS6	22AR-CS6	AR-CS7	AR-CS7		22AR-CS7
				Sample Depth (m)	0.05-0.20	0.05-0.20	0.30-0.50	0.05-0.20	0.05-0.20	0.05-0.20	0.30-0.50	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.30-0.50	0.05-0.20
				Sample Date	01-Nov-2021	18-Apr-2022	18-Apr-2022	09-Jun-2022	01-Nov-2021	18-Apr-2022	18-Apr-2022	10-Jun-2022	01-Nov-2021	18-Apr-2022	10-Jun-2022	01-Nov-2021	18-Apr-2022	09-Jun-2022	01-Nov-2021	18-Apr-2022	18-Apr-2022	09-Jun-2022
				Laboratory Sample ID	L2658660-14	EO2202581-005	EO2202581-006	EO2204388-029	L2658660-15	EO2202581-007	EO2202581-001	EO2204388-032	L2658660-16	EO2202581-009	EO2204388-036	L2658660-17	EO2202581-011	EO2204388-040	L2658660-18	EO2202581-013	EO2202582-002	EO2204388-042
		Agricultural	Industrial			Material Removed			Material Removed										Material Removed			
Salinity																						
Moisture	%	-	-	9.97	-	-	9.16	10.5	-	18.9	17.1	11.5	-	23.2	11.8	-	13.9	10.4	-	10.8	7.28
Metals																						
Antimony	mg/kg	20	40	-	0.4	0.43	0.38	-	0.36	-	0.4	-	0.24	-	-	0.25	-	-	0.38	-	-
Arsenic	mg/kg	17	26	-	6.73	10.6	6.8	-	8.72	-	8.57	-	6.47	-	-	6.32	-	-	9.01	-	-
Barium	mg/kg	750	2000	-	222	157	148	-	232	-	136	-	233	-	-	153	-	-	172	-	-
Beryllium	mg/kg	5	8	-	0.51	0.62	0.53	-	0.63	-	0.66	-	0.54	-	-	0.55	-	-	0.62	-	-
Cadmium	mg/kg	1.4	22	-	0.372	0.16	0.184	-	0.237	-	0.191	-	0.316	-	-	0.186	-	-	0.234	-	-
Chromium	mg/kg	64	87	-	26	25	21.2	-	24.6	-	26	-	23.8	-	-	23.3	-	-	19	-	-
Cobalt	mg/kg	20	300	-	8.78	8.36	7.83	-	10.4	-	12.8	-	8.4	-	-	7.72	-	-	8.69	-	-
Copper	mg/kg	63	91	-	18.6	15.1	17.4	-	18	-	19.2	-	17.6	-	-	13.9	-	-	17	-	-
Lead	mg/kg	70	600	-	19.1	9.34	7.7	-	11.9	-	9.7	-	8.62	-	-	8.05	-	-	9.87	-	-
Molybdenum	mg/kg	4	40	-	**4.2**	1.1	0.94	-	2.18	-	0.83	-	1.04	-	-	1.31	-	-	3.88	-	-
Nickel	mg/kg	45	89	-	23.2	22.9	24.4	-	24.4	-	29.8	-	20.7	-	-	19.4	-	-	21.9	-	-
Selenium	mg/kg	1	2.9	-	0.64	0.45	0.3	-	0.79	-	<0.2	-	0.51	-	-	0.65	-	-	0.69	-	-
Silver	mg/kg	20	40	-	0.12	<0.10	<0.10	-	<0.10	-	0.11	-	<0.1	-	-	<0.1	-	-	<0.1	-	-
Thallium	mg/kg	1	1	-	0.152	0.154	0.171	-	0.182	-	0.21	-	0.154	-	-	0.145	-	-	0.163	-	-
Tin	mg/kg	5	300	-	<2.0	<2.0	<2.0	-	<2.0	-	<2.0	-	<2.0	-	-	<2.0	-	-	<2.0	-	-
Uranium	mg/kg	23	300	-	0.793	1.13	0.79	-	0.883	-	0.981	-	0.728	-	-	0.746	-	-	0.871	-	-
Vanadium	mg/kg	130	130	-	44.7	33.6	27.7	-	44.6	-	39.1	-	35.6	-	-	31.5	-	-	36.6	-	-
Zinc	mg/kg	250	410	-	133	60.3	51.4	-	82.4	-	62.6	-	83.9	-	-	58	-	-	71.6	-	-
Particle Size																						
>75 µm	%	-	-	-	-	-	-		-	34.6	-	-	-	-	-	-	-	-	-	35.7	-
Fines (<0.075mm)	%	-	-	-	-	-	-		-	65.4	-	-	-	-	-	-	-	-	-	64.3	-
Soil Texture																						
Texture	N/A	-	-	-	-	-	-		-	Fine	-	-	-	-	-	-	-	-	-	Fine	-
Polycyclic Aromatic Hydrocarbons (PAHs)																						
IACR (CCME)	N/A	-	-	0.34	-	-	-	5.54	-	-	-	0.28	-	-	<0.15	-	-	1.19	-	-	-
Index of Additive Cancer Risk -Fine	N/A	1	1	<0.050	-	-	-	0.445	-	-	-	<0.050	-	-	<0.050	-	-	0.098	-	-	-
Index of Additive Cancer Risk-Coarse	N/A	1	1	<0.050	-	-	<0.10	0.233	-	-	<0.1	<0.050	-	<0.1	<0.050	-	<0.1	0.051	-	-	<0.1
B(a)P Total Potency Equivalent	mg/kg	5.3	8	0.026	-	-	<0.020	0.431	-	<0.02	<0.02	0.026	-	<0.02	<0.020	-	<0.02	0.094	-	<0.02	<0.02
Benzo(b&j)fluoranthene	mg/kg	6.2	-	0.031	-	-	<0.010	0.435	-	-	<0.01	0.025	-	<0.01	<0.010	-	<0.01	0.096	-	-	<0.01
Acenaphthene	mg/kg	0.33	0.33	<0.0050	-	-	<0.0050	0.0401	-	<0.005	<0.005	<0.0050	-	<0.005	<0.0050	-	<0.005	0.0075	-	<0.005	<0.005
Acenaphthylene	mg/kg	-	-	<0.0050	-	-	<0.0050	0.0157	-	<0.005	<0.005	<0.0050	-	<0.005	<0.0050	-	<0.005	0.0066	-	<0.005	<0.005
Acridine	mg/kg	-	-	<0.010	-	-	-	0.013	-	-		<0.010	-		<0.010	-	-	<0.010	-	-	-
Anthracene	mg/kg	1.3	1.3	<0.0040	-	-	<0.0040	0.0497	-	<0.004	<0.004	<0.0040	-	<0.004	<0.0040	-	<0.004	0.0132	-	<0.004	<0.004
Benz(a)anthracene	mg/kg	6.2	-	0.013	-	-	<0.010	0.27	-	<0.01	<0.01	<0.010	-	<0.01	<0.010	-	<0.01	0.049	-	<0.01	<0.01
Benzo(a) pyrene	mg/kg	0.6	72	0.016	-	-	<0.010	0.27	-	<0.01	<0.01	0.018	-	<0.01	<0.010	-	<0.01	0.058	-	<0.01	<0.01
Benzo(b,j,k) fluoranthene	mg/kg	-	-	0.031	-	-	-	0.558	-	-	-	0.025	-	-	<0.015	-	-	0.124	-	-	-
Benzo(e)pyrene	mg/kg	-	-	0.021	-	-	-	0.258	-	-	-	0.018	-	-	<0.010	-	-	0.064	-	-	-
Benzo(g,h,i)perylene	mg/kg	-	-	0.026	-	-	<0.010	0.23	-	<0.01	<0.01	0.022	-	<0.01	<0.010	-	<0.01	0.069	-	<0.01	<0.01
Benzo(k)fluoranthene	mg/kg	6.2	-	<0.010	-	-	<0.010	0.124	-	<0.01	<0.01	<0.010	-	<0.01	<0.010	-	<0.01	0.028	-	<0.01	<0.01
Chrysene	mg/kg	6.2	-	0.018	-	-	<0.010	0.342	-	<0.01	<0.01	0.015	-	<0.01	<0.010	-	<0.01	0.061	-	<0.01	<0.01
Dibenz(a,h)anthracene	mg/kg	-	-	<0.0050	-	-	<0.0050	0.0519	-	<0.005	<0.005	<0.0050	-	<0.005	<0.0050	-	<0.005	0.0109	-	<0.005	<0.005
Fluoranthene	mg/kg	15.4	180	0.023	-	-	<0.010	0.468	-	<0.01	<0.01	0.025	-	<0.01	<0.010	-	<0.01	0.087	-	<0.01	<0.01
Fluorene	mg/kg	0.4	0.4	<0.010	-	-	<0.010	0.028	-	<0.01	<0.01	<0.010	-	<0.01	<0.010	-	<0.01	<0.010	-	<0.01	<0.01
Indeno(1,2,3-c,d)pyrene	mg/kg	-	-	0.020	-	-	<0.010	0.207	-	<0.01	<0.01	0.020	-	<0.01	<0.010	-	<0.01	0.061	-	<0.01	<0.01
1-Methylnaphthalene	mg/kg	-	-	<0.010	-	-	-	0.019	-	-	-	<0.010	-	-	<0.010	-	-	<0.010	-	-	-
2-Methylnaphthalene	mg/kg	-	-	<0.010	-	-	-	0.035	-	-	-	<0.010	-	-	<0.010	-	-	<0.010	-	-	-
Naphthalene	mg/kg	0.014	0.014	<0.010	-	-	<0.010	**0.064**	-	<0.01	<0.01	0.011	-	<0.01	<0.010	-	<0.01	**0.023**	-	<0.01	<0.01
Perylene	mg/kg	-	-	0.01	-	-	-	0.102	-	-	-	<0.010	-	-	<0.010	-	-	0.022	-	-	-
Phenanthrene	mg/kg	0.11	0.11	0.015	-	-	<0.010	**0.274**	-	<0.01	<0.01	0.017	-	<0.01	<0.010	-	<0.01	0.059	-	<0.01	<0.01
Pyrene	mg/kg	7.7	30,000	0.026	-	-	<0.010	0.49	-	<0.01	<0.01	0.030	-	<0.01	<0.010	-	<0.01	0.090	-	<0.01	<0.01
Quinoline	mg/kg	-	-	<0.010	-	-	-	<0.010	-	-	-	<0.010	-	-	<0.010	-	-	<0.010	-	-	-

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. Referenced guidelines are for fine textured soils under Agricultural and Industrial land uses.

[2] AR-CS12 and AR-CS17 sample numbers were not used.

[3] The laboratory Certificate of Analysis sample date is shown as 06-Jun-2022. The correct sample date is 09-Jun-2022

"-" No applicable guideline

BOLD - Greater than Tier 1 Agricultural Guideline

BOLD - Greater than Tier 1 Industrial Guideline

N/A - Not applicable

Material Removed - Impacted material was excavated and landfilled. Additional material at other confirmatory sample locations may also have been removed, but not highlighted as there were no guideline exceedances.

Table 1: 2021 and 2022 Soil Analytical Results - North of Cell 4 Around

Parameter	Unit	Tier 1 Fine Guideline[1]		Location[2]	AR-CS8	AR-CS8	22AR-CS8	AR-CS9	AR-CS9	22AR-CS9	AR-CS10	AR-CS10	AR-CS10	22AR-CS10	AR-CS11	AR-CS11	22AR-CS11	AR-CS13	AR-CS13	22AR-CS13	AR-CS14	AR-CS14	AR-CS14		22AR-CS14
				Sample Depth (m)	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.30-0.50	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.30-0.50	0.30-0.50	0.05-0.20
				Sample Date	01-Nov-2021	18-Apr-2022	09-Jun-2022	01-Nov-2021	18-Apr-2022	09-Jun-2022	01-Nov-2021	18-Apr-2022	18-Apr-2022	09-Jun-2022	01-Nov-2021	18-Apr-2022	09-Jun-2022	01-Nov-2021	18-Apr-2022	09-Jun-2022	01-Nov-2021	18-Apr-2022	18-Apr-2022	18-Apr-2022	09-Jun-2022
				Laboratory Sample ID	L2658660-19	EO2202581-015	EO2204388-045	L2658660-20	EO2202581-017	EO2204388-047	L2658660-21	EO2202581-019	EO2202581-020	EO2204388-050	L2658660-22	EO2202581-021	EO2204388-053	L2658660-23	EO2202581-023	EO2204388-004	L2658660-24	EO2202581-025	EO2202582-003	EO2202581-026	EO2204388-007
		Agricultural	Industrial									Material Removed									Material Removed	Material Removed			
Salinity																									
Moisture	%	-	-		12.1	-	14.1	9.81	-	-	17.4	-	-	-	12.2	-	-	8.42	-	15.9	10.6	-	23.3	-	11.7
Metals																									
Antimony	mg/kg	20	40		-	0.29	-	-	0.36	0.29	-	0.21	0.45	0.39	-	0.14	0.24	-	0.43	0.36	-	2.17	-	0.4	0.29
Arsenic	mg/kg	17	26		-	6.77	-	-	7.38	6.93	-	5.7	7.92	7.1	-	4.94	7.05	-	7.63	6.97	-	9.81	-	9.62	6.03
Barium	mg/kg	750	2000		-	168	-	-	159	173	-	174	182	165	-	112	144	-	204	174	-	265	-	242	131
Beryllium	mg/kg	5	8		-	0.58	-	-	0.51	0.6	-	0.44	0.69	0.54	-	0.33	0.58	-	0.55	0.54	-	0.47	-	0.67	0.47
Cadmium	mg/kg	1.4	22		-	0.2	-	-	0.199	0.187	-	0.155	0.215	0.201	-	0.196	0.107	-	0.271	0.197	-	**3.78**	-	0.344	0.156
Chromium	mg/kg	64	87		-	19.9	-	-	19.5	25.5	-	19.7	31.8	27.6	-	12.5	25.4	-	28.6	19.6	-	**88.1**	-	28.1	26.2
Cobalt	mg/kg	20	300		-	8.21	-	-	8.88	8.35	-	7.91	8.63	8.27	-	4.32	9.49	-	11.5	7.14	-	12.8	-	10.5	6.56
Copper	mg/kg	63	91		-	14.7	-	-	16.1	14.6	-	12.1	19.2	17.1	-	11.3	11.6	-	17.8	15.2	-	**85.7**	-	17.8	14.6
Lead	mg/kg	70	600		-	7.98	-	-	8.72	7.62	-	7.16	8.44	7.94	-	6.81	7.35	-	12.9	10.1	-	**217**	-	8.67	6.72
Molybdenum	mg/kg	4	40		-	2.18	-	-	1.04	0.66	-	1.03	0.71	0.74	-	0.82	0.48	-	3.32	3.26	-	**15.2**	-	0.68	0.48
Nickel	mg/kg	45	89		-	20.5	-	-	22.5	25.1	-	13.4	33.7	27.7	-	10.3	21.8	-	28.3	22.4	-	**99.4**	-	26.4	22
Selenium	mg/kg	1	2.9		-	0.69	-	-	0.3	0.74	-	**1.05**	0.75	0.27	-	0.45	0.71	-	0.44	0.45	-	0.95	-	0.65	0.27
Silver	mg/kg	20	40		-	<0.1	-	-	<0.1	<0.1	-	<0.1	0.13	<0.1	-	<0.10	<0.10	-	<0.10	<0.10	-	0.83	-	0.1	<0.10
Thallium	mg/kg	1	1		-	0.158	-	-	0.169	0.174	-	0.13	0.198	0.176	-	0.104	0.177	-	0.163	0.155	-	0.138	-	0.199	0.15
Tin	mg/kg	5	300		-	<2.0	-	-	<2.0	<2.0	-	<2.0	<2.0	<2.0	-	<2.0	<2.0	-	<2.0	<2.0	-	**5.6**	-	<2.0	<2.0
Uranium	mg/kg	23	300		-	0.792	-	-	0.909	1.46	-	1.13	0.874	0.939	-	0.628	1.18	-	0.876	0.824	-	0.795	-	0.789	0.931
Vanadium	mg/kg	130	130		-	34.2	-	-	31.5	34.1	-	29.8	35.6	31.6	-	25	31.6	-	34.6	32.4	-	**186**	-	46.7	33.2
Zinc	mg/kg	250	410		-	57.4	-	-	60.9	58.4	-	56.9	54.2	51.9	-	59.1	46.7	-	85.1	69	-	**1500**	-	57.5	43
Particle Size																									
>75 µm	%	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33.5	-	-
Fines (<0.075mm)	%	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	66.5	-	-
Soil Texture																									
Texture	N/A	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Fine	-	-
Polycyclic Aromatic Hydrocarbons (PAHs)																									
IACR (CCME)	N/A	-	-		<0.15	-	-	<0.15	-	-	0.16	-	-	-	<0.15	-	-	0.35	-	-	17.5	-	-	-	-
Index of Additive Cancer Risk -Fine	N/A	1	1		<0.050	-	-	<0.050	-	-	<0.050	-	-	-	<0.050	-	-	<0.050	-	-	**1.48**	-	-	-	-
Index of Additive Cancer Risk-Coarse	N/A	1	1		<0.050	-	<0.1	<0.050	-	-	<0.050	-	-	-	<0.050	-	-	<0.050	-	<0.1	0.778	-	-	-	<0.1
B(a)P Total Potency Equivalent	mg/kg	5.3	8		<0.020	-	<0.02	<0.020	-	-	<0.020	-	-	-	<0.020	-	-	0.030	-	<0.02	1.57	-	<0.02	-	<0.02
Benzo(b&j)fluoranthene	mg/kg	6.2	-		<0.010	-	<0.01	<0.010	-	-	0.012	-	-	-	<0.010	-	-	0.031	-	<0.01	1.26	-	-	-	<0.01
Acenaphthene	mg/kg	0.33	0.33		<0.0050	-	<0.005	<0.0050	-	-	<0.0050	-	-	-	<0.0050	-	-	<0.0050	-	<0.005	0.128	-	<0.005	-	<0.005
Acenaphthylene	mg/kg	-	-		<0.0050	-	<0.005	<0.0050	-	-	<0.0050	-	-	-	<0.0050	-	-	<0.0050	-	<0.005	<0.0050	-	<0.005	-	<0.005
Acridine	mg/kg	-	-		<0.010	-	-	<0.010	-	-	<0.010	-	-	-	<0.010	-	-	<0.010	-	-	0.025	-	-	-	-
Anthracene	mg/kg	1.3	1.3		<0.0040	-	<0.004	<0.0040	-	-	<0.0040	-	-	-	<0.0040	-	-	<0.0040	-	<0.004	0.137	-	<0.004	-	<0.004
Benz(a)anthracene	mg/kg	6.2	-		<0.010	-	<0.01	<0.010	-	-	<0.010	-	-	-	<0.010	-	-	0.014	-	<0.01	0.807	-	<0.01	-	<0.01
Benzo(a) pyrene	mg/kg	0.6	72		<0.010	-	<0.01	<0.010	-	-	<0.010	-	-	-	<0.010	-	-	0.020	-	<0.01	1.02	-	<0.01	-	<0.01
Benzo(b,j,k) fluoranthene	mg/kg	-	-		<0.015	-	-	<0.015	-	-	<0.015	-	-	-	<0.015	-	-	0.031	-	-	1.71	-	-	-	-
Benzo(e)pyrene	mg/kg	-	-		<0.010	-	-	<0.010	-	-	<0.010	-	-	-	<0.010	-	-	0.022	-	-	0.638	-	-	-	-
Benzo(g,h,i)perylene	mg/kg	-	-		0.011	-	<0.01	<0.010	-	-	<0.010	-	-	-	<0.010	-	-	0.027	-	<0.01	0.756	-	<0.01	-	<0.01
Benzo(k)fluoranthene	mg/kg	6.2	-		<0.010	-	<0.01	<0.010	-	-	<0.010	-	-	-	<0.010	-	-	<0.010	-	<0.01	0.452	-	<0.01	-	<0.01
Chrysene	mg/kg	6.2	-		<0.010	-	<0.01	<0.010	-	-	0.019	-	-	-	<0.010	-	-	0.022	-	<0.01	0.783	-	<0.01	-	<0.01
Dibenz(a,h)anthracene	mg/kg	-	-		<0.0050	-	<0.005	<0.0050	-	-	<0.0050	-	-	-	<0.0050	-	-	<0.0050	-	<0.005	0.197	-	<0.005	-	<0.005
Fluoranthene	mg/kg	15.4	180		<0.010	-	<0.01	<0.010	-	-	0.037	-	-	-	<0.010	-	-	0.028	-	<0.01	1.25	-	<0.01	-	<0.01
Fluorene	mg/kg	0.4	0.4		<0.010	-	<0.01	<0.010	-	-	<0.010	-	-	-	<0.010	-	-	<0.010	-	<0.01	0.079	-	<0.01	-	<0.01
Indeno(1,2,3-c,d)pyrene	mg/kg	-	-		<0.010	-	<0.01	<0.010	-	-	<0.010	-	-	-	<0.010	-	-	0.023	-	<0.01	0.823	-	<0.01	-	<0.01
1-Methylnaphthalene	mg/kg	-	-		<0.010	-	-	<0.010	-	-	<0.010	-	-	-	<0.010	-	-	<0.010	-	-	<0.010	-	-	-	-
2-Methylnaphthalene	mg/kg	-	-		<0.010	-	-	<0.010	-	-	<0.010	-	-	-	<0.010	-	-	<0.010	-	-	0.012	-	-	-	-
Naphthalene	mg/kg	0.014	0.014		<0.010	-	<0.01	<0.010	-	-	<0.010	-	-	-	<0.010	-	-	0.014	-	<0.01	**0.027**	-	<0.01	-	<0.01
Perylene	mg/kg	-	-		0.020	-	-	<0.010	-	-	<0.010	-	-	-	<0.010	-	-	0.036	-	-	0.299	-	-	-	-
Phenanthrene	mg/kg	0.11	0.11		<0.010	-	<0.01	<0.010	-	-	0.040	-	-	-	<0.010	-	-	0.018	-	<0.01	**0.681**	-	<0.01	-	<0.01
Pyrene	mg/kg	7.7	30,000		<0.010	-	<0.01	<0.010	-	-	<0.010	-	-	-	<0.010	-	-	0.033	-	<0.01	1.10	-	<0.01	-	<0.01
Quinoline	mg/kg	-	-		<0.010	-	-	<0.010	-	-	<0.010	-	-	-	<0.010	-	-	<0.010	-	-	<0.010	-	-	-	-

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. Referenced guidelines are for fine textured soils under Agricultural and Industrial land uses.

[2] AR-CS12 and AR-CS17 sample numbers were not used.

[3] The laboratory Certificate of Analysis sample date is shown as 06-Jun-2022. The correct sample date is 09-Jun-2022

"-" No applicable guideline

BOLD - Greater than Tier 1 Agricultural Guideline

BOLD - Greater than Tier 1 Industrial Guideline

N/A - Not applicable

Material Removed - Impacted material was excavated and landfilled. Additional material at other confirmatory sample locations may also have been removed, but not highlighted as there were no guideline exceedances.

TETRA TECH

Table 1: 2021 and 2022 Soil Analytical Results - North of Cell 4 Around

				Location[2]	AR-CS15	AR-CS15	22AR-CS15	AR-CS16	AR-CS16	22AR-CS16	AR-CS18	AR-CS18	AR-CS18	22AR-CS18	AR-CS20	AR-CS20
				Sample Depth (m)	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.30-0.50	0.05-0.20	0.05-0.20	0.05-0.20	0.30-0.50	0.05-0.20	0.05-0.20	0.30-0.50
				Sample Date	01-Nov-2021	18-Apr-2022	09-Jun-2022	01-Nov-2021	19-May-2022	09-Jun-2022	01-Nov-2021	18-Apr-2022	18-Apr-2022	09-Jun-2022 [3]	01-Nov-2021	19-May-2022
				Laboratory Sample ID	L2658660-25	EO2202581-027	EO2204388-010	L2658660-26	EO2203595-012	EO2204388-013	L2658660-28	EO2202581-029	EO2202581-030	EO2204388-020	L2658660-30	EO2203595-014
Parameter	**Unit**	**Tier 1 Fine Guideline[1]**						Material Removed				Material Removed				
		Agricultural	**Industrial**													
Salinity																
Moisture	%	-	-	9.78	-	13.3	20.5	22.6	19.7	9.2	-	-	-	15.0	-	
Metals																
Antimony	mg/kg	20	40	-	0.38	0.37	-	0.41	-	-	1.79	0.13	0.29	-	0.18	
Arsenic	mg/kg	17	26	-	7.27	7.52	-	6.17	-	-	8.41	3.24	9.63	-	10.8	
Barium	mg/kg	750	2000	-	228	162	-	222	-	-	249	132	131	-	140	
Beryllium	mg/kg	5	8	-	0.58	0.53	-	0.93	-	-	0.4	0.29	0.63	-	0.56	
Cadmium	mg/kg	1.4	22	-	0.349	0.197	-	0.369	-	-	**2.18**	0.126	0.136	-	0.304	
Chromium	mg/kg	64	87	-	24	24.4	-	31.6	-	-	58.6	13.4	22.3	-	24.5	
Cobalt	mg/kg	20	300	-	9.19	8.38	-	10.8	-	-	13.3	3.21	9.8	-	6.09	
Copper	mg/kg	63	91	-	17.2	16.8	-	26	-	-	**70.3**	5.56	14.7	-	13.8	
Lead	mg/kg	70	600	-	15.7	8.85	-	17	-	-	**139**	4.16	8.57	-	8.39	
Molybdenum	mg/kg	4	40	-	3.07	1.72	-	0.18	-	-	**13.5**	0.39	0.32	-	0.18	
Nickel	mg/kg	45	89	-	24.3	24.5	-	27	-	-	**52.5**	7.27	20.3	-	16.5	
Selenium	mg/kg	1	2.9	-	0.64	0.25	-	0.25	-	-	0.63	0.37	0.21	-	0.2	
Silver	mg/kg	20	40	-	<0.10	<0.10	-	0.17	-	-	0.58	<0.10	<0.10	-	0.1	
Thallium	mg/kg	1	1	-	0.154	0.172	-	0.258	-	-	0.136	0.09	0.186	-	0.188	
Tin	mg/kg	5	300	-	<2.0	<2.0	-	<2.0	-	-	4.2	<2.0	<2.0	-	<2.0	
Uranium	mg/kg	23	300	-	0.767	0.834	-	1.1	-	-	0.752	0.809	0.752	-	0.975	
Vanadium	mg/kg	130	130	-	43	33.4	-	53.5	-	-	55.1	17.4	41.8	-	41	
Zinc	mg/kg	250	410	-	114	61.6	-	79.6	-	-	**865**	37.3	54.9	-	58.6	
Particle Size																
>75 µm	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Fines (<0.075mm)	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Soil Texture																
Texture	N/A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Polycyclic Aromatic Hydrocarbons (PAHs)																
IACR (CCME)	N/A	-	-	0.43	-	-	2.08	-	-	0.49	-	-	-	<0.15	-	
Index of Additive Cancer Risk -Fine	N/A	1	1	<0.050	-	-	0.173	-	-	<0.050	-	-	-	<0.050	-	
Index of Additive Cancer Risk-Coarse	N/A	1	1	<0.050	-	<0.1	0.091	-	<0.1	<0.050	-	-	-	<0.050	-	
B(a)P Total Potency Equivalent	mg/kg	5.3	8	0.035	-	<0.02	0.163	<0.02	<0.02	0.034	-	-	-	<0.020	-	
Benzo(b&j)fluoranthene	mg/kg	6.2	-	0.034	-	<0.01	0.162	-	<0.01	0.041	-	-	-	<0.010	-	
Acenaphthene	mg/kg	0.33	0.33	<0.0050	-	<0.005	0.0111	<0.005	<0.005	<0.0050	-	-	-	<0.0050	-	
Acenaphthylene	mg/kg	-	-	<0.0050	-	<0.005	0.0054	<0.005	<0.005	<0.0050	-	-	-	<0.0050	-	
Acridine	mg/kg	-	-	<0.010	-	-	<0.010	-	-	<0.010	-	-	-	<0.010	-	
Anthracene	mg/kg	1.3	1.3	<0.0040	-	<0.004	0.0186	<0.004	<0.004	0.0044	-	-	-	<0.0040	-	
Benz(a)anthracene	mg/kg	6.2	-	0.014	-	<0.01	0.095	<0.01	<0.01	0.017	-	-	-	<0.010	-	
Benzo(a) pyrene	mg/kg	0.6	72	0.023	-	<0.01	0.10	<0.01	<0.01	0.022	-	-	-	<0.010	-	
Benzo(b,j,k) fluoranthene	mg/kg	-	-	0.046	-	-	0.213	-	-	0.055	-	-	-	<0.015	-	
Benzo(e)pyrene	mg/kg	-	-	0.021	-	-	0.093	-	-	0.022	-	-	-	<0.010	-	
Benzo(g,h,i)perylene	mg/kg	-	-	0.027	-	<0.01	0.096	<0.01	<0.01	0.023	-	-	-	<0.010	-	
Benzo(k)fluoranthene	mg/kg	6.2	-	0.012	-	<0.01	0.051	<0.01	<0.01	0.014	-	-	-	<0.010	-	
Chrysene	mg/kg	6.2	-	0.019	-	<0.01	0.112	<0.01	<0.01	0.021	-	-	-	<0.010	-	
Dibenz(a,h)anthracene	mg/kg	-	-	<0.0050	-	<0.005	0.0209	<0.005	<0.005	<0.0050	-	-	-	<0.0050	-	
Fluoranthene	mg/kg	15.4	180	0.021	-	<0.01	0.148	<0.01	<0.01	0.037	-	-	-	<0.010	-	
Fluorene	mg/kg	0.4	0.4	<0.010	-	<0.01	<0.010	<0.01	<0.01	<0.010	-	-	-	<0.010	-	
Indeno(1,2,3-c,d)pyrene	mg/kg	-	-	0.026	-	<0.01	0.094	<0.01	<0.01	0.023	-	-	-	<0.010	-	
1-Methylnaphthalene	mg/kg	-	-	<0.010	-	-	<0.010	-	-	<0.010	-	-	-	<0.010	-	
2-Methylnaphthalene	mg/kg	-	-	<0.010	-	-	0.012	-	-	<0.010	-	-	-	<0.010	-	
Naphthalene	mg/kg	0.014	0.014	<0.010	-	<0.01	**0.021**	<0.01	<0.01	<0.010	-	-	-	<0.010	-	
Perylene	mg/kg	-	-	0.011	-	-	0.034	-	-	<0.010	-	-	-	<0.010	-	
Phenanthrene	mg/kg	0.11	0.11	0.010	-	<0.01	0.091	<0.01	<0.01	0.019	-	-	-	<0.010	-	
Pyrene	mg/kg	7.7	30,000	0.021	-	<0.01	0.014	<0.01	<0.01	0.034	-	-	-	<0.010	-	
Quinoline	mg/kg	-	-	<0.010	-	-	<0.010	-	-	<0.010	-	-	-	<0.010	-	

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. Referenced guidelines are for fine textured soils under Agricultural and Industrial land uses.

[2] AR-CS12 and AR-CS17 sample numbers were not used.

[3] The laboratory Certificate of Analysis sample date is shown as 06-Jun-2022. The correct sample date is 09-Jun-2022

"-" No applicable guideline

BOLD - Greater than Tier 1 Agricultural Guideline

BOLD - Greater than Tier 1 Industrial Guideline

N/A - Not applicable

Material Removed - Impacted material was excavated and landfilled. Additional material at other confirmatory sample locations may also have been removed, but not highlighted as there were no guideline exceedances.

Table 2: 2021 and 2022 Soil Analytical Results - North of Cell 4 Around Boreholes 19-6 and 19-8 - North Sample Locations

			Location[2]	22-6N.N6	21-6N.N7		22-8.N9	22AR-CS1.N7	AR-CS2.N5	22AR-CS2.N7	AR-CS3.N5	22AR-CS3.N7	AR-CS4.N7		22AR-CS4.N6	22AR-CS5.N9	22AR-CS6.N7	AR-CS7.N8		22AR-CS7.N7	22AR-CS8.N7
			Sample Depth (m)	0.05-0.20	0.00-0.15	0.18-0.30	0.05-0.20	0.05-0.20	0.00-0.15	0.05-0.20	0.00-0.15	0.05-0.20	0.00-0.15	0.15-0.30	0.05-0.20	0.05-0.20	0.05-0.20	0.00-0.15	0.15-0.30	0.30-0.50	0.05-0.20
			Sample Date	09-Jun-2022	19-May-2022	19-May-2022	09-Jun-2022	09-Jun-2022	19-May-2022	10-Jun-2022	19-May-2022	10-Jun-2022	19-May-2022	19-May-2022	10-Jun-2022	10-Jun-2022	10-Jun-2022	19-May-2022	19-May-2022	10-Jun-2022	10-Jun-2022
			Laboratory Sample ID	EO2204388-003	EO2203595-001	EO2203595-002	EO2204388-018	EO2204388-025	EO2203595-003	EO2204388-027	EO2203595-004	EO2204388-030	EO2203595-005	EO2203595-006	EO2204388-034	EO2204388-038	EO2204388-041	EO2203595-007	EO2203595-008	EO2204388-044	EO2204388-046
Parameter	**Unit**	**Tier 1 Fine Guideline[1]**																			
		Agricultural	**Industrial**																		
Salinity																					
Moisture	%	-	-	14.5	23.6	21.6	14.8	15.5	-	15.2	-	15.6	22.5	20.2	14.3	22.6	18.5	27.9	22.5	17.6	20.2
Metals		-	-																		
Antimony	mg/kg	20	40	0.31	0.14	0.38	0.47	0.25	0.21	0.36	0.12	0.32	0.18	0.27	0.28	0.37	0.3	0.26	0.36	0.37	0.24
Arsenic	mg/kg	17	26	7.32	2.36	7.91	10.9	5.66	4.73	7.31	1.75	6.21	4.15	6.26	5.76	8.33	7.42	6.12	10.7	8.43	7.47
Barium	mg/kg	750	2000	194	116	240	147	182	185	269	86.3	156	138	160	125	278	154	242	325	234	225
Beryllium	mg/kg	5	8	0.41	0.42	0.75	0.69	0.52	0.65	0.53	0.35	0.46	0.54	0.66	0.45	0.6	0.66	0.71	0.69	0.7	0.61
Cadmium	mg/kg	1.4	22	0.126	0.163	0.531	0.083	0.208	0.214	0.205	0.162	0.162	0.171	0.245	0.147	0.185	0.22	0.319	0.289	0.275	0.284
Chromium	mg/kg	64	87	21.7	15.2	29.7	26.7	24	23.7	22.9	13.6	18.1	20.4	28.8	19.6	26.7	22.4	25.2	29.8	25.4	25.4
Cobalt	mg/kg	20	300	7.59	3.42	11	9.78	6.56	3.98	9.42	2.16	7.78	3.31	6.29	6.34	11.7	8.28	6.04	11.5	14.6	8.57
Copper	mg/kg	63	91	14.1	5.98	21.8	18.5	15.6	8.05	17.3	4.36	13.8	5.74	14	13.1	19.5	14.4	11.8	18.9	24.5	14.7
Lead	mg/kg	70	600	7.39	3.74	15.2	9.82	9.15	5.82	8.49	2.99	6.79	4.28	8.42	6.67	9.51	9.75	7.07	10.4	10.6	13.5
Molybdenum	mg/kg	4	40	0.92	0.32	0.36	0.74	0.53	0.33	0.68	0.36	0.69	0.4	0.52	0.69	0.95	0.55	0.57	0.51	0.64	1.1
Nickel	mg/kg	45	89	22.2	9.56	30.7	23.5	22.4	11.2	27	6.2	24.8	8.77	18.2	19.3	34	22	15.8	26.9	34.3	24.1
Selenium	mg/kg	1	2.9	0.22	0.39	0.36	0.27	0.34	0.82	<0.20	0.37	<0.20	0.38	0.65	<0.20	<0.20	0.64	0.92	<0.20	0.74	0.63
Silver	mg/kg	20	40	<0.10	<0.10	0.14	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.1	<0.10	0.12	0.1	<0.10	0.14	0.14	0.12
Thallium	mg/kg	1	1	0.166	0.13	0.229	0.211	0.159	0.182	0.168	0.121	0.153	0.159	0.201	0.142	0.213	0.214	0.165	0.186	0.222	0.172
Tin	mg/kg	5	300	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Uranium	mg/kg	23	300	0.687	2.32	1.26	0.935	0.754	1.75	1.45	0.839	1.24	0.864	1.37	1.1	1.42	1.13	1.27	0.638	0.695	1.32
Vanadium	mg/kg	130	130	31.9	18.6	47.6	43.7	30.3	33.7	32.6	16.3	27.8	26.6	38.7	27.1	36.8	39.5	34.2	49.5	41.9	41.8
Zinc	mg/kg	250	410	46.8	31.2	64.3	59.4	52.7	47.8	56.5	32.5	44.9	37.8	51.3	45	64.1	58.5	59	58.5	66.7	91.1
Particle Size		-	-																		
>75 µm	%	-	-	35.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fines (<0.075mm)	%	-	-	64.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Soil Texture		-	-																		
Texture	N/A	-	-	Fine	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polycyclic Aromatic Hydrocarbons (PAHs)																					
IACR (CCME)	N/A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Index of Additive Cancer Risk -Fine	N/A	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Index of Additive Cancer Risk-Coarse	N/A	1	1	<0.10	<0.10	<0.10	<0.10	<0.10	-	<0.10	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
B(a)P Total Potency Equivalent	mg/kg	5.3	8	<0.020	<0.020	<0.020	<0.020	<0.020	-	<0.020	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Benzo(b&j)fluoranthene	mg/kg	6.2	-	<0.010	-	-	<0.010	<0.010	-	<0.010	-	<0.010	-	-	<0.010	<0.010	<0.010	-	-	<0.010	<0.010
Acenaphthene	mg/kg	0.33	0.33	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	-	<0.0050	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Acenaphthylene	mg/kg	-	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	-	<0.0050	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Acridine	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthracene	mg/kg	1.3	1.3	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	-	<0.0040	-	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Benz(a)anthracene	mg/kg	6.2	-	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(a) pyrene	mg/kg	0.6	72	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(b,j,k) fluoranthene	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(e)pyrene	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(k)fluoranthene	mg/kg	6.2	-	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chrysene	mg/kg	6.2	-	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Dibenz(a,h)anthracene	mg/kg	-	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	-	<0.0050	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Fluoranthene	mg/kg	15.4	180	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Fluorene	mg/kg	0.4	0.4	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Indeno(1,2,3-c,d)pyrene	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1-Methylnaphthalene	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	mg/kg	0.014	0.014	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Perylene	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phenanthrene	mg/kg	0.11	0.11	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Pyrene	mg/kg	7.7	30,000	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Quinoline	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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. Referenced guidelines are for fine textured soils under Agricultural and Industrial land uses

[2] AR-CS12 and AR-CS17 sample numbers were not used.

"-" No applicable guideline

BOLD - Greater than Tier 1 Agricultural Guideline

BOLD - Greater than Tier 1 Industrial Guideline

N/A - Not applicable

Material Removed - Impacted material was excavated and landfilled.

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Table 2: 2021 and 2022 Soil Analytical Results - North of Cell 4 Around Boreho

	Location[2]			22AR-CS9.N7		AR-CS10.N4	22AR-CS10.N7		22AR-CS11.N7		22AR-CS13.N6	AR-CS14.N5		22AR-CS14.N10	22AR-CS15.N9	22AR-CS16.N6	22AR-CS18.N8	AR-CS19	AR-CS19	AR-CS21	AR-CS21	AR-CS22	AR-CS22
	Sample Depth (m)			0.05-0.20	0.30-0.50	0.05-0.20	0.05-0.20	0.30-0.50	0.05-0.15	0.35-0.50	0.05-0.20	0.00-0.15	0.15-0.30	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20	0.05-0.20
	Sample Date			10-Jun-2022	10-Jun-2022	19-May-2022	10-Jun-2022	10-Jun-2022	10-Jun-2022	10-Jun-2022	09-Jun-2022	19-May-2022	19-May-2022	09-Jun-2022	09-Jun-2022	09-Jun-2022	09-Jun-2022	01-Nov-2021	18-Apr-2022	01-Nov-2021	18-Apr-2022	01-Nov-2021	18-Apr-2022
	Laboratory Sample ID			EO2204388-048	EO2204388-049	EO2203595-009	EO2204388-051	EO2204388-052	EO2204388-054	EO2204388-056	EO2204388-006	EO2203595-010	EO2203595-011	EO2204388-009	EO2204388-012	EO2204388-015	EO2204388-022	L2658660-29	EO2202581-031	L2658660-31	EO2202581-033	L2658660-32	EO2202581-035
Parameter	**Unit**	**Tier 1 Fine Guideline[1]**																					
		Agricultural	**Industrial**			Material Removed																	
Salinity																							
Moisture	%	-	-	21.7	-	-	10.8	-	7.39	-	18.2	20.6	17.6	13	15.9	16.5	15	8.8	-	16.1	-	13.5	-
Metals		-	-																				
Antimony	mg/kg	20	40	-	0.35	0.3	-	0.35	-	0.38	0.39	0.28	0.41	0.39	0.47	0.43	0.45	-	0.38	-	0.22	-	0.34
Arsenic	mg/kg	17	26	-	7.54	7.49	-	7.28	-	6.55	9.65	7.23	8.7	7.66	9.15	10.8	9.2	-	6.74	-	6.06	-	6.25
Barium	mg/kg	750	2000	-	201	146	-	135	-	169	154	152	128	250	150	149	186	-	182	-	144	-	167
Beryllium	mg/kg	5	8	-	0.62	0.63	-	0.58	-	0.53	0.57	0.6	0.52	0.52	0.62	0.7	0.64	-	0.49	-	0.42	-	0.48
Cadmium	mg/kg	1.4	22	-	0.236	0.164	-	0.156	-	0.212	0.268	0.253	0.29	0.271	0.141	0.15	0.26	-	0.368	-	0.242	-	0.351
Chromium	mg/kg	64	87	-	24.6	23.3	-	20.2	-	18.6	25.5	21.2	23.4	26.4	29.1	27	26.5	-	25.6	-	16	-	24.5
Cobalt	mg/kg	20	300	-	8.79	8.36	-	8	-	8.04	10.7	8.76	9.03	8.26	15	10.6	9.43	-	8.17	-	5.51	-	7.51
Copper	mg/kg	63	91	-	14.8	13.5	-	15.6	-	15.5	23.2	16.2	17	17.5	19.1	19.8	15.6	-	19.3	-	13.7	-	17.6
Lead	mg/kg	70	600	-	8.32	7.87	-	7.57	-	7.26	11.1	8.25	7.42	7.55	8.75	11	8.14	-	15.8	-	5.35	-	15
Molybdenum	mg/kg	4	40	-	0.68	0.7	-	0.49	-	0.57	0.61	0.41	0.52	0.84	0.72	0.73	0.83	-	1.84	-	0.51	-	1.94
Nickel	mg/kg	45	89	-	25.7	19.3	-	30.3	-	23.5	30.5	23.8	26.6	24.8	38	26.3	26.1	-	28.6	-	15.8	-	25.7
Selenium	mg/kg	1	2.9	-	0.51	**1.11**	**-**	0.57	-	0.4	0.21	0.32	0.22	0.36	0.36	<0.20	0.43	-	0.47	-	0.42	-	0.52
Silver	mg/kg	20	40	-	<0.10	<0.10	-	0.11	-	<0.10	0.14	0.11	0.1	<0.10	<0.10	0.12	0.11	-	0.11	-	<0.10	-	0.11
Thallium	mg/kg	1	1	-	0.175	0.192	-	0.202	-	0.166	0.172	0.172	0.18	0.183	0.219	0.224	0.218	-	0.15	-	0.128	-	0.136
Tin	mg/kg	5	300	-	<2.0	<2.0	-	<2.0	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	<2.0	-	<2.0	-	<2.0
Uranium	mg/kg	23	300	-	1.6	1.65	-	0.83	-	0.983	0.73	0.585	1.06	1.68	1.13	0.863	1.69	-	1.35	-	1.48	-	1.33
Vanadium	mg/kg	130	130	-	36.1	41.2	-	32.1	-	30.3	39.8	38.3	39.3	40.2	43.6	45.2	43.5	-	42	-	31.3	-	39.2
Zinc	mg/kg	250	410	-	55.9	61.1	-	49.3	-	49.6	51.6	64.9	50.8	51.3	54.5	69	60	-	126	-	54.3	-	117
Particle Size		-	-																				
>75 µm	%	-	-	-	-	-	44.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fines (<0.075mm)	%	-	-	-	-	-	55.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Soil Texture		-	-																				
Texture	N/A	-	-	-	-	-	Fine	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polycyclic Aromatic Hydrocarbons (PAHs)																							
IACR (CCME)	N/A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.16	-	<0.15	-	<0.15	-
Index of Additive Cancer Risk -Fine	N/A	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.050	-	<0.050	-	<0.050	-
Index of Additive Cancer Risk-Coarse	N/A	1	1	<0.10	-	-	<0.10	-	<0.10	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.050	-	<0.050	-	<0.050	-
B(a)P Total Potency Equivalent	mg/kg	5.3	8	<0.020	-	-	<0.020	-	<0.020	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	-	<0.020	-	<0.020	-
Benzo(b&j)fluoranthene	mg/kg	6.2	-	<0.010	-	-	0.016	-	<0.010	-	<0.010	-	-	<0.010	<0.010	<0.010	<0.010	0.013	-	<0.010	-	<0.010	-
Acenaphthene	mg/kg	0.33	0.33	<0.0050	-	-	<0.0050	-	<0.0050	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	-	<0.0050	-	<0.0050	-
Acenaphthylene	mg/kg	-	-	<0.0050	-	-	<0.0050	-	<0.0050	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	-	<0.0050	-	<0.0050	-
Acridine	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.010	-	<0.010	-	<0.010	-
Anthracene	mg/kg	1.3	1.3	<0.0040	-	-	<0.0040	-	<0.0040	-	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	-	<0.0040	-	<0.0040	-
Benz(a)anthracene	mg/kg	6.2	-	<0.010	-	-	<0.010	-	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.010	-	<0.010	-
Benzo(a) pyrene	mg/kg	0.6	72	<0.010	-	-	<0.010	-	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.010	-	<0.010	-
Benzo(b,j,k) fluoranthene	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.015	-	<0.015	-	<0.015	-
Benzo(e)pyrene	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.010	-	<0.010	-	<0.010	-
Benzo(g,h,i)perylene	mg/kg	-	-	<0.010	-	-	<0.010	-	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.016	-	<0.010	-	<0.010	-
Benzo(k)fluoranthene	mg/kg	6.2	-	<0.010	-	-	<0.010	-	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.010	-	<0.010	-
Chrysene	mg/kg	6.2	-	<0.010	-	-	0.01	-	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.010	-	<0.010	-
Dibenz(a,h)anthracene	mg/kg	-	-	<0.0050	-	-	<0.0050	-	<0.0050	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	-	<0.0050	-	<0.0050	-
Fluoranthene	mg/kg	15.4	180	<0.010	-	-	0.014	-	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.017	-	<0.010	-	<0.010	-
Fluorene	mg/kg	0.4	0.4	<0.010	-	-	<0.010	-	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.010	-	<0.010	-
Indeno(1,2,3-c,d)pyrene	mg/kg	-	-	<0.010	-	-	<0.010	-	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.011	-	<0.010	-	<0.010	-
1-Methylnaphthalene	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.010	-	<0.010	-	<0.010	-
2-Methylnaphthalene	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.010	-	<0.010	-	<0.010	-
Naphthalene	mg/kg	0.014	0.014	<0.010	-	-	<0.010	-	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	-	<0.010	-	<0.010	-
Perylene	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.017	-	<0.010	-	<0.010	-
Phenanthrene	mg/kg	0.11	0.11	<0.010	-	-	0.01	-	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.013	-	<0.010	-	<0.010	-
Pyrene	mg/kg	7.7	30,000	<0.010	-	-	0.016	-	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.023	-	<0.010	-	<0.010	-
Quinoline	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.010	-	<0.010	-	<0.010	-

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. Referenced guidelines are for fine textured soils under Agricultural and Industrial land uses

[2] AR-CS12 and AR-CS17 sample numbers were not used.

"-" No applicable guideline

BOLD - Greater than Tier 1 Agricultural Guideline

BOLD - Greater than Tier 1 Industrial Guideline

N/A - Not applicable

Material Removed - Impacted material was excavated and landfilled.

TETRA TECH

Table 3: 2020 Delineation Soil Analytical Results - Borehole 19-6

Parameter	Unit	2019 Tier 1 Agricultual [1]	2019 Tier 1 Industrial [1]	20-6					20-6A			20-6B				20-6C				20-6D				20-6E	
				0-9	9-30	30-60	100-150	150-200	0-12	15-26	30-60	0-12	12-30	30-60	60-100	0-15	30-60	60-100	100-150	0-15	15-30	30-60	100-150	0-15	15-30
				9/10/2020	9/10/2020	9/10/2020	9/10/2020	9/10/2020	8/18/2020	8/18/2020	8/18/2020	9/10/2020	9/10/2020	9/10/2020	9/10/2020	9/9/2020	9/9/2020	9/9/2020	9/9/2020	9/9/2020	9/9/2020	9/9/2020	9/9/2020	10/9/2020	10/9/2020
				Material Removed	Material Removed							Material Removed				Material Removed								Material Removed	
Material Type				Topsoil	Admixed topsoil	Admixed topsoil	Till	Till	Ah (topsoil)	Btgj	Cksa	Topsoil	Fill	Fill	Fill	Topsoil	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Topsoil	Fill
Field Texture				Silty clay loam to Clay loam	Silty clay loam to Clay loam	Silty clay to Clay	Silty clay to Clay	Sandy clay	Loam	Clay	Clay loam to Silty clay loam	Silty clay loam	Clay loam to Clay	Clay loam to Clay	Clay loam to Clay	Silty clay loam to Clay loam	Silty clay to Clay	Silty clay to Clay	Silty clay to Clay	Sand & gravel	Clay to Silty clay	Clay to Silty clay	Clay to Silty clay	Clay loam to Loam	Silty clay to Clay
Physical																									
Percent Saturation	%	NG	NG	-	-	-	-	-	60	-	92.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Moisture	%	NG	NG	23.5	-	34.2	21.9	15	14.8	20.5	18.2	57.1	30	-	14.1	10.3	12.5	-	14.4	8.47	16	-	13.8	12.8	14.3
Metals																									
Antimony	mg/kg	20	40	0.99	0.79	0.36	-	-	0.28	-	0.5	-	0.46	0.34	-	1.75	0.45	0.35	-	0.27	-	0.3	0.31	-	-
Arsenic	mg/kg	17	26	7.16	8.02	5.81	-	-	4.71	-	7.41	-	12	6.39	-	7.77	7.94	7.28	-	4.83	-	6.41	6.42	-	-
Barium	mg/kg	750	2000	188	188	151	-	-	120	-	192	-	186	209	-	206	161	176	-	108	-	170	166	-	-
Beryllium	mg/kg	5	8	0.51	0.56	0.48	-	-	0.39	-	0.51	-	0.83	0.48	-	0.45	0.52	0.52	-	0.37	-	0.55	0.51	-	-
Boron (saturated paste)	mg/L	3.3	5	-	-	-	-	-	<0.25	-	<0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	mg/kg	1.4	22	1.27	0.872	0.31	-	-	0.382	-	0.281	-	0.258	0.231	-	**3.73**	0.321	0.179	-	0.128	-	0.178	0.191	-	-
Chromium	mg/kg	64	87	36	28.9	20.9	-	-	17.1	-	21.3	-	28.4	18	-	**78.9**	28.3	20.4	-	25.8	-	22.2	23	-	-
Chromium (hexavalent)	mg/kg	0.4	1.4	-	-	-	-	-	<0.1	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	mg/kg	20	300	9.26	9.13	6.48	-	-	6.26	-	8.63	-	13.5	9.04	-	10.4	7.96	7.61	-	5.01	-	8.43	9.71	-	-
Copper	mg/kg	63	91	34.8	27.1	15	-	-	13.8	-	13.8	-	14.9	17.4	-	**75.7**	16.3	15.1	-	9.85	-	16.5	17.2	-	-
Lead	mg/kg	70	600	**73.2**	46.3	15.1	-	-	17.2	-	7.69	-	10.6	7.26	-	**211**	12.7	8.62	-	6.48	-	8.13	8.35	-	-
Mercury	mg/kg	6.6	50	0.0452	0.0467	0.0291	-	-	0.0336	-	0.0363	-	0.0483	0.0349	-	0.0835	0.0361	0.0368	-	0.0233	-	0.0368	0.0361	-	-
Molybdenum	mg/kg	4	40	**9.13**	**5.49**	2.16	-	-	2.1	-	0.6	-	0.91	0.62	-	**15.4**	1.8	1.21	-	1.41	-	0.88	0.76	-	-
Nickel	mg/kg	45	89	43.4	34.8	19.4	-	-	20.1	-	23.9	-	25.3	20.6	-	**106**	26.3	21.5	-	18.8	-	22.8	24.8	-	-
Selenium	mg/kg	1	2.9	0.53	0.57	0.47	-	-	0.47	-	0.49	-	0.59	0.32	-	0.87	0.49	0.35	-	0.2	-	0.21	0.25	-	-
Silver	mg/kg	20	40	0.35	0.24	<0.1	-	-	0.12	-	0.12	-	<0.1	0.1	-	0.83	0.1	<0.1	-	<0.1	-	<0.1	0.1	-	-
Thallium	mg/kg	1	1	0.143	0.161	0.133	-	-	0.108	-	0.287	-	0.222	0.146	-	0.159	0.176	0.163	-	0.118	-	0.171	0.189	-	-
Tin	mg/kg	5	300	2	<2	<2	-	-	<2	-	<2	-	<2	<2	-	**5.8**	<2	<2	-	<2	-	<2	<2	-	-
Uranium	mg/kg	23	300	0.82	0.788	0.762	-	-	1.29	-	1.57	-	0.617	0.652	-	0.72	0.894	0.877	-	0.677	-	0.892	0.776	-	-
Vanadium	mg/kg	130	130	76.7	62.6	35.1	-	-	43.3	-	34.5	-	55.4	33.4	-	**194**	38.6	32.5	-	22.1	-	30.3	33.8	-	-
Zinc	mg/kg	250	410	**472**	**334**	113	-	-	109	-	46.4	-	64.7	42.2	-	**1320**	99.2	59.4	-	42.1	-	54.3	52	-	-
Polycyclic Aromatic Hydrocarbons (PAHs)																									
Naphthalene	mg/kg	0.014	0.014	**0.022**	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	**0.032**	<0.01	-	<0.01	**0.1**	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	**0.251**	0.012
Acenaphthylene	mg/kg	NG	NG	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	-	0.013	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	0.0463	<0.005
Acenaphthene	mg/kg	0.33	0.33	0.0117	-	0.0058	<0.005	<0.005	<0.005	<0.005	-	0.0219	<0.005	-	<0.005	0.0482	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	0.101	<0.005
Fluorene	mg/kg	0.4	0.4	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	0.035	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	0.065	<0.01
Phenanthrene	mg/kg	0.11	0.11	0.092	-	0.033	<0.01	<0.01	0.021	<0.01	-	**0.13**	<0.01	-	<0.01	**0.354**	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	**0.626**	0.024
Anthracene	mg/kg	1.3	1.3	<0.004	-	<0.004	<0.004	<0.004	<0.004	<0.004	-	<0.004	<0.004	-	<0.004	<0.004	<0.004	-	<0.004	<0.004	<0.004	-	<0.004	0.122	0.005
Fluoranthene	mg/kg	15.4	180	0.176	-	0.063	<0.01	<0.01	0.04	<0.01	-	0.23	<0.01	-	<0.01	0.622	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	0.944	0.035
Pyrene	mg/kg	7.7	30000	0.184	-	0.065	<0.01	<0.01	0.037	<0.01	-	0.251	<0.01	-	<0.01	0.682	0.011	-	<0.01	<0.01	<0.01	-	<0.01	0.962	0.039
Benz(a)anthracene	mg/kg	6.2	NG	0.079	-	0.035	<0.01	<0.01	0.016	<0.01	-	0.108	<0.01	-	<0.01	0.302	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	0.475	0.018
Chrysene	mg/kg	6.2	NG	0.086	-	0.036	<0.01	<0.01	0.013	<0.01	-	0.141	<0.01	-	<0.01	0.4	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	0.645	0.028
Benzo(b+j)fluoranthene	mg/kg	6.2	NG	0.196	-	0.088	<0.01	<0.01	0.038	<0.01	-	0.221	<0.01	-	<0.01	0.489	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	0.94	0.043
Benzo(k)fluoranthene	mg/kg	6.2	NG	0.071	-	0.029	<0.01	<0.01	<0.01	<0.01	-	0.09	<0.01	-	<0.01	0.155	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	0.277	0.012
Benzo(a) pyrene	mg/kg	0.6	72	0.122	-	0.061	<0.01	<0.01	0.022	<0.01	-	0.161	<0.01	-	<0.01	0.323	0.011	-	<0.01	<0.01	<0.01	-	<0.01	0.568	0.028
Indeno(1,2,3-c,d)pyrene	mg/kg	NG	NG	0.123	-	0.053	<0.01	<0.01	0.022	<0.01	-	0.143	<0.01	-	<0.01	0.213	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	0.288	0.02
Dibenz(a,h)anthracene	mg/kg	NG	NG	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	0.0583	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	0.107	<0.007
Benzo(g,h,i)perylene	mg/kg	NG	NG	0.155	-	0.06	<0.01	<0.01	0.027	<0.01	-	0.189	<0.01	-	<0.01	0.268	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	0.435	0.033
Index of Additive Cancer Risk-Coarse	N/A	1.0	1.0	0.111	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	0.138	<0.05	-	<0.05	0.277	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	0.498	<0.05
Index of Additive Cancer Risk-Fine	N/A	1.0	1.0	0.212	-	0.092	<0.05	<0.05	<0.05	<0.05	-	0.262	<0.05	-	<0.05	0.527	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	0.95	<0.05
Carcinogenic PAHs (as B(a)P TPE)	mg/kg	5.3	8.0	0.173	-	0.085	<0.02	<0.02	0.033	<0.02	-	0.223	<0.02	-	<0.02	0.504	<0.02	-	<0.02	<0.02	<0.02	-	<0.02	0.884	0.042
Particle Size																									
>75 µm	%			-	-	-	-	-	-	36.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grain Size	N/A									Fine															
Laboratory Identification Number				L2501920-1	L2501920-2	L2501920-3	L2501920-5	L2501920-6	L2491315-1	L2491315-2	L2491315-3	L2501920-39	L2501920-40	L2501920-41	L2501920-42	L2501254-59	L2501254-61	L2501254-62	L2501254-63	L2501254-42	L2501254-43	L2501254-44	L2501254-46	L2516510-1	L2516510-2

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. Referenced guidelines are for fine textured soils under Agricultural and Industrial land use.

NG - No guideline

BOLD - Exceeds Tier 1 agricultural guideline

BOLD - Exceeds Tier 1 industrial guideline

"-" Not analyzed

N/A - Not Applicable

Material Removed - Impacted material was excavated and landfilled.

Table 4: 2020 Delineation Soil Analytical Results - Borehole 19-8

Parameter	Unit	2019 Tier 1 Agricultual [1]	2019 Tier 1 Industrial [1]	20-8				20-8A		20-8B			20-8C				20-8D				20-8E	20-8F	
				0-15	15-30	30-60	60-100	0-13	15-30	0-11	30-60	100-150	0-15	15-30	30-60	60-100	0-12	12-30	30-60	60-100	0-15	0-15	15-30
				9/10/2020	9/10/2020	9/10/2020	9/10/2020	8/18/2020	8/18/2020	9/9/2020	9/9/2020	9/9/2020	9/9/2020	9/9/2020	9/9/2020	9/9/2020	9/9/2020	9/9/2020	9/9/2020	9/9/2020	10/9/2020	10/9/2020	10/9/2020
				Material Removed	Material Removed					Material Removed													Material Removed	
Material Type				Admixed topsoil	Admixed topsoil	Admixed topsoil	Fill	Ahg	Bg1	Topsoil	Fill	Fill	Fill	Fill	Fill	Fill	Topsoil	Fill	Fill	Fill	Topsoil	Topsoil	Till
Field Texture				Silty clay loam to Clay loam	Silty clay loam to Clay loam	Silty clay loam to Clay loam	Silty clay loam	Loam	Clay	Silty clay loam to Clay loam	Silty clay to Clay	Silty clay to Clay	Clay to Silty clay	Clay to Silty clay	Silt	Clay to Silty clay	Silty clay loam to Clay loam	Silty clay to Clay	Silty clay to Clay	Silty clay to Clay	Clay to Clay loam	Clay to Clay loam	Clay
Physical																							
Percent Saturation	%	NG	NG	-	-	-	-	63	93.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Moisture	%	NG	NG	22.2	24	35.1	23.5	23.2	21.1	12	15.5	17	13.9	-	13.1	13.8	12	-	13.8	-	25.1	18.7	20.5
Metals																							
Antimony	mg/kg	20	40	0.51	0.86	0.37	-	0.23	0.21	-	0.45	0.37	-	0.37	-	0.41	0.44	0.37	-	0.42	-	-	-
Arsenic	mg/kg	17	26	5.86	6.77	3.8	-	4.65	3.61	-	7.04	6.61	-	8.31	-	6.84	7.68	7.77	-	4.55	-	-	-
Barium	mg/kg	750	2000	160	167	180	-	128	153	-	168	180	-	188	-	175	173	193	-	277	-	-	-
Beryllium	mg/kg	5	8	0.44	0.46	0.61	-	0.39	0.5	-	0.56	0.6	-	0.68	-	0.55	0.6	0.66	-	0.75	-	-	-
Boron (saturated paste)	mg/L	3.3	5	-	-	-	-	<0.50	<0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	mg/kg	1.4	22	0.515	1.03	0.458	-	0.306	0.267	-	0.264	0.187	-	0.264	-	0.189	0.393	0.33	-	0.252	-	-	-
Chromium	mg/kg	64	87	21.5	34	23.6	-	16.6	17.9	-	22	22	-	23.9	-	23.9	21.8	22.5	-	23.8	-	-	-
Chromium (hexavalent)	mg/kg	0.4	1.4	-	-	-	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	mg/kg	20	300	7.23	8.64	5.6	-	6.49	6.8	-	8.17	8.88	-	8.31	-	8.75	7.98	9.64	-	8.65	-	-	-
Copper	mg/kg	63	91	20.4	31.8	17.5	-	12.4	15.1	-	17.1	15.6	-	17.1	-	17.6	18.1	18.2	-	19	-	-	-
Lead	mg/kg	70	600	30.4	59.6	18.6	-	13.7	6.97	-	15.2	9.18	-	14.9	-	8.92	26.8	20.4	-	10	-	-	-
Mercury	mg/kg	6.6	50	0.0391	0.0605	0.0536	-	0.0364	0.0271	-	0.0444	0.0384	-	0.0375	-	0.0395	0.0821	0.0492	-	0.0523	-	-	-
Molybdenum	mg/kg	4	40	3.75	**7.04**	2.77	-	1.71	0.16	-	1.73	0.85	-	1.61	-	0.83	2	1.63	-	0.48	-	-	-
Nickel	mg/kg	45	89	25.8	37	18.3	-	16.8	16.9	-	26.8	23.1	-	25.6	-	24.3	25.3	26.4	-	20.6	-	-	-
Selenium	mg/kg	1	2.9	0.34	0.49	0.6	-	0.56	<0.2	-	0.24	0.34	-	0.35	-	0.35	0.44	0.38	-	0.25	-	-	-
Silver	mg/kg	20	40	0.14	0.28	0.15	-	0.11	0.11	-	0.11	<0.1	-	0.11	-	<0.1	0.12	0.13	-	0.13	-	-	-
Thallium	mg/kg	1	1	0.118	0.145	0.177	-	0.119	0.154	-	0.162	0.179	-	0.189	-	0.18	0.173	0.17	-	0.164	-	-	-
Tin	mg/kg	5	300	<2	<2	<2	-	<2	<2	-	<2	<2	-	<2	-	<2	<2	<2	-	<2	-	-	-
Uranium	mg/kg	23	300	0.696	0.684	1.97	-	1.52	0.66	-	0.963	0.967	-	1.29	-	0.992	1.13	1.18	-	1.35	-	-	-
Vanadium	mg/kg	130	130	46.7	73.6	37.8	-	37.2	29.1	-	32.9	32.9	-	36.6	-	33	40.4	37.8	-	32.2	-	-	-
Zinc	mg/kg	250	410	194	**390**	153	-	90.1	70.2	-	93.5	59.6	-	98.5	-	56	137	117	-	51.1	-	-	-
Polycyclic Aromatic Hydrocarbons (PAHs)																							
Naphthalene	mg/kg	0.014	0.014	<0.01	**0.017**	<0.01	<0.01	<0.01	<0.01	**0.024**	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	-	<0.01	**0.039**	<0.01
Acenaphthylene	mg/kg	NG	NG	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	-	<0.005	0.0091	<0.005
Acenaphthene	mg/kg	0.33	0.33	<0.005	0.014	<0.005	<0.005	<0.005	<0.005	0.0143	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	-	<0.005	0.0053	<0.005
Fluorene	mg/kg	0.4	0.4	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.011	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	-	<0.01	<0.01	<0.01
Phenanthrene	mg/kg	0.11	0.11	0.036	0.087	0.019	<0.01	0.011	<0.01	0.105	<0.01	<0.01	<0.01	-	<0.01	<0.01	0.031	-	0.018	-	<0.01	0.06	<0.01
Anthracene	mg/kg	1.3	1.3	<0.004	0.0202	<0.004	<0.004	<0.004	<0.004	0.0298	<0.004	<0.004	<0.004	-	<0.004	<0.004	<0.004	-	<0.004	-	<0.004	0.008	<0.004
Fluoranthene	mg/kg	15.4	180	0.067	0.201	0.013	<0.01	0.023	<0.01	0.205	0.011	<0.01	0.014	-	<0.01	<0.01	0.047	-	0.022	-	0.011	0.091	<0.01
Pyrene	mg/kg	7.7	30000	0.075	0.21	0.011	<0.01	0.021	<0.01	0.213	0.012	<0.01	0.019	-	<0.01	<0.01	0.063	-	0.025	-	<0.01	0.104	<0.01
Benz(a)anthracene	mg/kg	6.2	NG	0.029	0.1	<0.01	<0.01	<0.01	<0.01	0.117	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	-	<0.01	0.031	<0.01
Chrysene	mg/kg	6.2	NG	0.026	0.132	<0.01	<0.01	<0.01	<0.01	0.156	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	-	<0.01	0.05	<0.01
Benzo(b+j)fluoranthene	mg/kg	6.2	NG	0.068	0.246	<0.01	<0.01	0.024	<0.01	0.252	0.012	<0.01	<0.01	-	<0.01	<0.01	0.02	-	0.019	-	<0.01	0.06	<0.01
Benzo(k)fluoranthene	mg/kg	6.2	NG	0.026	0.074	<0.01	<0.01	<0.01	<0.01	0.09	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	-	<0.01	0.018	<0.01
Benzo(a) pyrene	mg/kg	0.6	72	0.051	0.158	<0.01	<0.01	0.011	<0.01	0.168	<0.01	<0.01	<0.01	-	<0.01	<0.01	0.017	-	0.013	-	<0.01	0.041	<0.01
Indeno(1,2,3-c,d)pyrene	mg/kg	NG	NG	0.044	0.131	<0.01	<0.01	0.014	<0.01	0.152	<0.01	<0.01	<0.01	-	<0.01	<0.01	0.015	-	0.011	-	<0.01	0.021	<0.01
Dibenz(a,h)anthracene	mg/kg	NG	NG	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0365	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	-	<0.005	0.0069	<0.005
Benzo(g,h,i)perylene	mg/kg	NG	NG	0.045	0.175	<0.01	<0.01	<0.01	<0.01	0.187	<0.01	<0.01	<0.01	-	<0.01	<0.01	0.015	-	<0.01	-	<0.01	0.036	<0.01
Index of Additive Cancer Risk-Coarse	N/A	1.0	1.0	<0.05	0.127	<0.05	<0.05	<0.05	<0.05	0.149	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	-	<0.05	<0.05	<0.05
Index of Additive Cancer Risk-Fine	N/A	1.0	1.0	0.077	0.243	<0.05	<0.05	<0.05	<0.05	0.283	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	-	<0.05	0.062	<0.05
Carcinogenic PAHs (as B(a)P TPE)	mg/kg	5.3	8.0	0.071	0.219	<0.02	<0.02	<0.02	<0.02	0.268	<0.02	<0.02	<0.02	-	<0.02	<0.02	0.025	-	<0.02	-	<0.02	0.062	<0.02
Particle Size																							
>75 µm	%			-	-	-	-	-	30.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grain Size	N/A								Fine														
Laboratory Identification Number				L2501920-43	L2501920-44	L2501920-45	L2501920-46	L2491315-5	L2491315-6	L2501254-74	L2501254-76	L2501254-78	L2501254-50	L2501254-51	L2501254-52	L2501254-53	L2501254-67	L2501254-68	L2501254-69	L2501254-70	L2516510-3	L2516510-5	L2516510-6

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. Referenced guidelines are for fine textured soils under Agricultural and Industrial land use.

NG - No guideline

BOLD - Exceeds Tier 1 agricultural guideline

BOLD - Exceeds Tier 1 industrial guideline

"-" Not analyzed

N/A - Not Applicable

Material Removed - Impacted material was excavated and landfilled.

Table 5: 2019 Soil Analytical Results - Boreholes 19-6 and 19-8

Parameter	Unit	2019 Tier 1 Agricultual [1]	2019 Tier 1 Industrial [1]	19-6				19-8			
				0-15	15-30	30-60	60-100	0-15	15-30	30-60	60-100
				09/25/19	09/25/19	09/25/19	09/25/19	09/25/19	09/25/19	09/25/19	09/25/19
Metals				Material Removed				Material Removed			
Antimony	mg/kg	20	40	1.3	0.9	1.2	0.7	0.8	0.8	0.7	<0.2
Arsenic	mg/kg	17	26	7.7	7.1	7.2	7.1	6.4	6.7	5.7	3.4
Barium	mg/kg	750	2000	189	187	176	202	198	188	167	126
Beryllium	mg/kg	5	8	0.5	0.4	0.5	0.5	0.5	0.5	0.4	0.6
Boron (saturated paste)	mg/L	3.3	5	0.6	0.55	0.58	<0.5	<0.5	<0.5	<0.5	<0.5
Cadmium	mg/kg	1.4	22	**1.62**	1.32	**1.79**	0.25	1.04	1.02	0.87	0.31
Chromium	mg/kg	64	87	44	33.2	43.3	16.8	29.2	28.1	28.3	16.2
Chromium (hexavalent)	mg/kg	0.4	1.4	0.06	0.1	0.05	0.09	<0.05	<0.05	<0.05	0.08
Cobalt	mg/kg	20	300	9.4	16.4	9.4	10.6	8	9	7.6	4.5
Copper	mg/kg	63	91	46.9	35.3	44.4	16.4	31.9	33	27.9	11
Lead	mg/kg	70	600	**86.6**	69	**88.1**	11.2	52.6	52.5	45.6	8.2
Mercury	mg/kg	6.6	50	0.13	0.09	0.1	<0.05	0.12	0.1	0.09	<0.05
Molybdenum	mg/kg	4	40	**10**	**7.4**	**8.6**	<1	**6.5**	**7.2**	**4.6**	<1
Nickel	mg/kg	45	89	**55**	40.7	**51.5**	23.2	42.8	41.3	38.5	13.4
Selenium	mg/kg	1	2.9	0.8	0.8	0.8	0.6	0.6	0.6	0.5	0.5
Silver	mg/kg	20	40	0.4	0.3	0.5	<0.1	0.3	0.3	0.2	<0.1
Thallium	mg/kg	1	1	0.14	0.13	0.14	0.13	0.13	0.12	0.11	0.14
Tin	mg/kg	5	300	2.8	2.2	3.2	<1	1.8	1.7	1.5	<1
Uranium	mg/kg	23	300	0.9	0.8	0.8	0.8	0.8	0.9	1	1.6
Vanadium	mg/kg	130	130	91.1	74.8	85	30.7	72.7	72	58.1	23.4
Zinc	mg/kg	250	410	**638**	**513**	**656**	82	**380**	**382**	**405**	76
Polycyclic Aromatic Hydrocarbons (PAHs)											
Naphthalene	mg/kg	0.014	0.014	**0.032**	0.01	**0.016**	**0.015**	**0.024**	**0.016**	0.013	<0.01
Acenaphthylene	mg/kg	NG	NG	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Acenaphthene	mg/kg	0.33	0.33	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Fluorene	mg/kg	0.4	0.4	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Phenanthrene	mg/kg	0.11	0.11	**0.19**	0.03	0.07	0.05	**0.12**	0.06	0.04	0.02
Anthracene	mg/kg	1.3	1.3	0.068	0.005	0.016	0.009	0.047	0.012	0.009	0.005
Fluoranthene	mg/kg	15.4	180	0.397	0.041	0.11	0.064	0.244	0.095	0.049	0.033
Pyrene	mg/kg	7.7	30000	0.379	0.046	0.117	0.072	0.23	0.095	0.047	0.031
Benz(a)anthracene	mg/kg	6.2	NG	0.26	0.02	0.05	0.03	0.15	0.06	0.03	0.02
Chrysene	mg/kg	6.2	NG	0.34	<0.05	0.08	<0.05	0.2	0.07	<0.05	<0.05
Benzo(b+j)fluoranthene	mg/kg	6.2	NG	0.49	<0.05	0.11	<0.05	0.28	0.12	<0.05	<0.05
Benzo(k)fluoranthene	mg/kg	6.2	NG	0.18	<0.05	0.06	<0.05	0.09	<0.05	<0.05	<0.05
Benzo(a) pyrene	mg/kg	0.6	72	0.35	<0.05	0.06	<0.05	0.17	0.07	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	NG	NG	0.22	<0.05	<0.05	<0.05	0.13	0.05	<0.05	<0.05
Dibenz(a,h)anthracene	mg/kg	NG	NG	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(g,h,i)perylene	mg/kg	NG	NG	0.21	<0.05	0.05	<0.05	0.1	0.05	<0.05	<0.05
Index of Additive Cancer Risk-Coarse	N/A	1.0	1.0	0.294	0.003	0.078	0.013	0.154	0.031	0.014	0.003
Index of Additive Cancer Risk-Fine	N/A	1.0	1.0	0.56	0.007	0.148	0.026	0.293	0.06	0.026	0.006
Carcinogenic PAHs (as B(a)P TPE)	mg/kg	5.3	8.0	0.523	0.022	0.088	0.039	0.233	0.092	0.041	0.019
Particle Size											
>75 µm	%	NG	NG	47.9	-	-	-	42.5	40.8	-	-
Grain Size	N/A	NG	NG	Fine-Grained	-	-	-	Fine-Grained	Fine-Grained	-	-
Laboratory Identification Number				1379633-5	1379633-6	1379633-7	1379633-8	1379633-9	1379633-10	1379633-11	1379633-12

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. Referenced guidelines are for fine textured soils under Agricultural and Industrial land use.

NG - No guideline

BOLD - Exceeds Tier 1 agricultural guideline

BOLD - Exceeds Tier 1 industrial guideline

"-" Not analyzed

N/A - Not Applicable

Material Removed - Impacted material was excavated and landfilled.

Table 6: Historical Background Control Salinity and Metals Data - 1996 to 2019

Parameter	Unit	2019 Tier 1, Agricultural[1]	2019 Tier 1 Industrial [1]	96-S1				96-S2							96-S3			96-S4		
				1996			2002	1996			2001				1996			1996		
				0-11	11-35	35-65	30 - 65 cm	0-5	5-30	30-60	0 - 15 cm	15 - 30 cm	30 - 60 cm	60 - 100 cm	0-5	5-45	45-70	0-15	15-50	75-100
Salinity																				
pH	pH Units	6-8.5	6-8.5	7.4	**5.2**	7.6	-	**5.6**	**5.9**	7.9	**5.5**	6.6	7.9	8.4	6.3	7.7	8.0	**5.5**	6.8	7.9
Electrical Conductivity (EC)	dS/m	**	**	0.97	4.64	1.57	-	0.7	3.22	9.54	3.41	6.24	6.63	10.4	0.99	2.2	7.09	0.95	0.84	3.78
Sodium Absorption Ratio (SAR)	N/A	**	**	7.6	9.2	6.2	-	6.9	20.6	23.6	-	-	-	-	4.9	17.1	16.1	7.3	7.2	10.3
Percent Saturation	%	NG	NG	46	57	60	-	163	69	122	48	37	51	49	92	83	117	60	80	70
Calcium	mg/kg	NG	NG	14.7	180.5	42.1	-	26.1	30.4	462.1	-	-	-	-	36.9	29.9	408	13.2	24.0	134.7
Magnesium	mg/kg	NG	NG	4.5	72.1	15.3	-	13.9	16.8	215.1	-	-	-	-	16.8	18.2	207.7	5.1	7.8	68.9
Sodium	mg/kg	NG	NG	85.7	433.8	142.1	-	217.3	471.1	2695.4	-	-	-	-	135.4	438.9	1729.6	95.2	141.6	490.8
Potassium	mg/kg	NG	NG	<1.8	2.2	2.3	-	31.9	2.7	23.8	-	-	-	-	18.0	9.7	22.9	<2.3	<3.1	2.7
Chloride	mg/kg	NG	NG	6.5	4.0	36.2	-	28.9	7.3	17.3	-	-	-	-	45.7	26.5	12.4	21.3	22.7	5.0
Sulfate (as SO4)	mg/kg	NG	NG	24.3	525.4	94.3	-	73.2	338.5	2425	-	-	-	-	51.6	267.4	1706.7	51	57.7	500.5
Sulfate (as S)	mg/kg	NG	NG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Moisture	%	NG	NG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other																				
Cation Exchange Capacity (CEC)	meq/100g	NG	NG	21.8	22.8	22.2	-	19.4	18.1	21.6	-	-	-	-	27.6	25.8	18.6	20.5	26.8	18.1
Nitrate (as N)	mg/kg	NG	NG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate and Nitrite (as N)	mg/kg	NG	NG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfur (Total)	%	NG	NG	-	-	-	-				0.08	0.08	-	-	-	-	-	-	-	-
Sulfur (Elemental)	mg/kg	500	NG	53	34	94	-	29	28	2	35	44	-	-	-	-	-	-	-	-
Total Organic Carbon (TOC)	%	NG	NG	1.9	2.5	0.64	-	5.5	2.2	0.52	-	-	-	-	5.4	1.3	0.42	5.6	1.2	0.31
Organic Matter	%	NG	NG	2.3	4.8	1.4	-	8.6	3.6	0.89	-	-	-	-	8.3	2.3	0.72	9.7	2.1	0.63
Metals																				
Antimony (Sb)	mg/kg	20	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic (As)	mg/kg	17	26	-	-	-	-	-	-	-	4.6	5.8	-	-	-	-	-	-	-	-
Barium (Ba)	mg/kg	750	2000	213	188	282	-	120	184	297	138	241	-	-	-	-	-	-	-	-
Barium (Ba) - Extractable	mg/kg	260	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium (Be)	mg/kg	5	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boron (B) - hot water soluble	mg/kg	2 [2]	-	<1	<1	<1	-	<1	<1	<1	<1	<1	-	-	-	-	-	-	-	-
Boron (B) - saturated paste [3]	mg/L	3.3	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium (Cd)	mg/kg	1.4	22	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-
Hexavalent Chromium (Cr+6)	mg/kg	0.4	87	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium (Cr), total	mg/kg	64	1.4	9	7	10	-	6	8	9	8	8	-	-	-	-	-	-	-	-
Cobalt (Co)	mg/kg	20	300	38.9	17.3	27.1	-	26.2	30.9	35.9	16.3	25.3	-	-	-	-	-	-	-	-
Copper (Cu)	mg/kg	63	91	19	16	24	-	53	13	48	13	16	-	-	-	-	-	-	-	-
Lead (Pb)	mg/kg	70	600	-	-	-	-	-	-	-	0.01	0.04	-	-	-	-	-	-	-	-
Mercury (Hg)	mg/kg	6.6	50	-	-	-	-	-	-	-	552	367	-	-	-	-	-	-	-	-
Molybdenum (Mo)	mg/kg	4	40	30	17	33	-	16	20	33	13	20	-	-	-	-	-	-	-	-
Nickel (Ni)	mg/kg	45	89	9	9	**100**	11	15	8	10	7	12	-	-	-	-	-	-	-	-
Selenium (Se)	mg/kg	1	2.9	<5	<5	<5	-	<5	<5	<5	<0.1	0.8	-	-	-	-	-	-	-	-
Silver (Ag)	mg/kg	20	40	-	-	-	-	-	-	-			-	-	-	-	-	-	-	-
Thallium (Tl)	mg/kg	1	1	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-	-	-
Tin (Sn)	mg/kg	5	300	<1	<1	<1	-	<1	<1	<1	<1	<1	-	-	-	-	-	-	-	-
Uranium	mg/kg	23	300	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium (V)	mg/kg	130	130	38	23	25	-	33	35	31	25	39	-	-	-	-	-	-	-	-
Zinc (Zn)	mg/kg	250	410	65.9	72.2	60.8	-	74.1	56.7	91.9	59.2	70.7	-	-	-	-	-	-	-	-
Grain Size																				
>75µm	%	NG	NG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grain Size	N/A	NG	NG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Soil Texture																				
Sand	%	NG	NG	40.0	42.0	33.0	-	53.3	52.0	46.0	-	-	-	-	27	26	40	37.0	22.0	40.0
Silt	%	NG	NG	25.3	27.3	20.3	-	32.1	33.3	13.3	-	-	-	-	38.3	29.3	23.3	36.3	36.3	27.3
Clay	%	NG	NG	34.7	30.7	46.7	-	14.5	14.7	40.7	-	-	-	-	34.7	44.7	36.7	26.7	41.7	32.7
Texture	N/A	NG	NG	Clay Loam	Clay Loam	Clay	-	Sandy Loam	Loam	Clay	-	-	-	-	Clay Loam	Clay	Clay Loam	Loam	Clay	Clay Loam

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. Referenced guidelines are for fine textured soils under agricultural land use.

[2] Hot water soluble boron guideline from the 2014 Alberta Tier 1 Soil and Groundwater Remediation Guidelines. Method no longer in use.

[3] Saturated paste boron data shown for boreholes 14-1 and 14-2 was collected in 2019.

** AENV. 2001. Salt Contamination Assessment and Remediation Guidelines. Pub. No.: T/606. ISBN: 0-7785-1718-7 (On-Line Edition).

NG - No guideline

BOLD - Exceeds Tier 1 agricultural guideline

BOLD - Exceeds Tier 1 industrial guideline

"-" Not analyzed

Parameters **	Rating Categories				Maximum Background
	Good	Fair	Poor	Unsuitable	
Topsoil					
EC (dS/m)	<2	2 to 4	4 to 8	>8	7.38
SAR	<4	4 to 8	8 to 12	>12	14.7
Subsoil					
EC (dS/m)	<3	3 to 5	5 to 10	>10	12.5
SAR	<4	4 to 8	8 to 12	>12	37.2

Table 6: Historical Background Control Salinity and Metals Data - 1996 to 2019

Parameter	Unit	2019 Tier 1, Agricultural[1]	2019 Tier 1 Industrial [1]	09-01				09-02				14-1				14-2			
				2009				2009				2014				2014			
				0-15	23-30	41-60	60-100	0-15	15-25	30-60	72-100	0-15	23-35	38-60	60-100	0-15	16-28	30-60	60-85
Salinity																			
pH	pH Units	6-8.5	6-8.5	**5.5**	**5.4**	7.3	7.5	**5.6**	6.6	7.8	8.1	**4.7**	7.4	8.0	8.2	**5.1**	**5.1**	6.0	7.6
Electrical Conductivity (EC)	dS/m	**	**	0.24	0.19	0.60	1.24	7.38	8.53	5.79	2.96	0.37	4.27	10.4	10.8	0.34	0.26	0.38	1.62
Sodium Absorption Ratio (SAR)	N/A	**	**	1.1	3.6	4.6	3.4	14.7	17.6	16.8	29.2	8.0	37.2	20.5	21.6	1.2	1.8	5.1	9.1
Percent Saturation	%	NG	NG	52	49	75	89	95	68	68	103	63	74	52	82	61	43	48	50
Calcium	mg/kg	NG	NG	10.9	2.7	15.6	81.4	414	308	171	26.3	3.7	17.6	232	392	21.8	9.2	6.1	28.3
Magnesium	mg/kg	NG	NG	3.6	1.0	6.2	26.9	171	131	54.7	11.0	1.3	15.4	148	234	4.9	2.1	1.6	8.8
Sodium	mg/kg	NG	NG	12	19	73	130	1380	1210	818	718	55	766	1170	1990	19	16	38	153
Potassium	mg/kg	NG	NG	4	<1	3	7	25	12	7	<10	<1	<7	9	20	<1	<1	<1	<1
Chloride	mg/kg	NG	NG	5	5	4	4	**276**	**122**	76	42	6	<1	<10	61	6	4	7	1
Sulfate (as SO4)	mg/kg	NG	NG	6.9	5.8	23	162	1330	1210	721	462	44.2	1510	3560	6040	53.7	27.9	13.0	286
Sulfate (as S)	mg/kg	NG	NG	-	-	-	-	-	-	-	-	14.7	502	1190	2010	17.9	9.3	4.4	95.2
Moisture	%	NG	NG	13.2	13.5	19.4	20.4	27.0	21.7	16.0	14.6	9.71	9.19	7.56	11	9.37	5.42	7.41	7.44
Other																			
Cation Exchange Capacity (CEC)	meq/100g	NG	NG	33	32	27	36	34	27	18	14	22	19	14	21	25	13	20	20
Nitrate (as N)	mg/kg	NG	NG	2	<2	2	<2	<2	<2	<2	<2	2	<2	<2	2	<2	<2	<2	<2
Nitrate and Nitrite (as N)	mg/kg	NG	NG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfur (Total)	%	NG	NG	0.02	0.01	0.01	0.05	0.30	0.16	0.08	0.06	0.04	0.03	0.28	0.34	0.03	0.01	0.02	0.01
Sulfur (Elemental)	mg/kg	500	NG	<20	<20	<20	<20	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Total Organic Carbon (TOC)	%	NG	NG	2.92	0.68	0.56	0.45	5.85	1.84	0.33	0.16	3.71	1.09	0.48	0.36	3.84	0.89	0.66	0.44
Organic Matter	%	NG	NG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals																			
Antimony (Sb)	mg/kg	20	40	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arsenic (As)	mg/kg	17	26	5.6	7.8	9.4	12.2	5.3	6.9	6.6	6.4	3.5	6.0	6.4	9.2	4.2	4.6	6.1	6.5
Barium (Ba)	mg/kg	750	2000	162	146	428	660	191	256	254	204	124	181	113	196	172	109	100	133
Barium (Ba) - Extractable	mg/kg	260	-	35.4	26.8	36.4	20.6	3.8	2.5	4.3	7.1	29.0	5.5	1.4	1.3	43.4	28.5	24.5	12.6
Beryllium (Be)	mg/kg	5	8	0.6	0.9	0.8	0.8	0.5	0.7	0.6	0.5	0.4	0.7	0.5	0.8	0.4	0.4	0.6	0.6
Boron (B) - hot water soluble	mg/kg	2 [2]	-	1.1	0.8	0.6	0.7	**4.4**	**4.1**	1.6	1.0	1.04	0.63	0.61	0.63	1.11	0.5	0.76	0.41
Boron (B) - saturated paste [3]	mg/L	3.3	5	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cadmium (Cd)	mg/kg	1.4	22	0.29	0.06	0.19	0.15	0.58	0.43	0.35	0.22	0.22	0.18	0.12	0.13	0.26	0.06	0.05	0.07
Hexavalent Chromium (Cr+6)	mg/kg	0.4	87	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Chromium (Cr), total	mg/kg	64	1.4	19.7	31.7	28.7	27.7	18.0	24.0	26.9	24.7	10.3	20.7	13.8	16.2	12.9	14.1	19.5	17.9
Cobalt (Co)	mg/kg	20	300	10.0	18.5	11.4	11.3	9.6	13.2	8.9	8.8	5.8	11.6	7.0	8.4	8.0	8.1	9.6	8.2
Copper (Cu)	mg/kg	63	91	16	16	22	25	36	18	16	14	9.4	10.6	11.3	15.2	11.8	7.1	13.8	17.2
Lead (Pb)	mg/kg	70	600	11.7	11.5	12.0	14.0	12.1	10.4	8.7	8.2	7.9	9.3	7.0	9.4	10.4	7.4	8.0	8.0
Mercury (Hg)	mg/kg	6.6	50	0.03	0.05	0.06	0.07	0.06	0.04	0.04	0.04	0.02	0.03	0.04	0.03	0.03	<0.01	0.03	0.04
Molybdenum (Mo)	mg/kg	4	40	<1	<1	<1	<1	<1	<1	<1	<1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Nickel (Ni)	mg/kg	45	89	16.8	22.1	35.3	28.8	22.2	26.6	27.3	26.2	8.5	19.3	21.1	22.3	15.7	12.8	20.8	24.8
Selenium (Se)	mg/kg	1	2.9	0.4	0.8	0.3	<0.3	0.6	0.5	0.4	0.3	<0.3	0.7	0.6	0.7	0.6	0.4	0.6	0.8
Silver (Ag)	mg/kg	20	40	0.3	0.2	0.2	0.1	0.6	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1
Thallium (Tl)	mg/kg	1	1	0.19	0.27	0.26	0.25	0.18	0.23	0.24	0.23	0.10	0.21	0.17	0.16	0.14	0.15	0.18	0.18
Tin (Sn)	mg/kg	5	300	1	1	<1	<1	2	1	1	1	<1.0	<1.0	<1.0	<1.0	1.1	1.4	1.1	1.1
Uranium	mg/kg	23	300	1.2	2.0	1.2	1.4	3.3	2.0	1.0	1.4	0.8	1.1	0.6	1.2	0.7	0.5	1.0	1.1
Vanadium (V)	mg/kg	130	130	38.0	56.3	51.1	50.1	32.6	47.3	48.5	42.9	21.3	35.9	25.4	29.9	26.3	26.5	33.8	32
Zinc (Zn)	mg/kg	250	410	68	58	65	74	89	70	62	49	60	65	40	55	57	39	46	48
Grain Size																			
>75µm	%	NG	NG	32.8	34.1	15.5	14.6	29.9	32.1	25.2	34	32.7	22.8	49.3	38.8	33.7	35.9	41.2	40.3
Grain Size	N/A	NG	NG	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine
Soil Texture																			
Sand	%	NG	NG	37.2	35.6	31.2	23.6	30.4	30.0	33.4	32.4	44.6	33.0	50.0	44.6	39.4	39.0	43.0	45.0
Silt	%	NG	NG	39.2	28.4	23.2	23.8	37.6	34.4	30.6	36.6	39.4	36.4	22.4	18.8	38.6	37.4	23.8	24.4
Clay	%	NG	NG	23.6	36.0	45.6	52.6	32.0	35.6	36.0	31.0	16.0	30.6	27.6	36.6	22.0	23.6	33.2	30.6
Texture	N/A	NG	NG	Loam	Clay Loam	Clay	Clay	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Loam	Clay Loam	Sandy Clay Loam	Clay Loam	Loam	Loam	Clay Loam	Sandy Clay Loam

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.
Referenced guidelines are for fine textured soils under agricultural land use.

[2] Hot water soluble boron guideline from the 2014 Alberta Tier 1 Soil and Groundwater Remediation Guidelines. Method no longer in use.

[3] Saturated paste boron data shown for boreholes 14-1 and 14-2 was collected in 2019.

** AENV. 2001. Salt Contamination Assessment and Remediation Guidelines. Pub. No.: T/606. ISBN: 0-7785-1718-7 (On-Line Edition).

NG - No guideline

BOLD - Exceeds Tier 1 agricultural guideline

BOLD - Exceeds Tier 1 industrial guideline

"-" Not analyzed

Parameters **	Rating Categories				Maximum Background
	Good	Fair	Poor	Unsuitable	
Topsoil					
EC (dS/m)	<2	2 to 4	4 to 8	>8	7.38
SAR	<4	4 to 8	8 to 12	>12	14.7
Subsoil					
EC (dS/m)	<3	3 to 5	5 to 10	>10	12.5
SAR	<4	4 to 8	8 to 12	>12	37.2

Table 6: Historical Background Control Salinity and Metals Data - 1996 to 2019

Parameter	Unit	2019 Tier 1, Agricultural[1]	2019 Tier 1 Industrial [1]	19-1				19-2			
				0-13	15-30	45-60	60-100	0-18	18-30	45-60	80-100
				09/19/19	09/19/19	09/19/19	09/19/19	09/19/19	09/19/19	09/19/19	09/19/19
Salinity											
pH	pH Units	6-8.5	6-8.5	**4.6**	6.9	8.1	8.5	**5.0**	6.6	7.7	7.8
Electrical Conductivity (EC)	dS/m	**	**	0.31	2.73	11.1	9.77	0.75	3.11	12.5	8.29
Sodium Absorption Ratio (SAR)	N/A	**	**	5.1	28.0	22.9	20.7	9.4	27.0	27.9	19.5
Percent Saturation	%	NG	NG	85	126	71	95	64	74	54	78
Calcium	mg/kg	NG	NG	6.0	21	361	450	8.7	21	275	369
Magnesium	mg/kg	NG	NG	2.4	24	279	289	3.0	16	172	126
Sodium	mg/kg	NG	NG	54	883	2010	2230	101	582	1770	1510
Potassium	mg/kg	NG	NG	14	<13	13	16	1	<7	10	11
Chloride	mg/kg	NG	NG	12	37	27	10	6	14	14	4
Sulfate (as SO4)	mg/kg	NG	NG	56.4	1500	5910	6530	187	1140	4870	4330
Sulfate (as S)	mg/kg	NG	NG	-	-	-	-	-	-	-	-
Moisture	%	NG	NG	-	-	-	-	-	-	-	-
Other											
Cation Exchange Capacity (CEC)	meq/100g	NG	NG	29.1	27.0	18.0	18.0	25.0	21.0	16.0	14.0
Nitrate (as N)	mg/kg	NG	NG	-	-	-	-	-	-	-	-
Nitrate and Nitrite (as N)	mg/kg	NG	NG	<4	<6	<4	<5	<3	<4	5	<4
Sulfur (Total)	%	NG	NG	0.07	0.08	1.52	0.33	0.08	0.03	0.38	0.16
Sulfur (Elemental)	mg/kg	500	NG	-	-	-	-	-	-	-	-
Total Organic Carbon (TOC)	%	NG	NG	6.03	1.55	0.27	0.30	3.87	1.13	0.22	0.34
Organic Matter	%	NG	NG	-	-	-	-	-	-	-	-
Metals											
Antimony (Sb)	mg/kg	20	40	<0.2	0.4	0.4	0.4	<0.2	0.2	0.4	0.4
Arsenic (As)	mg/kg	17	26	4.0	6.2	5.8	5.6	4.2	5.8	6.1	4.8
Barium (Ba)	mg/kg	750	2000	65	199	83	152	101	102	82	105
Barium (Ba) - Extractable	mg/kg	260	-	-	-	-	-	-	-	-	-
Beryllium (Be)	mg/kg	5	8	0.3	0.7	0.5	0.5	0.3	0.5	0.4	0.4
Boron (B) - hot water soluble	mg/kg	2 [2]	-	-	-	-	-	-	-	-	-
Boron (B) - saturated paste [3]	mg/L	3.3	5	0.11	<0.5	<0.5	<0.5	0.14	<0.5	<0.5	<0.5
Cadmium (Cd)	mg/kg	1.4	22	0.18	0.16	0.13	0.17	0.24	0.08	0.16	0.18
Hexavalent Chromium (Cr+6)	mg/kg	0.4	87	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chromium (Cr), total	mg/kg	64	1.4	9.0	19.0	15.4	15.6	10.4	19.7	15.4	15.8
Cobalt (Co)	mg/kg	20	300	3.5	8.8	7.2	7.2	5.9	8.1	6.7	6.0
Copper (Cu)	mg/kg	63	91	11.6	15.3	14.5	13.7	9.3	10.1	13.6	11.7
Lead (Pb)	mg/kg	70	600	7.3	7.2	6.8	7.1	8.1	6.6	5.7	5.7
Mercury (Hg)	mg/kg	6.6	50	<0.05	<0.05	0.06	<0.05	<0.05	<0.05	0.06	<0.05
Molybdenum (Mo)	mg/kg	4	40	1.8	<1	<1	<1	<1	<1	<1	<1
Nickel (Ni)	mg/kg	45	89	7.4	18.9	27.6	20.9	9.8	16.8	27.1	19.8
Selenium (Se)	mg/kg	1	2.9	<0.3	0.5	0.3	<0.3	0.5	1.0	<0.3	<0.3
Silver (Ag)	mg/kg	20	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
Thallium (Tl)	mg/kg	1	1	0.09	0.15	0.17	0.14	0.10	0.14	0.14	0.12
Tin (Sn)	mg/kg	5	300	<1	<1	<1	<1	<1	<1	<1	<1
Uranium	mg/kg	23	300	0.7	2.3	1.1	1.3	1.0	1.4	0.7	0.9
Vanadium (V)	mg/kg	130	130	23.5	28.5	20.7	20.2	22.6	27.7	22.5	19.3
Zinc (Zn)	mg/kg	250	410	63	53	42	45	60	50	40	38
Grain Size											
>75µm	%	NG	NG	43.7	32.8	39.4	38.4	36.1	31.5	45.3	39.5
Grain Size	N/A	NG	NG	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine
Soil Texture											
Sand	%	NG	NG	45	38	47	42	44	39	58	47
Silt	%	NG	NG	49	22	27	30	42	31	17	27
Clay	%	NG	NG	6	40	26	28	14	30	25	26
Texture	N/A	NG	NG	Sandy Loam	Clay	Sandy Clay Loam	Clay Loam	Loam	Clay Loam	Sandy Clay Loam	Sandy Clay Loam

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.
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Parameters **	Rating Categories				Maximum Background
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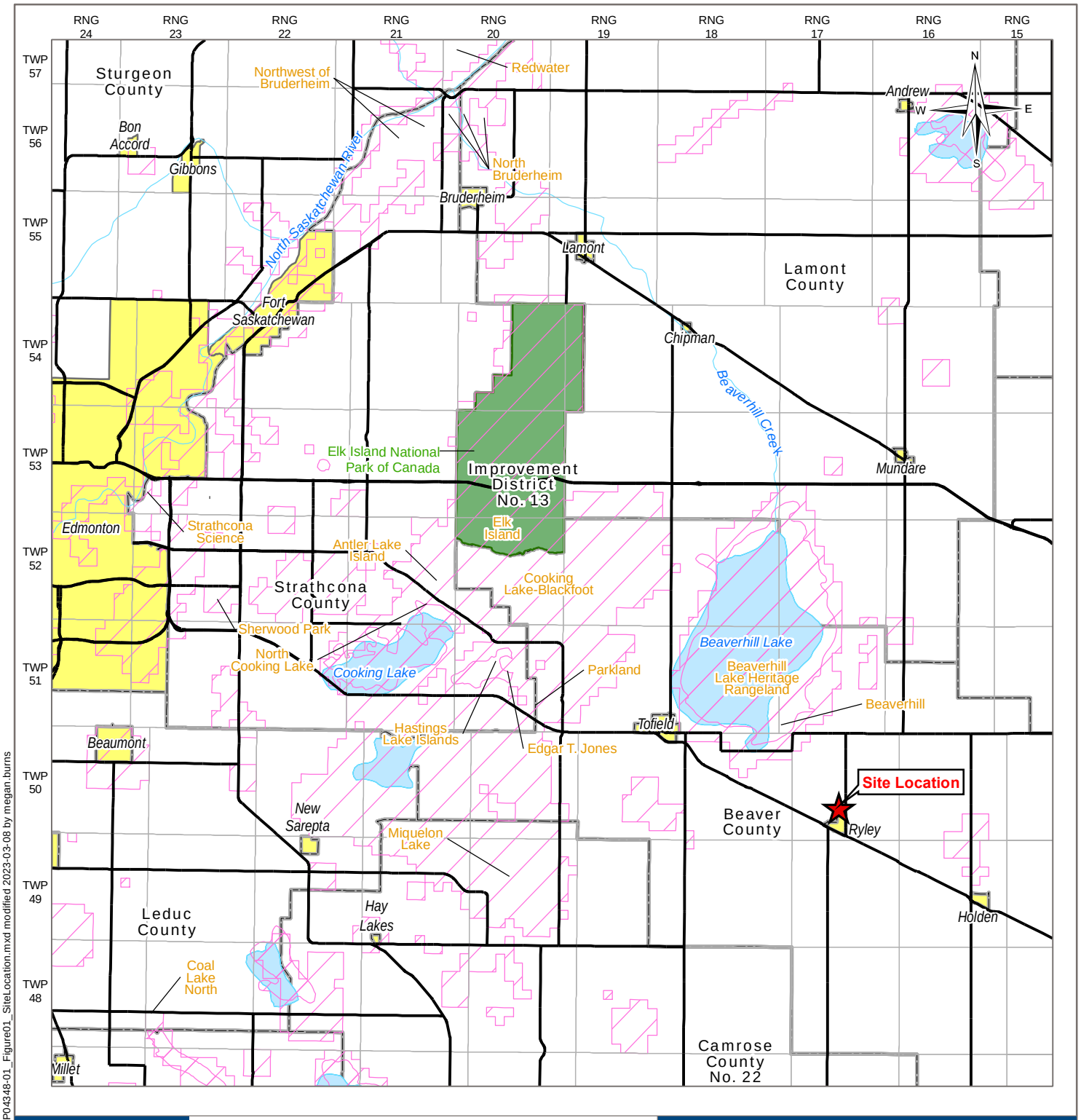
SAR	<4	4 to 8	8 to 12	>12	37.2

FIGURES



LEGEND

- Site Location
- Primary/Secondary Highway
- Environmentally Significant Area
- National Park
- Urban Area
- Municipal Area
- Watercourse
- Waterbody

NOTES

Base data source: ESRI, CanVec (50,000), AltaLIS, ESRD & Government of Alberta (Tourism, Parks and Recreation)

STATUS
ISSUED FOR USE

2022 SOIL REMEDIATION REPORT
NE/SE 09-50-17 W4M

Site Location and Regional Environmental Setting

PROJECTION UTM Zone 12	**DATUM** NAD83			**CLIENT** CleanHarbors
Scale: 1:500,000 (10 5 0 10 Kilometers)				TETRA TECH
FILE NO. SWOP04348-01_Figure01_SiteLocation.mxd				
PROJECT NO. SWOP04348-01	**DWN** RG/CF	**CKD** BS	**APVD** MF	**REV** 0
OFFICE Tt-VANC	**DATE** March 8, 2023			**Figure 1**

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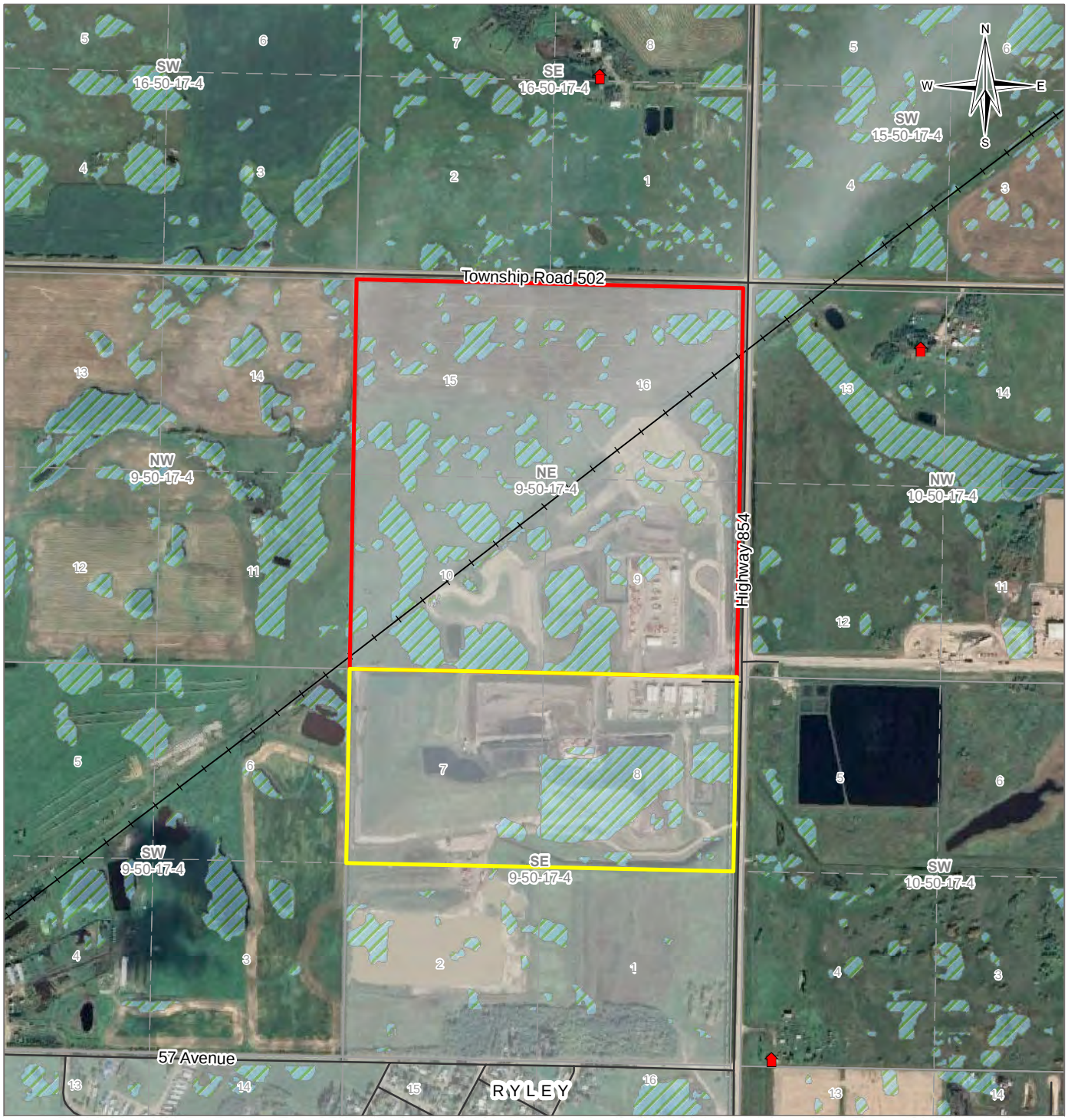

LEGEND

- Rural Residence
- Historical Railway Bed (Approximate Centreline)
- Road
- Existing Landfill Boundary
- Expansion Landfill Boundary
- Potential Wetland
- Town Boundary

NOTES
Base data source: Imagery provided by Google Earth, 2019
Alberta Merged Wetland Inventory, 2020
CanVec 1:50,000

STATUS
ISSUED FOR USE

2022 SOIL REMEDIATION REPORT
NE/SE 09-50-17 W4M

Project Footprint

PROJECTION UTM Zone 12			**DATUM** NAD83	**CLIENT** CleanHarbors
Scale: 1:12,000 — 200 100 0 200 Metres				TETRA TECH
FILE NO. SWOP04348-01_Figure02_PrjFootprint.mxd				
OFFICE Tt-VANC	**DWN** BB	**CKD** MS	**APVD** MF	**REV** 0
DATE March 8, 2023	**PROJECT NO.** SWM.SWOP04348-01			**Figure 2**

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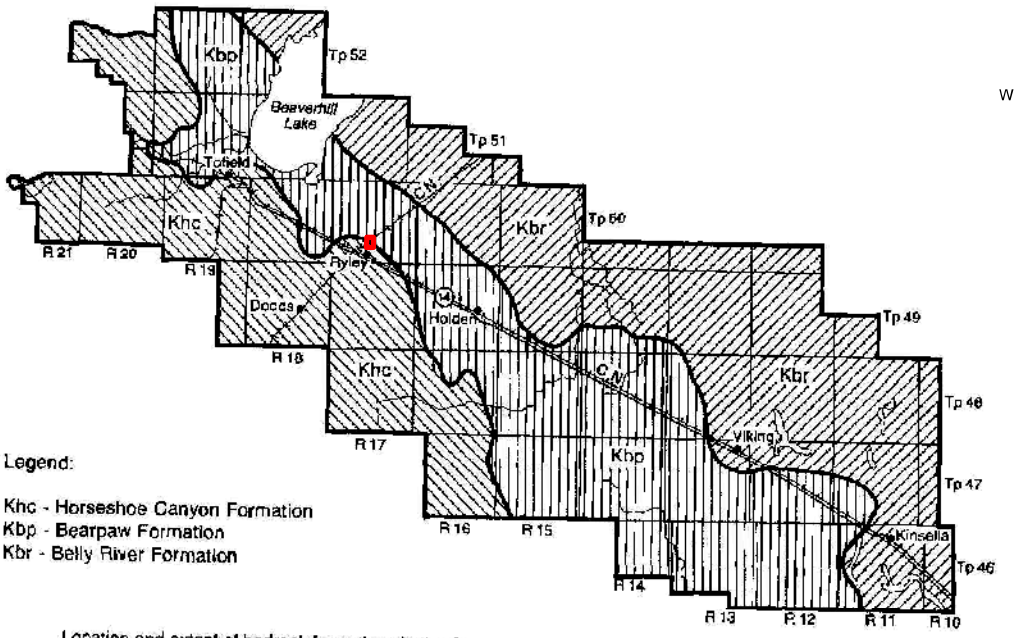
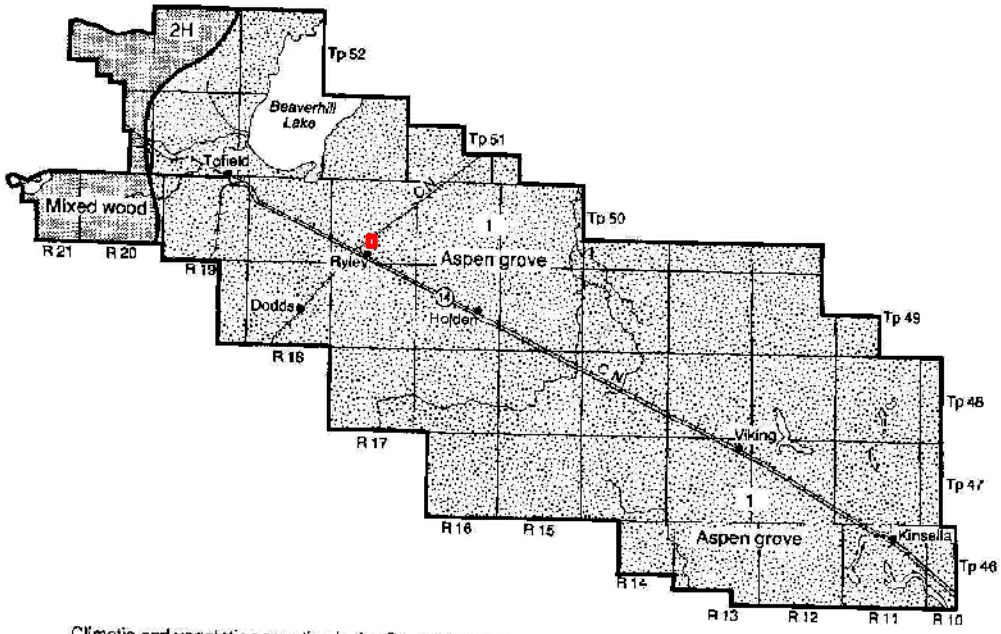


Location and extent of bedrock formations in the County of Beaver.



Climatic and vegetation zonation in the County of Beaver.

LEGEND

Project Footprint

NOTES

Base data source: Figures obtained from Alberta Soil Survey Report No. 47, 1988. Soil Survey of the County of Beaver, AB.

STATUS

ISSUED FOR USE

2022 SOIL REMEDIATION REPORT
NE/SE 09-50-17 W4M

Background Bedrock and Vegetation Information

PROJECTION UTM Zone 12			**DATUM** NAD83		**CLIENT** CleanHarbors
Scale: 1:875,000 10 5 0 10 Kilometres					
FILE NO. SWOP04348-01_Figure03_BedrockVeg.mxd					TETRA TECH
OFFICE Tt-VANC	**DWN** MRB	**CKD** SL	**APVD** MF	**REV** 0	**Figure 3**
DATE March 8, 2023	**PROJECT NO.** SWM.SWOP04348-01				

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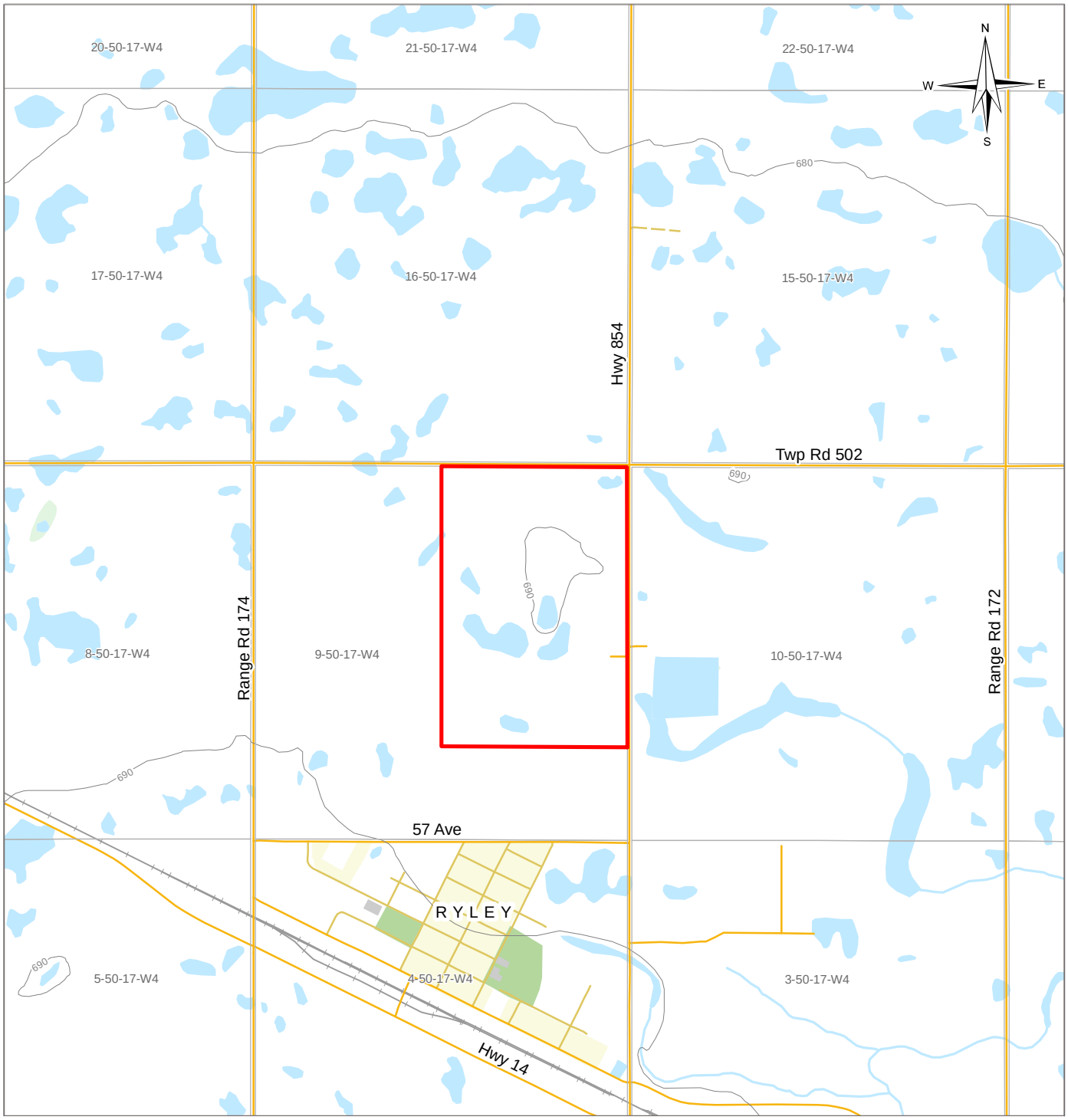

LEGEND

- Project Footprint
- Main Road
- Local Road
- Resource/Recreational Road
- Railway
- Building
- Park
- Residential Area
- Contour (10 m)
- Watercourse
- Waterbody
- Wooded Area

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

STATUS
ISSUED FOR USE

2022 SOIL REMEDIATION REPORT
NE/SE 09-50-17 W4M

Surface Waterbodies and Regional Topography

PROJECTION UTM Zone 12		**DATUM** NAD83		**CLIENT** CleanHarbors
Scale: 1:25,000 — 500 250 0 500 Metres				
FILE NO. SWOP04348-01_Figure04_SurfaceWater.mxd				TETRA TECH
OFFICE Tt-VANC	**DWN** MRB	**CKD** SL	**APVD** MF	**REV** 0
DATE March 8, 2023	**PROJECT NO.** SWM.SWOP04348-01			**Figure 4**

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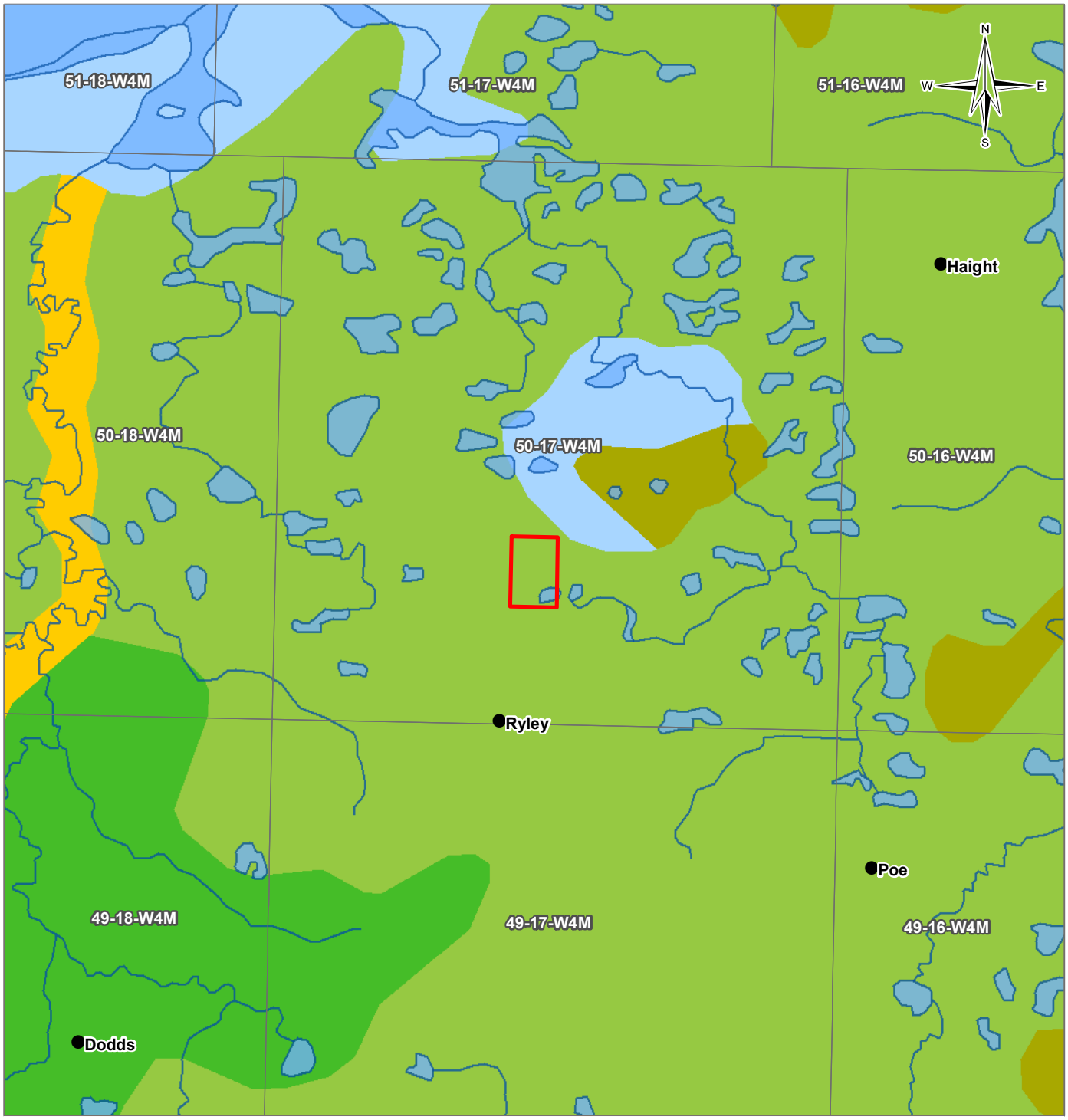

LEGEND

- Project Footprint
- Populated Place
- Watercourse
- Waterbody

Surficial Geology

- Glaciolacustrine Deposits
- Glaciofluvial Deposits
- Moraine
- Fluted Moraine
- Stagnant Ice Moraine

NOTES
Base data source: Map 601, Surficial Geology of Alberta, Alberta Geological Survey, 2013
CanVec 1:250,000

STATUS
ISSUED FOR USE

2022 SOIL REMEDIATION REPORT
NE/SE 09-50-17 W4M

Surficial Geology

PROJECTION	DATUM	CLIENT
UTM Zone 12	NAD83	CleanHarbors

Scale: 1:100,000
2 1 0 2
Kilometres

TETRA TECH

FILE NO. SWOP04348-01_Figure05_SurfGeo.mxd

OFFICE	DWN	CKD	APVD	REV
Tt-VANC	MRB	SL	MF	0

DATE March 8, 2023
PROJECT NO. SWM.SWOP04348-01

Figure 5

Q:\Vancouver\GIS\SOLID_WASTE\SWOP\SWOP04348-01\Maps\SWOP04348-01_Figure05_SurfGeo.mxd modified 2023-03-08 by megan.bums

Map Unit	Soil Group	Landform/Parent Material	Soil Composition
CMO 4	Camrose	Fine loamy brown till; undulating to slightly hummocky.	Mostly well-drained, Black Solonetic (Solodized Solonetz and Solod) soils but including some Chernozemic soils and some Gleyed subgroups.
CMO 5	Camrose	Fine loamy brown till; undulating to slightly hummocky with numerous scattered depresssions.	Mostly well-drained, Black Solonetzic (Solodized Solonetz and Solod) soils with poorly-drained Humic Gleysols in scattered depressions; also includes some Chernozemic soils and Gleyed subgroups.
CMO 7	Camrose	Mostly fine loamy brown till of variable thickness with some gray till at the surface; undulating to slightly hummocky with numerous scattered depressions.	Mostly well-drained, Black Solonetzic (Solodized Solonetz and Solod) soils with poorly-drained Humic Gleysols in scattered depressions; also includes some Chernozemic soils and Gleyed subgroups.
HGT 1	Haight	Fine clayey glaciolacustrine; level.	Poorly drained Humic Gleysols.
HGT 2	Haight	Fine clayey glaciolacustrine veneer of variable thickness with some till at the surface; undulating.	Poorly drained Humic Gleysols with some well and imperfectly drained Black Solonetzic and Chernozemic soils and some saline soils.
HGT 3	Haight	Fine clayey glaciolacustrine veneer; mapped in sinuous meltwater channels.	Poorly drained Humic Gleysols with some well and imperfectly drained Black Solonetzic and Chernozemic soils and some saline soils.

LEGEND

Project Footprint

NOTES
Base data source: Alberta Soil Survey Report No. 47, 1988. Soil Survey of the County of Beaver, Alberta

STATUS
ISSUED FOR USE

2022 SOIL REMEDIATION REPORT
NE/SE 09-50-17 W4M

Background Soil

PROJECTION UTM Zone 12			**DATUM** NAD83	**CLIENT** CleanHarbors
Scale: 1:40,000 500 250 0 500 Metres				TETRA TECH
FILE NO. SWOP04348-01_Figure06_Soil.mxd				
OFFICE Tt-VANC	**DWN** MRB	**CKD** SL	**APVD** MF	**REV** 0
DATE March 8, 2023	**PROJECT NO.** SWM.SWOP04348-01			**Figure 6**

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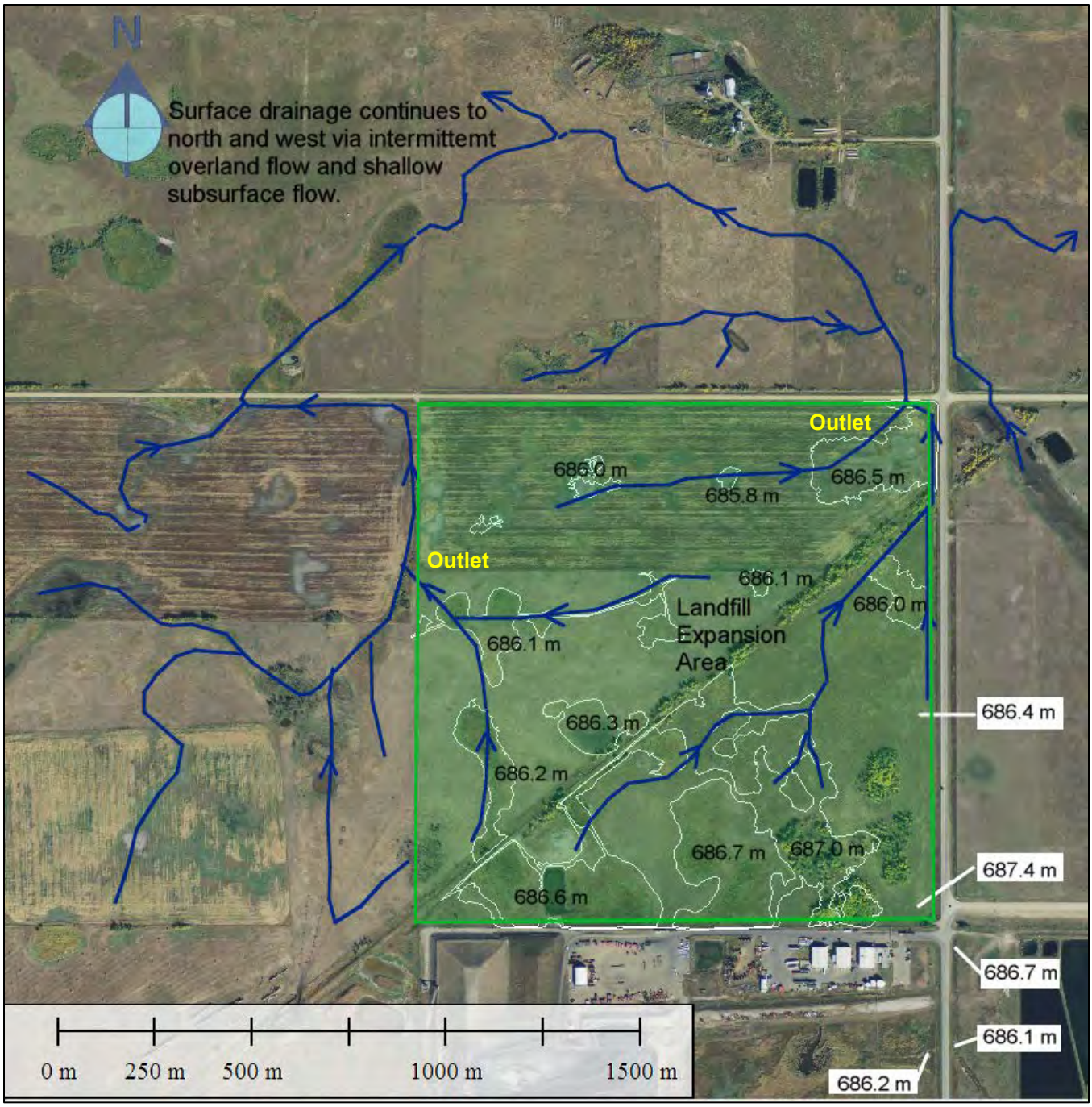


CLIENT

CleanHarbors

TETRA TECH

2022 SOIL REMEDIATION REPORT
NE/SE 09-50-17 W4M

Local Hydrology

PROJECT NO.	DWN	CKD	APVD	REV
SWM.SWOP04348-01				

OFFICE	DATE
Tt-VANC	March 8, 2023

Figure 7a

STATUS
ISSUED FOR USE

PROPERTY LINE

CELL 2

CELL 1

CELL 4

ACCESS RAMP

CELL 2 LEACHATE TANK

CELL 1 LEACHATE TANK

EL. 686.84

PROPERTY LINE

CELL 3A

CELL 3B

CELL 3C

CELL 3D

CELL 3E

RETENTION POND

PROPERTY LINE

EL. 685.90

CELL 3A LEACHATE PIPES

87.2 m

RUN-ON DIVERSION DITCH CENTRELINE

EL. 685.86

EL. 685.96

EL. 686.09

EL. 686.29

EL. 685.95

CELL 3B LEACHATE TANK

CELL 3C LEACHATE TANK

ACCESS ROAD

CELL 3D LEACHATE TANK

EL. 686.48

EL. 683.34

EL. 685.00

EL. 683.81

RUN-ON DIVERSION DITCH

RUN-OFF CONTROL DITCH

N

LEGEND:

- DRAINAGE DIRECTION

0 100 m

Scale: 1: 2 500

CLIENT

CleanHarbors

TETRA TECH

2022 SOIL REMEDIATION REPORT
NE/SE 09-50-17 W4M

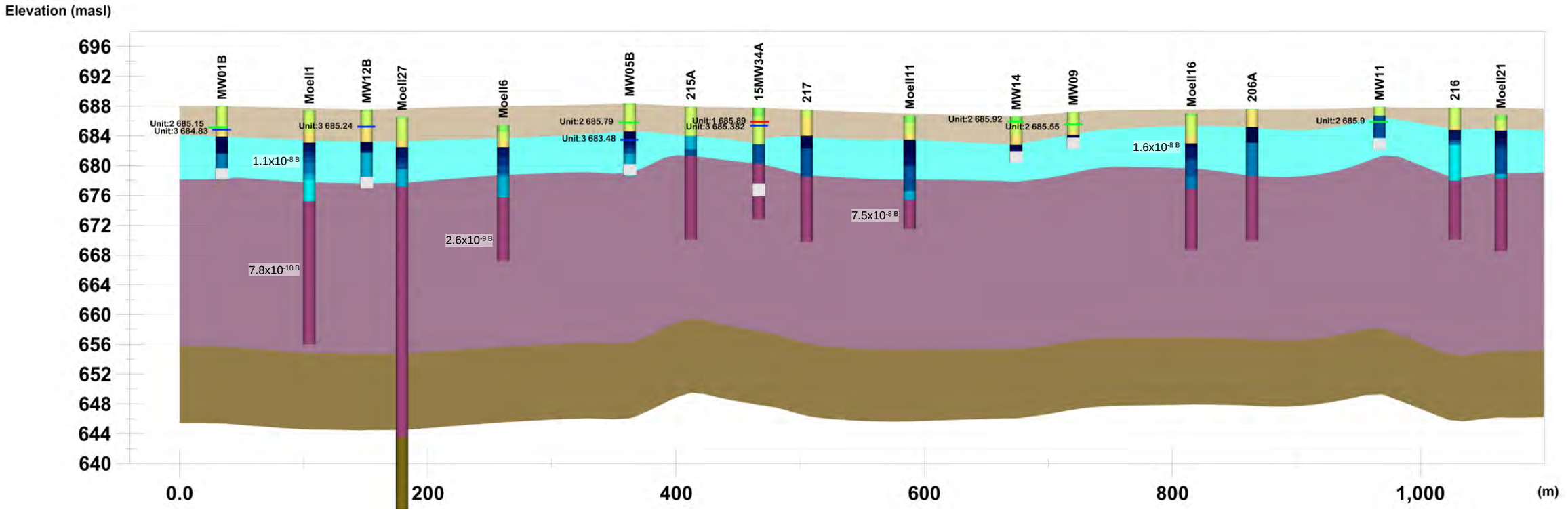
Surface Drainage

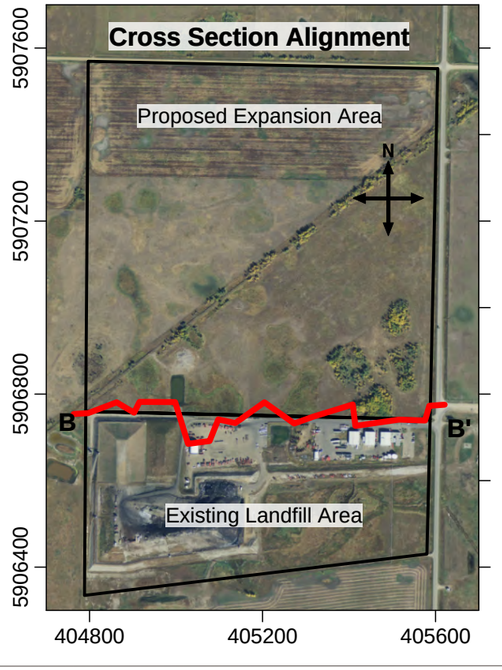
PROJECT NO.	DWN	CKD	REV
SWM.SWOP04348-01	MRB	MF	0
OFFICE: Tt-VANC	DATE: March 15, 2023		

Figure 7b

Q:\Edmonton\Drafting\PROJECTS\704-SWM.SWOP\SWM.SWOP04348-01\2022_SOIL_REMEDIATION\SWOP04348-01_Figure07b_SurfaceDrainage.dwg [FIGURE 7B] March 15, 2023 - 9:56:12 am (BY: BURNS, MEGAN)

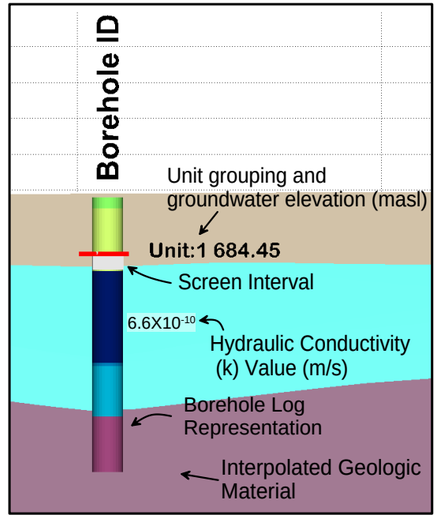
B — B'





Cross Section Guide

Glacial Drift — Surficial	Topsoil		Silt/Topsoil Material
	Till/Clay		
	Sand		Sand or weathered Sandstone
Bearspaw Formation — Upper Member	Sandstone		Brown-Blue, unconsolidated, medium grained
	Sandstone		Blue-Grey, Unconsolidated, Clay Bands.
	Sand		Argillaceous, V.fine, Dark Green, grades to shale.
	Shale		Dark brown to grey.
	Shale		Dark grey, thin sand interbeds.
	Sandstone		Unconsolidated, Grey, fine.
	Shale		Sandy, dark grey/brown.
Bearspaw Formation — Middle Shale Member	Shale		Fine, bentonite seams.
Belly River Formation — Lower Shale Member	Sandstone		Grey-green, siltstone and shale



The borehole representation are generalized material descriptions obtained through cross-referencing of multiple logs, created by several parties.
To facilitate consistent representation and interpolation between adjacent logs, materials have been grouped acording to detailed description.
For full log descriptions, properties,less common materials and distinctions between primary material types, please refer to the original logs. Geologic material was interpolated using 16 series borehole data only, drilled by Tt EBA in Feb/March, 2016.
A - K value obtained by Tetra Tech EBA, 2016.
B - K Value obtained by Moell and Associates, 1983.
Groundwater levels measured in June, 2016.

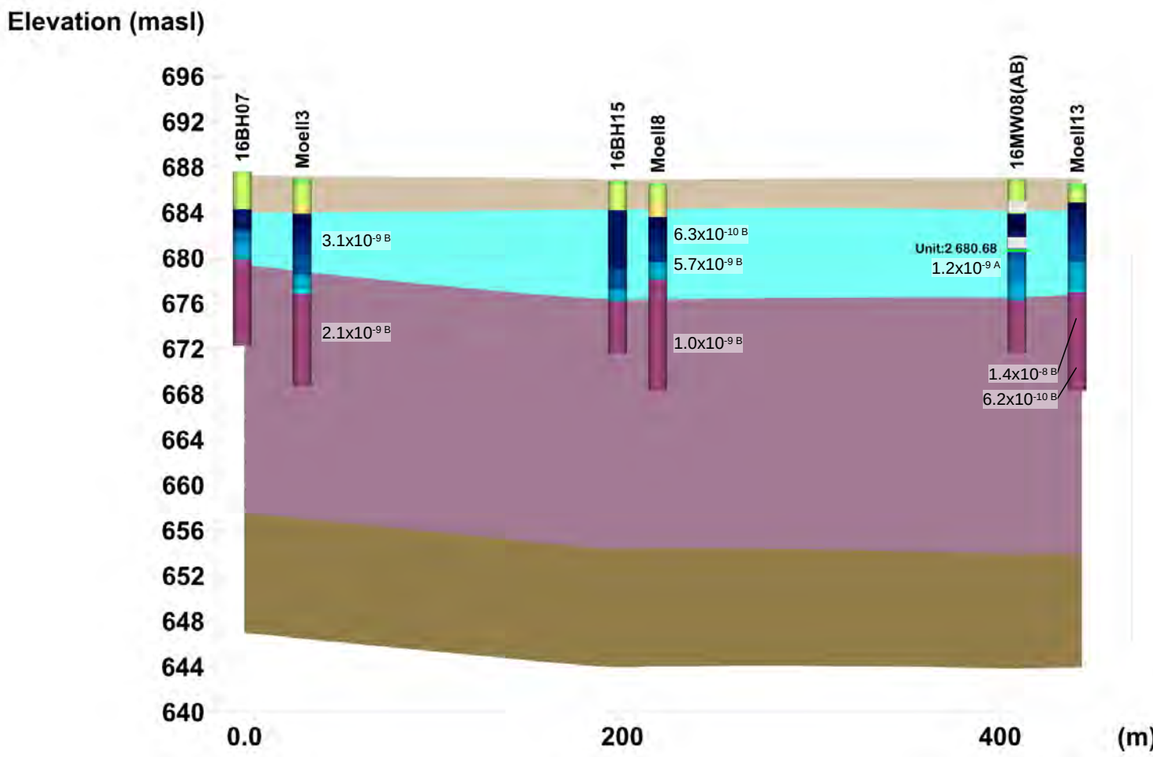
2022 SOIL REMEDIATION REPORT
NE/SE 09-50-17 W4M

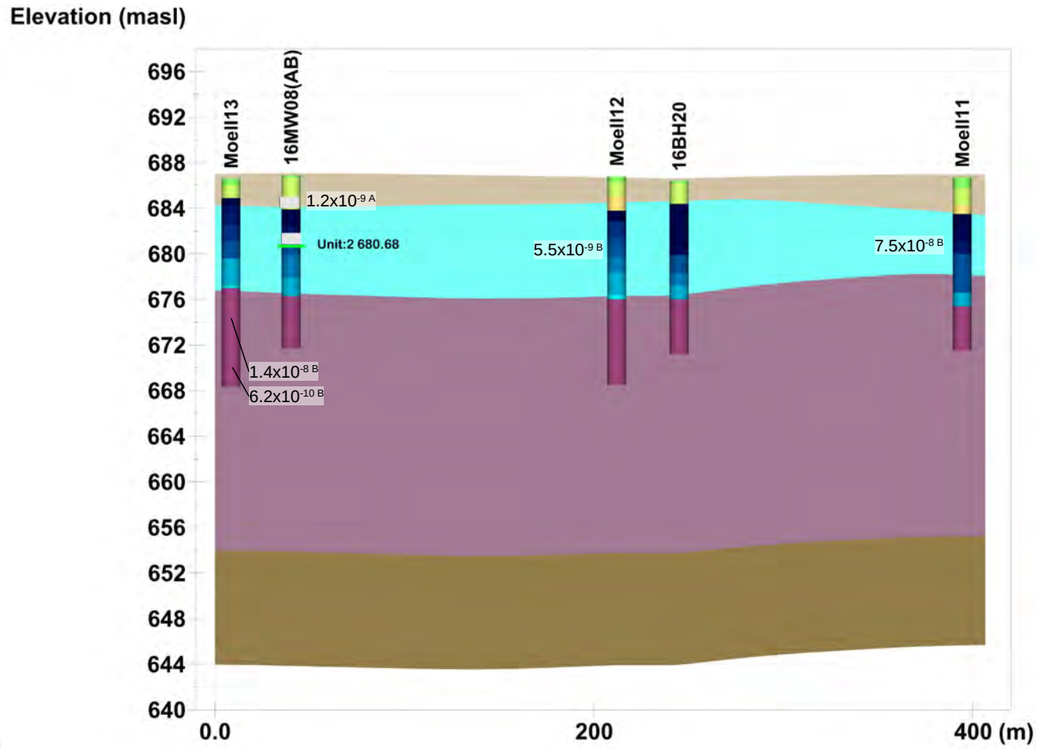
Cross Section B-B'

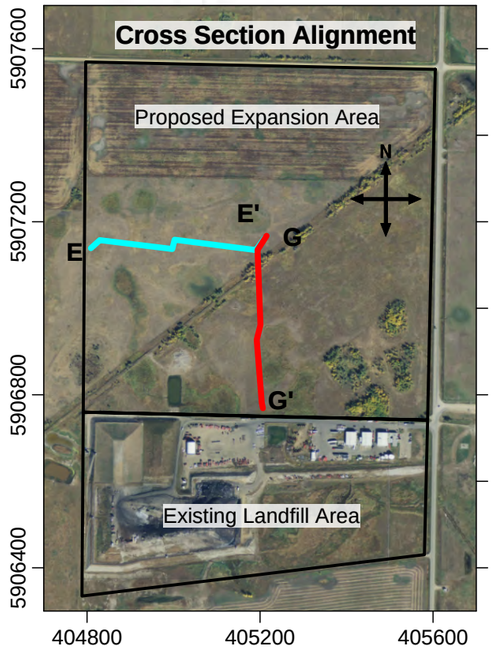
PROJECTION: UTM Zone 12	DATUM: NAD83				CLIENT: CleanHarbors
Vertical Exaggeration: 6X					TETRA TECH
FILE NO.: Figure08a - CrossSectionB-B'.srf					
PROJECT NO.: SWOP04348-01	DWN: CF	CKD: SB	APVD: MF	REV: 0	Figure 8a
OFFICE: Tt-VANC	DATE: March 8, 2023				

STATUS
ISSUED FOR USE

filepath :W:/Projects/CGY/78070/ENV/SWM03011-05/Data/Figure08b - CrossSectionB-B'.srf (06/12/2016)

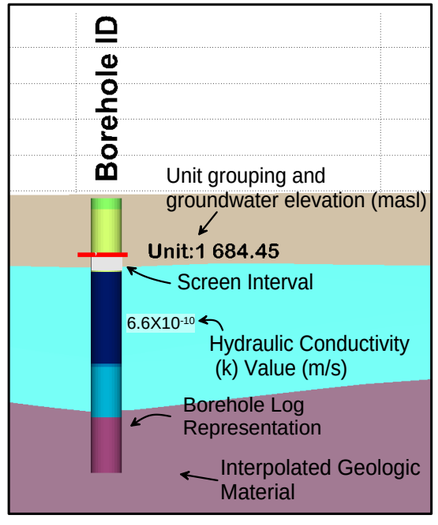






Cross Section Guide

Glacial Drift	Surficial	Topsoil	Silt/Topsoil Material
		Till/Clay	
		Sand	Sand or weathered Sandstone
Bearspaw Formation	Upper Member	Sandstone	Brown-Blue, unconsolidated, medium grained
		Sandstone	Blue-Grey, Unconsolidated, Clay Bands.
		Sand	Argillaceous, V.fine, Dark Green, grades to shale.
		Shale	Dark brown to grey.
		Shale	Dark grey, thin sand interbeds.
		Sandstone	Unconsolidated, Grey, fine.
		Shale	Sandy, dark grey/brown.
	Middle Shale Member	Shale	Fine, bentonite seams.
Belly River Formation	Lower Shale Member	Sandstone	Grey-green, siltstone and shale



The borehole representation are generalized material descriptions obtained through cross-referencing of multiple logs, created by several parties.
To facilitate consistent representation and interpolation between adjacent logs, materials have been grouped acording to detailed description.
For full log descriptions, properties,less common materials and distinctions between primary material types, please refer to the original logs. Geologic material was interpolated using 16 series borehole data only, drilled by Tt EBA in Feb/March, 2016.
A - K value obtained by Tetra Tech EBA, 2016.
B - K Value obtained by Moell and Associates, 1983.
Groundwater levels measured in June, 2016.

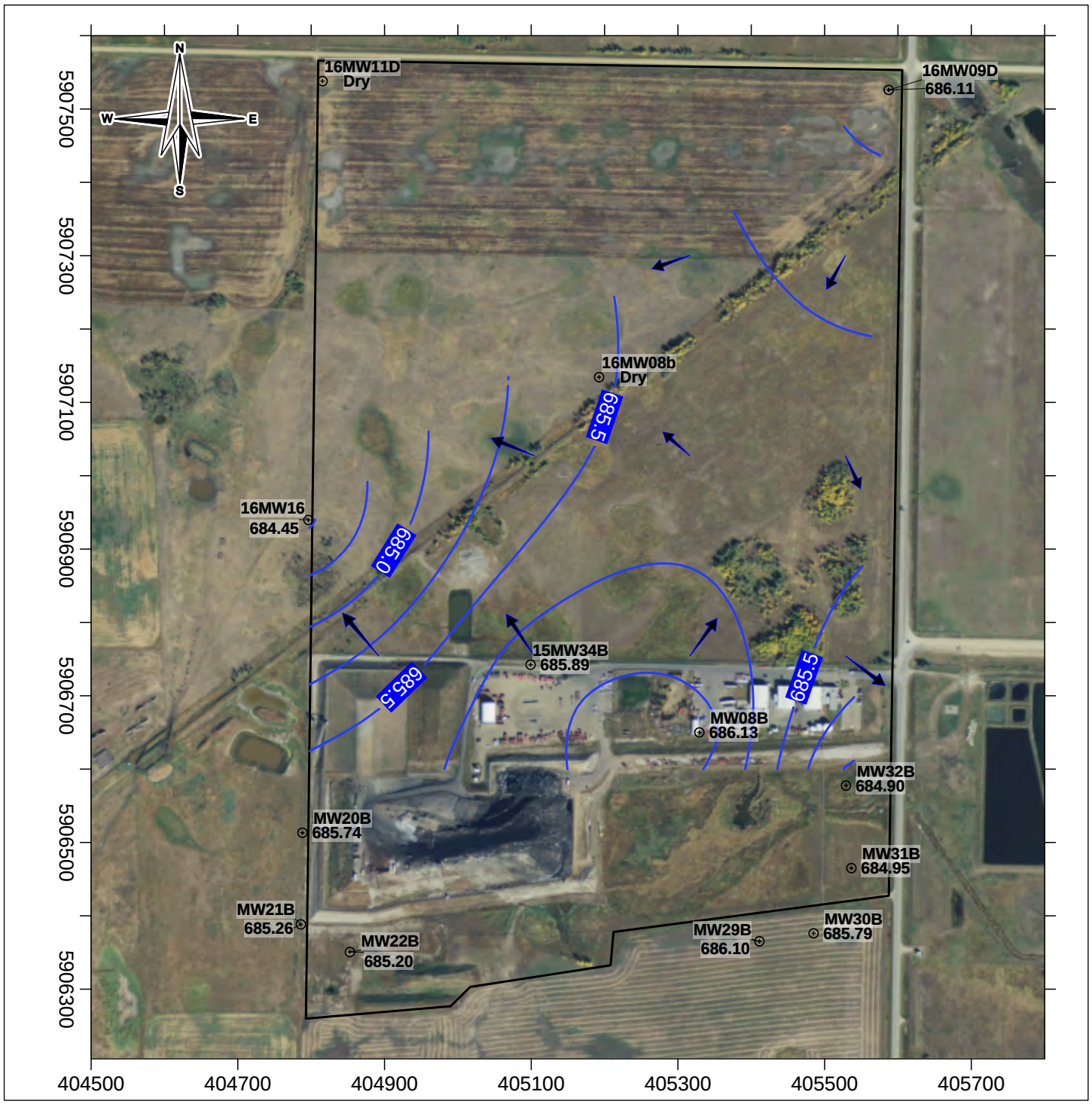
2022 SOIL REMEDIATION REPORT
NE/SE 09-50-17 W4M

Cross Section E-E' and G-G'

PROJECTION: UTM Zone 12	DATUM: NAD83			CLIENT: CleanHarbors
Vertical Exaggeration: 6X				TETRA TECH
FILE NO.: Figure08b - CrossSectionE-E'&G-G'.srf				
PROJECT NO.: SWOP04348-01	DWN: CF	CKD: SB	APVD: MF	REV: 0
OFFICE: Tt-VANC	DATE: March 8, 2023			Figure 8b

STATUS
ISSUED FOR USE

filepath :W:/Projects/CGY/78070/ENV/SWM03011-05/Data/Figure 08e - CrossSectionE&G.srf (06/12/2016)



LEGEND

- Monitoring Well
- 682 — Interpreted Elevation Contour
  Water levels measured 31/05/16-02/06/16
- Inferred Groundwater Flow Direction
- Approximate Site Boundary

Approximate Gradient
0.0000 0.0060

NOTES
Survey completed
June 2015 and July 2016

STATUS
ISSUED FOR USE

2022 SOIL REMEDIATION REPORT
NE/SE 09-50-17 W4M

Groundwater Elevation Contours
Surficial Material

PROJECTION	DATUM	CLIENT
UTM Zone 12	NAD83	CleanHarbors

0 50 100 150 200 250 300
Metres

TETRA TECH

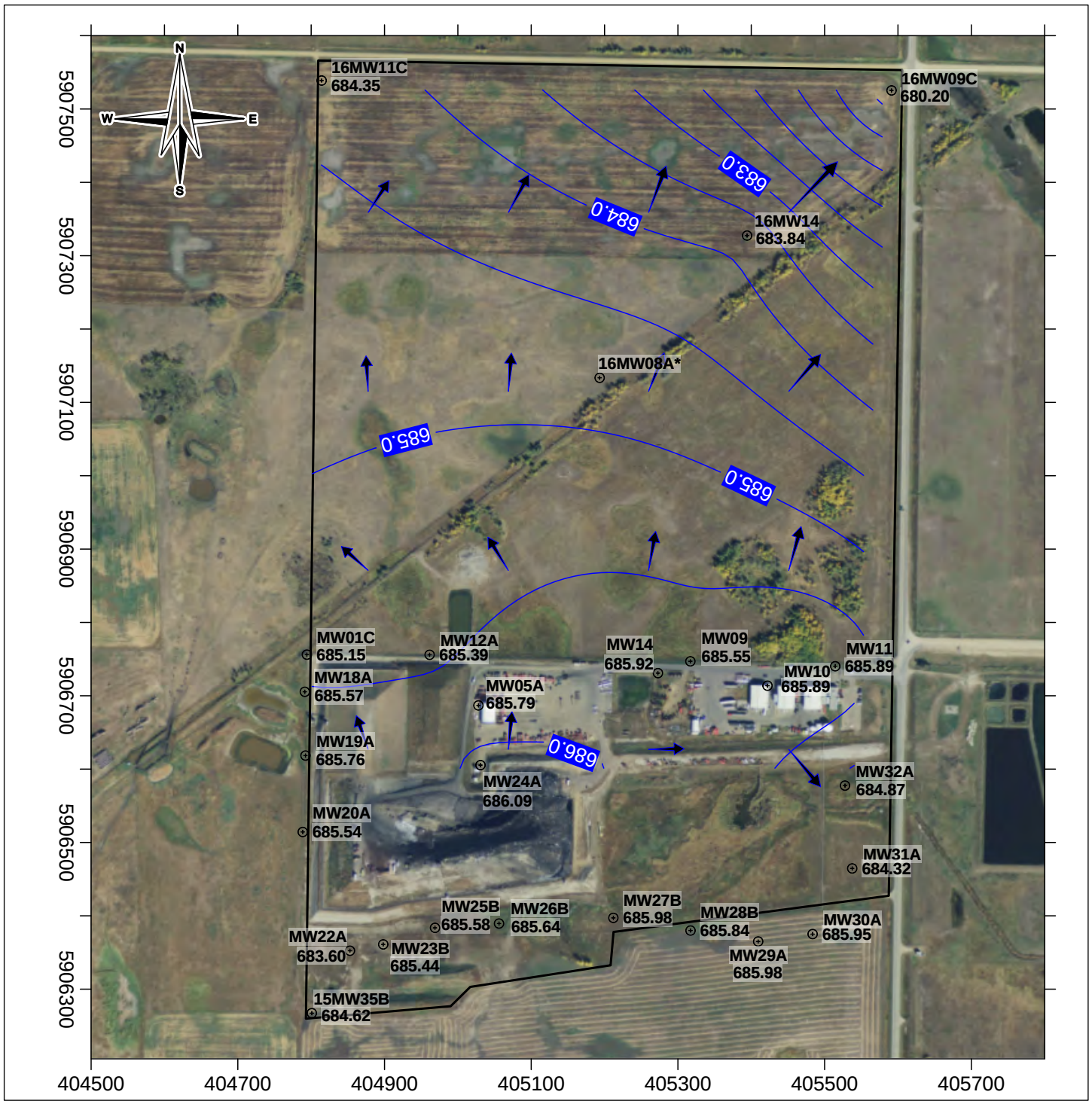
FILE NO.
Figure 09a - SurficialMaterial.srf

PROJECT NO.	DWN	CKD	APVD	REV
SWOP04348-01	CF	SB	MF	0

OFFICE	DATE
Tt-VANC	March 8, 2023

Figure 9a

filepath: filepath:W:/Projects/CGY/78070/ENV/SWM03011-05/Data/Surfer/Figure 9a - SurficialMaterial.srf (06/12/2016)



LEGEND

- Monitoring Well
- 682 — Interpreted Elevation Contour
  Water levels measured 31/05/16-02/06/16
- Inferred Groundwater Flow Direction
- Approximate Site Boundary

* Well not included in contours, refer to text discussion.

Approximate Gradient

0.0001 → 0.0132 →

NOTES
Survey completed
June 2015 and July 2016

STATUS
ISSUED FOR USE

2022 SOIL REMEDIATION REPORT
NE/SE 09-50-17 W4M

Groundwater Elevation Contours
Upper Bedrock Unit

PROJECTION	DATUM	CLIENT
UTM Zone 12	NAD83	CleanHarbors

0 50 100 150 200 250 300
Metres

TETRA TECH

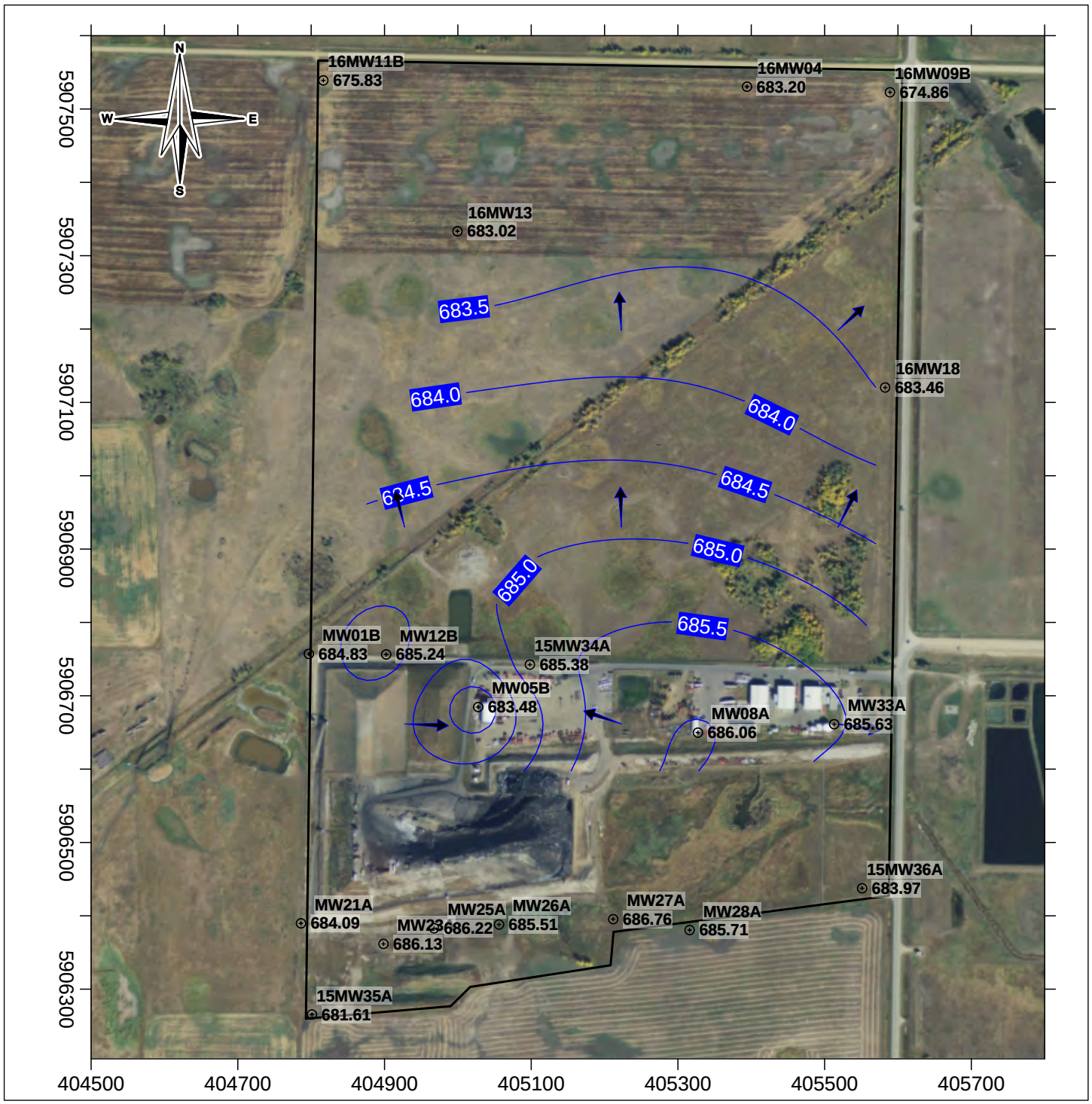
FILE NO.
Figure 9b - UpperBedrockUnit.srf

PROJECT NO.	DWN	CKD	APVD	REV
SWOP04348-01	CF	SB	MF	0

OFFICE	DATE
Tt-VANC	March 8, 2023

Figure 9b

filepath: filepath:W:/Projects/CGY/78070/ENV/SWM03011-05/Data/Surfer/Figure 9b - UpperBedrockUnit.srf (06/12/2016)



LEGEND

- Monitoring Well
- 682 — Interpreted Elevation Contour
  Water levels measured 31/05/16-02/06/16
- Inferred Groundwater Flow Direction
- Approximate Site Boundary

* Well not included in contours, refer to text discussion.

Approximate Gradient

0.0002 → 0.0214

NOTES
Survey completed
June 2015 and July 2016

STATUS
ISSUED FOR USE

2022 SOIL REMEDIATION REPORT
NE/SE 09-50-17 W4M

Groundwater Elevation Contours
Middle Bedrock Unit

PROJECTION	DATUM	CLIENT
UTM Zone 12	NAD83	CleanHarbors

0 50 100 150 200 250 300
Metres

TETRA TECH

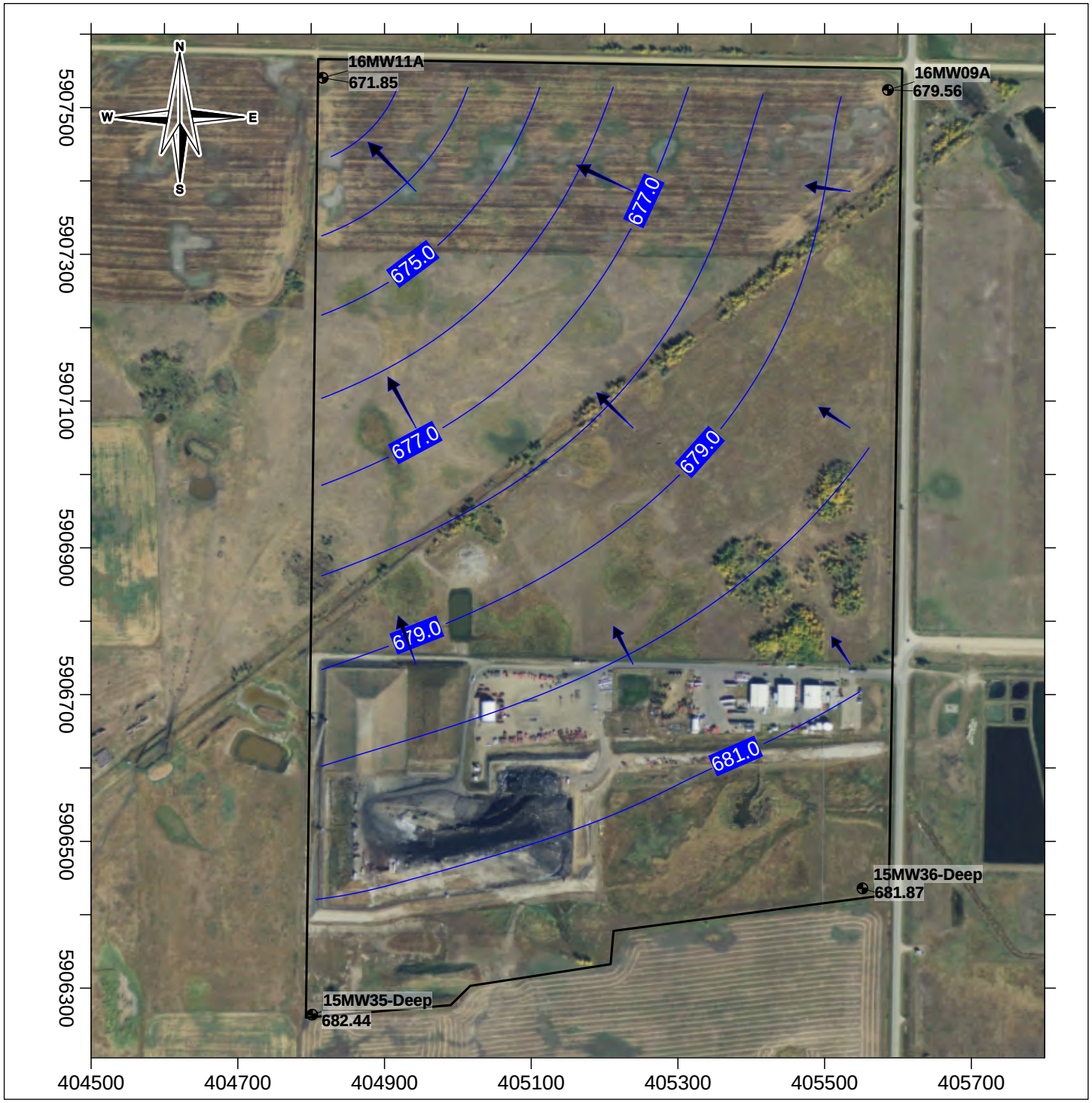
FILE NO.
Figure 9c - MiddleBedrockUnit.srf

PROJECT NO.	DWN	CKD	APVD	REV
SWOP04348-01	CF	SB	MF	0

OFFICE	DATE
Tt-VANC	March 8, 2023

Figure 9c

filepath: filepath:W:/Projects/CGY/78070/ENV/SWM03011-05/Data/Surfer/Figure 9c - MiddleBedrockUnit.srf (06/12/2016)



LEGEND

- Monitoring Well
- 682 — Interpreted Elevation Contour
  Water levels measured 31/05/16-02/06/16
- Inferred Groundwater Flow Direction
- Approximate Site Boundary

* Well not included in contours, refer to text discussion.

Approximate Gradient

0.004 → 0.012

NOTES
Survey completed
June 2015 and July 2016

STATUS
ISSUED FOR USE

2022 SOIL REMEDIATION REPORT
NE/SE 09-50-17 W4M

Groundwater Elevation Contours
Lower Bedrock Unit

PROJECTION	DATUM	CLIENT
UTM Zone 12	NAD83	CleanHarbors

0 50 100 150 200 250 300
Metres

TETRA TECH

FILE NO. Figure 9d - LowerBedrockUnit.srf

PROJECT NO.	DWN	CKD	APVD	REV
SWOP04348-01	CF	SB	MF	0

OFFICE	DATE
Tt-VANC	March 8, 2023

Figure 9d

filepath: filepath:W:/Projects/CGY/78070/ENV/SWM03011-05/Data/Surfer/Figure 9d - LowerBedrockUnit.srf (06/12/2016)

LEGEND

- Historical Background Sample

NOTES
Base data source: Imagery provided by Google Earth; Maxar (2019)

2022 SOIL REMEDIATION REPORT
NE/SE 09-50-17 W4M

Historical Background Sample Locations

PROJECTION UTM Zone 12			**DATUM** NAD83	**CLIENT** CleanHarbors
Scale: 1:6,000 100 50 0 100 Metres				TETRA TECH
FILE NO. SWOP04348-01_Figure10_HistSamples.mxd				
OFFICE Tt-VANC	**DWN** MRB	**CKD** SL	**APVD** MF	**REV** 0
DATE March 8, 2023	**PROJECT NO.** SWM.SWOP04348-01			**Figure 10**

Q:\Vancouver\GIS\SOLID_WASTE\SWOP\SWOP04348-01\Maps\SWOP04348-01_Figure10_HistSamples.mxd modified 2023-03-08 by megan.burns

404800 404900 405000 405100 405200 405300 405400 405500 405600 405700

5906700 5906600 5906500 5906400 5906300

19-16
19-10
19-8 0-15 cm
Molybdenum
Zinc
Naphthalene
Phenanthrene
19-8 15-30 cm
Molybdenum
Zinc
Naphthalene
19-8 30-60 cm
Molybdenum
Zinc
Chloride
19-8
19-6
19-6 0-15 cm
Cadmium
Lead
Molybdenum
Nickel
Zinc
Naphthalene
Phenanthrene
19-6 15-30 cm
Molybdenum
Zinc
19-6 30-60 cm
Cadmium
Lead
Molybdenum
Nickel
Zinc
Naphthalene
Chloride
19-6 60-100 cm
Naphthalene
19-4A
19-4B
19-4C
19-4
19-4D
19-4E
19-3A
19-3D
19-3B
19-3C
19-3
19-3 0-15 cm
Molybdenum
19-3A 0-15 cm
Cadmium
Chromium
Lead
Molybdenum
Nickel
Zinc
19-7
19-7 0-15 cm
Chloride
19-7 15-30 cm
Chloride
19-7 30-60 cm
Chloride
19-7 60-100 cm
Chloride
19-4 0-15 cm
Chloride
19-4 15-30 cm
Chloride
19-3B 0-15 cm
Cadmium
Chromium
Cobalt
Copper
Lead
Molybdenum
Nickel
Tin
Zinc
19-3B 15-30 cm
Molybdenum
19-14
19-4A 0-15 cm
Chloride
19-4A 15-30 cm
Chloride
19-4A 30-60 cm
Chloride
19-3D 0-15 cm
Cadmium
Chromium
Copper
Lead
Molybdenum
Nickel
Vanadium
Zinc
19-4C 15-30 cm
Chloride
19-4C 30-60 cm
Chloride
19-4C 60-100 cm
Chloride
19-15
19-4D 30-60 cm
Chloride
19-4E 0-15 cm
Chloride
19-4E 15-30 cm
Chloride
19-11
19-11 30-60 cm
Selenium
19-9
19-5
19-12
19-13
14-2
Hwy 854
N
W
E
S

LEGEND

- 2019 Sampling Location
- 2019 Sampling Location with Guideline Exceedence

NOTES
Base data source: Imagery provided by Google Earth; DigitalGlobe (2019)

2019 SOIL MONITORING PROGRAM RYLEY, ALBERTA

2019 Sampling Locations With Parameters Exceeding Guidelines

PROJECTION: UTM Zone 12	DATUM: NAD83	CLIENT: CleanHarbors			
Scale: 1:2,500 (50 25 0 50 Metres)		TETRA TECH			
FILE NO.: SWOP04076-02_Figure9.mxd					
OFFICE: Tt-EDM	DWN: MRV	CKD:	APVD: MF	REV: 0	Figure 11
DATE: January 2020	PROJECT NO.: SWM.SWOP04076-02				

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405000 405100 405200 405300 405400 405500

5906800 5906700 5906600

20-6 0-9 cm
Lead
Molybdenum
Zinc
Naphthalene
20-6 9-30 cm
Molybdenum
Zinc

20-6B 0-12 cm
Naphthalene
Phenathrene

20-6E 0-15 cm
Naphthalene
Phenathrene

20-8A 20-6A 20-8F 20-8E 20-6B 20-8D 20-8 20-8B 20-6 20-6C 20-6E 20-8C 20-6D

20-4.03A 60-100 cm
Chloride

20-4.04 20-4.05 20-4.06 20-4.09

20-4.03 20-30 cm
Chloride
20-4.03 30-60 cm
Chloride
20-4.03 60-100 cm
Chloride

20-8 15-30 cm
Molybdenum
Zinc
Naphthalene

20-8B 0-11 cm
Naphthalene

20-8F 0-15 cm
Naphthalene

20-6C 0-15 cm
Cadmium
Chromium
Copper
Lead
Molybdenum
Nickel
Tin
Vanadium
Zinc
Naphthalene
Phenathrene

20-3A 20-3B 20-3C 20-3D

20-4.03A 20-4.03 20-4.07 20-4.10

20-4.02A 20-4.02 20-4.08 20-4.11

20-4.02 60-100 cm
Chloride

20-4.01 20-4.01A

20-4.01 30-60 cm
Chloride
20-4.01 30-100 cm
Chloride

20-7.1 20-7.2 20-7.3 20-7.5

20-4.07 0-15 cm
Chloride
20-4.07 30-75 cm
Chloride
20-4.07 100-140 cm
Chloride

20-7.1 30-60 cm
Chloride
20-7.1 150-200 cm
pH

20-7.3 30-60 cm
pH

20-7.4

N W E S

LEGEND

- Approximate Extent of Chlorides Greater Than Typical Background Concentrations
- Approximate Extent of Metal Exceedences in Gravelled Area
- Approximate Extent of Metal and PAH Exceedences North of Cell 4

NOTES
Base data source: Imagery provided by Google Earth; DigitalGlobe (2019)

STATUS
ISSUED FOR USE

SOIL MANAGEMENT PROGRAM
RYLEY, ALBERTA

2020 Sampling Locations With Parameters Exceeding Guidelines

PROJECTION: UTM Zone 12	DATUM: NAD83				CLIENT: CleanHarbors
Scale: 1:1,600 (30 15 0 30 Metres)					TETRA TECH
FILE NO.: SWOP04348-01_Figure10 SMaP					
OFFICE: Tt-EDM	DWN	CKD	APVD: MF	REV: 1	Figure 12
DATE: March 2022	PROJECT NO.: SWM.SWOP04348-01				

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405150 405175 405200 405225 405250 405275 405300 405325 405350 405375 405400

5906800 5906775 5906750 5906725 5906700

N W E S

AR-CS16
Naphthalene

AR-CS14
IACR
Naphthalene
Phenanthrene

AR-CS4
Naphthalene
Phenanthrene

AR-CS7
Naphthalene

AR-CS22 AR-CS19 AR-CS21 AR-CS20 AR-CS16 AR-CS18 21-8 AR-CS15 AR-CS14 AR-CS13 AR-CS1 AR-CS2 AR-CS3 AR-CS4 AR-CS5 AR-CS6 AR-CS7 AR-CS8 AR-CS9 AR-CS10 AR-CS11

See Pit Boundary Inset

Cell 4

Pit Boundary Inset

21-6N
Naphthalene

21-6N
21-6W 21-6B 21-6E
21-6S

1 0.5 0 1m

LEGEND

- 2021 Sampling Location with No Guideline Exceedance
- 2021 Sampling Location with Guideline Exceedance
- Excavation Boundary
- Pit Boundary

NOTES
Base data source:
Imagery from Google Earth (2019)

STATUS
ISSUED FOR USE

2021 SOIL REMEDIATION REPORT RYLEY, ALBERTA

2021 Soil Remediation North of Cell 4 Around Boreholes 19-6 & 19-8

PROJECTION UTM Zone 12	**DATUM** NAD83			**CLIENT** CleanHarbors
Scale: 1:750 — 10 5 0 10 — Metres				TETRA TECH
FILE NO. SWOP04348-01_Figure11_SoilCell4.mxd				
OFFICE Tt-EDM	**DWN** DS	**CKD** SL	**APVD** BF	**REV** 0
DATE March 17, 2022	**PROJECT NO.** SWM.SWOP04348-01			**Figure 13**

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405150 405175 405200 405225 405250 405275 405300 405325 405350 405375 405400

5906800 5906775 5906750 5906725 5906700

N W E S

AR-CS22 22AR-CS18.N8 22-8.N9 AR-CS19 22AR-CS16.N6 22AR-CS15.N9 AR-CS14.N5 22AR-CS14.N10 22AR-CS13.N6 21-6N.N7 22-6N.N6 22AR-CS1.N7 22AR-CS2.N7 AR-CS2.N5 AR-CS3.N5 22AR-CS3.N7 AR-CS4.N7 22AR-CS4.N6 22AR-CS5.N9 22AR-CS6.N7 AR-CS7.N8 22AR-CS7.N7 22AR-CS8.N7 22AR-CS9.N7 AR-CS10.N4 22AR-CS10.N7 22AR-CS11.N7

AR-CS21 AR-CS20 22AR-CS18 22-8 22AR-CS16 22AR-CS15 22AR-CS14 22AR-CS13 22-6N 21-6S 22AR-CS1 22AR-CS2 22AR-CS3 22AR-CS4 22AR-CS5 22AR-CS6 22AR-CS7 22AR-CS8 22AR-CS9 22AR-CS10 22AR-CS11

Cell 4

405150 405175 405200 405225 405250 405275 405300 405325 405350 405375 405400

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LEGEND

- 2022 Sampling Location (No Guideline Exceedances)
- 2022 Excavation Boundary
- 2021 Excavation Boundary

NOTES
Base data source:
Imagery from Google Earth (2019)

STATUS
ISSUED FOR USE

2022 SOIL REMEDIATION REPORT NE/SE 09-50-17 W4M

2022 Soil Remediation North of Cell 4 Around Boreholes 19-6 & 19-8

PROJECTION UTM Zone 12		**DATUM** NAD83		**CLIENT** CleanHarbors
Scale: 1:750 — 10 5 0 10 Metres				TETRA TECH
FILE NO. SWOP04348-01_Figure14_SoilCell4.mxd				
OFFICE Tt-EDM	**DWN** MRB	**CKD** SL	**APVD** BF	**REV** 0
DATE March 21, 2023	**PROJECT NO.** SWM.SWOP04348-01			**Figure 14**

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

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

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

1.2 ALTERNATIVE DOCUMENT FORMAT

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.

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

1.3 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

EPEA APPROVAL NO. 10348-03-00

Alberta Environment and Parks

Operations
Regulatory Approvals Centre
5 Floor, South Petroleum Plaza
9915 – 108 Street
Edmonton, Alberta T5K 2G8
Telephone: (780) 427-6311
Fax: (780) 422-0154
www.aep.alberta.ca

April 19, 2017

Michael Parker
Vice President, Canadian Environmental Compliance
Clean Harbors Canada, Inc.
4090 Telfer Road RR#1
Corunna ON NON 1G0

Dear Mr. Parker:

Re: Ryley Hazardous Waste Storage Facility and Landfill
Application No. 014-10348

Your application for a renewal of an existing approval under the *Environmental Protection and Enhancement Act* (EPEA) has been reviewed and enclosed is Approval No. 10348-03-00.

It is your responsibility to obtain any approvals, permits or licences that are required from other agencies.

The Act may provide the approval holder a right of appeal against any term or condition contained in the approval to the Alberta Environmental Appeals Board. You should note that there are strict time lines for filing an appeal dependent on the type of appeal. If you choose to appeal, please contact the office of the Registrar of Appeals, Environmental Appeals Board of Alberta, 3rd Floor, 10011 - 109 Street, Edmonton, Alberta, T5J 3S8, telephone (780) 427-6207.

If you have any questions, please contact me at (780) 415-2201 in Edmonton.

Yours truly,

A Vawter

Annette Vawter
Application Coordinator

Enclosure

cc: Weiguo Wu, Red Deer/North Saskatchewan Region - Edmonton
cc: Tetra Tech EBA Inc.
Attention: J. Paul Ruffell

Alberta Environment and Parks

APPROVAL

PROVINCE OF ALBERTA

ENVIRONMENTAL PROTECTION AND ENHANCEMENT ACT
R.S.A. 2000, c.E-12, as amended.

APPROVAL NO. 10348-03-00

APPLICATION NO. 014-10348

EFFECTIVE DATE: March 31, 2017

EXPIRY DATE: March 31, 2027

APPROVAL HOLDER: Clean Harbors Canada, Inc.

ACTIVITY: **CONSTRUCTION, OPERATION AND RECLAMATION OF THE**

Ryley Industrial Waste Management Facility, consisting of a Class I and Class II Industrial Landfill and a Hazardous Waste/Recyclable Storage and Processing Facility,

IS SUBJECT TO THE ATTACHED TERMS AND CONDITIONS.

Designated Director under the Act .....
Mohammad Habib, P. Eng.

Date Signed March 31, 2017

TERMS AND CONDITIONS ATTACHED TO APPROVAL

PART 1: DEFINITIONS

SECTION 1.1: DEFINITIONS

1.1.1 All definitions from the Act and the regulations apply except where expressly defined in this approval.

1.1.2 In all PARTS of this approval:

(a) "Act" means the *Environmental Protection and Enhancement Act*, R.S.A. 2000, c.E-12, as amended;

(b) "action leakage rate" means the leakage rate that would occur through the primary liner, based on two holes per hectare, each with a diameter of 2 mm and that is calculated to be 790L/ha/day;

(c) "active landfill area" means the portion of the landfill that has received or is receiving waste for disposal, where final cover has not been placed, and includes areas that are being used for interim management of waste prior to disposition;

(d) "active landfill life" means the period of landfill life during which waste is received for disposal at the landfill, beginning with the initial receipt of waste and ending with the start of final landfill closure activities;

(e) "AER" means Alberta Energy Regulator;

(f) "affected lands" means lands which have received substances released from the facility;

(g) "air effluent stream" means any substance in a gaseous medium released by or from a facility;

(h) "APEGA" means the Association of Professional Engineers and Geoscientists of Alberta;

(i) "application" means the written submissions from the approval holder to the Director in respect of application No. 014-10348 and any subsequent applications where amendments are issued for this approval;

(j) "application No. 005-10348" means the written submissions from the approval holder to the Director in respect of renewal application No. 005-10348;

(k) "application No. 008-10348" means the written submissions from the approval holder to the Director in respect of amendment application No. 008-10348;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

(l) "application No. 012-10348" means the written submissions from the approval holder to the Director in respect of amendment application No. 012-10348;

(m) "as-built plans" means survey plans, signed and stamped by a professional registered with APEGA, that document variances from design or construction plans that were either approved or authorized according to the terms and conditions of this approval;

(n) "BTEX" means benzene, toluene, ethylbenzene and xylene;

(o) "COD" means Chemical Oxygen Demand;

(p) "composite liner" means a liner that meets the specifications in 3.1.2(b) of this approval;

(q) "container" means any portable device in which a substance is kept, including but not limited to the following:

(i) drums, barrels and pails which have a capacity greater than 18 litres but less than 210 litres,

(ii) 320 litre overpack drums, and

(iii) 1000 litre tote tanks or sacks;

(r) "cover" means soil or other approved material that is used to cover compacted wastes in a landfill cell;

(s) "day", when referring to sampling, means any sampling period of 24 consecutive hours;

(t) "decommissioning" means the dismantling and decontamination of the facility undertaken subsequent to the termination or abandonment of any activity or any part of any activity regulated under the Act, excluding the landfill cells and those infrastructure components and facilities that are required for the landfill post-closure;

(u) "decontamination" means the treatment or removal of substances from the facility and affected lands;

(v) "Director" means an employee of the Government of Alberta designated as a Director under the Act;

(w) "dismantling" means the removal of buildings, structures, process and pollution abatement equipment, vessels, storage facilities, material handling

TERMS AND CONDITIONS ATTACHED TO APPROVAL

facilities, railways, roadways, pipelines and any other installations that are being or have been used or held for or in connection with the facility;

(x) "DOC" means Dissolved Organic Carbon;

(y) "domestic wastewater" means wastewater that is the composite of liquid and water-carried wastes associated with the use of water for drinking, cooking, cleaning, washing, hygiene, sanitation or other domestic purposes, together with any infiltration and inflow wastewater, that is released into a wastewater collection system;

(z) "domestic wastewater system" means the parts of the facility that collect, store, or treat domestic wastewater from the facility;

(aa) "existing landfill cells" means Cell 1, Cell 2, Cell 3A, Cell 3B, and Cell 3C as described in application No. 005-10348;

(bb) "facility" means all buildings, structures, process and pollution abatement equipment, vessels, storage facilities, material handling facilities, roadways, railways, pipelines and other installations, the Class I and Class II industrial landfill and the HWRSP Facility, and includes the land, located on the SE 1/4 of Section 9, Township 50, Range 17, West of the 4th Meridian, that is being or has been used or held for or in connection with the Ryley Industrial Waste Management Facility;

(cc) "facility developed area" means the areas of the facility used for the storage, treatment, processing, transport, or handling of raw material, intermediate product, by-product, finished product, process chemicals, or waste material, and includes the active landfill area;

(dd) "final cover" means a designed system, natural or man-made, that is placed on the surface of a landfill or landfill cell that has reached its maximum designated waste elevation to control transmission of moisture and landfill gas, and conforms to the end use plan;

(ee) "final landfill closure" means the period of time when waste is no longer placed in the defined portion of a landfill and activities are undertaken to complete the final cover system and decommission components and facilities that are no longer required, and includes the construction of any additional components or monitoring systems that are necessary for post-closure;

(ff) "free liquids" means the liquids as determined by the US EPA SW-846 Test Method 9095B: Paint Filter Liquids Test, as specified in Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, US EPA Publication No. SW-846, as amended;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

(gg) "fugitive emissions" means emissions of substances to the atmosphere other than ozone depleting substances, originating from a facility source other than a flue, vent, or stack but does not include sources which may occur due to breaks or ruptures in process equipment;

(hh) "GCL" means geosynthetic clay liner that is made of a thin layer of bentonite either bonded to a geomembrane or fixed between two sheets of geotextile;

(ii) "geomembrane" means a sheet of manufactured synthetic material designed to control migration of liquid and gas;

(jj) "grab sample" means an individual sample collected in less than 30 minutes and which is representative of the substance sampled;

(kk) "groundwater" means groundwater as defined in the *Water Act,* R.S.A. 2000, c.W-3, as amended;

(ll) "groundwater monitoring well" means a well drilled at a site to measure groundwater levels and collect groundwater samples for the purpose of physical, chemical, or biological analysis to determine the concentration of groundwater constituents;

(mm) "HDPE" means High Density Polyethylene;

(nn) "HWRSP Facility" means the Hazardous Waste/Recyclable Storage and Processing Facility as described in the application for storage, processing and transfer of hazardous wastes and hazardous recyclables and which includes the Maintenance Shop, and is an integral part of the facility;

(oo) "hydraulic conductivity" means the ease with which water can be transported through a material

(pp) "hydrocarbon" means a chemical compound that consists entirely of hydrogen and carbon;

(qq) "ISO/IEC 17025" means the international standard, developed and published by International Organization for Standardization (ISO), specifying management and technical requirements for laboratories;

(rr) "incompatible waste" means waste materials which could cause dangerous reactions from direct contact with one another;

(ss) "industrial wastewater" means the composite of liquid wastes and water-carried wastes, any portion of which results from any industrial process carried on at the HWRSP Facility;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

(tt) "landfill" means the Class I and Class II industrial landfill as described in the application and which includes the waste stabilization area, and is an integral part of the facility;

(uu) "landfill cell" means a designed area of a landfill comprised of an excavation or earthen structure in which waste is enclosed;

(vv) "landfill cell closure" means the construction of a final cover for landfill cell including placement of previously conserved top soil and upper subsoil and re-vegetation as required for the intended future use of the landfill;

(ww) "landfill gas" means a mixture of gases generated by the microbial decomposition of and chemical reactions between wastes in a landfill;

(xx) "lateral expansion" means an expansion of landfill cell boundaries beyond the approved area;

(yy) "leachate" means a liquid that has been in contact with waste in the landfill cell and has undergone chemical or physical changes;

(zz) "leachate collection system" means a system that gathers leachate so that it may be removed from a landfill, and includes a permeable drainage material, a network of perforated pipes and sumps or manholes from where leachate can be removed;

(aaa) "leak detection liquid" means any liquid collected within the leak detection system;

(bbb) "leak detection system" means a system that gathers liquid between a primary liner and a secondary liner system, and consists of a permeable drainage material, a network of perforated pipes and sumps or manholes from where the liquid can be removed;

(ccc) "liner" means a continuous layer of synthetic material or compacted natural clay placed beneath and at the sides of a landfill cell that is compatible with the waste and restricts the migration of leachate, or landfill gas, or both;

(ddd) "local environmental authority" means the Department of Environment and Parks, in the Province of Alberta, or the agency that has the equivalent responsibilities for any jurisdiction outside the Province;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

(eee) "major ions" means the following:

Calcium	Carbonate
Magnesium	Bicarbonate
Sodium	Chloride
Potassium	Sulfate

(fff) "maximum acceptable leachate head" means the maximum depth of leachate above the lowest part of the primary liner, not including the sumps or leachate collection pipe trenches, and is:

(i) 1.0 m in each of the existing landfill cells, and

(ii) 0.3 m in each of the new landfill cells

during active landfill life, landfill cell closure, final landfill closure, and post-closure;

(ggg) "maximum designated waste elevation" means the maximum elevation of waste in metres above sea level that can be disposed of at the landfill prior to construction of final cover, and is 714 metres;

(hhh) "metals" means the following:

Aluminum, dissolved	Chromium, dissolved (hexavalent)	Nickel, dissolved
Antimony, dissolved	Cobalt, dissolved	Selenium, dissolved
Arsenic, dissolved	Copper, dissolved	Silver, dissolved
Barium, dissolved	Lead, dissolved	Thallium, dissolved
Boron, dissolved	Manganese, dissolved	Tin, dissolved
Cadmium, dissolved	Mercury, total	Uranium, dissolved
Chromium, total	Molybdenum, dissolved	Zinc, dissolved

(iii) "monitoring system" means all equipment used for sampling, conditioning, analyzing or recording data in respect of any parameter listed or referred to in this approval, including equipment used for continuous monitoring;

(jjj) "month" means calendar month;

(kkk) "municipal solid waste" means solid waste resulting from or incidental to municipal, community, commercial, institutional and recreation activities, and includes garbage, rubbish, ashes, street cleanings, abandoned automobiles and all other solid wastes except hazardous waste, industrial solid waste, oilfield waste and biomedical wastes;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

(lll) "new landfill cells" means Cell 3D as described in application No. 005-10348, Cell 3E as described in application No. 012-10348, and Cell 4 as described in the application;

(mmm) "new surface water detention pond" means the surface water detention pond as described in application No. 012-10348;

(nnn) "NORM" means Naturally Occurring Radioactive Materials;

(ooo) "NORM waste" means any waste material with concentrations of NORM above the limits specified in Tables 5.1, 5.2, or 5.3 of the *Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials (NORM)*, Health Canada, 2011, as amended;

(ppp) "nutrients" means the following:

Ammonia nitrogen	Nitrite nitrogen
Total Kjeldahl nitrogen	Total phosphorus
Nitrate nitrogen	Dissolved phosphorus

(qqq) "old surface water detention pond" means the surface water detention pond as described in application No. 005-10348;

(rrr) "Petroleum Hydrocarbons Fractions F1 and F2" means the specific hydrocarbon fraction measured by the analytical methods described in the *Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method,* published by the Canadian Council of Ministers of the Environment, 2001, as amended;

(sss) "points of compliance" means the location or locations of the groundwater monitoring wells where measurements of groundwater quality are taken to assess landfill and waste treatment performance;

(ttt) "post-closure" means the period of time after completion of the final landfill closure;

(uuu) "ppm" means concentration in parts per million;

(vvv) "primary liner" means the uppermost geomembrane liner;

(www) "QA/QC" means quality assurance and quality control;

(xxx) "quarter year" means a time period of three consecutive months designated as January, February and March; or April, May and June; or July, August and September; or October, November and December;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

(yyy) "regulations" means the regulations enacted pursuant to the Act, as amended;

(zzz) "representative grab" means a sample consisting of equal volume portions of water collected from at least four sites between 0.20 to 0.30 metres below the water surface within a pond;

(aaaa) "runoff" means any rainwater or melt water that drains as surface flow from the facility developed areas, excluding leachate;

(bbbb) "runoff control system" means the parts of the facility that collect, store or treat runoff from the facility, and includes but is not limited to runoff collection ditches, surface water detention pond(s) and tank farm bermed area;

(cccc) "run-on" means any rainwater or melt water that drains as surface flow toward the active landfill area;

(dddd) "run-on control system" means the parts of the facility that divert run-on away from the active landfill area;

(eeee) "scrubber exhaust stack" means the exhaust stack through which the air effluent streams that are:

(i) collected from the exhaust vents of the Drum Processing Building or Staging Building or both, and

(ii) treated with the caustic scrubber and activated carbon filter

are released to the atmosphere as described in the application;

(ffff) "secondary liner" means the lowermost geomembrane liner;

(gggg) "soil" means mineral or organic earthen materials that can, have, or are being altered by weathering, biological processes, or human activity;

(hhhh) "SOP" means Standard Operating Procedures;

(iiii) "storm event" means a 1 in 25 year, 24 hour duration rainfall event at Ryley, Alberta;

(jjjj) "tank" means a stationary device, designed to contain an accumulation of a substance, which is constructed primarily of non-earthen materials that provide structural support including wood, concrete, steel, and plastic;

(kkkk) "TDGR" means the *Transportation of Dangerous Goods Regulations* (SOR/2001-286) made under the *Transportation of Dangerous Goods Act*, 1992 (Canada), as amended;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

(llll) "TDS" means Total Dissolved Solids;

(mmmm) "topsoil" means the uppermost layer of soil and consists of:

(i) the A-horizons and all organic horizons as defined in *The Canadian System of Soil Classification* (Third Edition), Agriculture and Agri-Food Canada, Publication 1646, 1998, as amended, and

(ii) the soil ordinarily moved during tillage;

(nnnn) "TSS" means Total Suspended Solids;

(oooo) "upper subsoil" means the layer of soil directly below the topsoil layer that consists of the B-horizons as defined in *The Canadian System of Soil Classification,* (Third Edition), Agriculture and Agri-Food Canada, Publication 1646, 1998, as amended;

(pppp) "volume estimate" means a technical evaluation based on the sources contributing to the release including but not limited to pump capabilities, water meters, and batch release volumes;

(qqqq) "waste stabilization area" means the portion of the landfill that is used for waste stabilization or solidification or both, as described in application no. 008-10348;

(rrrr) "waste storage area" means the areas designated for storage of containers for waste or hazardous recyclable or both, or for storage of tanks for waste or hazardous recyclable or both, or for storage of both, as described in application No. 005-10348;

(ssss) "week" means any consecutive 7-day period;

(tttt) "working face" means that portion of the active landfill area where waste is currently being deposited, spread and compacted; and

(uuuu) "year" means calendar year.

PART 2: GENERAL

SECTION 2.1: REPORTING

2.1.1 The approval holder shall immediately report to the Director by telephone any contravention of the terms and conditions of this approval at 1-780-422-4505.

2.1.2 The approval holder shall submit a written report to the Director within 7 days of the reporting pursuant to 2.1.1.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

2.1.3 The approval holder shall immediately notify the Director in writing if any of the following events occurs:

(a) the approval holder is served with a petition into bankruptcy;

(b) the approval holder files an assignment in bankruptcy or Notice of Intent to make a proposal;

(c) a receiver or receiver-manager is appointed;

(d) an application for protection from creditors is filed for the benefit of the approval holder under any creditor protection legislation; or

(e) any of the assets which are the subject matter of this approval are seized for any reason.

2.1.4 If the approval holder monitors for any substances or parameters which are the subject of operational limits as set out in this approval more frequently than is required and uses procedures authorized in this approval, then the approval holder shall provide the results of such monitoring as an addendum to the reports required by this approval.

2.1.5 The approval holder shall submit all monthly reports required by this approval to be compiled or submitted to the Director on or before the end of the month following the month in which the information was collected, unless otherwise specified in this approval.

2.1.6 The approval holder shall submit all annual reports required by this approval to be compiled or submitted to the Director on or before March 31 of the year following the year in which the information was collected, unless otherwise specified in this approval.

SECTION 2.2: RECORD KEEPING

2.2.1 The approval holder shall:

(a) record; and

(b) retain

all the following information in respect of any sampling conducted or analyses performed in accordance with this approval for a minimum of ten years, unless otherwise authorized in writing by the Director:

(i) the place, date and time of sampling,

(ii) sample type,

TERMS AND CONDITIONS ATTACHED TO APPROVAL

(iii) the dates the analyses were performed,

(iv) the analytical techniques, methods or procedures used in the analyses,

(v) the names of the persons who collected and analysed each sample, and

(vi) the results of the analyses.

2.2.2 The approval holder shall keep and maintain an Operating Record of the landfill as per 4.6.34(a) until the end of the landfill post-closure.

2.2.3 The Operating Record referred to in 2.2.2 shall include, at a minimum, all of the following information:

(a) the information required in section 7.3(c) of the *Standards for Landfills in Alberta*, as amended;

(b) the name and contact information of all persons who discover any contravention;

(c) the names and contact information of all persons who take any remedial actions arising from the contravention of the Act, the regulations, or this approval; and

(d) a description of the remedial measures taken in respect of a contravention of the Act, the regulations, or this approval.

2.2.4 The approval holder shall submit a copy of the most recent Operating Record to the Director upon written request from the Director within the timeline specified in writing by the Director.

SECTION 2.3: ANALYTICAL REQUIREMENTS

2.3.1 With respect to any sample required to be taken pursuant to this approval, the approval holder shall ensure that:

(a) collection;

(b) preservation;

(c) storage;

(d) handling; and

(e) analysis

TERMS AND CONDITIONS ATTACHED TO APPROVAL

shall be conducted in accordance with the following unless otherwise authorized in writing by the Director:

(i) for air:

(A) the *Alberta Stack Sampling Code*, Alberta Environment, 1995, as amended,

(B) the *Methods Manual for Chemical Analysis of Atmospheric Pollutants*, Alberta Environment, 1993, as amended, and

(C) the *Air Monitoring Directive*, Alberta Environment, 1989, as amended;

(ii) for industrial wastewater, industrial runoff, groundwater and domestic wastewater:

(A) the *Standard Methods for the Examination of Water and Wastewater*, published jointly by the American Public Health Association, American Water Works Association, and the Water Environment Federation, 1998, as amended;

(iii) for whole effluent toxicity tests:

(A) the *Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout*, Environment Canada, Environmental Protection Series 1/RM/13, December 2000, as amended,

(B) the *Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Daphnia Magna*, Environment Canada, Environmental Protection Series 1/RM/14, December 2000, as amended,

(C) the *Biological Test Method: Growth Inhibition Test Using the Freshwater Alga Selenastrum capricornutum*, Environment Canada, Environmental Protection Series, November 1992, as amended,

(D) the *Biological Test Method: Test of Reproduction and Survival Using the Cladoceran Ceriodaphnia dubia*, Environment Canada, Environmental Protection Series 1/RM/21, February 1992, as amended,

(E) the *Biological Test Method: Test of Larval Growth and Survival Using Fathead Minnows*, Environment Canada,

TERMS AND CONDITIONS ATTACHED TO APPROVAL

Environmental Protection Series 1/RM/22, February 1992, as amended, and

(F) the *Biological Test Method: Toxicity Test Using Luminescent Bacteria (Photobacterium phosphoreum)*, Environment Canada, Environmental Protection Series, 1/RM/24, November 1992, as amended;

(iv) for soil:

(A) the *Soil Monitoring Directive,* Alberta Environment, May 2009, as amended, and

(B) the *Soil Quality Criteria Relative to Disturbance and Reclamation*, Alberta Agriculture, March 1987, as amended; and

(v) for waste:

(A) the *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, USEPA, SW-846, September 1986, as amended,

(B) the *Methods Manual for Chemical Analysis of Water and Wastes*, Alberta Environmental Centre, Vegreville, Alberta, 1996, AECV96-M1, as amended,

(C) the *Toxicity Characteristic Leaching Procedure (TCLP)* USEPA Regulation 40 CFR261, Appendix II, Method No. 1311, as amended, or

(D) the *Standard Methods for the Examination of Water and Wastewater*, American Public Health Association, American Water Works Association, and the Water Environment Federation, 2010, as amended.

2.3.2 The approval holder shall analyse all samples that are required to be obtained by this approval in a laboratory accredited pursuant to ISO/IEC 17025, as amended, for the specific parameter(s) to be analysed, unless otherwise authorized in writing by the Director.

2.3.3 The term sample used in 2.3.2 does not include samples directed to continuous monitoring equipment, unless specifically required in writing by the Director.

2.3.4 The approval holder shall comply with the terms and conditions of any written authorization issued by the Director under 2.3.2.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

SECTION 2.4: OTHER

2.4.1 The terms and conditions of this approval are severable. If any term or condition of this approval or the application of any term or condition is held invalid, the application of such term or condition to other circumstances and the remainder of this approval shall not be affected thereby.

2.4.2 Any conflict between the *Standards for Landfills in Alberta*, as amended, and the terms and conditions of this approval shall be resolved in favour of this approval.

2.4.3 *Environmental Protection and Enhancement Act* Approval No. 10348-02-00, as amended, is cancelled.

2.4.4 All tanks shall conform to the *Guidelines for Secondary Containment for Above Ground Storage Tanks,* Alberta Environmental Protection, 1997, as amended, unless otherwise authorized in writing by the Director.

2.4.5 All above ground storage tanks containing liquid hydrocarbons or organic compounds shall conform to the *Environmental Guidelines for Controlling Emissions of Volatile Organic Compounds from Aboveground Storage Tanks*, Canadian Council of Ministers of the Environment, PN 1180, 1995, as amended.

PART 3: CONSTRUCTION

SECTION 3.1: LANDFILL

3.1.1 The approval holder shall not commence construction of Cell 4 unless and until updated financial security of the facility has been provided to include Cell 4 lateral expansion.

3.1.2 The approval holder shall construct each new Class I industrial landfill cell in such a way that each new Class I landfill cell shall consist of the following components, at a minimum, unless otherwise authorized in writing by the Director:

(a) a minimum of 0.45 metre thick cover of clean sand or soil placed over top of the uppermost drainage layer;

(b) a composite liner that consists of, at a minimum:

(i) a GCL liner placed in direct contact with an underlying 80 mil HDPE geomembrane liner as a primary liner;

(ii) a GCL liner placed in direct contact with an underlying 80 mil HDPE geomembrane liner as a secondary liner; and

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(iii) a GCL liner placed in direct contact with an underlying clay liner that has:

(A) a minimum thickness of 1.0 metre at all points, measured perpendicular to the slope, and

(B) been compacted to achieve an in-place hydraulic conductivity of 1×10^{-9} m/s or less;

(c) a leachate collection system that:

(i) is placed over the primary liner;

(ii) is capable of maintaining the maximum acceptable leachate head; and

(iii) consists of:

(A) a geo-composite drainage layer with a transmissivity of at least 1×10^{-4} m^2/s placed over top of the primary liner,

(B) a network of perforated leachate collection pipes, and

(C) a leachate collection sump placed over the primary liner;

(d) a leak detection system that:

(i) is installed over the secondary liner;

(ii) is capable of detecting the leakage through the primary liner; and

(iii) consists of:

(A) a geo-composite drainage layer with a transmissivity of at least 1×10^{-4} m^2/s placed over top of the secondary liner,

(B) a network of perforated leak detection liquid collection pipes, and

(C) a leak detection liquid collection sump placed over the secondary liner;

(e) a final cover:

(i) that meets the requirements in section 6.1(c) of the *Standards for Landfills in Alberta*, as amended; or

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(ii) as specified in the Landfill Cell Closure Plan submitted by the approval holder and authorized in writing by the Director pursuant to 7.1.1 and 7.1.4;

(f) a run-on control system capable of preventing flow onto the active landfill area from at least the peak discharge from a 1 in 25 year, 24 hour duration storm event at the facility; and

(g) a runoff control system capable of collecting and controlling at least the runoff volume resulting from a 1 in 25 year, 24 hour duration storm event at the facility.

3.1.3 The composite liner for the landfill shall be constructed on a foundation or base such that there shall be no failure of the liners due to settlement, compression, or uplift.

3.1.4 The approval holder shall submit to the Director the following plans and specifications for the proposed construction of each of the items listed in 3.1.2, signed and stamped by a professional registered with APEGA at least three (3) months prior to construction:

(a) a Detailed Construction Plan and Specifications prepared as per 3.1.2;

(b) a Construction Quality Assurance Plan; and

(c) a Construction Quality Control Plan.

3.1.5 If the Detailed Construction Plan and Specifications in 3.1.4 is found deficient by the Director, the approval holder shall correct all deficiencies as outlined in writing by the Director within the timeline specified in writing by the Director.

3.1.6 The approval holder shall implement the Detailed Construction Plan and Specifications in 3.1.4 as authorized in writing by the Director.

3.1.7 During construction of any of the items listed in 3.1.2, the approval holder shall not deviate from the Detailed Construction Plan and Specifications as authorized in writing by the Director in 3.1.6, unless the following conditions are met:

(a) the deviation results in a minor adjustment to the Detailed Construction Plan and Specifications in order to suit field conditions encountered; and

(b) the deviation will result in an equivalent or better design performance of the landfill.

3.1.8 The approval holder shall submit to the Director a summary report of the Construction Quality Assurance and Construction Quality Control results signed and stamped by a professional registered with APEGA.

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3.1.9 The summary report in 3.1.8 shall contain the following information, at a minimum:

(a) confirmation that the landfill has been constructed according to:

(i) the Construction Quality Assurance Plan,

(ii) the Construction Quality Control Plan, and

(iii) the Detailed Construction Plan and Specifications as authorized in writing by the Director in 3.1.6, subject to the deviations as per 3.1.7;

(b) description of any minor deviations as per 3.1.7;

(c) confirmation by the professional registered with APEGA, that deviations as per 3.1.7 will result in an equivalent or better design performance of the landfill;

(d) "as-built" plans;

(e) photo-documentation of important stages of construction including any repair work or remediation activities to establish or maintain liner integrity; and

(f) any other information as required in writing by the Director.

3.1.10 The approval holder shall notify the Director in writing at least fourteen (14) days prior to commencing operations of any new landfill cell.

3.1.11 The approval holder shall construct the off-loading area (tipping area) as described in the application, unless otherwise authorized in writing by the Director.

3.1.12 The approval holder shall manage landfill progression in such a manner as to minimize off-site visual impacts of the landfill, as described in the Landfill Cell Closure Plan submitted by the approval holder and authorized in writing by the Director pursuant to 7.1.1 and 7.1.4.

SECTION 3.2: WASTE STABILIZATION AREA

3.2.1 The approval holder shall construct the waste stabilization area in accordance with the following:

(a) application No. 008-10348; and

(b) within a Class I landfill cell;

unless otherwise authorized in writing by the Director.

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SECTION 3.3: SOIL CONSERVATION

3.3.1 The approval holder shall:

(a) salvage; and

(b) conserve

all topsoil for land reclamation of the landfill.

3.3.2 The approval holder shall:

(a) salvage; and

(b) conserve

all upper subsoil for land reclamation of the landfill.

3.3.3 The approval holder shall:

(a) conserve; and

(b) stockpile

all topsoil separately from the upper subsoil.

3.3.4 The approval holder shall place all:

(a) topsoil stockpiles; and

(b) upper subsoil stockpiles

at the landfill.

3.3.5 The approval holder shall stockpile all topsoil as follows:

(a) on stable foundations; and

(b) on undisturbed topsoil.

3.3.6 The approval holder shall stockpile all upper subsoil as follows:

(a) on stable foundations; and

(b) on areas where the topsoil has been removed.

3.3.7 The approval holder shall take all steps necessary to prevent any erosion (e.g., wind or water), including but not limited to, all of the following:

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(a) revegetating the stockpiles; and

(b) any other steps authorized in writing by the Director.

3.3.8 The approval holder shall immediately suspend conservation of:

(a) topsoil; and

(b) upper subsoil

when:

(i) wet or frozen conditions will result in mixing, loss, degradation or compaction of topsoil or upper subsoil, or

(ii) high wind velocities, any other field conditions or facility operations will result in mixing, loss, or degradation of topsoil or upper subsoil.

3.3.9 The approval holder shall recommence conservation of:

(a) topsoil; and

(b) upper subsoil

only when conditions in 3.3.8 no longer exist.

PART 4: OPERATIONS, LIMITS, MONITORING AND REPORTING

SECTION 4.1: GENERAL

4.1.1 The approval holder shall maintain the geographical boundaries of the landfill to that located within SE 1/4 of Section 9, Township 50, Range 17, West of the 4th Meridian, as described in the application.

4.1.2 The approval holder shall limit the waste elevation of the landfill to no more than the maximum designated waste elevation.

4.1.3 The approval holder shall restrict access to the facility to only personnel authorized by the approval holder.

4.1.4 The approval holder shall maintain a publicly available 24 hour "HOTLINE" number for a prompt response during an emergency.

4.1.5 The approval holder shall:

(a) operate; and

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(b) maintain the integrity of

the following waste management facilities at the facility:

(i) the HWRSP Facility;

(ii) the Class I and Class II industrial landfill, including:

(A) Class I landfill cells,

(B) Class II landfill cell(s), and

(C) waste stabilization area within a Class I landfill cell; and

(iii) waste storage area(s);

as described in the application.

4.1.6 In addition to 4.1.5, the approval holder shall:

(a) operate; and

(b) maintain the integrity of

the following infrastructure components at the facility:

(i) the composite liner;

(ii) the leachate collection system,

(iii) the leak detection system,

(iv) the run-on control system,

(v) the runoff control system,

(vi) the groundwater monitoring wells,

(vii) the weigh scale, and

(viii) the site access control;

as described in the application.

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FACILITY AUDIT

4.1.7 The approval holder shall cause the facility to be audited by an independent third-party environmental consultant or organization to assess compliance with the terms and conditions of this approval:

(a) at least once every three years; and

(b) commencing on or before October 1, 2018 for the first audit.

4.1.8 The approval holder shall submit the audit report required in 4.1.7 in the Annual Landfill Operations Report as required in 4.6.58(c).

4.1.9 The requirements in 4.1.7 and 4.1.8 shall not relieve the approval holder of any duty under the Act, or its associated regulations, or this approval.

SECTION 4.2: AIR

OPERATIONS

4.2.1 The approval holder shall not release any air effluent streams to the atmosphere except as authorized by this approval.

4.2.2 The approval holder shall only release air effluent streams to the atmosphere from the following sources:

(a) the scrubber exhaust stack;

(b) the Drum Processing Building natural gas fired air make up unit exhaust vent;

(c) the Staging Building natural gas fired air make up unit exhaust vent;

(d) the Administration Building natural gas fired furnaces exhaust vents;

(e) the Laboratory fume hood and natural gas fired air make up unit exhaust vents;

(f) the Maintenance Shop equipment and natural gas fired Radiant Heater exhaust vents;

(g) the Leachate Collection Tanks natural gas fired heaters exhaust vents;

(h) the leachate transfer lines passive gas vents; and

(i) any other source authorized in writing by the Director.

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4.2.3 The approval holder shall not operate any process equipment unless and until the pollution abatement equipment associated with the corresponding process equipment is:

(a) operational; and

(b) operating.

4.2.4 The approval holder shall treat all air effluent streams from the exhaust vents of the Drum Processing or Staging or both Buildings with a caustic scrubber and an activated carbon filter before directing the air effluent streams to the scrubber exhaust stack for release to the atmosphere while:

(a) hazardous waste or hazardous recyclables or both are being processed;

(b) hazardous waste or hazardous recyclables or both are being transferred; or

(c) containers of hazardous waste or hazardous recyclables or both are open

in the Drum Processing or Staging or both Buildings.

4.2.5 The approval holder shall control fugitive emissions and any source not specified in 4.2.2 in accordance with 4.2.6 of this approval unless otherwise authorized in writing by the Director.

4.2.6 With respect to fugitive emissions and any source not specified in 4.2.2, the approval holder shall not release a substance or cause to be released a substance that causes or may cause any of the following:

(a) impairment, degradation or alteration of the quality of natural resources;

(b) material discomfort, harm or adverse effect to the well being or health of a person; or

(c) harm to property or to vegetative or animal life.

4.2.7 The approval holder shall not burn any debris by means of an open fire unless authorized in writing by the Director.

4.2.8 If the approval holder receives complaints of offensive odours, or fugitive dust, or both, beyond the facility boundaries, the approval holder shall:

(a) conduct the following to reduce the release of those odours, or fugitive dust, or both by:

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(i) placing restrictions on types, or volumes, or both, of the wastes being handled or processed or deposited that are causing those odours, or fugitive dust, or both,

(ii) increasing the frequency of cover placement, or modifying waste handling activities, or performing both, at the landfill,

(iii) modifying waste handling activities at the HWRSP Facility, or

(iv) performing any combination of the above; and

(b) activate the Odour and Fugitive Dust Response Program as specified in the Landfill Operations Plan 4.6.34(j).

LIMITS

4.2.9 The approval holder shall maintain the pH of the scrubbing liquid of the caustic scrubber referred to in 4.2.4 at 8.0 or higher.

4.2.10 The approval holder shall replace activated carbon in the activated carbon filter referred to in 4.2.4 immediately when the concentration of total petroleum hydrocarbons in the air effluent streams released from the scrubber exhaust stack to the atmosphere exceeds 25 ppm.

MONITORING AND REPORTING

4.2.11 The approval holder shall monitor, daily at a minimum, the pH of the scrubbing liquid of the caustic scrubber referred to in 4.2.4.

4.2.12 The approval holder shall monitor, weekly at a minimum, the air effluent streams released from the scrubber exhaust stack, using a portable total petroleum hydrocarbon analyzer while:

(a) hazardous waste or hazardous recyclables or both are being processed;

(b) hazardous waste or hazardous recyclables or both are being transferred; or

(c) containers of hazardous waste or hazardous recyclables or both are open

in the Drum Processing or Staging or both Buildings.

4.2.13 The portable total petroleum hydrocarbon analyzer referred to in 4.2.12 shall:

(a) have a detection limit of 1 ppm or lower for total petroleum hydrocarbons;

(b) be located in a straight section of the scrubber exhaust stack, a minimum of one (1) metre downstream from the last flow disturbance; and

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(c) be calibrated regularly in accordance with the analyzer manufacturer's specifications.

4.2.14 The approval holder shall continue to implement the Ambient Air Monitoring Program as authorized in writing by the Director on June 24, 2009, unless and until otherwise authorized in writing by the Director pursuant to 4.2.18.

4.2.15 The approval holder shall submit to the Director the results of the Ambient Air Monitoring Program in 4.2.14 with the following reports:

(a) a Monthly Ambient Air Monitoring Report; and

(b) an Annual Ambient Air Monitoring Report

in accordance with the written authorization by the Director on June 24, 2009, unless and until otherwise authorized in writing by the Director pursuant to 4.2.18.

4.2.16 The approval holder shall submit:

(a) a revised Ambient Air Monitoring Program;

(b) revised reporting requirements, or

(c) both of the above

to the Director upon written request from the Director within the timeline specified in writing by the Director.

4.2.17 If the revised:

(a) Ambient Air Monitoring Program;

(b) reporting requirements; or

(c) both of the above

submitted pursuant to 4.2.16 is found deficient by the Director, the approval holder shall correct all deficiencies as outlined in writing by the Director within the timeline specified in writing by the Director.

4.2.18 The approval holder shall implement the revised:

(a) Ambient Air Monitoring Program;

(b) reporting requirements; or

(c) both of the above

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submitted pursuant to 4.2.16 as authorized in writing by the Director within the timeline specified in writing by the Director.

SECTION 4.3: RUNOFF AND INDUSTRIAL WASTEWATER

OPERATIONS

4.3.1 The approval holder shall not release any substances from the facility to the surrounding watershed except as authorized by this approval.

4.3.2 The approval holder shall operate and maintain the integrity of:

(a) the run-on control system to prevent flow onto the active landfill area from at least the peak discharge from a 1 in 25 year, 24 hour duration storm event at the facility; and

(b) the runoff control system for the facility to collect and control at least the runoff volume resulting from a 1 in 25 year, 24 hour duration storm event at the facility.

4.3.3 All runoff from the facility developed area shall be directed to the runoff control system as described in:

(a) application No. 012-10348, prior to decommissioning and reclamation of the old surface water detention pond; and

(b) the application, after decommissioning and reclamation of the old surface water detention pond;

unless otherwise authorized in writing by the Director.

4.3.4 Prior to decommissioning and reclamation of the old surface water detention pond and subject to 4.3.7, the approval holder shall only make or permit a release from the old surface water detention pond:

(a) at the release point as designated in application No. 012-10348, which is:

(i) located in the south east corner of the old surface water detention pond, and

(ii) referred to as sampling location A1 in 4.3.11;

(b) through a pump and a release hose over the south berm into the drainage control ditch, east of the landfill access road, to the new surface water detention pond, under normal operating conditions; and

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(c) through a pump and a release hose over the south berm directly to the culvert under Highway 854, during periods of high runoff exceeding the holding capacity of the old surface water detention pond;

unless otherwise authorized in writing by the Director.

4.3.5 Subject to 4.3.7, the approval holder shall only make or permit a release from the new surface water detention pond:

(a) at the release point as designated in application No. 012-10348, which is:

(i) located in the north east corner of the new surface water detention pond, and

(ii) referred to as sampling location B1 in 4.3.11; and

(b) through a pump and a release hose over the east berm into the culvert under Highway 854;

unless otherwise authorized in writing by the Director.

4.3.6 The approval holder shall only dispose of industrial wastewaters, or specified runoff in TABLE 4.3-A, or both, by one or more of the following methods:

(a) to facilities holding a current Act authorization to accept such waste;

(b) to facilities approved by a local environmental authority outside of Alberta to accept such waste;

(c) to a disposal well approved by AER;

(d) as per 4.6.51; or

(e) as otherwise authorized in writing by the Director.

TABLE 4.3-A: SPECIFIED RUNOFF

SOURCES
Runoff that exceeds any of the limits for the parameters listed in TABLE 4.3-B.
Runoff for which the results of the parameters listed in TABLE 4.3-B are unavailable at the time that the runoff must be disposed of.
Runoff from within the tank farm bermed area.

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LIMITS

4.3.7 Releases of runoff from:

(a) the old surface water detention pond;

(b) the new surface water detention pond; or

(c) both ponds

to the surrounding watershed shall comply with the limits specified in TABLE 4.3-B.

4.3.8 Releases of runoff from within the tank farm bermed area to the old or new or both surface water detention ponds shall comply with the limits specified in TABLE 4.3-C.

TABLE 4.3-B: RUNOFF LIMITS FOR SURFACE WATER DETENTION POND

PARAMETER	LIMITS Maximum unless otherwise indicated
pH	6.0 – 9.5 pH units
COD	50 mg/L
TDS	2500 mg/L
TSS	25 mg/L
Ammonia (expressed as Nitrogen)	5 mg/L
Chloride	250 mg/L
Sodium	200 mg/L
Sulphate	500 mg/L
Oil or other substances	Not present in amounts sufficient to create a visible film or sheen
96-Hour Multiple Concentration Acute Lethality Test Using Rainbow Trout (*Oncorhynchus mykiss*)	50% or greater survival

TABLE 4.3-C: RUNOFF LIMITS FOR TANK FARM BERMED AREA

PARAMETER	LIMITS Maximum unless otherwise indicated
pH	6.0 – 9.5 pH units
COD	50 mg/L
TSS	25 mg/L
Ammonia (expressed as Nitrogen)	5 mg/L
Oil or other substances	Not present in amounts sufficient to create a visible film or sheen

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MONITORING AND REPORTING

4.3.9 The approval holder shall monitor the runoff control system as required in TABLE 4.3-D, subject to 4.3.12.

4.3.10 The approval holder shall report to the Director the results of the runoff control system monitoring as required in TABLE 4.3-D, subject to 4.3.12.

4.3.11 For the purpose of TABLE 4.3-D:

(a) sampling location A1 is defined as the old surface water detention pond release point;

(b) sampling location A2 is defined as the old surface water detention pond;

(c) sampling location B1 is defined as the new surface water detention pond release point;

(d) sampling location B2 is defined as the new surface water detention pond; and

(e) sampling location C is defined as the tank farm bermed area.

4.3.12 The monitoring and reporting requirements in 4.3.9 and 4.3.10 for the old surface water detention pond (sampling locations A1 and A2) shall not apply after decommissioning and reclamation of the old surface water detention pond.

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TABLE 4.3-D: RUNOFF CONTROL SYSTEM MONITORING AND REPORTING

MONITORING				REPORTING	
Parameter	**Frequency**	**Sample Type**	**Sampling Location**	**Monthly**	**Annually**
Surface Water Detention Pond(s)				Monthly Runoff and Industrial Wastewater Report, for each month when release occurs	Annual Runoff and Industrial Wastewater Report
Flow (m^3/day)	Daily during release	Estimate	A1, B1		
pH	Once per batch release, prior to release	Representative Grab	A2, B2		
COD					
TDS					
TSS					
Ammonia (expressed as nitrogen)					
Chloride					
Sodium					
Sulphate					
Oil or other substances	Daily during release	Visual			
96-hour multiple concentration acute lethality test using rainbow trout (*oncorhynchus mykiss*)	Each month when release occurs, prior to release, for the first batch release of the month	Representative Grab			
48-hour static acute lethality test using *daphnia magna*					
Tank Farm Bermed Area					
Volume (m^3)	Total batch volume released	Estimate	C		
pH	Once per batch release, prior to release to the surface water detention pond(s)	Representative Grab			
COD					
TSS					
Ammonia (expressed as nitrogen)					
Oil or other substances		Visual			

4.3.13 The monitoring and reporting required in TABLE 4.3-D for the acute lethality tests shall comply with:

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(a) the *Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout*, Environment Canada, Environmental Protection Series 1/RM/13, December2000, as amended; and

(b) the *Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Daphnia Magna*, Environment Canada, Environmental Protection Series 1/RM/14, December 2000, as amended.

4.3.14 The approval holder shall:

(a) treat any acute lethality test that deviates from the corresponding test method referred to in 4.3.13 as invalid; and

(b) repeat the test as soon as logistically possible.

4.3.15 In the event that less than 50% of the rainbow trout survived in the 100% concentration sample, the approval holder shall:

(a) implement a program immediately to identify the source of the toxicity; and

(b) submit to the Director within 90 days after the test result is available, a proposed program to reduce the toxicity of the runoff.

4.3.16 The approval holder shall submit the Monthly Runoff and Industrial Wastewater Report in TABLE 4.3-D to the Director.

4.3.17 The Monthly Runoff and Industrial Wastewater Report shall include, at a minimum, all of the following information:

(a) a monthly assessment of the monitoring results relative to the limits in TABLE 4.3-B;

(b) a monthly assessment of the monitoring results relative to the limits in TABLE 4.3-C;

(c) a monthly assessment of the performance of the:

(i) runoff control system,

(ii) pollution abatement equipment, and

(iii) monitoring equipment;

(d) a monthly summary of management and disposal of the:

(i) industrial wastewaters, and

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(ii) specified runoff

as per 4.3.6;

(e) a monthly summary of management and disposal of runoff in general;

(f) a monthly summary of runoff contraventions reported pursuant to 2.1.1; and

(g) any other information as required in writing by the Director.

4.3.18 The approval holder shall submit the Annual Runoff and Industrial Wastewater Report in TABLE 4.3-D to the Director.

4.3.19 The Annual Runoff and Industrial Wastewater Report shall include, at a minimum, all of the following information:

(a) an annual summary assessment of the monitoring results relative to the limits in TABLE 4.3-B;

(b) an annual summary assessment of the monitoring results relative to the limits in TABLE 4.3-C;

(c) an annual summary assessment of the performance of the:

(i) runoff control system,

(ii) pollution abatement equipment, and

(iii) monitoring equipment;

(d) an annual summary of management and disposal of the:

(i) industrial wastewaters, and

(ii) specified runoff

as per 4.3.6;

(e) an annual summary and evaluation of management and disposal of runoff in general;

(f) an annual summary of the results pursuant to 4.3.21;

(g) an annual summary of runoff contraventions reported pursuant to 2.1.1; and

(h) any other information as required in writing by the Director.

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4.3.20 The approval holder shall:

(a) collect a representative grab sample from the old surface water detention pond at least once per year, prior to decommissioning and reclamation of the pond;

(b) collect a representative grab sample from the new surface water detention pond at least once per year; and

(c) analyze the sample(s) for all of the parameters specified in TABLE 4.3-E.

4.3.21 The approval holder shall submit the results of the analyses in 4.3.20 to the Director in the Annual Runoff and Industrial Wastewater Report.

TABLE 4.3-E: ANNUAL MONITORING OF SURFACE WATER DETENTION POND

PARAMETERS			
pH	TDS; TSS	Fluoride, dissolved	Phenols
Electrical conductivity	Metals	Cyanide (weak acid dissociable)	Total chlorinated phenols
COD	Major ions	BTEX	Polychlorinated biphenyls, total
DOC	Nutrients	Petroleum Hydrocarbons Fractions F1 and F2	Total organic halogens

SECTION 4.4: LEACHATE COLLECTION AND LEAK DETECTION

OPERATIONS

4.4.1 The approval holder shall only dispose of leachate removed from the leachate collection system by one or more of the following methods:

(a) to facilities holding a current Act authorization to accept such waste;

(b) to facilities approved by a local environmental authority outside of Alberta to accept such waste;

(c) to a disposal well approved by AER; or

(d) as per 4.6.51.

4.4.2 The approval holder shall only dispose of liquid removed from the leak detection system by one or more of the following methods:

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(a) to facilities holding a current Act authorization to accept such waste;

(b) to facilities approved by a local environmental authority outside of Alberta to accept such waste;

(c) to a disposal well approved by AER; or

(d) as per 4.6.51.

LIMITS

4.4.3 Subject to 4.4.4, the approval holder shall not exceed the maximum acceptable leachate head in any landfill cell.

4.4.4 Subsequent to a storm event, the leachate head in any landfill cell shall not exceed the maximum acceptable leachate head for more than fourteen (14) days, unless otherwise authorized in writing by the Director.

4.4.5 The volume of liquid in the leak detection system, as monitored in TABLE 4.6-D, shall not exceed the action leakage rate in any landfill cell.

MONITORING AND REPORTING

4.4.6 The approval holder shall monitor the leachate collection and leak detection systems as required in TABLE 4.6-D and for all parameters specified in TABLE 4.4-A, subject to 4.4.8 and 4.4.9.

4.4.7 The approval holder shall report to the Director the results of the leachate collection and leak detection systems monitoring as required in TABLE 4.6-D, including the results of the analyses for all parameters specified in TABLE 4.4-A, subject to 4.4.8 and 4.4.9.

TABLE 4.4-A: LEACHATE AND LEAK DETECTION LIQUID MONITORING

PARAMETERS		
pH (field and laboratory)	TDS	Nutrients
Electrical conductivity (field and laboratory)	TSS	BTEX
COD	Metals	Phenols
DOC	Major Ions	Petroleum Hydrocarbons Fractions F1 and F2

4.4.8 The requirements in 4.4.6 and 4.4.7 for monitoring and reporting the parameters in TABLE 4.4-A for leachate shall not apply if insufficient leachate is available for conducting the analyses.

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4.4.9 The requirements in 4.4.6 and 4.4.7 for monitoring and reporting the parameters in TABLE 4.4-A for leak detection liquid shall not apply if insufficient leak detection liquid is available for conducting the analyses.

4.4.10 If the volume of liquid removed from the leak detection system exceeds the action leakage rate, in addition to reporting pursuant to 2.1.1, the approval holder shall submit a Response Action Plan to the Director within 30 days of the exceedance.

SECTION 4.5: DUGOUTS AND WATER WELLS IN SURROUNDING AREA

MONITORING AND REPORTING

4.5.1 The approval holder shall:

(a) collect a representative sample from:

(i) each of the dugouts, and

(ii) each of the water wells

within an approximate 1.6 kilometre radius around the facility; and

(b) analyze the sample for the parameters listed in TABLE 4.5-A;

unless the approval holder is not granted access by the landowner.

4.5.2 The monitoring required in 4.5.1 shall be conducted once each year in October unless otherwise authorized in writing by the Director.

4.5.3 The approval holder shall record the analytical results of the sampling information required in 4.5.1 in an Annual Dugout and Water Well Sampling Program Report.

4.5.4 The approval holder shall submit the Annual Dugout and Water Well Sampling Program Report to the Director pursuant to 4.6.58(i).

TABLE 4.5-A: DUGOUT AND WATER WELL MONITORING

PARAMETERS		
pH (field and laboratory)	TDS	Nutrients
Electrical conductivity (field and laboratory)	TSS	BTEX
COD	Metals	Phenols
DOC	Major Ions	Petroleum Hydrocarbons Fractions F1 and F2

TERMS AND CONDITIONS ATTACHED TO APPROVAL

SECTION 4.6: HWRSP FACILITY AND LANDFILL

GENERAL

4.6.1 The approval holder shall not:

(a) receive;

(b) process;

(c) dispose of; or

(d) perform any combination of the above for

any of the following wastes, individually or in any combination, at the places specified below respectively:

(i) explosives (Class 1 TDGR wastes), at the facility;

(ii) radioactive wastes (Class 7 TDGR wastes), at the facility;

(iii) radioactive wastes regulated under the *Nuclear Safety and Control Act* (Canada), at the facility;

(iv) biomedical waste, at the facility;

(v) waste containing free liquids, at the landfill, excluding the waste stabilization area;

(vi) material containing ozone depleting substances, at the landfill;

(vii) municipal solid waste, at the facility; and

(viii) NORM waste, at the facility.

4.6.2 Incompatible wastes and incompatible hazardous recyclables shall be prevented from mixing.

4.6.3 The approval holder shall dispose of wastes generated at the facility only:

(a) to facilities holding a current Act authorization;

(b) to facilities approved by a local environmental authority outside of Alberta; or

(c) as otherwise authorized in writing by the Director.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

HWRSP FACILITY

OPERATIONS PLAN

4.6.4 The approval holder shall:

(a) develop;

(b) keep up-to-date; and

(c) implement

an HWRSP Facility Operations Plan.

4.6.5 The approval holder shall:

(a) review the HWRSP Facility Operations Plan annually, at a minimum; and

(b) update the HWRSP Facility Operations Plan if any of the following circumstances apply:

(i) there are facility expansions or changes in site operations or equipment,

(ii) there is an applicable change to an applicable regulation, or

(iii) an update is required in writing by the Director.

4.6.6 The approval holder shall retain a copy of the most recent HWRSP Facility Operations Plan at the facility.

4.6.7 The approval holder shall submit a copy of the most recent HWRSP Facility Operations Plan to the Director upon written request from the Director within the timeline specified in writing by the Director.

4.6.8 If the HWRSP Facility Operations Plan submitted pursuant to 4.6.7 is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.

4.6.9 The approval hold shall implement the latest HWRSP Facility Operations Plan, unless otherwise authorized in writing by the Director.

OPERATIONS

4.6.10 The approval holder shall only transfer wastes and hazardous recyclables at designated transfer areas designed to contain spills and leaks.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

4.6.11 The approval holder shall use the following when transferring substances to, from, and between containers, tanks, and trucks:

(a) couplings equipped with seals that are compatible with the substance transferred;

(b) the necessary precautions to prevent spills when the couplings are disconnected;

(c) emergency shut-off valves;

(d) established transfer areas and associated curbing, paving and catchment areas;

(e) drip trays to capture potential losses under coupling devices and other connections; and

(f) manual inspections of the transfer area for leaks and spills during and after waste transfer.

4.6.12 All wastes and all hazardous recyclables that are unloaded shall be immediately transferred to the waste storage area.

4.6.13 All containers and unrinsed empty containers shall be stored in the waste storage area.

4.6.14 The approval holder shall:

(a) provide and maintain an adequate aisle space between containers in the waste storage area to allow:

(i) inspection, and

(ii) unobstructed movement of personnel, fire protection equipment, spill control equipment and decontamination equipment to any area of the waste storage area; and

(b) arrange inspection aisles in the waste storage area such that the identification label on each container is readable.

4.6.15 All tanks within the tank farm area shall be equipped, at a minimum, with all of the following:

(a) sensors for detecting the level in each tank;

(b) high level alarms that activate when a tank overfill is imminent;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

(c) automatic shut-off devices or sufficient free board space above the high level sensor to allow operators time to prevent overfill from occurring; and

(d) earthen dikes or equivalent secondary containment structures capable of containing 110% of the volume of the largest tank within the bermed area plus 10% of the aggregate capacity of all other tanks in the bermed area.

4.6.16 All tanks containing hazardous waste and all tanks containing hazardous recyclables in each building shall be equipped, at a minimum, with all of the following:

(a) sensors or gauges for detecting the level in each tank;

(b) a written operating procedure to prevent tank overfill; and

(c) secondary containment structures capable of containing 110% of the volume of the largest tank within the building plus 10% of the aggregate capacity of all other tanks containing hazardous waste and hazardous recyclables in the same building.

4.6.17 Hazardous waste and hazardous recyclables stored in containers and tanks shall be stored in accordance with the *Hazardous Waste Storage Guidelines*, June 1988, Alberta Environment, as amended.

4.6.18 The approval holder shall only carry out the following activities, individually or in any combination, at the HWRSP Facility in relation to hazardous waste or hazardous recyclables or both:

(a) commingling of hazardous waste or hazardous recyclables to make maximum use of available container or tank capacity, only if the resultant mixture has the same TDGR hazard classification as any one of the individual components;

(b) phase separation by gravity settling, only without the addition of any chemicals designed to accelerate settling;

(c) dispersion of solids into liquids by natural or mechanical means, only if the resultant mixture has the same TDGR hazard classification as the original waste;

(d) physical segregation of hazardous from non-hazardous articles or components from the same container, only if no process equipment is used;

(e) washing of drums or other objects, only for the purpose of removing hazardous residue;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

(f) crushing or shredding of used filters, rags, absorbent materials, or empty containers, only for the purpose of volume reduction or liquid recovery, unless otherwise authorized in writing by the Director; or

(g) treatment of hazardous waste, only as authorized in writing by the Director.

4.6.19 Notwithstanding 4.6.18(g), the approval holder shall not incinerate waste at the facility.

LIMITS

4.6.20 The approval holder shall not store a total of more than 752,500 litres of hazardous waste or hazardous recyclables or both at the HWRSP Facility at any time.

4.6.21 In addition to the storage limits in 4.6.20, the approval holder shall not exceed the waste storage limits as specified in TABLE 4.6-A.

TABLE 4.6-A: STORAGE LIMITS FOR HAZARDOUS WASTE OR HAZARDOUS RECYCLABLES OR BOTH AT HWRSP FACILITY

Waste/Recyclable Type	Material	Maximum Quantity
Containers: Hazardous waste or hazardous recyclables or both	TDGR Classification 2, 3, 4, 5, 6, 8 or 9 waste type only	512,500 litres (consisting of 2,500 drum equivalents, each 205 litre capacity)
Bulk Tanks: Hazardous waste or hazardous recyclables or both	Waste flammable liquids, used oil, or wastewaters; or TDGR Classification 3, 5, 6, 8 or 9 waste type only	240,000 litres (consisting of a total of 135 m^3 in the tank farm area, and a total of 105 m^3 inside the buildings)

4.6.22 Containers other than 205 litre drums shall be prorated to 205 litre drum equivalents based on their nominal volumes, e.g., 10 X 20 litre pails = 1 X 205 litre drum.

4.6.23 The limits referred to in 4.6.20 and 4.6.21 shall be calculated based on the:

(a) total nominal volumes of all containers, treating all partially filled containers as if they were full; and

(b) total filled capacities of all tanks.

MONITORING AND REPORTING

4.6.24 The approval holder shall:

TERMS AND CONDITIONS ATTACHED TO APPROVAL

(a) identify;

(b) characterize; and

(c) classify

all waste streams and all hazardous recyclables, generated or received at the HWRSP Facility, not including runoff, industrial wastewater streams and air effluent streams in accordance with the:

(i) *Industrial Waste Identification and Management Options*, Alberta Environment, May 1996, as amended, and

(ii) *Alberta User Guide for Waste Managers*, Alberta Environment, August 1996, as amended.

4.6.25 The approval holder shall measure or, when not feasible to measure, estimate, the quantity of each waste and hazardous recyclable identified in 4.6.24 each year.

4.6.26 The approval holder shall keep a daily:

(a) total; and

(b) inventory

of all materials being stored at the HWRSP Facility.

4.6.27 The daily total and inventory records in 4.6.26 shall be available at the facility at all times for inspection by the Director or an inspector.

4.6.28 The approval holder shall submit a Monthly Waste Management Report to the Director.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

TABLE 4.6-B: MONTHLY WASTE INVENTORY REPORT (BY WASTE CLASS)

COMPANY NAME: _____ APPROVAL NO.: _____

REPORT PERIOD: MONTH _____ YEAR _____

CLASS	UNIT (Kg or L)	OPENING BALANCE	+ RECEIVED IN PROVINCE	+ RECEIVED OUT OF PROVINCE	- SHIPPED *		- ON-SITE DISPOSAL	+ or - ADJUSTMENT **	CLOSING BALANCE	APPROVAL LIMIT
					RECYCLING / PRODUCT	OFF-SITE DISPOSAL				
2										
3										
4										
5										
6.1										
8										
9.1										
9.2										
9.3										
PCB										
NR										
TOTAL										XXXXX
							No. of Containers On site			XXXXX
							Total Litres in Bulk Tanks			XXXXX

Name of Company Official: _____ Title: _____ Signature: _____

Report Date: _____

* Provide a list of the recycling and disposal locations.

** Identity the amount and reason for each adjustment.
Adjustments include consolidation/reclassification, losses to processing, spills, volume miscalculations, or any other circumstances, which would affect the mass balance of the monthly inventory report.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

4.6.29 The approval holder shall compile all of the information indicated in TABLE 4.6-B in the Monthly Waste Management Report which shall contain, at minimum, all of the following information:

(a) an opening waste and hazardous recyclables inventory balance in kilograms or litres by waste class or material type;

(b) the amount and type of waste and hazardous recyclables received:

(i) within the province, and

(ii) from outside the province;

(c) the amount and type of waste and hazardous recyclables:

(i) shipped for recycling or product,

(ii) shipped off-site for disposal, and

(iii) disposed on-site;

(d) any adjustments, including but not limited to, consolidation, reclassification, losses to processing, spills, volume miscalculations, or any other circumstances, which would affect the mass balance of the monthly inventory report;

(e) closing balance in kilograms or litres;

(f) a summary of contraventions reported pursuant to 2.1.1 related to waste and hazardous recyclables; and

(g) any other information as required in writing by the Director.

4.6.30 The approval holder shall compile all the information required by 4.6.24 and 4.6.25 in an Annual Waste Management Summary Report:

(a) as specified in TABLE 4.6-C; and

(b) in accordance with the:

(i) *Industrial Waste Identification and Management Options*, Alberta Environment, May 1996, as amended, and

(ii) *Alberta User Guide for Waste Managers*, Alberta Environment, August 1996, as amended.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

TABLE 4.6-C: ANNUAL WASTE MANAGEMENT SUMMARY

Waste or Hazardous Recyclable Name	Uniform Waste Code				Quantity (kg or L)		Stored	Recycled		Disposed	
	WC	PIN	Class	Mgmt	Hazardous	Non-hazardous	On-site	On-site	Off-site	On-site	Off-site
TOTAL											

4.6.31 The approval holder shall submit the Annual Waste Management Summary Report to the Director.

LANDFILL

OPERATIONS PLAN

4.6.32 The approval holder shall:

(a) develop;

(b) keep up-to-date; and

(c) implement

a Landfill Operations Plan that does not contravene with the requirements of this approval.

4.6.33 The approval holder shall:

(a) review the Landfill Operations Plan annually, at a minimum; and

(b) update the Landfill Operations Plan if any of the following circumstances apply:

(i) there are facility expansions or changes in site operations or equipment,

(ii) there is an applicable change to the *Standards for Landfills in Alberta,* as amended,

(iii) an update is required in writing by the Director, or

(iv) there is an update to an applicable regulation.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

4.6.34 The Landfill Operations Plan shall include, at a minimum, all of the following:

(a) SOP for keeping and maintaining an Operating Record;

(b) SOP for waste control, run-on and runoff controls, and nuisance controls;

(c) SOP for the waste stabilization area operations;

(d) SOP for the acceptance, handling and disposal of wastes, including;

(i) waste characterization and classification at source,

(ii) waste manifesting and tracking,

(iii) QA/QC waste acceptance procedures, and

(iv) waste sampling;

(e) SOP for detecting, preventing and disposal of unauthorized wastes;

(f) SOP for placing waste in a landfill cell including;

(i) working face width,

(ii) lift depth,

(iii) compaction, and

(iv) waste placement location using a grid system;

(g) SOP for managing contaminated sulphur and sulphur containing wastes;

(h) SOP for managing asbestos wastes;

(i) SOP for placing leachate, leak detection liquid, or other authorized wastes and liquids over the surface of the active landfill area for the purpose of evaporation or dust suppression;

(j) an Odour and Fugitive Dust Response Program;

(k) a Fugitive Dust and Odour Best Management Plan;

(l) a runoff and industrial wastewater monitoring and management program;

(m) a leachate monitoring and management program;

(n) a leak detection liquid monitoring and management program;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

(o) a groundwater monitoring program;

(p) a Remediation Plan to deal with groundwater quality deterioration;

(q) a soil monitoring program;

(r) a soil management program;

(s) a landfill cell cover system;

(t) a monitoring and maintenance program for the scale house and heavy operational equipment;

(u) a health and safety program;

(v) an emergency response program, including SOP for handling fires, substance releases to the environment, and health concerns; and

(w) an up-to-date plan of the landfill layout with survey records showing the location of all infrastructure components of the landfill including final cover elevations and contours.

4.6.35 The approval holder shall retain a copy of the most recent Landfill Operations Plan at the facility.

4.6.36 The approval holder shall submit to the Director the most recent Landfill Operations Plan when requested in writing by the Director within the timeline specified in writing by the Director.

4.6.37 The approval holder shall correct all deficiencies in the Landfill Operations Plan submitted pursuant to 4.6.36, as outlined in writing by the Director, within the timeline specified in writing by the Director.

4.6.38 The approval holder shall implement the latest Landfill Operations Plan, unless otherwise authorized in writing by the Director.

OPERATIONS

4.6.39 The approval holder shall classify all materials entering the landfill in accordance with the:

(a) *Waste Control Regulation (AR 192/96)*;

(b) *Industrial Waste Identification and Management Options*, Alberta Environment, May 1996, as amended; and

(c) *Alberta User Guide for Waste Managers*, May 1995, as amended.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

4.6.40 The approval holder shall obtain a detailed representative physical and chemical analysis of a waste prior to disposal of the waste into the landfill at the following times, at a minimum:

(a) the first time a waste is received from a new generator;

(b) the first time a delivery is received from a different process associated with a known waste generator;

(c) the first time a waste is received from a different location associated with a known waste generator; and

(d) when the nature or composition of the waste that was previously characterized by the generator changes.

4.6.41 The approval holder shall not dispose of hazardous waste in any Class II landfill cell.

4.6.42 The approval holder shall:

(a) only carry out waste stabilization or solidification or both within the waste stabilization area; and

(b) not transfer waste from the waste stabilization area to the Class I landfill cell before the waste stabilization or solidification or both have completed.

4.6.43 The approval holder shall only dispose of any liquid collected within the waste stabilization area by one or more of the following methods:

(a) to facilities holding a current Act authorization to accept such waste;

(b) to facilities approved by a local environmental authority outside of Alberta to accept such waste;

(c) to a disposal well approved by AER; or

(d) as otherwise authorized in writing by the Director.

4.6.44 The approval holder shall conduct:

(a) annually, in-house visual inspections for corrosion; and

(b) biennially, ultrasonic testing to monitor thickness

of the steel plate liner of the stabilization pits in the waste stabilization area, unless otherwise authorized in writing by the Director.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

4.6.45 The approval holder shall dispose of asbestos wastes in accordance with *"Guidelines for the Disposal of Asbestos Waste"*, Environmental Protection Services, Alberta Environment, 1989, as amended.

4.6.46 The approval holder shall dispose of sulphur waste in accordance with *"Guidelines for Landfill Disposal of Sulphur Wastes and Remediation of Sulphur Containing Soils"*, Alberta Environment, 2011, as amended.

4.6.47 The approval holder shall only dispose of wastes that the landfill is not authorized to dispose of:

(a) to facilities holding a current Act authorization;

(b) to facilities approved by a local environmental authority outside of Alberta; or

(c) as otherwise authorized in writing by the Director.

4.6.48 If an unauthorized waste is received at the landfill, the approval holder shall remove the waste from the landfill within seven (7) days of the receipt, unless otherwise authorized in writing by the Director.

4.6.49 The approval holder shall restrict the working face of each landfill cell to the smallest practical area.

4.6.50 For any waste disposed of at the landfill that is subject to wind dispersal, the approval holder shall:

(a) wet the waste to prevent dispersal of particulate matter; or

(b) immediately apply cover on top of the waste to minimize entrainment of particulate matter.

4.6.51 Notwithstanding 4.6.1(v), the approval holder may place any of the following wastes over the surface of the active landfill area for the purpose of dust suppression:

(a) specified runoff;

(b) leachate;

(c) leak detection liquid;

(d) sump waste of car wash bays or similar operations;

(e) waste from hydrovac excavation operations; or

(f) any other waste authorized by t*he Alberta User Guide for Waste Managers*, May 1995, as amended;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

provided that placement of such wastes will not cause offensive odours.

4.6.52 The approval holder shall inspect the landfill, at a minimum:

(a) weekly; and

(b) immediately after each storm event to:

(i) detect evidence of deterioration of any infrastructure components, including the composite liner,

(ii) detect any malfunction or improper operation of the run-on and runoff control systems, leachate collection system, or leak detection system, and

(iii) take corrective measures to repair any damage to infrastructure components, including the composite liner.

4.6.53 The approval holder shall:

(a) keep a record of inspections conducted pursuant to 4.6.52;

(b) have the record of inspections available for review upon written request from the Director; and

(c) immediately report any deficiencies detected by the inspection in 4.6.52 to the Director in writing along with any corrective measures taken or proposed.

4.6.54 The approval holder shall not stockpile waste exceeding the maximum designated waste elevation of the landfill for a period of more than two (2) weeks, unless otherwise authorized in writing by the Director.

4.6.55 The approval holder shall take all practical measures to prevent off-site tracking of waste from vehicles and equipment leaving the facility.

MONITORING AND REPORTING

4.6.56 The approval holder shall monitor the landfill operations as required in TABLE 4.6-D.

4.6.57 The approval holder shall report to the Director the results of the landfill operations monitoring as required in TABLE 4.6-D.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

TABLE 4.6-D: LANDFILL OPERATIONS MONITORING AND REPORTING REQUIREMENTS

MONITORING AND REPORTING				
Parameter	**Frequency**	**Sample Type**	**Sampling Location**	**Reporting**
Quantity and type of waste received	Continuously, When operating	Measured or estimated	At entrance to landfill	Annual Landfill Operations Report
Quantity and type of material removed	Continuously, when operating	Measured or estimated	At entrance to landfill	
General location of waste deposited	Continuously, when operating	As per survey, or using grid system	At active landfill area, or survey coordinates	
Leachate head	at least: - once every three working days; - after storm event; and - immediately prior to leachate removal	Calculated	At primary leachate collection system sumps for existing landfill Cell 1	
		Measured	At primary leachate collection system sumps for all other landfill cells	
Leachate analysis, as per TABLE 4.4-A	At least once every quarter year, unless insufficient sample volume is available	Grab sample	At each primary leachate collection system sump	
Volume of leachate removed from the leachate collection system	As removed	Measured or calculated	At leachate collection system sumps	
Leak detection liquid analysis, as per TABLE 4.4-A	At least once every quarter year, unless insufficient sample volume is available	Grab sample	At each leak detection system sump	
Volume of leak detection liquid removed from the leak detection system	At least once every working day, as removed	Measured or calculated	At leak detection system sumps	
Final cover	When final cover is applied	Final cover by survey cores or test pits or both	On each completed landfill cell	

4.6.58 The Annual Landfill Operations Report required in TABLE 4.6-D shall include, at a minimum, all of the following:

(a) the name and contact information of the person responsible for the facility;

(b) a summary of all information collected as required in TABLE 4.6-D;

(c) a summary of the results of any audit conducted in accordance with 4.1.7;

TERMS AND CONDITIONS ATTACHED TO APPROVAL

(d) a summary of the operations of the waste stabilization area;

(e) a summary of the performance of the run-on and runoff control systems, including a comparison to the limits in TABLES 4.3-B and 4.3-C;

(f) a summary of the performance of the leachate collection system, including a comparison to the maximum acceptable leachate head;

(g) a summary of the performance of the leak detection system, including a comparison to the action leakage rate limit;

(h) the Response Action Plan for the leak detection system pursuant to 4.4.10;

(i) the Annual Dugout and Water Well Sampling Program Report pursuant to 4.5.4;

(j) a summary of all revisions to the Landfill Operations Plan pursuant to 4.6.33(b);

(k) any groundwater remedial action taken pursuant to 4.6.34(p);

(l) a summary of records of landfill inspections pursuant to 4.6.53;

(m) a summary of:

  (i) operational issues encountered,

  (ii) emergencies occurred, and

  (iii) measures or actions taken;

(n) a summary of records of:

  (i) public complaints, and

  (ii) the approval holder's responses;

(o) an up-to-date financial security estimate pursuant to 5.1.2;

(p) an updated site development plan showing the status of the landfill progression at the end of the operating year, including but not limited to:

  (i) contour mapping,

  (ii) the location of active and inactive disposal areas,

  (iii) areas where a final cover has been placed, and

TERMS AND CONDITIONS ATTACHED TO APPROVAL

(iv) the location of new landfill cell(s) constructed;

(q) the Annual Landfill Cell Closure Report pursuant to 7.1.7;

(r) a summary of contraventions reported pursuant to 2.1.1 related to landfill operations; and

(s) any other information as required in writing by the Director.

4.6.59 The approval holder shall submit the Annual Landfill Operations Report to the Director.

SECTION 4.7: DOMESTIC WASTEWATER

OPERATIONS

4.7.1 The approval holder shall not release any substances from the domestic wastewater system to the surrounding watershed except as authorized by this approval.

4.7.2 The approval holder shall direct all domestic wastewater to the domestic wastewater system.

4.7.3 The approval holder shall only dispose of substances from the domestic wastewater system:

(a) to facilities holding a current Act authorization;

(b) to facilities approved by a local environmental authority outside of Alberta; or

(c) as otherwise authorized in writing by the Director.

SECTION 4.8: WATERWORKS

Not used at this time.

SECTION 4.9: GROUNDWATER

MONITORING

4.9.1 The approval holder shall continue to implement the existing Groundwater Monitoring Program as authorized in writing by the Director, unless and until otherwise authorized in writing by the Director pursuant to 4.9.4.

4.9.2 The approval holder shall submit a revised Groundwater Monitoring Program to the Director on or before September 30, 2017, unless otherwise authorized in writing by the Director.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

4.9.3 If the revised Groundwater Monitoring Program submitted pursuant to 4.9.2 is found deficient by the Director, the approval holder shall correct all deficiencies as outlined in writing by the Director within the timeline specified in writing by the Director.

4.9.4 The approval holder shall implement the revised Groundwater Monitoring Program submitted pursuant to 4.9.2 as authorized in writing by the Director within the timeline specified in writing by the Director.

4.9.5 The approval holder shall:

(a) collect a representative groundwater sample from each of the groundwater monitor wells specified in the Groundwater Monitoring Program, including the groundwater monitoring wells designated as points of compliance; and

(b) analyze each sample for the parameters listed in TABLE 4.9-A.

TABLE 4.9-A: GROUNDWATER MONITORING PROGRAM

PARAMETERS	
pH	Metals
Electrical conductivity	Major ions
COD	Nutrients
DOC	BTEX
TDS	Petroleum Hydrocarbons Fractions F1 and F2

4.9.6 The monitoring required in 4.9.5 shall be conducted at the following frequencies, unless otherwise authorized in writing by the Director:

(a) a minimum of once per year during each of the active landfill life, landfill cell closure, final landfill closure, and post-closure periods; and

(b) a minimum of four times per year following detection of leachate constituents in groundwater at levels above those specified in 4.9.7, and until the levels specified in 4.9.7 have been met.

4.9.7 The groundwater quality in the monitoring wells, designated as points of compliance in the Groundwater Monitoring Program, shall not exceed the higher of:

(a) the objectives established in the water quality objectives in the *Canadian Environmental Quality Guidelines (CEQG)* for drinking water published by the Canadian Council of Ministers of the Environment (CCME), as amended; or

(b) background groundwater chemistry as determined through a statistical analysis, as a derived alternate groundwater performance standard.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

4.9.8 The approval holder shall implement the Remediation Plan as specified in the Landfill Operations Plan, when groundwater quality exceeds the groundwater performance criteria in 4.9.7.

4.9.9 The samples extracted from the groundwater monitor wells shall be collected using scientifically acceptable purging, sampling and preservation procedures so that a representative groundwater sample is obtained.

4.9.10 The approval holder shall:

(a) protect from damage; and

(b) keep locked except when being sampled

all groundwater monitoring wells unless otherwise authorized in writing by the Director.

4.9.11 If a representative groundwater sample cannot be collected because the groundwater monitoring well is damaged or is no longer capable of producing a representative groundwater sample, the approval holder shall:

(a) clean, repair or replace the groundwater monitoring well; and

(b) collect and analyse a representative groundwater sample prior to the next scheduled sampling event;

unless otherwise authorized in writing by the Director.

4.9.12 In addition to the sampling information recorded in 2.2.1, the approval holder shall record the following sampling information for all groundwater samples collected:

(a) a description of purging and sampling procedures;

(b) the static elevations above sea level, and depth below ground surface of fluid phases in the groundwater monitoring well prior to purging;

(c) the temperature of each sample at the time of sampling;

(d) the pH of each sample at the time of sampling; and

(e) the specific conductance of each sample at the time of sampling.

4.9.13 The approval holder shall carry out remediation of the groundwater in accordance with the following:

(a) *Alberta Tier 1 Soil and Groundwater Remediation Guidelines*, Alberta Environment, February 2009, as amended; and

TERMS AND CONDITIONS ATTACHED TO APPROVAL

(b) *Alberta Tier 2 Soil and Groundwater Remediation Guidelines*, Alberta Environment, February 2009, as amended.

REPORTING

4.9.14 The approval holder shall compile an Annual Groundwater Monitoring Program Report which shall include, at a minimum, all of the following information:

(a) a completed *Record of Site Condition Form*, Alberta Environment, 2009, as amended;

(b) a legal land description of the facility and a map illustrating the facility boundaries;

(c) a topographic map of the facility;

(d) a description of the industrial activity and processes;

(e) a map showing the location of all surface and groundwater users, and a listing describing surface water and water well use details, within at least a 1.6 kilometre radius of the facility;

(f) a general hydrogeological characterization of the region within a five kilometre radius of the facility;

(g) a detailed hydrogeological characterization of the facility, including an interpretation of groundwater flow patterns;

(h) cross-sections showing depth to water table, patterns of groundwater movement and hydraulic gradients at the facility;

(i) borehole logs and completion details for groundwater monitoring wells;

(j) a map showing locations of all known buried channels within at least five kilometre of the facility;

(k) a map of surface drainage within the facility and surrounding area to include nearby water bodies;

(l) a map of groundwater monitoring well locations and a table summarizing the existing groundwater monitoring program for the facility;

(m) a summary of any changes to the groundwater monitoring program made since the last groundwater monitoring report;

(n) analytical data recorded as required in 4.9.5 and 4.9.11(b);

TERMS AND CONDITIONS ATTACHED TO APPROVAL

(o) a summary of fluid elevations recorded as required in 4.9.12(b) and an interpretation of changes in fluid elevations;

(p) an interpretation of QA/QC program results;

(q) an interpretation of all the data in this report, including the following:

  (i) diagrams indicating the location and extent of any contamination,

  (ii) a description of probable sources of contamination, and

  (iii) a site map showing the location and type of current and historical potential sources of groundwater contamination;

(r) a summary and interpretation of the data collected since the groundwater monitoring program began including:

  (i) control charts which indicate trends in concentrations of parameters, and

  (ii) the migration of contaminants;

(s) a description of the following:

  (i) contaminated groundwater remediation techniques employed,

  (ii) source elimination measures employed,

  (iii) risk assessment studies undertaken, and

  (iv) risk management studies undertaken;

(t) a proposed sampling schedule for the following year(s);

(u) a description of any contaminant remediation, risk assessment or risk management action conducted at the facility; and

(v) recommendations for:

  (i) changes to the groundwater monitoring program to make it more effective, and

  (ii) remediation, risk assessment or risk management of contamination identified.

4.9.15 The approval holder shall submit the Annual Groundwater Monitoring Program Report to the Director.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

4.9.16 If the Annual Groundwater Monitoring Program Report is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director, within the timeline specified in writing by the Director.

SECTION 4.10: SOIL

4.10.1 In addition to any other requirements specified in this approval, the approval holder shall conduct all of the following activities related to soil monitoring and soil management required by this approval in accordance with the *Soil Monitoring Directive,* Alberta Environment, 2009, as amended:

(a) designing and developing proposals for the Soil Monitoring Program;

(b) designing and developing proposals for the Soil Management Program;

(c) all other actions, including sampling, analysing, and reporting, associated with the Soil Monitoring Program; and

(d) all other actions, including sampling, analysing and reporting, associated with the Soil Management Program.

MONITORING AND REPORTING

4.10.2 The approval holder shall submit the Soil Monitoring Program proposal to the Director according to the following schedule:

(a) for the first soil monitoring event on or before January 31, 2019; and

(b) for the second soil monitoring event on or before January 31, 2024;

unless otherwise authorized in writing by the Director.

4.10.3 If any Soil Monitoring Program proposal is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.

4.10.4 Subject to 4.10.3, the approval holder shall implement the Soil Monitoring Program as authorized in writing by the Director.

4.10.5 If an authorization or a deficiency letter is not issued within 120 days of the applicable date required by 4.10.2, the approval holder shall implement the Soil Monitoring Program:

(a) in accordance with the program as set out in the proposal submitted by the approval holder; and

(b) within 270 days after the applicable date required by 4.10.2.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

4.10.6 The approval holder shall submit to the Director each Soil Monitoring Program Report obtained from the soil monitoring referred to in 4.10.4 and 4.10.5 according to the following schedule:

(a) for the first Soil Monitoring Program Report on or before January 31, 2020; and

(b) for the second Soil Monitoring Program Report on or before January 31, 2025;

unless otherwise authorized in writing by the Director.

4.10.7 If any Soil Monitoring Program Report is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.

SOIL MANAGEMENT PROGRAM

4.10.8 If the Soil Monitoring Program, or any other soil monitoring, reveals that there are substances present in the soil at concentrations greater than any of the applicable concentrations set out in the standards in the *Soil Monitoring Directive*, Alberta Environment, 2009, as amended, the approval holder shall develop a Soil Management Program Proposal.

4.10.9 If a Soil Management Program Proposal is required pursuant to 4.10.8, the approval holder shall submit a Soil Management Program Proposal to the Director according to the following schedule:

(a) for Soil Management Program Proposal that is triggered by the findings from the first soil monitoring event on or before the date in 4.10.6(a);

(b) for Soil Management Program Proposal that is triggered by the findings from a second soil monitoring event on or before the date in 4.10.6(b); or

(c) for any other soil monitoring event not specified in this approval within six months of completion of the soil monitoring event.

4.10.10 If any Soil Management Program Proposal is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.

4.10.11 The approval holder shall implement the Soil Management Program as authorized in writing by the Director.

4.10.12 If the approval holder is required to implement a Soil Management Program pursuant to 4.10.11, the approval holder shall submit a written Soil Management Program

TERMS AND CONDITIONS ATTACHED TO APPROVAL

Report to the Director on or before March 31 of each year following the year in which the information was collected.

4.10.13 If any Soil Management Program Report is found deficient by the Director, the approval holder shall correct all deficiencies identified by the Director by the date specified in writing by the Director.

PART 5: FINANCIAL SECURITY REQUIREMENTS

5.1.1 The approval holder shall annually review and revise the cost estimate for reclamation of the facility including decommissioning and land reclamation.

5.1.2 The annual revised cost estimate for the facility shall be submitted to the Director by March 31 of each year.

5.1.3 The approval holder shall review and revise the cost estimate for reclamation of the facility when one or more of the following occurs:

(a) the cost estimate of future conservation and reclamation of the facility changes;

(b) the extent of the operation of the facility is increased or reduced;

(c) the facility or any portion of it is conserved and reclaimed;

(d) the conservation and reclamation plan required by this approval is changed; or

(e) the activities conducted at the facility for which security is required is increased or decreased.

5.1.4 The approval holder shall submit the revised cost estimate arising from 5.1.3 to the Director within 30 days after the occurrence of any of the circumstances described in 5.1.3.

5.1.5 The approval holder shall provide additional financial security as required in writing by the Director.

5.1.6 The approval holder shall renew the financial security for the facility at least 30 days prior to the date it expires.

5.1.7 The approval holder shall maintain the financial security for the facility until returned in accordance with the Act or the regulations.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

PART 6: DECOMMISSIONING AND LAND RECLAMATION OF HWRSP FACILITY

SECTION 6.1: GENERAL

6.1.1 The approval holder shall apply for an amendment to this approval to reclaim the HWRSP Facility by submitting to the Director:

(a) a Decommissioning Plan; and

(b) a Land Reclamation Plan.

6.1.2 The approval holder shall submit the:

(a) Decommissioning Plan; and

(b) Land Reclamation Plan

referred to in 6.1.1 within six (6) months of the HWRSP Facility ceasing operation, except for repairs and maintenance, unless otherwise authorized in writing by the Director.

SECTION 6.2: DECOMMISSIONING

6.2.1 The Decommissioning Plan referred to in 6.1.1 shall include, at a minimum, all of the following:

(a) a plan for dismantling the HWRSP Facility;

(b) a comprehensive study to determine the nature, degree and extent of contamination at the HWRSP Facility and affected lands;

(c) a plan to manage all wastes at the HWRSP Facility;

(d) evaluation of remediation technologies proposed to be used at the HWRSP Facility and affected lands;

(e) a plan for decontamination of the HWRSP Facility and affected lands in accordance with the following:

(i) for soil or groundwater, *Alberta Tier 1 Soil and Groundwater Remediation Guidelines*, Alberta Environment, February 2009, as amended,

(ii) for soil or groundwater, *Alberta Tier 2 Soil and Groundwater Remediation Guidelines*, Alberta Environment, February 2009, as amended,

TERMS AND CONDITIONS ATTACHED TO APPROVAL

(iii) for drinking water, *Canadian Environmental Quality Guidelines*, Canadian Council of Ministers of the Environment, PN 1299, 1999, as amended, and

(iv) for surface water, *Surface Water Quality Guidelines for Use in Alberta*, Alberta Environment, November 1999, as amended;

(f) confirmatory testing to indicate compliance with the remediation objectives;

(g) a plan for maintaining and operating contaminant monitoring systems;

(h) a schedule for activities (a) through (g) above; and

(i) any other information as required in writing by the Director.

6.2.2 If the Decommissioning Plan is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.

SECTION 6.3: LAND RECLAMATION

6.3.1 The Land Reclamation Plan referred to in 6.1.1 shall include, at a minimum, all of the following:

(a) the final use of the reclaimed area and how equivalent land capability will be achieved;

(b) removal of infrastructure;

(c) restoration of drainage;

(d) soil replacement;

(e) erosion control;

(f) revegetation and conditioning of the HWRSP Facility including:

(i) species list, seed source and quality, seeding rates and methods,

(ii) fertilization rates and methods, and

(iii) wildlife habitat plans where applicable;

(g) reclamation schedule; and

(h) any other information as required in writing by the Director.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

6.3.2 If the Land Reclamation Plan is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.

PART 7: FINAL LANDFILL CLOSURE AND POST-CLOSURE

SECTION 7.1: LANDFILL CELL CLOSURE AND MAINTENANCE

7.1.1 The approval holder shall submit a Landfill Cell Closure Plan for individual landfill cell closure to the Director on or before September 30, 2017, unless otherwise authorized in writing by the Director.

7.1.2 The Landfill Cell Closure Plan submitted pursuant to 7.1.1 shall be signed and stamped by a professional registered with APEGA.

7.1.3 If the Landfill Cell Closure Plan submitted pursuant to 7.1.1 is found deficient by the Director, the approval holder shall correct all deficiencies as outlined in writing by the Director within the timeline specified in writing by the Director.

7.1.4 The approval holder shall implement the Landfill Cell Closure Plan submitted pursuant to 7.1.1 as authorized in writing by the Director.

7.1.5 The approval holder shall maintain the closed landfill cells to:

(a) protect and maintain the integrity of the final cover and surface water drainage systems;

(b) prevent erosion;

(c) prevent surface water ponding;

(d) remediate areas affected by subsidence and differential settlement; and

(e) prevent leachate break out.

7.1.6 If the approval holder completes landfill cell closure in a year, the approval holder shall prepare an Annual Landfill Cell Closure Report, and include, at a minimum, all of the following information in the Report:

(a) as-built plans and details on the location of landfill cells that have been closed;

(b) certified construction QA/QC procedures employed during cover construction and installation; and

(c) survey reports showing the final cover depths.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

7.1.7 The approval holder shall submit the Annual Landfill Cell Closure Report with the Annual Landfill Operations Report required in 4.6.58.

SECTION 7.2: FINAL LANDFILL CLOSURE AND POST-CLOSURE

7.2.1 The approval holder shall apply for an amendment to this approval for final landfill closure by submitting to the Director:

(a) a Detailed Final Landfill Closure Plan ; and

(b) a Landfill Post-Closure Plan.

7.2.2 The approval holder shall submit the:

(a) Detailed Final Landfill Closure Plan; and

(b) Landfill Post-Closure Plan

referred to in 7.2.1 within six (6) months of the landfill ceasing operations, unless otherwise authorized in writing by the Director.

DETAILED FINAL LANDFILL CLOSURE PLAN

7.2.3 The Detailed Final Landfill Closure Plan shall be developed in accordance with sections 6.1(b) and 6.1(c) of the *Standards for Landfills in Alberta*, as amended.

7.2.4 In addition to 7.2.3, the Detailed Final Landfill Closure Plan shall include, at a minimum, all of the following:

(a) a plan for replacement of soil;

(b) a QA/QC Program; and

(c) any deviations from the most recently submitted closure plan.

7.2.5 The Detailed Final Landfill Closure Plan shall be signed and stamped by a professional registered with APEGA.

7.2.6 If the Detailed Final Landfill Closure Plan is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.

7.2.7 The approval holder shall implement the Detailed Final Landfill Closure Plan as authorized in writing by the Director.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

LANDFILL POST-CLOSURE PLAN

7.2.8 The Landfill Post-Closure Plan shall be developed in accordance with sections 6.2 and 6.3 of the *Standards for Landfills in Alberta*, as amended.

7.2.9 In addition to 7.2.8, the Landfill Post-Closure Plan shall include, at a minimum, all of the following:

(a) the groundwater monitoring program including performance standards and points of compliance;

(b) the subsurface landfill gas monitoring program and performance standards at points of compliance;

(c) a plan for erosion control;

(d) a plan for maintaining vegetative cover; and

(e) any other information requested in writing by the Director.

7.2.10 The Landfill Post-Closure Plan shall be signed and stamped by a professional registered with APEGA.

7.2.11 If the Landfill Post-Closure Plan is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.

7.2.12 The approval holder shall implement the Landfill Post-Closure Plan as authorized in writing by the Director.

PART 8: DECOMMISSIONING AND LAND RECLAMATION OF OLD SURFACE WATER DETENTION POND

8.1.1 The approval holder shall:

(a) decommission; and

(b) reclaim

the old surface water detention pond prior to construction of Cell 4.

8.1.2 The approval holder shall submit a Decommissioning and Land Reclamation Plan for the old surface water detention pond to the Director a minimum of six (6) months prior to decommissioning and land reclamation of the pond.

TERMS AND CONDITIONS ATTACHED TO APPROVAL

8.1.3 If the Decommissioning and Land Reclamation Plan is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director by the date specified in writing by the Director.

DATED March 31, 2017

DESIGNATED DIRECTOR UNDER THE ACT
Mohammad Habib, P. Eng.

APPENDIX C

LABORATORY DATA

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EO2202581**	Page	: 1 of 8
Amendment	: **1**		
Client	: **Tetra Tech Canada Inc.**	Laboratory	: Edmonton - Environmental
Contact	: Mark Fawcett	Account Manager	: Kieran Tordoff
Address	: North Building 14940 123 Ave NW Edmonton AB Canada T5V 1B4	Address	: 9450 - 17 Avenue NW Edmonton AB Canada T6N 1M9
Telephone	: 780 451 2130	Telephone	: +1 780 413 5227
Project	: SWM.SWOP04348-01 task 002	Date Samples Received	: 19-Apr-2022 16:08
PO	: ----	Date Analysis Commenced	: 21-Apr-2022
C-O-C number	: ----	Issue Date	: 02-May-2022 07:50
Sampler	: ----		
Site	: SE-09-05-17 W4M		
Quote number	: ----		
No. of samples received	: 39		
No. of samples analysed	: 26		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Austin Wasylyshyn	Lab Analyst	Metals, Edmonton, Alberta
Dan Nguyen	Team Leader - Inorganics	Metals, Edmonton, Alberta
Joan Wu	Lab Analyst	Metals, Edmonton, Alberta

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
mg/kg	milligrams per kilogram

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	AR-CS1 5-20	AR-CS2 5-20	AR-CS2 30-50	AR-CS3 5-20	AR-CS3 30-50
					Client sampling date / time	18-Apr-2022	18-Apr-2022	18-Apr-2022	18-Apr-2022	18-Apr-2022
						EO2202581-001	EO2202581-003	EO2202581-004	EO2202581-005	EO2202581-006
						Result	Result	Result	Result	Result
Metals										
antimony	7440-36-0	E440	0.10	mg/kg		0.32	0.45	0.58	0.40	0.43
arsenic	7440-38-2	E440	0.10	mg/kg		7.08	7.64	8.83	6.73	10.6
barium	7440-39-3	E440	0.50	mg/kg		194	195	191	222	157
beryllium	7440-41-7	E440	0.10	mg/kg		0.54	0.56	0.58	0.51	0.62
cadmium	7440-43-9	E440	0.020	mg/kg		0.236	0.413	0.187	0.372	0.160
chromium	7440-47-3	E440	0.50	mg/kg		20.6	25.8	24.4	26.0	25.0
cobalt	7440-48-4	E440	0.10	mg/kg		9.13	9.27	8.72	8.78	8.36
copper	7440-50-8	E440	0.50	mg/kg		14.6	19.3	18.0	18.6	15.1
lead	7439-92-1	E440	0.50	mg/kg		10.1	20.8	9.42	19.1	9.34
mercury	7439-97-6	E510	0.0050	mg/kg		----	----	0.0429	----	0.0312
molybdenum	7439-98-7	E440	0.10	mg/kg		1.53	4.73	0.90	4.20	1.10
nickel	7440-02-0	E440	0.50	mg/kg		20.5	25.1	24.8	23.2	22.9
selenium	7782-49-2	E440	0.20	mg/kg		0.70	0.71	0.33	0.64	0.45
silver	7440-22-4	E440	0.10	mg/kg		<0.10	0.12	0.10	0.12	<0.10
thallium	7440-28-0	E440	0.050	mg/kg		0.174	0.164	0.186	0.152	0.154
tin	7440-31-5	E440	2.0	mg/kg		<2.0	<2.0	<2.0	<2.0	<2.0
uranium	7440-61-1	E440	0.050	mg/kg		0.924	0.844	1.08	0.793	1.13
vanadium	7440-62-2	E440	0.20	mg/kg		35.7	48.1	31.7	44.7	33.6
zinc	7440-66-6	E440	2.0	mg/kg		74.0	145	58.6	133	60.3

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	AR-CS4 5-20	AR-CS5 5-20	AR-CS6 5-20	AR-CS7 5-20	AR-CS8 5-20
					Client sampling date / time	18-Apr-2022	18-Apr-2022	18-Apr-2022	18-Apr-2022	18-Apr-2022
						EO2202581-007	EO2202581-009	EO2202581-011	EO2202581-013	EO2202581-015
						Result	Result	Result	Result	Result
Metals										
antimony	7440-36-0	E440	0.10	mg/kg		0.36	0.24	0.25	0.38	0.29
arsenic	7440-38-2	E440	0.10	mg/kg		8.72	6.47	6.32	9.01	6.77
barium	7440-39-3	E440	0.50	mg/kg		232	233	153	172	168
beryllium	7440-41-7	E440	0.10	mg/kg		0.63	0.54	0.55	0.62	0.58
cadmium	7440-43-9	E440	0.020	mg/kg		0.237	0.316	0.186	0.234	0.200
chromium	7440-47-3	E440	0.50	mg/kg		24.6	23.8	23.3	19.0	19.9
cobalt	7440-48-4	E440	0.10	mg/kg		10.4	8.40	7.72	8.69	8.21
copper	7440-50-8	E440	0.50	mg/kg		18.0	17.6	13.9	17.0	14.7
lead	7439-92-1	E440	0.50	mg/kg		11.9	8.62	8.05	9.87	7.98
molybdenum	7439-98-7	E440	0.10	mg/kg		2.18	1.04	1.31	3.88	2.18
nickel	7440-02-0	E440	0.50	mg/kg		24.4	20.7	19.4	21.9	20.5
selenium	7782-49-2	E440	0.20	mg/kg		0.79	0.51	0.65	0.69	0.69
silver	7440-22-4	E440	0.10	mg/kg		<0.10	<0.10	<0.10	<0.10	<0.10
thallium	7440-28-0	E440	0.050	mg/kg		0.182	0.154	0.145	0.163	0.158
tin	7440-31-5	E440	2.0	mg/kg		<2.0	<2.0	<2.0	<2.0	<2.0
uranium	7440-61-1	E440	0.050	mg/kg		0.883	0.728	0.746	0.871	0.792
vanadium	7440-62-2	E440	0.20	mg/kg		44.6	35.6	31.5	36.6	34.2
zinc	7440-66-6	E440	2.0	mg/kg		82.4	83.9	58.0	71.6	57.4

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	AR-CS9 5-20	AR-CS10 5-20	AR-CS10 30-50	AR-CS11 5-20	AR-CS13 5-20
					Client sampling date / time	18-Apr-2022	18-Apr-2022	18-Apr-2022	18-Apr-2022	18-Apr-2022
						EO2202581-017	EO2202581-019	EO2202581-020	EO2202581-021	EO2202581-023
						Result	Result	Result	Result	Result
Metals										
antimony	7440-36-0	E440	0.10	mg/kg		0.36	0.21	0.45	0.14	0.43
arsenic	7440-38-2	E440	0.10	mg/kg		7.38	5.70	7.92	4.94	7.63
barium	7440-39-3	E440	0.50	mg/kg		159	174	182	112	204
beryllium	7440-41-7	E440	0.10	mg/kg		0.51	0.44	0.69	0.33	0.55
cadmium	7440-43-9	E440	0.020	mg/kg		0.199	0.155	0.215	0.196	0.271
chromium	7440-47-3	E440	0.50	mg/kg		19.5	19.7	31.8	12.5	28.6
cobalt	7440-48-4	E440	0.10	mg/kg		8.88	7.91	8.63	4.32	11.5
copper	7440-50-8	E440	0.50	mg/kg		16.1	12.1	19.2	11.3	17.8
lead	7439-92-1	E440	0.50	mg/kg		8.72	7.16	8.44	6.81	12.9
mercury	7439-97-6	E510	0.0050	mg/kg		----	----	0.0535	----	----
molybdenum	7439-98-7	E440	0.10	mg/kg		1.04	1.03	0.71	0.82	3.32
nickel	7440-02-0	E440	0.50	mg/kg		22.5	13.4	33.7	10.3	28.3
selenium	7782-49-2	E440	0.20	mg/kg		0.30	1.05	0.75	0.45	0.44
silver	7440-22-4	E440	0.10	mg/kg		<0.10	<0.10	0.13	<0.10	<0.10
thallium	7440-28-0	E440	0.050	mg/kg		0.169	0.130	0.198	0.104	0.163
tin	7440-31-5	E440	2.0	mg/kg		<2.0	<2.0	<2.0	<2.0	<2.0
uranium	7440-61-1	E440	0.050	mg/kg		0.909	1.13	0.874	0.628	0.876
vanadium	7440-62-2	E440	0.20	mg/kg		31.5	29.8	35.6	25.0	34.6
zinc	7440-66-6	E440	2.0	mg/kg		60.9	56.9	54.2	59.1	85.1

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	AR-CS14 5-20	AR-CS14 30-50	AR-CS15 5-20	AR-CS18 5-20	AR-CS18 30-50
					Client sampling date / time	18-Apr-2022	18-Apr-2022	18-Apr-2022	18-Apr-2022	18-Apr-2022
						EO2202581-025	EO2202581-026	EO2202581-027	EO2202581-029	EO2202581-030
						Result	Result	Result	Result	Result
Metals										
antimony	7440-36-0	E440	0.10	mg/kg		2.17	0.40	0.38	1.79	0.13
arsenic	7440-38-2	E440	0.10	mg/kg		9.81	9.62	7.27	8.41	3.24
barium	7440-39-3	E440	0.50	mg/kg		265	242	228	249	132
beryllium	7440-41-7	E440	0.10	mg/kg		0.47	0.67	0.58	0.40	0.29
cadmium	7440-43-9	E440	0.020	mg/kg		3.78	0.344	0.349	2.18	0.126
chromium	7440-47-3	E440	0.50	mg/kg		88.1	28.1	24.0	58.6	13.4
cobalt	7440-48-4	E440	0.10	mg/kg		12.8	10.5	9.19	13.3	3.21
copper	7440-50-8	E440	0.50	mg/kg		85.7	17.8	17.2	70.3	5.56
lead	7439-92-1	E440	0.50	mg/kg		217	8.67	15.7	139	4.16
mercury	7439-97-6	E510	0.0050	mg/kg		----	0.0418	----	----	0.0129
molybdenum	7439-98-7	E440	0.10	mg/kg		15.2	0.68	3.07	13.5	0.39
nickel	7440-02-0	E440	0.50	mg/kg		99.4	26.4	24.3	52.5	7.27
selenium	7782-49-2	E440	0.20	mg/kg		0.95	0.65	0.64	0.63	0.37
silver	7440-22-4	E440	0.10	mg/kg		0.83	0.10	<0.10	0.58	<0.10
thallium	7440-28-0	E440	0.050	mg/kg		0.138	0.199	0.154	0.136	0.090
tin	7440-31-5	E440	2.0	mg/kg		5.6	<2.0	<2.0	4.2	<2.0
uranium	7440-61-1	E440	0.050	mg/kg		0.795	0.789	0.767	0.752	0.809
vanadium	7440-62-2	E440	0.20	mg/kg		186	46.7	43.0	55.1	17.4
zinc	7440-66-6	E440	2.0	mg/kg		1500	57.5	114	865	37.3

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	AR-CS19 5-20	AR-CS21 5-20	AR-CS22 5-20	21-6S 5-20	21-8 5-20
					Client sampling date / time	18-Apr-2022	18-Apr-2022	18-Apr-2022	18-Apr-2022	18-Apr-2022
						EO2202581-031	EO2202581-033	EO2202581-035	EO2202581-036	EO2202581-038
						Result	Result	Result	Result	Result
Metals										
antimony	7440-36-0	E440	0.10	mg/kg		0.38	0.22	0.34	0.39	0.38
arsenic	7440-38-2	E440	0.10	mg/kg		6.74	6.06	6.25	7.11	9.39
barium	7440-39-3	E440	0.50	mg/kg		182	144	167	159	213
beryllium	7440-41-7	E440	0.10	mg/kg		0.49	0.42	0.48	0.50	0.66
cadmium	7440-43-9	E440	0.020	mg/kg		0.368	0.242	0.351	0.254	0.252
chromium	7440-47-3	E440	0.50	mg/kg		25.6	16.0	24.5	38.1	32.8
cobalt	7440-48-4	E440	0.10	mg/kg		8.17	5.51	7.51	8.95	10.0
copper	7440-50-8	E440	0.50	mg/kg		19.3	13.7	17.6	16.6	19.5
lead	7439-92-1	E440	0.50	mg/kg		15.8	5.35	15.0	13.0	12.5
molybdenum	7439-98-7	E440	0.10	mg/kg		1.84	0.51	1.94	3.75	1.37
nickel	7440-02-0	E440	0.50	mg/kg		28.6	15.8	25.7	29.9	32.0
selenium	7782-49-2	E440	0.20	mg/kg		0.47	0.42	0.52	0.44	0.32
silver	7440-22-4	E440	0.10	mg/kg		0.11	<0.10	0.11	<0.10	0.11
thallium	7440-28-0	E440	0.050	mg/kg		0.150	0.128	0.136	0.151	0.186
tin	7440-31-5	E440	2.0	mg/kg		<2.0	<2.0	<2.0	<2.0	<2.0
uranium	7440-61-1	E440	0.050	mg/kg		1.35	1.48	1.33	0.765	1.18
vanadium	7440-62-2	E440	0.20	mg/kg		42.0	31.3	39.2	33.8	34.6
zinc	7440-66-6	E440	2.0	mg/kg		126	54.3	117	84.2	89.6

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	Duplicate 1	----	----	----	----
					Client sampling date / time	18-Apr-2022	----	----	----	----
						EO2202581-040	--------	--------	--------	--------
						Result	----	----	----	----
Metals										
antimony	7440-36-0	E440	0.10	mg/kg		0.38	----	----	----	----
arsenic	7440-38-2	E440	0.10	mg/kg		7.63	----	----	----	----
barium	7440-39-3	E440	0.50	mg/kg		215	----	----	----	----
beryllium	7440-41-7	E440	0.10	mg/kg		0.61	----	----	----	----
cadmium	7440-43-9	E440	0.020	mg/kg		0.344	----	----	----	----
chromium	7440-47-3	E440	0.50	mg/kg		26.0	----	----	----	----
cobalt	7440-48-4	E440	0.10	mg/kg		10.2	----	----	----	----
copper	7440-50-8	E440	0.50	mg/kg		18.3	----	----	----	----
lead	7439-92-1	E440	0.50	mg/kg		15.5	----	----	----	----
molybdenum	7439-98-7	E440	0.10	mg/kg		2.81	----	----	----	----
nickel	7440-02-0	E440	0.50	mg/kg		24.7	----	----	----	----
selenium	7782-49-2	E440	0.20	mg/kg		0.75	----	----	----	----
silver	7440-22-4	E440	0.10	mg/kg		0.11	----	----	----	----
thallium	7440-28-0	E440	0.050	mg/kg		0.156	----	----	----	----
tin	7440-31-5	E440	2.0	mg/kg		<2.0	----	----	----	----
uranium	7440-61-1	E440	0.050	mg/kg		0.809	----	----	----	----
vanadium	7440-62-2	E440	0.20	mg/kg		41.1	----	----	----	----
zinc	7440-66-6	E440	2.0	mg/kg		114	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **EO2202581**	Page	: 1 of 8
Amendment	: 1		
Client	: **Tetra Tech Canada Inc.**	Laboratory	: Edmonton - Environmental
Contact	: Mark Fawcett	Account Manager	: Kieran Tordoff
Address	: North Building 14940 123 Ave NW Edmonton AB Canada T5V 1B4	Address	: 9450 - 17 Avenue NW Edmonton, Alberta Canada T6N 1M9
Telephone	: 780 451 2130	Telephone	: +1 780 413 5227
Project	: SWM.SWOP04348-01 task 002	Date Samples Received	: 19-Apr-2022 16:08
PO	: ----	Issue Date	: 02-May-2022 07:50
C-O-C number	: ----		
Sampler	: ----		
Site	: SE-09-05-17 W4M		
Quote number	: ----		
No. of samples received	: 39		
No. of samples analysed	: 26		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Soil/Solid by CVAAS										
LDPE bag AR-CS10 30-50	E510	18-Apr-2022	27-Apr-2022	----	----		27-Apr-2022	28 days	9 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
LDPE bag AR-CS14 30-50	E510	18-Apr-2022	27-Apr-2022	----	----		27-Apr-2022	28 days	9 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
LDPE bag AR-CS18 30-50	E510	18-Apr-2022	27-Apr-2022	----	----		27-Apr-2022	28 days	9 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
LDPE bag AR-CS2 30-50	E510	18-Apr-2022	27-Apr-2022	----	----		27-Apr-2022	28 days	9 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
LDPE bag AR-CS3 30-50	E510	18-Apr-2022	27-Apr-2022	----	----		27-Apr-2022	28 days	9 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 21-6S 5-20	E440	18-Apr-2022	21-Apr-2022	----	----		21-Apr-2022	180 days	3 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS1 5-20	E440	18-Apr-2022	21-Apr-2022	----	----		21-Apr-2022	180 days	3 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS10 5-20	E440	18-Apr-2022	21-Apr-2022	----	----		21-Apr-2022	180 days	3 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS11 5-20	E440	18-Apr-2022	21-Apr-2022	----	----		21-Apr-2022	180 days	3 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS13 5-20	E440	18-Apr-2022	21-Apr-2022	----	----		21-Apr-2022	180 days	3 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS14 5-20	E440	18-Apr-2022	21-Apr-2022	----	----		21-Apr-2022	180 days	3 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS15 5-20	E440	18-Apr-2022	21-Apr-2022	----	----		21-Apr-2022	180 days	3 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS18 5-20	E440	18-Apr-2022	21-Apr-2022	----	----		21-Apr-2022	180 days	3 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS19 5-20	E440	18-Apr-2022	21-Apr-2022	----	----		21-Apr-2022	180 days	3 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS2 5-20	E440	18-Apr-2022	21-Apr-2022	----	----		21-Apr-2022	180 days	3 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS21 5-20	E440	18-Apr-2022	21-Apr-2022	----	----		21-Apr-2022	180 days	3 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS22 5-20	E440	18-Apr-2022	21-Apr-2022	----	----		21-Apr-2022	180 days	3 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS3 5-20	E440	18-Apr-2022	21-Apr-2022	----	----		21-Apr-2022	180 days	3 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS4 5-20	E440	18-Apr-2022	21-Apr-2022	----	----		21-Apr-2022	180 days	3 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS5 5-20	E440	18-Apr-2022	21-Apr-2022	----	----		21-Apr-2022	180 days	3 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS6 5-20	E440	18-Apr-2022	21-Apr-2022	----	----		21-Apr-2022	180 days	3 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS7 5-20	E440	18-Apr-2022	21-Apr-2022	----	----		21-Apr-2022	180 days	3 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS8 5-20	E440	18-Apr-2022	21-Apr-2022	----	----		21-Apr-2022	180 days	3 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS9 5-20	E440	18-Apr-2022	21-Apr-2022	----	----		21-Apr-2022	180 days	3 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 21-8 5-20	E440	18-Apr-2022	23-Apr-2022	----	----		24-Apr-2022	180 days	6 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag Duplicate 1	E440	18-Apr-2022	23-Apr-2022	----	----		24-Apr-2022	180 days	6 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS10 30-50	E440	18-Apr-2022	27-Apr-2022	----	----		27-Apr-2022	180 days	9 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS14 30-50	E440	18-Apr-2022	27-Apr-2022	----	----		27-Apr-2022	180 days	9 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS18 30-50	E440	18-Apr-2022	27-Apr-2022	----	----		27-Apr-2022	180 days	9 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS2 30-50	E440	18-Apr-2022	27-Apr-2022	----	----		27-Apr-2022	180 days	9 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS3 30-50	E440	18-Apr-2022	27-Apr-2022	----	----		27-Apr-2022	180 days	9 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Mercury in Soil/Solid by CVAAS	E510	469216	1	6	16.6	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	463911	3	29	10.3	5.0	✓
Laboratory Control Samples (LCS)							
Mercury in Soil/Solid by CVAAS	E510	469216	2	6	33.3	10.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	463911	6	29	20.6	10.0	✓
Method Blanks (MB)							
Mercury in Soil/Solid by CVAAS	E510	469216	1	6	16.6	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	463911	3	29	10.3	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Metals in Soil/Solid by CRC ICPMS	E440 Edmonton - Environmental	Soil/Solid	EPA 6020B (mod)	This method is intended to liberate metals that may be environmentally available. Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Silicate minerals are not solubilized. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. This method does not adequately recover elemental sulfur, and is unsuitable for assessment of elemental sulfur standards or guidelines. Analysis is by Collision/Reaction Cell ICPMS.
Mercury in Soil/Solid by CVAAS	E510 Edmonton - Environmental	Soil/Solid	EPA 200.2/1631 Appendix (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl, followed by CVAAS analysis.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Digestion for Metals and Mercury	EP440 Edmonton - Environmental	Soil/Solid	EPA 200.2 (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl. This method is intended to liberate metals that may be environmentally available.

QUALITY CONTROL REPORT

Work Order	: **EO2202581**	Page	: 1 of 10
Amendment	: **1**		

Client	: Tetra Tech Canada Inc.	Laboratory	: Edmonton - Environmental
Contact	: Mark Fawcett	Account Manager	: Kieran Tordoff
Address	: North Building 14940 123 Ave NW Edmonton AB Canada T5V 1B4	Address	: 9450 - 17 Avenue NW Edmonton, Alberta Canada T6N 1M9
Telephone	: 780 451 2130	Telephone	: +1 780 413 5227
Project	: SWM.SWOP04348-01 task 002	Date Samples Received	: 19-Apr-2022 16:08
PO	: ----	Date Analysis Commenced	: 21-Apr-2022
C-O-C number	: ----	Issue Date	: 02-May-2022 07:50
Sampler	: ----		
Site	: SE-09-05-17 W4M		
Quote number	: ----		
No. of samples received	: 39		
No. of samples analysed	: 26		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Austin Wasylyshyn	Lab Analyst	Metals, Edmonton, Alberta
Dan Nguyen	Team Leader - Inorganics	Metals, Edmonton, Alberta
Joan Wu	Lab Analyst	Metals, Edmonton, Alberta

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include 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 predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Metals (QC Lot: 463911)											
EO2202576-001	Anonymous	antimony	7440-36-0	E440	0.10	mg/kg	0.40	0.30	0.10	Diff <2x LOR	----
		arsenic	7440-38-2	E440	0.10	mg/kg	6.68	6.23	6.90%	30%	----
		barium	7440-39-3	E440	0.50	mg/kg	169	165	2.76%	40%	----
		beryllium	7440-41-7	E440	0.10	mg/kg	0.40	0.38	0.02	Diff <2x LOR	----
		cadmium	7440-43-9	E440	0.020	mg/kg	0.177	0.182	2.75%	30%	----
		chromium	7440-47-3	E440	0.50	mg/kg	15.5	13.4	15.1%	30%	----
		cobalt	7440-48-4	E440	0.10	mg/kg	7.00	6.90	1.44%	30%	----
		copper	7440-50-8	E440	0.50	mg/kg	11.6	10.8	7.08%	30%	----
		lead	7439-92-1	E440	0.50	mg/kg	6.73	6.35	5.84%	40%	----
		molybdenum	7439-98-7	E440	0.10	mg/kg	0.69	0.62	10.9%	40%	----
		nickel	7440-02-0	E440	0.50	mg/kg	17.6	16.2	8.28%	30%	----
		selenium	7782-49-2	E440	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	----
		silver	7440-22-4	E440	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	----
		thallium	7440-28-0	E440	0.050	mg/kg	0.160	0.156	0.004	Diff <2x LOR	----
		tin	7440-31-5	E440	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	----
		uranium	7440-61-1	E440	0.050	mg/kg	0.960	0.904	5.99%	30%	----
		vanadium	7440-62-2	E440	0.20	mg/kg	25.8	23.2	10.6%	30%	----
		zinc	7440-66-6	E440	2.0	mg/kg	47.1	43.5	7.92%	30%	----
Metals (QC Lot: 466015)											
EO2202579-001	Anonymous	antimony	7440-36-0	E440	0.10	mg/kg	0.53	0.42	0.11	Diff <2x LOR	----
		arsenic	7440-38-2	E440	0.10	mg/kg	9.74	7.78	22.5%	30%	----
		barium	7440-39-3	E440	0.50	mg/kg	211	167	23.5%	40%	----
		beryllium	7440-41-7	E440	0.10	mg/kg	0.57	0.46	0.10	Diff <2x LOR	----
		cadmium	7440-43-9	E440	0.020	mg/kg	0.285	0.247	14.4%	30%	----
		chromium	7440-47-3	E440	0.50	mg/kg	20.4	16.2	23.0%	30%	----
		cobalt	7440-48-4	E440	0.10	mg/kg	7.94	6.43	21.0%	30%	----
		copper	7440-50-8	E440	0.50	mg/kg	15.1	12.2	20.9%	30%	----
		lead	7439-92-1	E440	0.50	mg/kg	34.2	28.5	17.9%	40%	----
		molybdenum	7439-98-7	E440	0.10	mg/kg	0.78	0.61	23.7%	40%	----
		nickel	7440-02-0	E440	0.50	mg/kg	21.2	17.5	19.4%	30%	----
		selenium	7782-49-2	E440	0.20	mg/kg	0.21	<0.20	0.006	Diff <2x LOR	----
		silver	7440-22-4	E440	0.10	mg/kg	0.15	0.12	0.03	Diff <2x LOR	----

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Metals (QC Lot: 466015) - continued											
EO2202579-001	Anonymous	thallium	7440-28-0	E440	0.050	mg/kg	0.160	0.135	0.026	Diff <2x LOR	----
		tin	7440-31-5	E440	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	----
		uranium	7440-61-1	E440	0.050	mg/kg	1.56	1.27	21.0%	30%	----
		vanadium	7440-62-2	E440	0.20	mg/kg	24.2	19.5	21.3%	30%	----
		zinc	7440-66-6	E440	2.0	mg/kg	153	131	15.3%	30%	----
Metals (QC Lot: 469216)											
EO2202581-004	AR-CS2 30-50	mercury	7439-97-6	E510	0.0050	mg/kg	0.0429	0.0421	1.96%	40%	----
Metals (QC Lot: 469217)											
EO2202581-004	AR-CS2 30-50	antimony	7440-36-0	E440	0.10	mg/kg	0.58	0.52	0.06	Diff <2x LOR	----
		arsenic	7440-38-2	E440	0.10	mg/kg	8.83	8.94	1.28%	30%	----
		barium	7440-39-3	E440	0.50	mg/kg	191	196	2.50%	40%	----
		beryllium	7440-41-7	E440	0.10	mg/kg	0.58	0.54	0.03	Diff <2x LOR	----
		cadmium	7440-43-9	E440	0.020	mg/kg	0.187	0.190	1.66%	30%	----
		chromium	7440-47-3	E440	0.50	mg/kg	24.4	28.6	15.6%	30%	----
		cobalt	7440-48-4	E440	0.10	mg/kg	8.72	8.81	1.08%	30%	----
		copper	7440-50-8	E440	0.50	mg/kg	18.0	18.0	0.0345%	30%	----
		lead	7439-92-1	E440	0.50	mg/kg	9.42	9.31	1.20%	40%	----
		molybdenum	7439-98-7	E440	0.10	mg/kg	0.90	0.93	3.26%	40%	----
		nickel	7440-02-0	E440	0.50	mg/kg	24.8	26.4	6.38%	30%	----
		selenium	7782-49-2	E440	0.20	mg/kg	0.33	0.39	0.06	Diff <2x LOR	----
		silver	7440-22-4	E440	0.10	mg/kg	0.10	0.11	0.005	Diff <2x LOR	----
		thallium	7440-28-0	E440	0.050	mg/kg	0.186	0.203	0.017	Diff <2x LOR	----
		tin	7440-31-5	E440	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	----
		uranium	7440-61-1	E440	0.050	mg/kg	1.08	1.04	3.38%	30%	----
		vanadium	7440-62-2	E440	0.20	mg/kg	31.7	32.4	2.14%	30%	----
		zinc	7440-66-6	E440	2.0	mg/kg	58.6	58.0	0.977%	30%	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 463911)						
antimony	7440-36-0	E440	0.1	mg/kg	<0.10	----
arsenic	7440-38-2	E440	0.1	mg/kg	<0.10	----
barium	7440-39-3	E440	0.5	mg/kg	<0.50	----
beryllium	7440-41-7	E440	0.1	mg/kg	<0.10	----
cadmium	7440-43-9	E440	0.02	mg/kg	<0.020	----
chromium	7440-47-3	E440	0.5	mg/kg	<0.50	----
cobalt	7440-48-4	E440	0.1	mg/kg	<0.10	----
copper	7440-50-8	E440	0.5	mg/kg	<0.50	----
lead	7439-92-1	E440	0.5	mg/kg	<0.50	----
molybdenum	7439-98-7	E440	0.1	mg/kg	<0.10	----
nickel	7440-02-0	E440	0.5	mg/kg	<0.50	----
selenium	7782-49-2	E440	0.2	mg/kg	<0.20	----
silver	7440-22-4	E440	0.1	mg/kg	<0.10	----
thallium	7440-28-0	E440	0.05	mg/kg	<0.050	----
tin	7440-31-5	E440	2	mg/kg	<2.0	----
uranium	7440-61-1	E440	0.05	mg/kg	<0.050	----
vanadium	7440-62-2	E440	0.2	mg/kg	<0.20	----
zinc	7440-66-6	E440	2	mg/kg	<2.0	----
Metals (QCLot: 466015)						
antimony	7440-36-0	E440	0.1	mg/kg	<0.10	----
arsenic	7440-38-2	E440	0.1	mg/kg	<0.10	----
barium	7440-39-3	E440	0.5	mg/kg	<0.50	----
beryllium	7440-41-7	E440	0.1	mg/kg	<0.10	----
cadmium	7440-43-9	E440	0.02	mg/kg	<0.020	----
chromium	7440-47-3	E440	0.5	mg/kg	<0.50	----
cobalt	7440-48-4	E440	0.1	mg/kg	<0.10	----
copper	7440-50-8	E440	0.5	mg/kg	<0.50	----
lead	7439-92-1	E440	0.5	mg/kg	<0.50	----
molybdenum	7439-98-7	E440	0.1	mg/kg	<0.10	----
nickel	7440-02-0	E440	0.5	mg/kg	<0.50	----
selenium	7782-49-2	E440	0.2	mg/kg	<0.20	----
silver	7440-22-4	E440	0.1	mg/kg	<0.10	----
thallium	7440-28-0	E440	0.05	mg/kg	<0.050	----

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 466015) - continued						
tin	7440-31-5	E440	2	mg/kg	<2.0	----
uranium	7440-61-1	E440	0.05	mg/kg	<0.050	----
vanadium	7440-62-2	E440	0.2	mg/kg	<0.20	----
zinc	7440-66-6	E440	2	mg/kg	<2.0	----
Metals (QCLot: 469216)						
mercury	7439-97-6	E510	0.005	mg/kg	<0.0050	----
Metals (QCLot: 469217)						
antimony	7440-36-0	E440	0.1	mg/kg	<0.10	----
arsenic	7440-38-2	E440	0.1	mg/kg	<0.10	----
barium	7440-39-3	E440	0.5	mg/kg	<0.50	----
beryllium	7440-41-7	E440	0.1	mg/kg	<0.10	----
cadmium	7440-43-9	E440	0.02	mg/kg	<0.020	----
chromium	7440-47-3	E440	0.5	mg/kg	<0.50	----
cobalt	7440-48-4	E440	0.1	mg/kg	<0.10	----
copper	7440-50-8	E440	0.5	mg/kg	<0.50	----
lead	7439-92-1	E440	0.5	mg/kg	<0.50	----
molybdenum	7439-98-7	E440	0.1	mg/kg	<0.10	----
nickel	7440-02-0	E440	0.5	mg/kg	<0.50	----
selenium	7782-49-2	E440	0.2	mg/kg	<0.20	----
silver	7440-22-4	E440	0.1	mg/kg	<0.10	----
thallium	7440-28-0	E440	0.05	mg/kg	<0.050	----
tin	7440-31-5	E440	2	mg/kg	<2.0	----
uranium	7440-61-1	E440	0.05	mg/kg	<0.050	----
vanadium	7440-62-2	E440	0.2	mg/kg	<0.20	----
zinc	7440-66-6	E440	2	mg/kg	<2.0	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Metals (QCLot: 463911)									
antimony	7440-36-0	E440	0.1	mg/kg	100 mg/kg	94.0	80.0	120	----
arsenic	7440-38-2	E440	0.1	mg/kg	100 mg/kg	101	80.0	120	----
barium	7440-39-3	E440	0.5	mg/kg	25 mg/kg	100	80.0	120	----
beryllium	7440-41-7	E440	0.1	mg/kg	10 mg/kg	94.6	80.0	120	----
cadmium	7440-43-9	E440	0.02	mg/kg	10 mg/kg	93.1	80.0	120	----
chromium	7440-47-3	E440	0.5	mg/kg	25 mg/kg	96.6	80.0	120	----
cobalt	7440-48-4	E440	0.1	mg/kg	25 mg/kg	98.8	80.0	120	----
copper	7440-50-8	E440	0.5	mg/kg	25 mg/kg	100	80.0	120	----
lead	7439-92-1	E440	0.5	mg/kg	50 mg/kg	97.8	80.0	120	----
molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	100	80.0	120	----
nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	96.5	80.0	120	----
selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	104	80.0	120	----
silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	87.6	80.0	120	----
thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	95.1	80.0	120	----
tin	7440-31-5	E440	2	mg/kg	50 mg/kg	93.7	80.0	120	----
uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	101	80.0	120	----
vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	101	80.0	120	----
zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	94.8	80.0	120	----
Metals (QCLot: 466015)									
antimony	7440-36-0	E440	0.1	mg/kg	100 mg/kg	104	80.0	120	----
arsenic	7440-38-2	E440	0.1	mg/kg	100 mg/kg	109	80.0	120	----
barium	7440-39-3	E440	0.5	mg/kg	25 mg/kg	107	80.0	120	----
beryllium	7440-41-7	E440	0.1	mg/kg	10 mg/kg	104	80.0	120	----
cadmium	7440-43-9	E440	0.02	mg/kg	10 mg/kg	99.3	80.0	120	----
chromium	7440-47-3	E440	0.5	mg/kg	25 mg/kg	105	80.0	120	----
cobalt	7440-48-4	E440	0.1	mg/kg	25 mg/kg	107	80.0	120	----
copper	7440-50-8	E440	0.5	mg/kg	25 mg/kg	106	80.0	120	----
lead	7439-92-1	E440	0.5	mg/kg	50 mg/kg	96.9	80.0	120	----
molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	104	80.0	120	----
nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	103	80.0	120	----
selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	103	80.0	120	----
silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	94.5	80.0	120	----
thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	97.4	80.0	120	----
tin	7440-31-5	E440	2	mg/kg	50 mg/kg	101	80.0	120	----

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Metals (QCLot: 466015) - continued									
uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	95.0	80.0	120	----
vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	109	80.0	120	----
zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	103	80.0	120	----
Metals (QCLot: 469216)									
mercury	7439-97-6	E510	0.005	mg/kg	0.1 mg/kg	104	70.0	130	----
Metals (QCLot: 469217)									
antimony	7440-36-0	E440	0.1	mg/kg	100 mg/kg	108	80.0	120	----
arsenic	7440-38-2	E440	0.1	mg/kg	100 mg/kg	105	80.0	120	----
barium	7440-39-3	E440	0.5	mg/kg	25 mg/kg	111	80.0	120	----
beryllium	7440-41-7	E440	0.1	mg/kg	10 mg/kg	109	80.0	120	----
cadmium	7440-43-9	E440	0.02	mg/kg	10 mg/kg	113	80.0	120	----
chromium	7440-47-3	E440	0.5	mg/kg	25 mg/kg	113	80.0	120	----
cobalt	7440-48-4	E440	0.1	mg/kg	25 mg/kg	113	80.0	120	----
copper	7440-50-8	E440	0.5	mg/kg	25 mg/kg	112	80.0	120	----
lead	7439-92-1	E440	0.5	mg/kg	50 mg/kg	107	80.0	120	----
molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	114	80.0	120	----
nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	110	80.0	120	----
selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	105	80.0	120	----
silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	113	80.0	120	----
thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	105	80.0	120	----
tin	7440-31-5	E440	2	mg/kg	50 mg/kg	96.4	80.0	120	----
uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	112	80.0	120	----
vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	113	80.0	120	----
zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	111	80.0	120	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix: **Soil/Solid**

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Metals (QCLot: 463911)									
QC-463911-003	RM	antimony	7440-36-0	E440	3.99 mg/kg	109	70.0	130	----
QC-463911-003	RM	arsenic	7440-38-2	E440	3.73 mg/kg	108	70.0	130	----
QC-463911-003	RM	barium	7440-39-3	E440	105 mg/kg	111	70.0	130	----
QC-463911-003	RM	beryllium	7440-41-7	E440	0.349 mg/kg	106	70.0	130	----
QC-463911-003	RM	cadmium	7440-43-9	E440	0.91 mg/kg	110	70.0	130	----
QC-463911-003	RM	chromium	7440-47-3	E440	101 mg/kg	107	70.0	130	----
QC-463911-003	RM	cobalt	7440-48-4	E440	6.9 mg/kg	107	70.0	130	----
QC-463911-003	RM	copper	7440-50-8	E440	123 mg/kg	116	70.0	130	----
QC-463911-003	RM	lead	7439-92-1	E440	267 mg/kg	124	70.0	130	----
QC-463911-003	RM	molybdenum	7439-98-7	E440	1.03 mg/kg	115	70.0	130	----
QC-463911-003	RM	nickel	7440-02-0	E440	26.7 mg/kg	107	70.0	130	----
QC-463911-003	RM	silver	7440-22-4	E440	4.06 mg/kg	87.7	50.0	150	----
QC-463911-003	RM	thallium	7440-28-0	E440	0.0786 mg/kg	126	40.0	160	----
QC-463911-003	RM	tin	7440-31-5	E440	10.6 mg/kg	105	70.0	130	----
QC-463911-003	RM	uranium	7440-61-1	E440	0.52 mg/kg	110	70.0	130	----
QC-463911-003	RM	vanadium	7440-62-2	E440	32.7 mg/kg	109	70.0	130	----
QC-463911-003	RM	zinc	7440-66-6	E440	297 mg/kg	100	70.0	130	----
Metals (QCLot: 466015)									
QC-466015-003	RM	antimony	7440-36-0	E440	3.99 mg/kg	90.7	70.0	130	----
QC-466015-003	RM	arsenic	7440-38-2	E440	3.73 mg/kg	109	70.0	130	----
QC-466015-003	RM	barium	7440-39-3	E440	105 mg/kg	113	70.0	130	----
QC-466015-003	RM	beryllium	7440-41-7	E440	0.349 mg/kg	113	70.0	130	----
QC-466015-003	RM	cadmium	7440-43-9	E440	0.91 mg/kg	123	70.0	130	----
QC-466015-003	RM	chromium	7440-47-3	E440	101 mg/kg	113	70.0	130	----
QC-466015-003	RM	cobalt	7440-48-4	E440	6.9 mg/kg	114	70.0	130	----
QC-466015-003	RM	copper	7440-50-8	E440	123 mg/kg	116	70.0	130	----
QC-466015-003	RM	lead	7439-92-1	E440	267 mg/kg	104	70.0	130	----
QC-466015-003	RM	molybdenum	7439-98-7	E440	1.03 mg/kg	105	70.0	130	----
QC-466015-003	RM	nickel	7440-02-0	E440	26.7 mg/kg	110	70.0	130	----

Sub-Matrix: **Soil/Solid**

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Metals (QCLot: 466015) - continued									
QC-466015-003	RM	silver	7440-22-4	E440	4.06 mg/kg	108	50.0	150	----
QC-466015-003	RM	thallium	7440-28-0	E440	0.0786 mg/kg	113	40.0	160	----
QC-466015-003	RM	tin	7440-31-5	E440	10.6 mg/kg	99.6	70.0	130	----
QC-466015-003	RM	uranium	7440-61-1	E440	0.52 mg/kg	99.8	70.0	130	----
QC-466015-003	RM	vanadium	7440-62-2	E440	32.7 mg/kg	113	70.0	130	----
QC-466015-003	RM	zinc	7440-66-6	E440	297 mg/kg	109	70.0	130	----
Metals (QCLot: 469216)									
QC-469216-003	RM	mercury	7439-97-6	E510	0.059 mg/kg	101	70.0	130	----
Metals (QCLot: 469217)									
QC-469217-003	RM	antimony	7440-36-0	E440	3.99 mg/kg	113	70.0	130	----
QC-469217-003	RM	arsenic	7440-38-2	E440	3.73 mg/kg	104	70.0	130	----
QC-469217-003	RM	barium	7440-39-3	E440	105 mg/kg	102	70.0	130	----
QC-469217-003	RM	beryllium	7440-41-7	E440	0.349 mg/kg	101	70.0	130	----
QC-469217-003	RM	cadmium	7440-43-9	E440	0.91 mg/kg	98.5	70.0	130	----
QC-469217-003	RM	chromium	7440-47-3	E440	101 mg/kg	104	70.0	130	----
QC-469217-003	RM	cobalt	7440-48-4	E440	6.9 mg/kg	104	70.0	130	----
QC-469217-003	RM	copper	7440-50-8	E440	123 mg/kg	105	70.0	130	----
QC-469217-003	RM	lead	7439-92-1	E440	267 mg/kg	102	70.0	130	----
QC-469217-003	RM	molybdenum	7439-98-7	E440	1.03 mg/kg	100.0	70.0	130	----
QC-469217-003	RM	nickel	7440-02-0	E440	26.7 mg/kg	101	70.0	130	----
QC-469217-003	RM	silver	7440-22-4	E440	4.06 mg/kg	99.6	50.0	150	----
QC-469217-003	RM	thallium	7440-28-0	E440	0.0786 mg/kg	122	40.0	160	----
QC-469217-003	RM	tin	7440-31-5	E440	10.6 mg/kg	110	70.0	130	----
QC-469217-003	RM	uranium	7440-61-1	E440	0.52 mg/kg	109	70.0	130	----
QC-469217-003	RM	vanadium	7440-62-2	E440	32.7 mg/kg	100	70.0	130	----
QC-469217-003	RM	zinc	7440-66-6	E440	297 mg/kg	101	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number:

Page 1 of 4

Report To	Contact and company name below will appear on the final report
Company:	Tetra Tech Canada Inc.
Contact:	Mark Fawcett
Phone:	780-818-6352
	Company address below will appear on the final report
Street:	14940 - 123 Avenue
City/Province:	Edmonton, AB
Postal Code:	T5V 1B4
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax mark.fawcett@tetratech.com
Email 2 brent.finnestad@tetratech.com
Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax mark.fawcett@tetratech.com
Email 2

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☒ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)
- 4 day [P4-20%] ☐
- 3 day [P3-25%] ☐
- 2 day [P2-50%] ☐

EMERGENCY
- 1 Business day [E1 - 100%] ☐
- Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #:	Tetra Tech - ALS 2022 Env. Price
Job #:	SWM.SWOP04348-01 task 002
PO / AFE:	
LSD:	SE-09-50-17 W4M

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only): EO2202581

ALS Contact: **Sampler:**

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	E440 - metals, full scan (Hg not included)	SAMPLES ON HOLD	Sample is hazardous (please provide further details)	NUMBER OF CONTAINERS
1	AR-CS1 5-20	18-Apr-22		Soil	X			1
2	AR-CS1 30-50					X		1
3	AR-CS2 5-20				X			1
4	AR-CS2 30-50					X		1
5	AR-CS3 5-20				X			1
6	AR-CS3 30-50					X		1
7	AR-CS4 5-20				X			1
8	AR-CS4 30-50					X		1
9	AR-CS5 5-20				X			1
10	AR-CS5 30-50					X		1
11	AR-CS6 5-20				X			1
12	AR-CS6 30-50					X		1

Environmental Division
Edmonton
Work Order Reference
EO2202581

Telephone : +1 780 413 5227

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☐ NO

Are samples for human consumption/ use?
☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No	☐
Ice Packs	☑	Ice Cubes ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☐				

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
5.5							

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:
Mark Fawcett	4/19/22	

INITIAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:
	19-APR-22	4:00

FINAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

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 back page of the white - report copy.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number:

Report To	Contact and company name below will appear on the final report
Company:	Tetra Tech Canada Inc.
Contact:	Mark Fawcett
Phone:	780-818-6352
	Company address below will appear on the final report
Street:	14940 - 123 Avenue
City/Province:	Edmonton, AB
Postal Code:	T5V 1B4
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mark.fawcett@tetratech.com
Email 2: brent.finnestad@tetratech.com
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mark.fawcett@tetratech.com
Email 2:

Project Information

ALS Account # / Quote #: Tetra Tech - ALS 2022 Env. Price
Job #: SWM.SWOP04348-01 task 002
PO / AFE:
LSD: SE-09-50-17 W4M

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only):

ALS Contact: **Sampler:**

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☒ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E1 - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

E440

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	SAMPLES ON HOLD	Sample is hazardous (please provide further details)	NUMBER OF CONTAINERS
15	AR-CS7 5-20	18-Apr-22		soil	X		1
16	AR-CS7 30-50						1
11	AR-CS8 5-20				X		1
16	AR-CS9 5-20				X		1
12	AR-CS9 30-50						1
14	AR-CS10 5-20				X		1
15	AR-CS10 30-50						1
20	AR-CS11 5-20				X		1
21	AR-CS11 30-50				X		1
22	AR-CS13 5-20				X		1
23	AR-CS13 30-50				X		1
					X		1

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☐ NO
Are samples for human consumption/ use?
☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:
Mark Fawcett	4/19/22	

INITIAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:

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Chain of Custody (COC) / Analytical Request Form

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Contact:	Mark Fawcett
Phone:	780-818-6352
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Street:	14940 - 123 Avenue
City/Province:	Edmonton, AB
Postal Code:	T5V 1B4
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mark.fawcett@tetratech.com
Email 2: brent.finnestad@tetratech.com
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mark.fawcett@tetratech.com
Email 2:

Project Information

ALS Account # / Quote #: Tetra Tech - ALS 2022 Env. Price
Job #: SWM.SWOP04348-01 task 002
PO / AFE:
LSD: SE-09-50-17 W4M

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only):

ALS Contact: **Sampler:**

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☒ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E1 - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200%] (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

BTEX, DIESEL E440

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	SAMPLES ON HOLD	Sample is hazardous (please provide further details)	NUMBER OF CONTAINERS
24	AR-CS14 5-20	18-Apr-22		Soil			1
25	AR-CS14 30-50	"	"	"	X		1
26	AR-CS15 5-20	"	"	"			1
27	AR-CS15 30-50	"	"	"	X		1
28	AR-CS18 5-20	"	"	"			1
29	AR-CS18 30-50	"	"	"	X		1
30	AR-CS19 5-20	"	"	"			1
31	AR-CS19 30-50	"	"	"	X		1
32	AR-CS21 5-20	"	"	"			1
33	AR-CS21 30-50	"	"	"	X		1
34	AR-CS22 5-20	"	"	"			1
					X		1

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☐ NO
Are samples for human consumption/ use?
☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			

SHIPMENT RELEASE (client use)

Released by: Mark Fawcett Date: 4/19/22 Time:

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: Date: Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by: Date: Time:

Chain of Custody (COC) / Analytical Request Form

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Canada Toll Free: 1 800 668 9878

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COC Number:

Page 4 of 4

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Contact:	Mark Fawcett
Phone:	780-818-6352
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City/Province:	Edmonton, AB
Postal Code:	T5V 1B4
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mark.fawcett@tetratech.com
Email 2: brent.finnestad@tetratech.com
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mark.fawcett@tetratech.com
Email 2:

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☒ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days):
- 4 day [P4-20%] ☐
- 3 day [P3-25%] ☐
- 2 day [P2-50%] ☐

EMERGENCY:
- 1 Business day [E1 - 100%] ☐
- Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #:	Tetra Tech - ALS 2022 Env. Price
Job #:	SWM.SWOP04348-01 task 002
PO / AFE:	
LSD:	SE-09-50-17 W4M

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only):	ALS Contact:	Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	SAL_DIESAL E440	SAMPLES ON HOLD	Sample is hazardous (please provide further details)	NUMBER OF CONTAINERS
35	21-6S 5-20	18-Apr-22		Soil	X			1
36	21-6S 30-50					X		1
37	21-8 5-20				X			1
38	21-8 30-50					X		1
39	Duplicate 1				X			1

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☐ NO

Are samples for human consumption/ use?
☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date: 4/19/22	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

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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 back page of the white - report copy.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EO2202582**	Page	: 1 of 4
Amendment	: **1**		
Client	: **Tetra Tech Canada Inc.**	Laboratory	: Edmonton - Environmental
Contact	: Mark Fawcett	Account Manager	: Kieran Tordoff
Address	: North Building 14940 123 Ave NW Edmonton AB Canada T5V 1B4	Address	: 9450 - 17 Avenue NW Edmonton AB Canada T6N 1M9
Telephone	: 780 451 2130	Telephone	: +1 780 413 5227
Project	: SWM.SWOP04348-01 Task 003	Date Samples Received	: 19-Apr-2022 16:20
PO	: ----	Date Analysis Commenced	: 20-Apr-2022
C-O-C number	: ----	Issue Date	: 09-May-2022 10:09
Sampler	: ----		
Site	: SE-09-50-17 W4M		
Quote number	: ----		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Geoff Berg	Lab Analyst	Organics, Edmonton, Alberta
Kari Mulroy	Lab Supervisor - Environmental	Organics, Edmonton, Alberta
Leah Yee	Lab Assistant	Inorganics, Edmonton, Alberta

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
mg/kg	milligrams per kilogram

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	AR-CS4 30-50	AR-CS7 30-50	AR-CS14 30-50	----	----
					Client sampling date / time	18-Apr-2022	18-Apr-2022	18-Apr-2022	----	----
						EO2202582-001	EO2202582-002	EO2202582-003	--------	--------
						Result	Result	Result	----	----
Physical Tests										
moisture	----	E144	0.25	%		18.9	10.8	23.3	----	----
Particle Size										
sand (>0.075mm)	----	E178	1.0	%		34.6	35.7	33.5	----	----
fines (<0.075mm)	----	E178	1.0	%		65.4	64.3	66.5	----	----
texture class	----	E178	-	-		Fine	Fine	Fine	----	----
Polycyclic Aromatic Hydrocarbons										
acenaphthene	83-32-9	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	<0.0050	----	----
acenaphthylene	208-96-8	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	<0.0050	----	----
anthracene	120-12-7	E641A-L	0.0040	mg/kg		<0.0040	<0.0040	<0.0040	----	----
benz(a)anthracene	56-55-3	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	----
benzo(a)pyrene	50-32-8	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	----
benzo(b+j)fluoranthene	n/a	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	----
benzo(g,h,i)perylene	191-24-2	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	----
benzo(k)fluoranthene	207-08-9	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	----
chrysene	218-01-9	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	----
dibenz(a,h)anthracene	53-70-3	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	<0.0050	----	----
fluoranthene	206-44-0	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	----
fluorene	86-73-7	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	----
naphthalene	91-20-3	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	----
phenanthrene	85-01-8	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	----
pyrene	129-00-0	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	----
B(a)P total potency equivalents [B(a)P TPE]	----	E641A-L	0.020	mg/kg		<0.020	<0.020	<0.020	----	----
IACR AB (coarse)	----	E641A-L	0.10	-		<0.10	<0.10	<0.10	----	----
IACR AB (fine)	----	E641A-L	0.10	-		<0.10	<0.10	<0.10	----	----
Polycyclic Aromatic Hydrocarbons Surrogates										
acridine-d9	34749-75-2	E641A-L	0.1	%		102	81.3	95.5	----	----
chrysene-d12	1719-03-5	E641A-L	0.1	%		120	98.4	105	----	----
naphthalene-d8	1146-65-2	E641A-L	0.1	%		115	100	101	----	----
phenanthrene-d10	1517-22-2	E641A-L	0.1	%		110	95.9	98.1	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **EO2202582**	Page	: 1 of 6
Amendment	: 1		
Client	: **Tetra Tech Canada Inc.**	Laboratory	: Edmonton - Environmental
Contact	: Mark Fawcett	Account Manager	: Kieran Tordoff
Address	: North Building 14940 123 Ave NW Edmonton AB Canada T5V 1B4	Address	: 9450 - 17 Avenue NW Edmonton, Alberta Canada T6N 1M9
Telephone	: 780 451 2130	Telephone	: +1 780 413 5227
Project	: SWM.SWOP04348-01 Task 003	Date Samples Received	: 19-Apr-2022 16:20
PO	: ----	Issue Date	: 09-May-2022 10:09
C-O-C number	: ----		
Sampler	: ----		
Site	: SE-09-50-17 W4M		
Quote number	: ----		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers occur - please see following pages for full details.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Particle Size : CCME fine/coarse Particle Size Analysis by wet sieve										
Glass soil jar/Teflon lined cap										
AR-CS14 30-50	E178	18-Apr-2022	----	----	----		04-May-2022	180 days	17 days	✓
Particle Size : CCME fine/coarse Particle Size Analysis by wet sieve										
Glass soil jar/Teflon lined cap										
AR-CS4 30-50	E178	18-Apr-2022	----	----	----		04-May-2022	180 days	17 days	✓
Particle Size : CCME fine/coarse Particle Size Analysis by wet sieve										
Glass soil jar/Teflon lined cap										
AR-CS7 30-50	E178	18-Apr-2022	----	----	----		04-May-2022	180 days	17 days	✓
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
AR-CS14 30-50	E144	18-Apr-2022	----	----	----		20-Apr-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
AR-CS4 30-50	E144	18-Apr-2022	----	----	----		20-Apr-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
AR-CS7 30-50	E144	18-Apr-2022	----	----	----		20-Apr-2022	----	----	
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap										
AR-CS14 30-50	E641A-L	18-Apr-2022	20-Apr-2022	14 days	2 days	✓	20-Apr-2022	40 days	0 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap										
AR-CS4 30-50	E641A-L	18-Apr-2022	20-Apr-2022	14 days	2 days	✓	20-Apr-2022	40 days	0 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap										
AR-CS7 30-50	E641A-L	18-Apr-2022	20-Apr-2022	14 days	2 days	✓	20-Apr-2022	40 days	0 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
CCME fine/coarse Particle Size Analysis by wet sieve	E178	477012	1	3	33.3	5.0	✓
Moisture Content by Gravimetry	E144	462595	1	7	14.2	5.0	✓
PAHs by Hex:Ace GC-MS (Low Level CCME)	E641A-L	462511	0	3	0.0	5.0	×
Laboratory Control Samples (LCS)							
CCME fine/coarse Particle Size Analysis by wet sieve	E178	477012	1	3	33.3	5.0	✓
Moisture Content by Gravimetry	E144	462595	1	7	14.2	5.0	✓
PAHs by Hex:Ace GC-MS (Low Level CCME)	E641A-L	462511	1	3	33.3	5.0	✓
Method Blanks (MB)							
Moisture Content by Gravimetry	E144	462595	1	7	14.2	5.0	✓
PAHs by Hex:Ace GC-MS (Low Level CCME)	E641A-L	462511	1	3	33.3	5.0	✓
Matrix Spikes (MS)							
PAHs by Hex:Ace GC-MS (Low Level CCME)	E641A-L	462511	1	3	33.3	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Moisture Content by Gravimetry	E144 Edmonton - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	Moisture is measured gravimetrically by drying the sample at 105°C. Moisture content is calculated as the weight loss (due to water) divided by the wet weight of the sample, expressed as a percentage.
CCME fine/coarse Particle Size Analysis by wet sieve	E178 Edmonton - Environmental	Soil/Solid	CCME Vol 4 Analytical Methods	An air-dried sample is reduced to < 2 mm size and mixed with a dispersing agent (sodium hexametaphosphate). The sample is washed through a 200 mesh (0.075 mm) sieve. The retained mass of sample is used to determine % sand fraction. If the percentage of sand is >50%, the soil is considered to be coarse textured soil. If the percentage of sand is <50%, the soil is considered to be fine textured.
PAHs by Hex:Ace GC-MS (Low Level CCME)	E641A-L Edmonton - Environmental	Soil/Solid	EPA 8270E (mod)	Polycyclic Aromatic Hydrocarbons (PAHs) are extracted with hexane/acetone and analyzed by GC-MS. If reported, IACR (index of additive cancer risk, unitless) and B(a)P toxic potency equivalent (in soil concentration units) are calculated as per CCME PAH Soil Quality Guidelines fact sheet (2010) or ABT1.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
PHCs and PAHs Hexane-Acetone Tumbler Extraction	EP601 Edmonton - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1 (mod)	Samples are subsampled and Petroleum Hydrocarbons (PHC) and PAHs are extracted with 1:1 hexane:acetone using a rotary extractor.
Dry and Grind	EPP442 Edmonton - Environmental	Soil/Solid	Soil Sampling and Methods of Analysis, Carter 2008	After removal of any coarse fragments and reservation of wet subsamples a portion of homogenized sample is set in a tray and dried at less than 60°C until dry. The sample is then particle size reduced with an automated crusher or mortar and pestle, typically to <2 mm. Further size reduction may be needed for particular tests.

QUALITY CONTROL REPORT

Work Order	: **EO2202582**	Page	: 1 of 5
Amendment	: **1**		

Client	: Tetra Tech Canada Inc.	Laboratory	: Edmonton - Environmental
Contact	: Mark Fawcett	Account Manager	: Kieran Tordoff
Address	: North Building 14940 123 Ave NW Edmonton AB Canada T5V 1B4	Address	: 9450 - 17 Avenue NW Edmonton, Alberta Canada T6N 1M9
Telephone	: 780 451 2130	Telephone	: +1 780 413 5227
Project	: SWM.SWOP04348-01 Task 003	Date Samples Received	: 19-Apr-2022 16:20
PO	: ----	Date Analysis Commenced	: 20-Apr-2022
C-O-C number	: ----	Issue Date	: 09-May-2022 10:09
Sampler	: ----		
Site	: SE-09-50-17 W4M		
Quote number	: ----		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Geoff Berg	Lab Analyst	Organics, Edmonton, Alberta
Kari Mulroy	Lab Supervisor - Environmental	Organics, Edmonton, Alberta
Leah Yee	Lab Assistant	Inorganics, Edmonton, Alberta

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include 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 predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 462595)											
EO2202576-001	Anonymous	moisture	----	E144	0.25	%	13.4	13.4	0.465%	20%	----
Particle Size (QC Lot: 477012)											
EO2202582-001	AR-CS4 30-50	sand (>0.075mm)	----	E178	1.0	%	34.6	35.6	2.60%	10%	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 462595)						
moisture	----	E144	0.25	%	<0.25	----
Polycyclic Aromatic Hydrocarbons (QCLot: 462511)						
acenaphthene	83-32-9	E641A-L	0.005	mg/kg	<0.0050	----
acenaphthylene	208-96-8	E641A-L	0.005	mg/kg	<0.0050	----
anthracene	120-12-7	E641A-L	0.004	mg/kg	<0.0040	----
benz(a)anthracene	56-55-3	E641A-L	0.01	mg/kg	<0.010	----
benzo(a)pyrene	50-32-8	E641A-L	0.01	mg/kg	<0.010	----
benzo(b+j)fluoranthene	n/a	E641A-L	0.01	mg/kg	<0.010	----
benzo(g,h,i)perylene	191-24-2	E641A-L	0.01	mg/kg	<0.010	----
benzo(k)fluoranthene	207-08-9	E641A-L	0.01	mg/kg	<0.010	----
chrysene	218-01-9	E641A-L	0.01	mg/kg	<0.010	----
dibenz(a,h)anthracene	53-70-3	E641A-L	0.005	mg/kg	<0.0050	----
fluoranthene	206-44-0	E641A-L	0.01	mg/kg	<0.010	----
fluorene	86-73-7	E641A-L	0.01	mg/kg	<0.010	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.01	mg/kg	<0.010	----
naphthalene	91-20-3	E641A-L	0.01	mg/kg	<0.010	----
phenanthrene	85-01-8	E641A-L	0.01	mg/kg	<0.010	----
pyrene	129-00-0	E641A-L	0.01	mg/kg	<0.010	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 462595)									
moisture	----	E144	0.25	%	50 %	100	90.0	110	----
Polycyclic Aromatic Hydrocarbons (QCLot: 462511)									
acenaphthene	83-32-9	E641A-L	0.005	mg/kg	0.5 mg/kg	99.2	60.0	130	----
acenaphthylene	208-96-8	E641A-L	0.005	mg/kg	0.5 mg/kg	95.8	60.0	130	----
anthracene	120-12-7	E641A-L	0.004	mg/kg	0.5 mg/kg	87.7	60.0	130	----
benz(a)anthracene	56-55-3	E641A-L	0.01	mg/kg	0.5 mg/kg	95.0	60.0	130	----
benzo(a)pyrene	50-32-8	E641A-L	0.01	mg/kg	0.5 mg/kg	92.0	60.0	130	----
benzo(b+j)fluoranthene	n/a	E641A-L	0.01	mg/kg	0.5 mg/kg	92.2	60.0	130	----
benzo(g,h,i)perylene	191-24-2	E641A-L	0.01	mg/kg	0.5 mg/kg	104	60.0	130	----
benzo(k)fluoranthene	207-08-9	E641A-L	0.01	mg/kg	0.5 mg/kg	91.2	60.0	130	----
chrysene	218-01-9	E641A-L	0.01	mg/kg	0.5 mg/kg	93.8	60.0	130	----
dibenz(a,h)anthracene	53-70-3	E641A-L	0.005	mg/kg	0.5 mg/kg	103	60.0	130	----
fluoranthene	206-44-0	E641A-L	0.01	mg/kg	0.5 mg/kg	101	60.0	130	----
fluorene	86-73-7	E641A-L	0.01	mg/kg	0.5 mg/kg	104	60.0	130	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.01	mg/kg	0.5 mg/kg	113	60.0	130	----
naphthalene	91-20-3	E641A-L	0.01	mg/kg	0.5 mg/kg	98.9	60.0	130	----
phenanthrene	85-01-8	E641A-L	0.01	mg/kg	0.5 mg/kg	100	60.0	130	----
pyrene	129-00-0	E641A-L	0.01	mg/kg	0.5 mg/kg	96.5	60.0	130	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Soil/Solid**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Polycyclic Aromatic Hydrocarbons (QCLot: 462511)										
EO2202582-001	AR-CS4 30-50	acenaphthene	83-32-9	E641A-L	0.445 mg/kg	0.5 mg/kg	107	50.0	140	----
		acenaphthylene	208-96-8	E641A-L	0.425 mg/kg	0.5 mg/kg	102	50.0	140	----
		anthracene	120-12-7	E641A-L	0.398 mg/kg	0.5 mg/kg	95.6	50.0	140	----
		benz(a)anthracene	56-55-3	E641A-L	0.414 mg/kg	0.5 mg/kg	99.4	50.0	140	----
		benzo(a)pyrene	50-32-8	E641A-L	0.367 mg/kg	0.5 mg/kg	88.0	50.0	140	----
		benzo(b+j)fluoranthene	n/a	E641A-L	0.401 mg/kg	0.5 mg/kg	96.2	50.0	140	----
		benzo(g,h,i)perylene	191-24-2	E641A-L	0.436 mg/kg	0.5 mg/kg	104	50.0	140	----
		benzo(k)fluoranthene	207-08-9	E641A-L	0.386 mg/kg	0.5 mg/kg	92.6	50.0	140	----
		chrysene	218-01-9	E641A-L	0.393 mg/kg	0.5 mg/kg	94.4	50.0	140	----
		dibenz(a,h)anthracene	53-70-3	E641A-L	0.442 mg/kg	0.5 mg/kg	106	50.0	140	----
		fluoranthene	206-44-0	E641A-L	0.454 mg/kg	0.5 mg/kg	109	50.0	140	----
		fluorene	86-73-7	E641A-L	0.461 mg/kg	0.5 mg/kg	111	50.0	140	----
		indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.472 mg/kg	0.5 mg/kg	113	50.0	140	----
		naphthalene	91-20-3	E641A-L	0.437 mg/kg	0.5 mg/kg	105	50.0	140	----
		phenanthrene	85-01-8	E641A-L	0.453 mg/kg	0.5 mg/kg	109	50.0	140	----
		pyrene	129-00-0	E641A-L	0.458 mg/kg	0.5 mg/kg	110	50.0	140	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix: **Soil/Solid**

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Particle Size (QCLot: 477012)									
QC-477012-001	RM	sand (>0.075mm)	----	E178	36.4 %	104	91.0	109	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number:

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	Tetra Tech Canada Inc.
Contact:	Mark Fawcett
Phone:	780-818-6352
	Company address below will appear on the final report
Street:	14940 - 123 Avenue
City/Province:	Edmonton, AB
Postal Code:	T5V 1B4
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mark.fawcett@tetratech.com
Email 2: brent.finnestad@tetratech.com
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mark.fawcett@tetratech.com
Email 2:

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☒ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E1 - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #:	Tetra Tech - ALS 2022 Env. Price
Job #:	SWM.SWOP04348-01 task 003
PO / AFE:	
LSD:	SE-09-50-17 W4M

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only): EO2202582

ALS Contact: | **Sampler:**

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	S641.A - PAH: AB Tier 1	SAMPLES ON HOLD	Sample is hazardous (please provide further details)	NUMBER OF CONTAINERS
	AR-CS4 30-50	18-Apr-22		Soil	X			2
	AR-CS7 30-50	"		"	X			2
	AR-CS14 30-50	"		"	X			2

Environmental Division
Edmonton
Work Order Reference
EO2202582
Telephone : +1 780 413 5227

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human consumption/ use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMI
Frozen ☐ No ☐
Ice Packs ☐ Ice Cubes [☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
7.8							

SHIPMENT RELEASE (client use)

Released by: Mark Fawcett Date: 4/19/22 Time:

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: Date: Apr 19, 22 Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by: Date: Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

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 back page of the white - report copy.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EO2203595**	Page	: 1 of 9
Client	: **Tetra Tech Canada Inc.**	Laboratory	: Edmonton - Environmental
Contact	: Mark Fawcett	Account Manager	: Kieran Tordoff
Address	: North Building 14940 123 Ave NW Edmonton AB Canada T5V 1B4	Address	: 9450 - 17 Avenue NW Edmonton AB Canada T6N 1M9
Telephone	: 780 451 2130	Telephone	: +1 780 413 5227
Project	: SWM.SWOP04348-01 Task 003	Date Samples Received	: 20-May-2022 10:50
PO	: ----	Date Analysis Commenced	: 21-May-2022
C-O-C number	: 20-926489	Issue Date	: 26-May-2022 14:04
Sampler	: ----		
Site	: NE-09-050-17-W4		
Quote number	: ----		
No. of samples received	: 14		
No. of samples analysed	: 13		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Austin Wasylyshyn	Lab Analyst	Metals, Edmonton, Alberta
Christian Murera	Lab Analyst	Organics, Edmonton, Alberta
Geoff Berg	Lab Analyst	Organics, Edmonton, Alberta

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
mg/kg	milligrams per kilogram

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	21-6N.N7 0-15	21-6N.N7 18-30	AR-CS2.N5 0-15	AR-CS3.N5 0-15	AR-CS4.N7 0-15
					Client sampling date / time	19-May-2022	19-May-2022	19-May-2022	19-May-2022	19-May-2022
						EO2203595-001	EO2203595-002	EO2203595-003	EO2203595-004	EO2203595-005
						Result	Result	Result	Result	Result
Physical Tests										
moisture	----	E144	0.25	%		23.6	21.6	----	----	22.5
Metals										
aluminum	7429-90-5	E440	50	mg/kg		9450	19400	17800	9440	13700
antimony	7440-36-0	E440	0.10	mg/kg		0.14	0.38	0.21	0.12	0.18
arsenic	7440-38-2	E440	0.10	mg/kg		2.36	7.91	4.73	1.75	4.15
barium	7440-39-3	E440	0.50	mg/kg		116	240	185	86.3	138
beryllium	7440-41-7	E440	0.10	mg/kg		0.42	0.75	0.65	0.35	0.54
bismuth	7440-69-9	E440	0.20	mg/kg		<0.20	<0.20	<0.20	<0.20	<0.20
boron	7440-42-8	E440	5.0	mg/kg		<5.0	7.2	5.1	<5.0	<5.0
cadmium	7440-43-9	E440	0.020	mg/kg		0.163	0.531	0.214	0.162	0.171
calcium	7440-70-2	E440	50	mg/kg		2250	4760	2240	2210	1960
chromium	7440-47-3	E440	0.50	mg/kg		15.2	29.7	23.7	13.6	20.4
cobalt	7440-48-4	E440	0.10	mg/kg		3.42	11.0	3.98	2.16	3.31
copper	7440-50-8	E440	0.50	mg/kg		5.98	21.8	8.05	4.36	5.74
iron	7439-89-6	E440	50	mg/kg		9730	24700	14500	6740	12800
lead	7439-92-1	E440	0.50	mg/kg		3.74	15.2	5.82	2.99	4.28
lithium	7439-93-2	E440	2.0	mg/kg		9.4	17.3	24.5	11.4	16.3
magnesium	7439-95-4	E440	20	mg/kg		2170	5040	3040	1960	2540
manganese	7439-96-5	E440	1.0	mg/kg		53.4	157	40.4	30.0	39.1
molybdenum	7439-98-7	E440	0.10	mg/kg		0.32	0.36	0.33	0.36	0.40
nickel	7440-02-0	E440	0.50	mg/kg		9.56	30.7	11.2	6.20	8.77
phosphorus	7723-14-0	E440	50	mg/kg		206	308	273	321	238
potassium	7440-09-7	E440	100	mg/kg		1730	3390	3190	1800	2280
selenium	7782-49-2	E440	0.20	mg/kg		0.39	0.36	0.82	0.37	0.38
silver	7440-22-4	E440	0.10	mg/kg		<0.10	0.14	<0.10	<0.10	<0.10
sodium	7440-23-5	E440	50	mg/kg		1750	3260	2560	2090	1900
strontium	7440-24-6	E440	0.50	mg/kg		35.6	65.6	46.0	39.8	38.5
sulfur	7704-34-9	E440	1000	mg/kg		<1000	<1000	<1000	1000	<1000
thallium	7440-28-0	E440	0.050	mg/kg		0.130	0.229	0.182	0.121	0.159
tin	7440-31-5	E440	2.0	mg/kg		<2.0	<2.0	<2.0	<2.0	<2.0
titanium	7440-32-6	E440	1.0	mg/kg		70.0	112	66.0	69.1	45.6

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	21-6N.N7 0-15	21-6N.N7 18-30	AR-CS2.N5 0-15	AR-CS3.N5 0-15	AR-CS4.N7 0-15
					Client sampling date / time	19-May-2022	19-May-2022	19-May-2022	19-May-2022	19-May-2022
						EO2203595-001	EO2203595-002	EO2203595-003	EO2203595-004	EO2203595-005
						Result	Result	Result	Result	Result
Metals										
tungsten	7440-33-7	E440	0.50	mg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
uranium	7440-61-1	E440	0.050	mg/kg		2.32	1.26	1.75	0.839	0.864
vanadium	7440-62-2	E440	0.20	mg/kg		18.6	47.6	33.7	16.3	26.6
zinc	7440-66-6	E440	2.0	mg/kg		31.2	64.3	47.8	32.5	37.8
zirconium	7440-67-7	E440	1.0	mg/kg		4.2	14.6	6.5	1.7	3.5
Polycyclic Aromatic Hydrocarbons										
acenaphthene	83-32-9	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	----	----	<0.0050
acenaphthylene	208-96-8	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	----	----	<0.0050
anthracene	120-12-7	E641A-L	0.0040	mg/kg		<0.0040	<0.0040	----	----	<0.0040
benz(a)anthracene	56-55-3	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	<0.010
benzo(a)pyrene	50-32-8	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	<0.010
benzo(b+j)fluoranthene	n/a	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	<0.010
benzo(g,h,i)perylene	191-24-2	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	<0.010
benzo(k)fluoranthene	207-08-9	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	<0.010
chrysene	218-01-9	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	<0.010
dibenz(a,h)anthracene	53-70-3	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	----	----	<0.0050
fluoranthene	206-44-0	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	<0.010
fluorene	86-73-7	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	<0.010
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	<0.010
naphthalene	91-20-3	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	<0.010
phenanthrene	85-01-8	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	<0.010
pyrene	129-00-0	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	<0.010
B(a)P total potency equivalents [B(a)P TPE]	----	E641A-L	0.020	mg/kg		<0.020	<0.020	----	----	<0.020
IACR AB (coarse)	----	E641A-L	0.10	-		<0.10	<0.10	----	----	<0.10
IACR AB (fine)	----	E641A-L	0.10	-		<0.10	<0.10	----	----	<0.10
Polycyclic Aromatic Hydrocarbons Surrogates										
acridine-d9	34749-75-2	E641A-L	0.1	%		99.3	98.4	----	----	93.3
chrysene-d12	1719-03-5	E641A-L	0.1	%		107	106	----	----	97.0
naphthalene-d8	1146-65-2	E641A-L	0.1	%		110	108	----	----	101
phenanthrene-d10	1517-22-2	E641A-L	0.1	%		111	108	----	----	102

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	AR-CS4.N7 15-30	AR-CS7.N8 0-15	AR-CS7.N8 15-30	AR-CS10.N4 5-20	AR-CS14.N5 0-15
					Client sampling date / time	19-May-2022	19-May-2022	19-May-2022	19-May-2022	19-May-2022
						EO2203595-006	EO2203595-007	EO2203595-008	EO2203595-009	EO2203595-010
						Result	Result	Result	Result	Result
Physical Tests										
moisture	----	E144	0.25	%		20.2	27.9	22.5	----	20.6
Metals										
aluminum	7429-90-5	E440	50	mg/kg		17600	15100	18100	17700	15200
antimony	7440-36-0	E440	0.10	mg/kg		0.27	0.26	0.36	0.30	0.28
arsenic	7440-38-2	E440	0.10	mg/kg		6.26	6.12	10.7	7.49	7.23
barium	7440-39-3	E440	0.50	mg/kg		160	242	325	146	152
beryllium	7440-41-7	E440	0.10	mg/kg		0.66	0.71	0.69	0.63	0.60
bismuth	7440-69-9	E440	0.20	mg/kg		<0.20	<0.20	<0.20	<0.20	<0.20
boron	7440-42-8	E440	5.0	mg/kg		<5.0	<5.0	5.9	5.5	11.9
cadmium	7440-43-9	E440	0.020	mg/kg		0.245	0.319	0.289	0.164	0.253
calcium	7440-70-2	E440	50	mg/kg		2020	1960	1720	2710	4730
chromium	7440-47-3	E440	0.50	mg/kg		28.8	25.2	29.8	23.3	21.2
cobalt	7440-48-4	E440	0.10	mg/kg		6.29	6.04	11.5	8.36	8.76
copper	7440-50-8	E440	0.50	mg/kg		14.0	11.8	18.9	13.5	16.2
iron	7439-89-6	E440	50	mg/kg		18500	21600	25100	20600	18500
lead	7439-92-1	E440	0.50	mg/kg		8.42	7.07	10.4	7.87	8.25
lithium	7439-93-2	E440	2.0	mg/kg		18.8	16.5	15.4	17.2	19.8
magnesium	7439-95-4	E440	20	mg/kg		3300	3070	4090	3480	4280
manganese	7439-96-5	E440	1.0	mg/kg		41.5	105	86.9	284	446
molybdenum	7439-98-7	E440	0.10	mg/kg		0.52	0.57	0.51	0.70	0.41
nickel	7440-02-0	E440	0.50	mg/kg		18.2	15.8	26.9	19.3	23.8
phosphorus	7723-14-0	E440	50	mg/kg		244	305	290	470	375
potassium	7440-09-7	E440	100	mg/kg		2830	1930	2470	1580	3400
selenium	7782-49-2	E440	0.20	mg/kg		0.65	0.92	<0.20	1.11	0.32
silver	7440-22-4	E440	0.10	mg/kg		0.10	<0.10	0.14	<0.10	0.11
sodium	7440-23-5	E440	50	mg/kg		2340	2120	2720	516	2000
strontium	7440-24-6	E440	0.50	mg/kg		45.8	45.0	49.4	31.4	52.7
sulfur	7704-34-9	E440	1000	mg/kg		<1000	<1000	<1000	<1000	<1000
thallium	7440-28-0	E440	0.050	mg/kg		0.201	0.165	0.186	0.192	0.172
tin	7440-31-5	E440	2.0	mg/kg		<2.0	<2.0	<2.0	<2.0	<2.0
titanium	7440-32-6	E440	1.0	mg/kg		53.6	53.1	79.4	50.4	105
tungsten	7440-33-7	E440	0.50	mg/kg		<0.50	<0.50	<0.50	<0.50	<0.50

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	AR-CS4.N7 15-30	AR-CS7.N8 0-15	AR-CS7.N8 15-30	AR-CS10.N4 5-20	AR-CS14.N5 0-15
					Client sampling date / time	19-May-2022	19-May-2022	19-May-2022	19-May-2022	19-May-2022
						EO2203595-006	EO2203595-007	EO2203595-008	EO2203595-009	EO2203595-010
						Result	Result	Result	Result	Result
Metals										
uranium	7440-61-1	E440	0.050	mg/kg		1.37	1.27	0.638	1.65	0.585
vanadium	7440-62-2	E440	0.20	mg/kg		38.7	34.2	49.5	41.2	38.3
zinc	7440-66-6	E440	2.0	mg/kg		51.3	59.0	58.5	61.1	64.9
zirconium	7440-67-7	E440	1.0	mg/kg		10.3	7.0	10.2	2.1	7.2
Polycyclic Aromatic Hydrocarbons										
acenaphthene	83-32-9	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	<0.0050	----	<0.0050
acenaphthylene	208-96-8	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	<0.0050	----	<0.0050
anthracene	120-12-7	E641A-L	0.0040	mg/kg		<0.0040	<0.0040	<0.0040	----	<0.0040
benz(a)anthracene	56-55-3	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	<0.010
benzo(a)pyrene	50-32-8	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	<0.010
benzo(b+j)fluoranthene	n/a	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	<0.010
benzo(g,h,i)perylene	191-24-2	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	<0.010
benzo(k)fluoranthene	207-08-9	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	<0.010
chrysene	218-01-9	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	<0.010
dibenz(a,h)anthracene	53-70-3	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	<0.0050	----	<0.0050
fluoranthene	206-44-0	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	<0.010
fluorene	86-73-7	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	<0.010
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	<0.010
naphthalene	91-20-3	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	<0.010
phenanthrene	85-01-8	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	<0.010
pyrene	129-00-0	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	<0.010
B(a)P total potency equivalents [B(a)P TPE]	----	E641A-L	0.020	mg/kg		<0.020	<0.020	<0.020	----	<0.020
IACR AB (coarse)	----	E641A-L	0.10	-		<0.10	<0.10	<0.10	----	<0.10
IACR AB (fine)	----	E641A-L	0.10	-		<0.10	<0.10	<0.10	----	<0.10
Polycyclic Aromatic Hydrocarbons Surrogates										
acridine-d9	34749-75-2	E641A-L	0.1	%		103	106	84.3	----	85.7
chrysene-d12	1719-03-5	E641A-L	0.1	%		108	112	89.8	----	89.9
naphthalene-d8	1146-65-2	E641A-L	0.1	%		112	112	94.4	----	94.3
phenanthrene-d10	1517-22-2	E641A-L	0.1	%		112	112	92.9	----	92.0

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	AR-CS14.N5 15-30	AR-CS16 30-50	AR-CS20 30-50	----	----
					Client sampling date / time	19-May-2022	19-May-2022	19-May-2022	----	----
						EO2203595-011	EO2203595-012	EO2203595-014	--------	--------
						Result	Result	Result	----	----
Physical Tests										
moisture	----	E144	0.25	%		17.6	22.6	----	----	----
Metals										
aluminum	7429-90-5	E440	50	mg/kg		14000	23400	14600	----	----
antimony	7440-36-0	E440	0.10	mg/kg		0.41	0.41	0.18	----	----
arsenic	7440-38-2	E440	0.10	mg/kg		8.70	6.17	10.8	----	----
barium	7440-39-3	E440	0.50	mg/kg		128	222	140	----	----
beryllium	7440-41-7	E440	0.10	mg/kg		0.52	0.93	0.56	----	----
bismuth	7440-69-9	E440	0.20	mg/kg		<0.20	0.24	<0.20	----	----
boron	7440-42-8	E440	5.0	mg/kg		11.0	7.1	7.0	----	----
cadmium	7440-43-9	E440	0.020	mg/kg		0.290	0.369	0.304	----	----
calcium	7440-70-2	E440	50	mg/kg		45100	2480	19500	----	----
chromium	7440-47-3	E440	0.50	mg/kg		23.4	31.6	24.5	----	----
cobalt	7440-48-4	E440	0.10	mg/kg		9.03	10.8	6.09	----	----
copper	7440-50-8	E440	0.50	mg/kg		17.0	26.0	13.8	----	----
iron	7439-89-6	E440	50	mg/kg		21400	24400	17900	----	----
lead	7439-92-1	E440	0.50	mg/kg		7.42	17.0	8.39	----	----
lithium	7439-93-2	E440	2.0	mg/kg		19.8	24.0	23.2	----	----
magnesium	7439-95-4	E440	20	mg/kg		10600	5640	4990	----	----
manganese	7439-96-5	E440	1.0	mg/kg		376	64.0	136	----	----
molybdenum	7439-98-7	E440	0.10	mg/kg		0.52	0.18	0.18	----	----
nickel	7440-02-0	E440	0.50	mg/kg		26.6	27.0	16.5	----	----
phosphorus	7723-14-0	E440	50	mg/kg		508	292	317	----	----
potassium	7440-09-7	E440	100	mg/kg		2580	3340	2310	----	----
selenium	7782-49-2	E440	0.20	mg/kg		0.22	0.25	0.20	----	----
silver	7440-22-4	E440	0.10	mg/kg		0.10	0.17	0.10	----	----
sodium	7440-23-5	E440	50	mg/kg		2540	3530	3990	----	----
strontium	7440-24-6	E440	0.50	mg/kg		253	64.8	154	----	----
sulfur	7704-34-9	E440	1000	mg/kg		<1000	<1000	2000	----	----
thallium	7440-28-0	E440	0.050	mg/kg		0.180	0.258	0.188	----	----
tin	7440-31-5	E440	2.0	mg/kg		<2.0	<2.0	<2.0	----	----
titanium	7440-32-6	E440	1.0	mg/kg		113	128	87.7	----	----
tungsten	7440-33-7	E440	0.50	mg/kg		<0.50	<0.50	<0.50	----	----

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	AR-CS14.N5 15-30	AR-CS16 30-50	AR-CS20 30-50	----	----
					Client sampling date / time	19-May-2022	19-May-2022	19-May-2022	----	----
						EO2203595-011	EO2203595-012	EO2203595-014	--------	--------
						Result	Result	Result	----	----
Metals										
uranium	7440-61-1	E440	0.050	mg/kg		1.06	1.10	0.975	----	----
vanadium	7440-62-2	E440	0.20	mg/kg		39.3	53.5	41.0	----	----
zinc	7440-66-6	E440	2.0	mg/kg		50.8	79.6	58.6	----	----
zirconium	7440-67-7	E440	1.0	mg/kg		6.4	18.4	5.8	----	----
Polycyclic Aromatic Hydrocarbons										
acenaphthene	83-32-9	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	----	----	----
acenaphthylene	208-96-8	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	----	----	----
anthracene	120-12-7	E641A-L	0.0040	mg/kg		<0.0040	<0.0040	----	----	----
benz(a)anthracene	56-55-3	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	----
benzo(a)pyrene	50-32-8	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	----
benzo(b+j)fluoranthene	n/a	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	----
benzo(g,h,i)perylene	191-24-2	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	----
benzo(k)fluoranthene	207-08-9	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	----
chrysene	218-01-9	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	----
dibenz(a,h)anthracene	53-70-3	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	----	----	----
fluoranthene	206-44-0	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	----
fluorene	86-73-7	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	----
naphthalene	91-20-3	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	----
phenanthrene	85-01-8	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	----
pyrene	129-00-0	E641A-L	0.010	mg/kg		<0.010	<0.010	----	----	----
B(a)P total potency equivalents [B(a)P TPE]	----	E641A-L	0.020	mg/kg		<0.020	<0.020	----	----	----
IACR AB (coarse)	----	E641A-L	0.10	-		<0.10	<0.10	----	----	----
IACR AB (fine)	----	E641A-L	0.10	-		<0.10	<0.10	----	----	----
Polycyclic Aromatic Hydrocarbons Surrogates										
acridine-d9	34749-75-2	E641A-L	0.1	%		88.2	97.0	----	----	----
chrysene-d12	1719-03-5	E641A-L	0.1	%		99.7	104	----	----	----
naphthalene-d8	1146-65-2	E641A-L	0.1	%		98.9	102	----	----	----
phenanthrene-d10	1517-22-2	E641A-L	0.1	%		98.6	103	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **EO2203595**	Page	: 1 of 8
Client	: **Tetra Tech Canada Inc.**	Laboratory	: Edmonton - Environmental
Contact	: Mark Fawcett	Account Manager	: Kieran Tordoff
Address	: North Building 14940 123 Ave NW Edmonton AB Canada T5V 1B4	Address	: 9450 - 17 Avenue NW Edmonton, Alberta Canada T6N 1M9
Telephone	: 780 451 2130	Telephone	: +1 780 413 5227
Project	: SWM.SWOP04348-01 Task 003	Date Samples Received	: 20-May-2022 10:50
PO	: ----	Issue Date	: 26-May-2022 14:04
C-O-C number	: 20-926489		
Sampler	: ----		
Site	: NE-09-050-17-W4		
Quote number	: ----		
No. of samples received	: 14		
No. of samples analysed	: 13		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers occur - please see following pages for full details.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
21-6N.N7 0-15	E440	19-May-2022	24-May-2022	----	----		24-May-2022	180 days	5 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
21-6N.N7 18-30	E440	19-May-2022	24-May-2022	----	----		24-May-2022	180 days	5 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag										
AR-CS10.N4 5-20	E440	19-May-2022	24-May-2022	----	----		24-May-2022	180 days	5 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
AR-CS14.N5 0-15	E440	19-May-2022	24-May-2022	----	----		24-May-2022	180 days	5 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
AR-CS14.N5 15-30	E440	19-May-2022	24-May-2022	----	----		24-May-2022	180 days	5 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
AR-CS16 30-50	E440	19-May-2022	24-May-2022	----	----		24-May-2022	180 days	5 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag										
AR-CS2.N5 0-15	E440	19-May-2022	24-May-2022	----	----		24-May-2022	180 days	5 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS20 30-50	E440	19-May-2022	24-May-2022	----	----		24-May-2022	180 days	5 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag AR-CS3.N5 0-15	E440	19-May-2022	24-May-2022	----	----		24-May-2022	180 days	5 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap AR-CS4.N7 0-15	E440	19-May-2022	24-May-2022	----	----		24-May-2022	180 days	5 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap AR-CS4.N7 15-30	E440	19-May-2022	24-May-2022	----	----		24-May-2022	180 days	5 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap AR-CS7.N8 0-15	E440	19-May-2022	24-May-2022	----	----		24-May-2022	180 days	5 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap AR-CS7.N8 15-30	E440	19-May-2022	24-May-2022	----	----		24-May-2022	180 days	5 days	✓
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap 21-6N.N7 0-15	E144	19-May-2022	----	----	----		21-May-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap 21-6N.N7 18-30	E144	19-May-2022	----	----	----		21-May-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap AR-CS14.N5 0-15	E144	19-May-2022	----	----	----		21-May-2022	----	----	

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap AR-CS14.N5 15-30	E144	19-May-2022	----	----	----		21-May-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap AR-CS16 30-50	E144	19-May-2022	----	----	----		21-May-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap AR-CS4.N7 0-15	E144	19-May-2022	----	----	----		21-May-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap AR-CS4.N7 15-30	E144	19-May-2022	----	----	----		21-May-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap AR-CS7.N8 0-15	E144	19-May-2022	----	----	----		21-May-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap AR-CS7.N8 15-30	E144	19-May-2022	----	----	----		21-May-2022	----	----	
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap 21-6N.N7 0-15	E641A-L	19-May-2022	21-May-2022	14 days	2 days	✓	24-May-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap 21-6N.N7 18-30	E641A-L	19-May-2022	21-May-2022	14 days	2 days	✓	24-May-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap AR-CS14.N5 0-15	E641A-L	19-May-2022	21-May-2022	14 days	2 days	✓	24-May-2022	40 days	3 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap AR-CS14.N5 15-30	E641A-L	19-May-2022	21-May-2022	14 days	2 days	✓	24-May-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap AR-CS16 30-50	E641A-L	19-May-2022	21-May-2022	14 days	2 days	✓	24-May-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap AR-CS4.N7 0-15	E641A-L	19-May-2022	21-May-2022	14 days	2 days	✓	24-May-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap AR-CS4.N7 15-30	E641A-L	19-May-2022	21-May-2022	14 days	2 days	✓	24-May-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap AR-CS7.N8 0-15	E641A-L	19-May-2022	21-May-2022	14 days	2 days	✓	24-May-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap AR-CS7.N8 15-30	E641A-L	19-May-2022	21-May-2022	14 days	2 days	✓	24-May-2022	40 days	3 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: ✗ = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Metals in Soil/Solid by CRC ICPMS	E440	497557	1	20	5.0	5.0	✓
Moisture Content by Gravimetry	E144	495723	1	20	5.0	5.0	✓
PAHs by Hex:Ace GC-MS (Low Level CCME)	E641A-L	495722	0	9	0.0	5.0	✗
Laboratory Control Samples (LCS)							
Metals in Soil/Solid by CRC ICPMS	E440	497557	2	20	10.0	10.0	✓
Moisture Content by Gravimetry	E144	495723	1	20	5.0	5.0	✓
PAHs by Hex:Ace GC-MS (Low Level CCME)	E641A-L	495722	1	9	11.1	5.0	✓
Method Blanks (MB)							
Metals in Soil/Solid by CRC ICPMS	E440	497557	1	20	5.0	5.0	✓
Moisture Content by Gravimetry	E144	495723	1	20	5.0	5.0	✓
PAHs by Hex:Ace GC-MS (Low Level CCME)	E641A-L	495722	1	9	11.1	5.0	✓
Matrix Spikes (MS)							
PAHs by Hex:Ace GC-MS (Low Level CCME)	E641A-L	495722	1	9	11.1	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Moisture Content by Gravimetry	E144 Edmonton - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	Moisture is measured gravimetrically by drying the sample at 105°C. Moisture content is calculated as the weight loss (due to water) divided by the wet weight of the sample, expressed as a percentage.
Metals in Soil/Solid by CRC ICPMS	E440 Edmonton - Environmental	Soil/Solid	EPA 6020B (mod)	This method is intended to liberate metals that may be environmentally available. Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Silicate minerals are not solubilized. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. This method does not adequately recover elemental sulfur, and is unsuitable for assessment of elemental sulfur standards or guidelines. Analysis is by Collision/Reaction Cell ICPMS.
PAHs by Hex:Ace GC-MS (Low Level CCME)	E641A-L Edmonton - Environmental	Soil/Solid	EPA 8270E (mod)	Polycyclic Aromatic Hydrocarbons (PAHs) are extracted with hexane/acetone and analyzed by GC-MS. If reported, IACR (index of additive cancer risk, unitless) and B(a)P toxic potency equivalent (in soil concentration units) are calculated as per CCME PAH Soil Quality Guidelines fact sheet (2010) or ABT1.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Digestion for Metals and Mercury	EP440 Edmonton - Environmental	Soil/Solid	EPA 200.2 (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl. This method is intended to liberate metals that may be environmentally available.
PHCs and PAHs Hexane-Acetone Tumbler Extraction	EP601 Edmonton - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1 (mod)	Samples are subsampled and Petroleum Hydrocarbons (PHC) and PAHs are extracted with 1:1 hexane:acetone using a rotary extractor.

QUALITY CONTROL REPORT

Work Order	: **EO2203595**	Page	: 1 of 11
Client	: Tetra Tech Canada Inc.	Laboratory	: Edmonton - Environmental
Contact	: Mark Fawcett	Account Manager	: Kieran Tordoff
Address	: North Building 14940 123 Ave NW Edmonton AB Canada T5V 1B4	Address	: 9450 - 17 Avenue NW Edmonton, Alberta Canada T6N 1M9
Telephone	: 780 451 2130	Telephone	: +1 780 413 5227
Project	: SWM.SWOP04348-01 Task 003	Date Samples Received	: 20-May-2022 10:50
PO	: ----	Date Analysis Commenced	: 21-May-2022
C-O-C number	: 20-926489	Issue Date	: 26-May-2022 14:04
Sampler	: ----		
Site	: NE-09-050-17-W4		
Quote number	: ----		
No. of samples received	: 14		
No. of samples analysed	: 13		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Austin Wasylyshyn	Lab Analyst	Edmonton Metals, Edmonton, Alberta
Christian Murera	Lab Analyst	Edmonton Organics, Edmonton, Alberta
Geoff Berg	Lab Analyst	Edmonton Organics, Edmonton, Alberta

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include 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 predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 495723)											
EO2203386-014	Anonymous	moisture	----	E144	0.25	%	12.5	12.4	0.735%	20%	----
Metals (QC Lot: 497557)											
EO2203184-001	Anonymous	aluminum	7429-90-5	E440	50	mg/kg	12200	11400	6.42%	40%	----
		antimony	7440-36-0	E440	0.10	mg/kg	0.59	0.43	0.16	Diff <2x LOR	----
		arsenic	7440-38-2	E440	0.10	mg/kg	8.89	8.11	9.19%	30%	----
		barium	7440-39-3	E440	0.50	mg/kg	212	184	14.4%	40%	----
		beryllium	7440-41-7	E440	0.10	mg/kg	0.69	0.64	0.06	Diff <2x LOR	----
		bismuth	7440-69-9	E440	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	----
		boron	7440-42-8	E440	5.0	mg/kg	7.6	7.0	0.6	Diff <2x LOR	----
		cadmium	7440-43-9	E440	0.020	mg/kg	0.212	0.175	18.8%	30%	----
		calcium	7440-70-2	E440	50	mg/kg	10800	9500	13.3%	30%	----
		chromium	7440-47-3	E440	0.50	mg/kg	23.6	20.8	12.8%	30%	----
		cobalt	7440-48-4	E440	0.10	mg/kg	10.7	8.90	18.0%	30%	----
		copper	7440-50-8	E440	0.50	mg/kg	22.3	19.0	15.8%	30%	----
		iron	7439-89-6	E440	50	mg/kg	23300	19900	15.9%	30%	----
		lead	7439-92-1	E440	0.50	mg/kg	11.6	9.33	21.8%	40%	----
		lithium	7439-93-2	E440	2.0	mg/kg	14.8	13.4	10.1%	30%	----
		magnesium	7439-95-4	E440	20	mg/kg	5080	4580	10.4%	30%	----
		manganese	7439-96-5	E440	1.0	mg/kg	418	347	18.4%	30%	----
		molybdenum	7439-98-7	E440	0.10	mg/kg	0.94	0.76	21.2%	40%	----
		nickel	7440-02-0	E440	0.50	mg/kg	28.7	24.2	17.0%	30%	----
		phosphorus	7723-14-0	E440	50	mg/kg	543	439	21.3%	30%	----
		potassium	7440-09-7	E440	100	mg/kg	1560	1410	9.85%	40%	----
		selenium	7782-49-2	E440	0.20	mg/kg	<0.20	0.31	0.11	Diff <2x LOR	----
		silver	7440-22-4	E440	0.10	mg/kg	0.12	0.10	0.02	Diff <2x LOR	----
		sodium	7440-23-5	E440	50	mg/kg	239	200	39	Diff <2x LOR	----
		strontium	7440-24-6	E440	0.50	mg/kg	56.7	48.5	15.4%	40%	----
		sulfur	7704-34-9	E440	1000	mg/kg	<1000	<1000	0	Diff <2x LOR	----
		thallium	7440-28-0	E440	0.050	mg/kg	0.243	0.194	0.049	Diff <2x LOR	----
		tin	7440-31-5	E440	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	----
		titanium	7440-32-6	E440	1.0	mg/kg	66.2	60.3	9.45%	40%	----
		tungsten	7440-33-7	E440	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	----

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Metals (QC Lot: 497557) - continued											
EO2203184-001	Anonymous	uranium	7440-61-1	E440	0.050	mg/kg	1.36	1.15	16.2%	30%	----
		vanadium	7440-62-2	E440	0.20	mg/kg	33.9	31.6	7.16%	30%	----
		zinc	7440-66-6	E440	2.0	mg/kg	63.7	57.8	9.74%	30%	----
		zirconium	7440-67-7	E440	1.0	mg/kg	6.8	5.8	1.0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 495723)						
moisture	----	E144	0.25	%	<0.25	----
Metals (QCLot: 497557)						
aluminum	7429-90-5	E440	50	mg/kg	<50	----
antimony	7440-36-0	E440	0.1	mg/kg	<0.10	----
arsenic	7440-38-2	E440	0.1	mg/kg	<0.10	----
barium	7440-39-3	E440	0.5	mg/kg	<0.50	----
beryllium	7440-41-7	E440	0.1	mg/kg	<0.10	----
bismuth	7440-69-9	E440	0.2	mg/kg	<0.20	----
boron	7440-42-8	E440	5	mg/kg	<5.0	----
cadmium	7440-43-9	E440	0.02	mg/kg	<0.020	----
calcium	7440-70-2	E440	50	mg/kg	<50	----
chromium	7440-47-3	E440	0.5	mg/kg	<0.50	----
cobalt	7440-48-4	E440	0.1	mg/kg	<0.10	----
copper	7440-50-8	E440	0.5	mg/kg	<0.50	----
iron	7439-89-6	E440	50	mg/kg	<50	----
lead	7439-92-1	E440	0.5	mg/kg	<0.50	----
lithium	7439-93-2	E440	2	mg/kg	<2.0	----
magnesium	7439-95-4	E440	20	mg/kg	<20	----
manganese	7439-96-5	E440	1	mg/kg	<1.0	----
molybdenum	7439-98-7	E440	0.1	mg/kg	<0.10	----
nickel	7440-02-0	E440	0.5	mg/kg	<0.50	----
phosphorus	7723-14-0	E440	50	mg/kg	<50	----
potassium	7440-09-7	E440	100	mg/kg	<100	----
selenium	7782-49-2	E440	0.2	mg/kg	<0.20	----
silver	7440-22-4	E440	0.1	mg/kg	<0.10	----
sodium	7440-23-5	E440	50	mg/kg	<50	----
strontium	7440-24-6	E440	0.5	mg/kg	<0.50	----
sulfur	7704-34-9	E440	1000	mg/kg	<1000	----
thallium	7440-28-0	E440	0.05	mg/kg	<0.050	----
tin	7440-31-5	E440	2	mg/kg	<2.0	----
titanium	7440-32-6	E440	1	mg/kg	<1.0	----
tungsten	7440-33-7	E440	0.5	mg/kg	<0.50	----
uranium	7440-61-1	E440	0.05	mg/kg	<0.050	----

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 497557) - continued						
vanadium	7440-62-2	E440	0.2	mg/kg	<0.20	----
zinc	7440-66-6	E440	2	mg/kg	<2.0	----
zirconium	7440-67-7	E440	1	mg/kg	<1.0	----
Polycyclic Aromatic Hydrocarbons (QCLot: 495722)						
acenaphthene	83-32-9	E641A-L	0.005	mg/kg	<0.0050	----
acenaphthylene	208-96-8	E641A-L	0.005	mg/kg	<0.0050	----
anthracene	120-12-7	E641A-L	0.004	mg/kg	<0.0040	----
benz(a)anthracene	56-55-3	E641A-L	0.01	mg/kg	<0.010	----
benzo(a)pyrene	50-32-8	E641A-L	0.01	mg/kg	<0.010	----
benzo(b+j)fluoranthene	n/a	E641A-L	0.01	mg/kg	<0.010	----
benzo(g,h,i)perylene	191-24-2	E641A-L	0.01	mg/kg	<0.010	----
benzo(k)fluoranthene	207-08-9	E641A-L	0.01	mg/kg	<0.010	----
chrysene	218-01-9	E641A-L	0.01	mg/kg	<0.010	----
dibenz(a,h)anthracene	53-70-3	E641A-L	0.005	mg/kg	<0.0050	----
fluoranthene	206-44-0	E641A-L	0.01	mg/kg	<0.010	----
fluorene	86-73-7	E641A-L	0.01	mg/kg	<0.010	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.01	mg/kg	<0.010	----
naphthalene	91-20-3	E641A-L	0.01	mg/kg	<0.010	----
phenanthrene	85-01-8	E641A-L	0.01	mg/kg	<0.010	----
pyrene	129-00-0	E641A-L	0.01	mg/kg	<0.010	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 495723)									
moisture	----	E144	0.25	%	50 %	100.0	90.0	110	----
Metals (QCLot: 497557)									
aluminum	7429-90-5	E440	50	mg/kg	200 mg/kg	106	80.0	120	----
antimony	7440-36-0	E440	0.1	mg/kg	100 mg/kg	101	80.0	120	----
arsenic	7440-38-2	E440	0.1	mg/kg	100 mg/kg	102	80.0	120	----
barium	7440-39-3	E440	0.5	mg/kg	25 mg/kg	101	80.0	120	----
beryllium	7440-41-7	E440	0.1	mg/kg	10 mg/kg	100	80.0	120	----
bismuth	7440-69-9	E440	0.2	mg/kg	100 mg/kg	102	80.0	120	----
boron	7440-42-8	E440	5	mg/kg	100 mg/kg	96.2	80.0	120	----
cadmium	7440-43-9	E440	0.02	mg/kg	10 mg/kg	100	80.0	120	----
calcium	7440-70-2	E440	50	mg/kg	5000 mg/kg	95.0	80.0	120	----
chromium	7440-47-3	E440	0.5	mg/kg	25 mg/kg	103	80.0	120	----
cobalt	7440-48-4	E440	0.1	mg/kg	25 mg/kg	99.7	80.0	120	----
copper	7440-50-8	E440	0.5	mg/kg	25 mg/kg	98.4	80.0	120	----
iron	7439-89-6	E440	50	mg/kg	100 mg/kg	96.6	80.0	120	----
lead	7439-92-1	E440	0.5	mg/kg	50 mg/kg	97.9	80.0	120	----
lithium	7439-93-2	E440	2	mg/kg	25 mg/kg	97.7	80.0	120	----
magnesium	7439-95-4	E440	20	mg/kg	5000 mg/kg	99.7	80.0	120	----
manganese	7439-96-5	E440	1	mg/kg	25 mg/kg	99.9	80.0	120	----
molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	97.1	80.0	120	----
nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	100	80.0	120	----
phosphorus	7723-14-0	E440	50	mg/kg	1000 mg/kg	108	80.0	120	----
potassium	7440-09-7	E440	100	mg/kg	5000 mg/kg	101	80.0	120	----
selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	98.3	80.0	120	----
silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	93.6	80.0	120	----
sodium	7440-23-5	E440	50	mg/kg	5000 mg/kg	102	80.0	120	----
strontium	7440-24-6	E440	0.5	mg/kg	25 mg/kg	98.1	80.0	120	----
sulfur	7704-34-9	E440	1000	mg/kg	5000 mg/kg	107	80.0	120	----
thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	96.7	80.0	120	----
tin	7440-31-5	E440	2	mg/kg	50 mg/kg	101	80.0	120	----
titanium	7440-32-6	E440	1	mg/kg	25 mg/kg	98.6	80.0	120	----
tungsten	7440-33-7	E440	0.5	mg/kg	10 mg/kg	99.2	80.0	120	----
uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	99.6	80.0	120	----

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Metals (QCLot: 497557) - continued									
vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	102	80.0	120	----
zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	94.4	80.0	120	----
zirconium	7440-67-7	E440	1	mg/kg	10 mg/kg	91.2	80.0	120	----
Polycyclic Aromatic Hydrocarbons (QCLot: 495722)									
acenaphthene	83-32-9	E641A-L	0.005	mg/kg	0.5 mg/kg	101	60.0	130	----
acenaphthylene	208-96-8	E641A-L	0.005	mg/kg	0.5 mg/kg	96.1	60.0	130	----
anthracene	120-12-7	E641A-L	0.004	mg/kg	0.5 mg/kg	99.6	60.0	130	----
benz(a)anthracene	56-55-3	E641A-L	0.01	mg/kg	0.5 mg/kg	95.4	60.0	130	----
benzo(a)pyrene	50-32-8	E641A-L	0.01	mg/kg	0.5 mg/kg	82.8	60.0	130	----
benzo(b+j)fluoranthene	n/a	E641A-L	0.01	mg/kg	0.5 mg/kg	88.4	60.0	130	----
benzo(g,h,i)perylene	191-24-2	E641A-L	0.01	mg/kg	0.5 mg/kg	110	60.0	130	----
benzo(k)fluoranthene	207-08-9	E641A-L	0.01	mg/kg	0.5 mg/kg	84.7	60.0	130	----
chrysene	218-01-9	E641A-L	0.01	mg/kg	0.5 mg/kg	94.1	60.0	130	----
dibenz(a,h)anthracene	53-70-3	E641A-L	0.005	mg/kg	0.5 mg/kg	94.5	60.0	130	----
fluoranthene	206-44-0	E641A-L	0.01	mg/kg	0.5 mg/kg	101	60.0	130	----
fluorene	86-73-7	E641A-L	0.01	mg/kg	0.5 mg/kg	103	60.0	130	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.01	mg/kg	0.5 mg/kg	114	60.0	130	----
naphthalene	91-20-3	E641A-L	0.01	mg/kg	0.5 mg/kg	97.5	60.0	130	----
phenanthrene	85-01-8	E641A-L	0.01	mg/kg	0.5 mg/kg	100	60.0	130	----
pyrene	129-00-0	E641A-L	0.01	mg/kg	0.5 mg/kg	103	60.0	130	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Soil/Solid**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Polycyclic Aromatic Hydrocarbons (QCLot: 495722)										
EO2203595-001	21-6N.N7 0-15	acenaphthene	83-32-9	E641A-L	0.353 mg/kg	0.5 mg/kg	94.9	50.0	140	----
		acenaphthylene	208-96-8	E641A-L	0.331 mg/kg	0.5 mg/kg	88.9	50.0	140	----
		anthracene	120-12-7	E641A-L	0.357 mg/kg	0.5 mg/kg	95.9	50.0	140	----
		benz(a)anthracene	56-55-3	E641A-L	0.313 mg/kg	0.5 mg/kg	84.2	50.0	140	----
		benzo(a)pyrene	50-32-8	E641A-L	0.317 mg/kg	0.5 mg/kg	85.2	50.0	140	----
		benzo(b+j)fluoranthene	n/a	E641A-L	0.294 mg/kg	0.5 mg/kg	78.9	50.0	140	----
		benzo(g,h,i)perylene	191-24-2	E641A-L	0.377 mg/kg	0.5 mg/kg	101	50.0	140	----
		benzo(k)fluoranthene	207-08-9	E641A-L	0.306 mg/kg	0.5 mg/kg	82.2	50.0	140	----
		chrysene	218-01-9	E641A-L	0.283 mg/kg	0.5 mg/kg	76.1	50.0	140	----
		dibenz(a,h)anthracene	53-70-3	E641A-L	0.338 mg/kg	0.5 mg/kg	90.9	50.0	140	----
		fluoranthene	206-44-0	E641A-L	0.350 mg/kg	0.5 mg/kg	94.0	50.0	140	----
		fluorene	86-73-7	E641A-L	0.359 mg/kg	0.5 mg/kg	96.4	50.0	140	----
		indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.387 mg/kg	0.5 mg/kg	104	50.0	140	----
		naphthalene	91-20-3	E641A-L	0.341 mg/kg	0.5 mg/kg	91.8	50.0	140	----
		phenanthrene	85-01-8	E641A-L	0.352 mg/kg	0.5 mg/kg	94.7	50.0	140	----
		pyrene	129-00-0	E641A-L	0.364 mg/kg	0.5 mg/kg	97.8	50.0	140	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Metals (QCLot: 497557)									
	RM	aluminum	7429-90-5	E440	9817 mg/kg	96.3	70.0	130	----
	RM	antimony	7440-36-0	E440	3.99 mg/kg	99.5	70.0	130	----
	RM	arsenic	7440-38-2	E440	3.73 mg/kg	104	70.0	130	----
	RM	barium	7440-39-3	E440	105 mg/kg	100	70.0	130	----
	RM	beryllium	7440-41-7	E440	0.349 mg/kg	97.8	70.0	130	----
	RM	boron	7440-42-8	E440	8.5 mg/kg	102	40.0	160	----
	RM	cadmium	7440-43-9	E440	0.91 mg/kg	105	70.0	130	----
	RM	calcium	7440-70-2	E440	31082 mg/kg	93.0	70.0	130	----
	RM	chromium	7440-47-3	E440	101 mg/kg	95.0	70.0	130	----
	RM	cobalt	7440-48-4	E440	6.9 mg/kg	96.8	70.0	130	----
	RM	copper	7440-50-8	E440	123 mg/kg	99.5	70.0	130	----
	RM	iron	7439-89-6	E440	23558 mg/kg	99.9	70.0	130	----
	RM	lead	7439-92-1	E440	267 mg/kg	99.1	70.0	130	----
	RM	lithium	7439-93-2	E440	9.5 mg/kg	98.6	70.0	130	----
	RM	magnesium	7439-95-4	E440	5509 mg/kg	93.3	70.0	130	----
	RM	manganese	7439-96-5	E440	269 mg/kg	96.8	70.0	130	----
	RM	molybdenum	7439-98-7	E440	1.03 mg/kg	103	70.0	130	----
	RM	nickel	7440-02-0	E440	26.7 mg/kg	99.6	70.0	130	----
	RM	phosphorus	7723-14-0	E440	752 mg/kg	103	70.0	130	----
	RM	potassium	7440-09-7	E440	1587 mg/kg	98.9	70.0	130	----
	RM	silver	7440-22-4	E440	4.06 mg/kg	98.0	50.0	150	----
	RM	sodium	7440-23-5	E440	797 mg/kg	105	70.0	130	----
	RM	strontium	7440-24-6	E440	86.1 mg/kg	100	70.0	130	----
	RM	thallium	7440-28-0	E440	0.0786 mg/kg	101	40.0	160	----
	RM	tin	7440-31-5	E440	10.6 mg/kg	115	70.0	130	----
	RM	titanium	7440-32-6	E440	839 mg/kg	90.6	70.0	130	----
	RM	uranium	7440-61-1	E440	0.52 mg/kg	97.7	70.0	130	----
	RM	vanadium	7440-62-2	E440	32.7 mg/kg	94.8	70.0	130	----
	RM	zinc	7440-66-6	E440	297 mg/kg	92.5	70.0	130	----

Sub-Matrix:

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Metals (QCLot: 497557) - continued									
	RM	zirconium	7440-67-7	E440	5.73 mg/kg	86.9	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

COC Number: 20 - 926489

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Canada Toll Free: 1 800 668 9878

Report To	Contact and company name below will appear on the final report
Company:	Tetra Tech
Contact:	Mark Fawcett
Phone:	780-818-6352
	Company address below will appear on the final report
Street:	
City/Province:	
Postal Code:	
Invoice To	Same as Report To: X YES ☐ NO
	Copy of Invoice with Report: X YES ☐ NO
Company:	
Contact:	mark.fawcett@tetratech.com

Reports / Recipients

Select Report Format: X PDF X EXCEL X EDD (DIGITAL)

Merge QC/QCI Reports with COA: X YES ☐ NO ☐ N/A

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: X EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: mark.fawcett@tetratech.com

Email 2:

Email 3:

Invoice Recipients

Select Invoice Distribution: X EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax:

Email 2: mark.fawcett@tetratech.com

Turnaround Time (TAT) Requested

☐ Routine [R] if received by 3pm M-F - no surcharges apply
☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum
☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum
☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum
☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum
☐ Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional fees may apply to rush requests on weekends, statutory holidays and non-routine tests

Date and Time Required for all E&P TATs: May 25, 2022

For all tests with rush TATs requested, please contact your AM to confirm availability.

AFFIX ALS BARCODE LABEL HERE (ALS use only)

Project Information

ALS Account # / Quote #:	Tetra Tech 2022 pricing
Job #:	SWM.SWOP04348-01 task 003
PO / AFE:	
LSD:	NE-09-050-17-W4
ALS Lab Work Order # (ALS use only):	EO2203595

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)		Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	PAH	metals - CCME	[illegible]	Mo	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
1	21-6N.N7	0-15	19/May/22		soil	3	X	X					
2	21-6N.N7	18-30				3	X	X					
3	AR-CS2.N5	0-15				1				X			
4	AR-CS3.N5	0-15				1				X			
5	AR-CS4.N7	0-15				3	X						
6	AR-CS4.N7	15-30				3	X						
7	AR-CS7.N8	0-15				3	X						
8	AR-CS7.N8	15-30				3	X						
9	AR-CS10.N4	5-20				1		X	X				
10	AR-CS14.N5	0-15				3	X	X					
11	AR-CS14.N5	15-30				3	X	X					
12													

Environmental Division
Edmonton
Work Order Reference
EO2203595

Telephone : +1 780 413 5227

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human consumption/ use? ☐ YES ☐ NO

Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)

SAMPLE RECEIPT D

Cooling Method: ☐ NONE ☐ ICE ☐ ICE P

Submission Comments identified on Sample Receipt

Cooler Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C: 12.6

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:

INITIAL SHIPMENT RECEPTION (ALS use only)

Received by:	Date:	Time:
VH	May 19/2022	7:03 pm

FINAL SHIPMEN

Received by:	Date:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

AMO 2020 FRONT

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 back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Chain of Custody (COC) / Analytical Request Form

COC Number: 20 - 926490

Page 2 of 2

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Report To	Contact and company name below will appear on the final report
Company:	Tetra Tech
Contact:	Mark Fawcett
Phone:	780-818-6352
	Company address below will appear on the final report
Street:	
City/Province:	
Postal Code:	

Invoice To		
	Same as Report To	[X] YES [ ] NO
	Copy of Invoice with Report	[X] YES [ ] NO
Company:		
Contact:	mark.fawcett@tetratech.com	

Project Information

ALS Account # / Quote #:	
Job #:	SWM.SWOP04348-01 task 003
PO / AFE:	
LSD:	NE-09-050-17-W4
ALS Lab Work Order # (ALS use only):	

Reports / Recipients

Select Report Format: [X] PDF [X] EXCEL [X] EDD (DIGITAL)

Merge QC/QCI Reports with COA [X] YES [ ] NO [ ] N/A

[ ] Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: [X] EMAIL [ ] MAIL [ ] FAX

Email 1 or Fax

Email 2

Email 3

Invoice Recipients

Select Invoice Distribution: [X] EMAIL [ ] MAIL [ ] FAX

Email 1 or Fax

Email 2

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler:

Turnaround Time (TAT) Requested

- [ ] Routine [R] if received by 3pm M-F - no surcharges apply
- [ ] 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum
- [ ] 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum
- [ ] 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum
- [ ] 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum
- [ ] Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional fees may apply to rush requests on weekends, statutory holidays and non-routine tests

AFFIX ALS BARCODE LABEL HERE (ALS use only)

Date and Time Required for all E&P TATs: May 25, 2022

For all tests with rush TATs requested, please contact your AM to confirm availability.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)		Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	PAH	metals - CCME	Se	M2	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
12	AR-CS16	30-50	19 May/22		SOIL	3	X	X					
13	AR-CS20	5-20	1		1	1					X		
14	AR-CS20	30-50	1		1	1		X					

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? [ ] YES [ ] NO

Are samples for human consumption/ use? [ ] YES [ ] NO

Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: [ ] NONE [ ] ICE [ ] ICE PACKS [ ] FROZEN [ ] COOLING INITIATED

Submission Comments identified on Sample Receipt Notification. [ ] YES [ ] NO

Cooler Custody Seals Intact: [ ] YES [ ] N/A Sample Custody Seals Intact: [ ] YES [ ] N/A

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

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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 back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EO2204388**	Page	: 1 of 18
Client	: **Tetra Tech Canada Inc.**	Laboratory	: Edmonton - Environmental
Contact	: Mark Fawcett	Account Manager	: Kieran Tordoff
Address	: North Building 14940 123 Ave NW Edmonton AB Canada T5V 1B4	Address	: 9450 - 17 Avenue NW Edmonton AB Canada T6N 1M9
Telephone	: 780 451 2130	Telephone	: +1 780 413 5227
Project	: SWM.SWOP4348-01.003	Date Samples Received	: 12-Jun-2022 10:00
PO	: ----	Date Analysis Commenced	: 15-Jun-2022
C-O-C number	: ----	Issue Date	: 29-Jun-2022 16:41
Sampler	: ----		
Site	: NE-09-50-17-W4		
Quote number	: ----		
No. of samples received	: 56		
No. of samples analysed	: 40		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Dan Nguyen	Team Leader - Inorganics	Inorganics, Edmonton, Alberta
Dan Nguyen	Team Leader - Inorganics	Metals, Edmonton, Alberta
Geoff Berg	Lab Analyst	Organics, Edmonton, Alberta
Uyen Munro	Lab Analyst	Organics, Edmonton, Alberta
Yan Zhang	Lab Analyst	Organics, Edmonton, Alberta

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
mg/kg	milligrams per kilogram

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Qualifiers

Qualifier	*Description*
DLQ	*Detection Limit raised due to co-eluting interference. GCMS qualifier ion ratio did not meet acceptance criteria.*
SLMI	*Surrogate recovery was outside ALS DQO (Low) due to Matrix Interference*

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	22-6N 5-20	22-6N 30-50	22-6N.N6 5-20	22AR-CS13 5-20	22AR-CS13.N6 5-20
					Client sampling date / time	09-Jun-2022	06-Jun-2022	09-Jun-2022	09-Jun-2022	09-Jun-2022
						EO2204388-001	EO2204388-002	EO2204388-003	EO2204388-004	EO2204388-006
						Result	Result	Result	Result	Result
Physical Tests										
moisture	----	E144	0.25	%		24.6	----	14.5	15.9	18.2
Particle Size										
sand (>0.075mm)	----	E178	1.0	%		----	----	35.6	----	----
fines (<0.075mm)	----	E178	1.0	%		----	----	64.4	----	----
texture class	----	E178	-	-		----	----	Fine	----	----
Metals										
antimony	7440-36-0	E440	0.10	mg/kg		0.32	0.44	0.31	0.36	0.39
arsenic	7440-38-2	E440	0.10	mg/kg		6.78	8.92	7.32	6.97	9.65
barium	7440-39-3	E440	0.50	mg/kg		185	382	194	174	154
beryllium	7440-41-7	E440	0.10	mg/kg		0.79	0.78	0.41	0.54	0.57
cadmium	7440-43-9	E440	0.020	mg/kg		0.371	0.188	0.126	0.197	0.268
chromium	7440-47-3	E440	0.50	mg/kg		28.6	29.3	21.7	19.6	25.5
cobalt	7440-48-4	E440	0.10	mg/kg		9.17	9.34	7.59	7.14	10.7
copper	7440-50-8	E440	0.50	mg/kg		20.2	24.2	14.1	15.2	23.2
lead	7439-92-1	E440	0.50	mg/kg		13.4	11.1	7.39	10.1	11.1
molybdenum	7439-98-7	E440	0.10	mg/kg		0.29	1.23	0.92	3.26	0.61
nickel	7440-02-0	E440	0.50	mg/kg		25.1	29.5	22.2	22.4	30.5
selenium	7782-49-2	E440	0.20	mg/kg		0.41	0.42	0.22	0.45	0.21
silver	7440-22-4	E440	0.10	mg/kg		0.13	0.13	<0.10	<0.10	0.14
thallium	7440-28-0	E440	0.050	mg/kg		0.256	0.220	0.166	0.155	0.172
tin	7440-31-5	E440	2.0	mg/kg		<2.0	<2.0	<2.0	<2.0	<2.0
uranium	7440-61-1	E440	0.050	mg/kg		1.03	1.08	0.687	0.824	0.730
vanadium	7440-62-2	E440	0.20	mg/kg		42.6	43.4	31.9	32.4	39.8
zinc	7440-66-6	E440	2.0	mg/kg		80.2	73.9	46.8	69.0	51.6
Polycyclic Aromatic Hydrocarbons										
acenaphthene	83-32-9	E641A-L	0.0050	mg/kg		<0.0050	----	<0.0050	<0.0050	<0.0050
acenaphthylene	208-96-8	E641A-L	0.0050	mg/kg		<0.0050	----	<0.0050	<0.0050	<0.0050
anthracene	120-12-7	E641A-L	0.0040	mg/kg		<0.0040	----	<0.0040	<0.0040	<0.0040
benz(a)anthracene	56-55-3	E641A-L	0.010	mg/kg		<0.010	----	<0.010	<0.010	<0.010
benzo(a)pyrene	50-32-8	E641A-L	0.010	mg/kg		<0.010	----	<0.010	<0.010	<0.010
benzo(b+j)fluoranthene	n/a	E641A-L	0.010	mg/kg		<0.010	----	<0.010	<0.010	<0.010

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	22-6N 5-20	22-6N 30-50	22-6N.N6 5-20	22AR-CS13 5-20	22AR-CS13.N6 5-20
					Client sampling date / time	09-Jun-2022	06-Jun-2022	09-Jun-2022	09-Jun-2022	09-Jun-2022
						EO2204388-001	EO2204388-002	EO2204388-003	EO2204388-004	EO2204388-006
						Result	Result	Result	Result	Result
Polycyclic Aromatic Hydrocarbons										
benzo(g,h,i)perylene	191-24-2	E641A-L	0.010	mg/kg		<0.010	----	<0.010	<0.010	<0.010
benzo(k)fluoranthene	207-08-9	E641A-L	0.010	mg/kg		<0.010	----	<0.010	<0.010	<0.010
chrysene	218-01-9	E641A-L	0.010	mg/kg		<0.010	----	<0.010	<0.010	<0.010
dibenz(a,h)anthracene	53-70-3	E641A-L	0.0050	mg/kg		<0.0050	----	<0.0050	<0.0050	<0.0050
fluoranthene	206-44-0	E641A-L	0.010	mg/kg		<0.010	----	<0.010	<0.010	<0.010
fluorene	86-73-7	E641A-L	0.010	mg/kg		<0.010	----	<0.010	<0.010	<0.010
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.010	mg/kg		<0.010	----	<0.010	<0.010	<0.010
naphthalene	91-20-3	E641A-L	0.010	mg/kg		<0.010	----	<0.010	<0.010	<0.010
phenanthrene	85-01-8	E641A-L	0.010	mg/kg		<0.010	----	<0.010	<0.010	<0.010
pyrene	129-00-0	E641A-L	0.010	mg/kg		<0.010	----	<0.010	<0.010	<0.010
B(a)P total potency equivalents [B(a)P TPE]	----	E641A-L	0.020	mg/kg		<0.020	----	<0.020	<0.020	<0.020
IACR AB (coarse)	----	E641A-L	0.10	-		<0.10	----	<0.10	<0.10	<0.10
IACR AB (fine)	----	E641A-L	0.10	-		<0.10	----	<0.10	<0.10	<0.10
Polycyclic Aromatic Hydrocarbons Surrogates										
acridine-d9	34749-75-2	E641A-L	0.1	%		73.6	----	67.9	70.3	67.3
chrysene-d12	1719-03-5	E641A-L	0.1	%		128	----	130	127	128
naphthalene-d8	1146-65-2	E641A-L	0.1	%		123	----	107	112	108
phenanthrene-d10	1517-22-2	E641A-L	0.1	%		97.0	----	89.5	89.9	85.1

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	22AR-CS14 5-20	22AR-CS14.N10 5-20	22AR-CS15 5-20	22AR-CS15.N9 5-20	22AR-CS16 5-20
					Client sampling date / time	09-Jun-2022	09-Jun-2022	09-Jun-2022	09-Jun-2022	09-Jun-2022
						EO2204388-007	EO2204388-009	EO2204388-010	EO2204388-012	EO2204388-013
						Result	Result	Result	Result	Result
Physical Tests										
moisture	----	E144	0.25	%		11.7	13.0	13.3	15.9	19.7
Metals										
antimony	7440-36-0	E440	0.10	mg/kg		0.29	0.39	0.37	0.47	----
arsenic	7440-38-2	E440	0.10	mg/kg		6.03	7.66	7.52	9.15	----
barium	7440-39-3	E440	0.50	mg/kg		131	250	162	150	----
beryllium	7440-41-7	E440	0.10	mg/kg		0.47	0.52	0.53	0.62	----
cadmium	7440-43-9	E440	0.020	mg/kg		0.156	0.271	0.197	0.141	----
chromium	7440-47-3	E440	0.50	mg/kg		26.2	26.4	24.4	29.1	----
cobalt	7440-48-4	E440	0.10	mg/kg		6.56	8.26	8.38	15.0	----
copper	7440-50-8	E440	0.50	mg/kg		14.6	17.5	16.8	19.1	----
lead	7439-92-1	E440	0.50	mg/kg		6.72	7.55	8.85	8.75	----
molybdenum	7439-98-7	E440	0.10	mg/kg		0.48	0.84	1.72	0.72	----
nickel	7440-02-0	E440	0.50	mg/kg		22.0	24.8	24.5	38.0	----
selenium	7782-49-2	E440	0.20	mg/kg		0.27	0.36	0.25	0.36	----
silver	7440-22-4	E440	0.10	mg/kg		<0.10	<0.10	<0.10	<0.10	----
thallium	7440-28-0	E440	0.050	mg/kg		0.150	0.183	0.172	0.219	----
tin	7440-31-5	E440	2.0	mg/kg		<2.0	<2.0	<2.0	<2.0	----
uranium	7440-61-1	E440	0.050	mg/kg		0.931	1.68	0.834	1.13	----
vanadium	7440-62-2	E440	0.20	mg/kg		33.2	40.2	33.4	43.6	----
zinc	7440-66-6	E440	2.0	mg/kg		43.0	51.3	61.6	54.5	----
Polycyclic Aromatic Hydrocarbons										
acenaphthene	83-32-9	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
acenaphthylene	208-96-8	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
anthracene	120-12-7	E641A-L	0.0040	mg/kg		<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
benz(a)anthracene	56-55-3	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
benzo(a)pyrene	50-32-8	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
benzo(b+j)fluoranthene	n/a	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
benzo(g,h,i)perylene	191-24-2	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
benzo(k)fluoranthene	207-08-9	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
chrysene	218-01-9	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
dibenz(a,h)anthracene	53-70-3	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
fluoranthene	206-44-0	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	22AR-CS14 5-20	22AR-CS14.N10 5-20	22AR-CS15 5-20	22AR-CS15.N9 5-20	22AR-CS16 5-20
					Client sampling date / time	09-Jun-2022	09-Jun-2022	09-Jun-2022	09-Jun-2022	09-Jun-2022
						EO2204388-007	EO2204388-009	EO2204388-010	EO2204388-012	EO2204388-013
						Result	Result	Result	Result	Result
Polycyclic Aromatic Hydrocarbons										
fluorene	86-73-7	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
naphthalene	91-20-3	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
phenanthrene	85-01-8	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
pyrene	129-00-0	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
B(a)P total potency equivalents [B(a)P TPE]	----	E641A-L	0.020	mg/kg		<0.020	<0.020	<0.020	<0.020	<0.020
IACR AB (coarse)	----	E641A-L	0.10	-		<0.10	<0.10	<0.10	<0.10	<0.10
IACR AB (fine)	----	E641A-L	0.10	-		<0.10	<0.10	<0.10	<0.10	<0.10
Polycyclic Aromatic Hydrocarbons Surrogates										
acridine-d9	34749-75-2	E641A-L	0.1	%		71.8	69.3	70.0	72.2	69.3
chrysene-d12	1719-03-5	E641A-L	0.1	%		128	123	125	130	129
naphthalene-d8	1146-65-2	E641A-L	0.1	%		116	111	108	116	112
phenanthrene-d10	1517-22-2	E641A-L	0.1	%		91.3	87.1	88.6	91.2	87.6

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	22AR-CS16.N6 5-20	22-8 5-20	22-8.N9 5-20	22AR-CS18 5-20	22AR-CS18.N8 5-20
					Client sampling date / time	09-Jun-2022	09-Jun-2022	09-Jun-2022	06-Jun-2022	09-Jun-2022
						EO2204388-015	EO2204388-016	EO2204388-018	EO2204388-020	EO2204388-022
						Result	Result	Result	Result	Result
Physical Tests										
moisture	----	E144	0.25	%		16.5	11.6	14.8	----	15.0
Particle Size										
sand (>0.075mm)	----	E178	1.0	%		----	38.4	----	----	----
fines (<0.075mm)	----	E178	1.0	%		----	61.5	----	----	----
texture class	----	E178	-	-		----	Fine	----	----	----
Metals										
antimony	7440-36-0	E440	0.10	mg/kg		0.43	0.39	0.47	0.29	0.45
arsenic	7440-38-2	E440	0.10	mg/kg		10.8	7.94	10.9	9.63	9.20
barium	7440-39-3	E440	0.50	mg/kg		149	198	147	131	186
beryllium	7440-41-7	E440	0.10	mg/kg		0.70	0.64	0.69	0.63	0.64
cadmium	7440-43-9	E440	0.020	mg/kg		0.150	0.233	0.083	0.136	0.260
chromium	7440-47-3	E440	0.50	mg/kg		27.0	21.7	26.7	22.3	26.5
cobalt	7440-48-4	E440	0.10	mg/kg		10.6	8.41	9.78	9.80	9.43
copper	7440-50-8	E440	0.50	mg/kg		19.8	17.6	18.5	14.7	15.6
lead	7439-92-1	E440	0.50	mg/kg		11.0	12.1	9.82	8.57	8.14
molybdenum	7439-98-7	E440	0.10	mg/kg		0.73	1.37	0.74	0.32	0.83
nickel	7440-02-0	E440	0.50	mg/kg		26.3	24.9	23.5	20.3	26.1
selenium	7782-49-2	E440	0.20	mg/kg		<0.20	0.36	0.27	0.21	0.43
silver	7440-22-4	E440	0.10	mg/kg		0.12	0.11	<0.10	<0.10	0.11
thallium	7440-28-0	E440	0.050	mg/kg		0.224	0.162	0.211	0.186	0.218
tin	7440-31-5	E440	2.0	mg/kg		<2.0	<2.0	<2.0	<2.0	<2.0
uranium	7440-61-1	E440	0.050	mg/kg		0.863	1.22	0.935	0.752	1.69
vanadium	7440-62-2	E440	0.20	mg/kg		45.2	33.4	43.7	41.8	43.5
zinc	7440-66-6	E440	2.0	mg/kg		69.0	86.2	59.4	54.9	60.0
Polycyclic Aromatic Hydrocarbons										
acenaphthene	83-32-9	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	<0.0050	----	<0.0050
acenaphthylene	208-96-8	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	<0.0050	----	<0.0050
anthracene	120-12-7	E641A-L	0.0040	mg/kg		<0.0040	<0.0040	<0.0040	----	<0.0040
benz(a)anthracene	56-55-3	E641A-L	0.010	mg/kg		<0.010	0.026	<0.010	----	<0.010
benzo(a)pyrene	50-32-8	E641A-L	0.010	mg/kg		<0.010	0.038	<0.010	----	<0.010
benzo(b+j)fluoranthene	n/a	E641A-L	0.010	mg/kg		<0.010	0.050	<0.010	----	<0.010
benzo(g,h,i)perylene	191-24-2	E641A-L	0.010	mg/kg		<0.010	0.029	<0.010	----	<0.010

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	22AR-CS16.N6 5-20	22-8 5-20	22-8.N9 5-20	22AR-CS18 5-20	22AR-CS18.N8 5-20
					Client sampling date / time	09-Jun-2022	09-Jun-2022	09-Jun-2022	06-Jun-2022	09-Jun-2022
						EO2204388-015	EO2204388-016	EO2204388-018	EO2204388-020	EO2204388-022
						Result	Result	Result	Result	Result
Polycyclic Aromatic Hydrocarbons										
benzo(k)fluoranthene	207-08-9	E641A-L	0.010	mg/kg		<0.010	0.018	<0.010	----	<0.010
chrysene	218-01-9	E641A-L	0.010	mg/kg		<0.010	0.031	<0.010	----	<0.010
dibenz(a,h)anthracene	53-70-3	E641A-L	0.0050	mg/kg		<0.0050	<0.0083 DLQ	<0.0050	----	<0.0050
fluoranthene	206-44-0	E641A-L	0.010	mg/kg		<0.010	0.036	<0.010	----	<0.010
fluorene	86-73-7	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	<0.010
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.010	mg/kg		<0.010	0.032	<0.010	----	<0.010
naphthalene	91-20-3	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	----	<0.010
phenanthrene	85-01-8	E641A-L	0.010	mg/kg		<0.010	0.011	<0.010	----	<0.010
pyrene	129-00-0	E641A-L	0.010	mg/kg		<0.010	0.039	<0.010	----	<0.010
B(a)P total potency equivalents [B(a)P TPE]	----	E641A-L	0.020	mg/kg		<0.020	0.055	<0.020	----	<0.020
IACR AB (coarse)	----	E641A-L	0.10	-		<0.10	<0.10	<0.10	----	<0.10
IACR AB (fine)	----	E641A-L	0.10	-		<0.10	<0.10	<0.10	----	<0.10
Polycyclic Aromatic Hydrocarbons Surrogates										
acridine-d9	34749-75-2	E641A-L	0.1	%		72.8	77.0	76.4	----	85.3
chrysene-d12	1719-03-5	E641A-L	0.1	%		128	96.8	95.0	----	99.4
naphthalene-d8	1146-65-2	E641A-L	0.1	%		115	93.8	88.0	----	91.2
phenanthrene-d10	1517-22-2	E641A-L	0.1	%		92.1	90.1	87.1	----	88.5

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	22AR-CS1 5-20	22AR-CS1.N7 5-20	22AR-CS2 5-20	22AR-CS2.N7 5-20	22AR-CS3 5-20
					Client sampling date / time	09-Jun-2022	09-Jun-2022	09-Jun-2022	10-Jun-2022	09-Jun-2022
						EO2204388-024	EO2204388-025	EO2204388-026	EO2204388-027	EO2204388-029
						Result	Result	Result	Result	Result
Physical Tests										
moisture	----	E144	0.25	%		19.3	15.5	----	15.2	9.16
Metals										
antimony	7440-36-0	E440	0.10	mg/kg		0.42	0.25	0.37	0.36	0.38
arsenic	7440-38-2	E440	0.10	mg/kg		9.91	5.66	7.71	7.31	6.80
barium	7440-39-3	E440	0.50	mg/kg		326	182	192	269	148
beryllium	7440-41-7	E440	0.10	mg/kg		0.75	0.52	0.64	0.53	0.53
cadmium	7440-43-9	E440	0.020	mg/kg		0.254	0.208	0.193	0.205	0.184
chromium	7440-47-3	E440	0.50	mg/kg		27.9	24.0	20.3	22.9	21.2
cobalt	7440-48-4	E440	0.10	mg/kg		11.0	6.56	8.26	9.42	7.83
copper	7440-50-8	E440	0.50	mg/kg		20.7	15.6	16.9	17.3	17.4
lead	7439-92-1	E440	0.50	mg/kg		12.0	9.15	8.30	8.49	7.70
molybdenum	7439-98-7	E440	0.10	mg/kg		0.74	0.53	0.83	0.68	0.94
nickel	7440-02-0	E440	0.50	mg/kg		26.9	22.4	24.2	27.0	24.4
selenium	7782-49-2	E440	0.20	mg/kg		0.60	0.34	0.29	<0.20	0.30
silver	7440-22-4	E440	0.10	mg/kg		0.14	<0.10	<0.10	<0.10	<0.10
thallium	7440-28-0	E440	0.050	mg/kg		0.205	0.159	0.178	0.168	0.171
tin	7440-31-5	E440	2.0	mg/kg		<2.0	<2.0	<2.0	<2.0	<2.0
uranium	7440-61-1	E440	0.050	mg/kg		0.766	0.754	1.04	1.45	0.790
vanadium	7440-62-2	E440	0.20	mg/kg		48.7	30.3	32.3	32.6	27.7
zinc	7440-66-6	E440	2.0	mg/kg		49.7	52.7	58.7	56.5	51.4
Polycyclic Aromatic Hydrocarbons										
acenaphthene	83-32-9	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	----	<0.0050	<0.0050
acenaphthylene	208-96-8	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	----	<0.0050	<0.0050
anthracene	120-12-7	E641A-L	0.0040	mg/kg		<0.0040	<0.0040	----	<0.0040	<0.0040
benz(a)anthracene	56-55-3	E641A-L	0.010	mg/kg		<0.010	<0.010	----	<0.010	<0.010
benzo(a)pyrene	50-32-8	E641A-L	0.010	mg/kg		<0.010	<0.010	----	<0.010	<0.010
benzo(b+j)fluoranthene	n/a	E641A-L	0.010	mg/kg		<0.010	<0.010	----	<0.010	<0.010
benzo(g,h,i)perylene	191-24-2	E641A-L	0.010	mg/kg		<0.010	<0.010	----	<0.010	<0.010
benzo(k)fluoranthene	207-08-9	E641A-L	0.010	mg/kg		<0.010	<0.010	----	<0.010	<0.010
chrysene	218-01-9	E641A-L	0.010	mg/kg		<0.010	<0.010	----	<0.010	<0.010
dibenz(a,h)anthracene	53-70-3	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	----	<0.0050	<0.0050
fluoranthene	206-44-0	E641A-L	0.010	mg/kg		<0.010	<0.010	----	<0.010	<0.010

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	22AR-CS1 5-20	22AR-CS1.N7 5-20	22AR-CS2 5-20	22AR-CS2.N7 5-20	22AR-CS3 5-20
					Client sampling date / time	09-Jun-2022	09-Jun-2022	09-Jun-2022	10-Jun-2022	09-Jun-2022
						EO2204388-024	EO2204388-025	EO2204388-026	EO2204388-027	EO2204388-029
						Result	Result	Result	Result	Result
Polycyclic Aromatic Hydrocarbons										
fluorene	86-73-7	E641A-L	0.010	mg/kg		<0.010	<0.010	----	<0.010	<0.010
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.010	mg/kg		<0.010	<0.010	----	<0.010	<0.010
naphthalene	91-20-3	E641A-L	0.010	mg/kg		<0.010	<0.010	----	<0.010	<0.010
phenanthrene	85-01-8	E641A-L	0.010	mg/kg		<0.010	<0.010	----	<0.010	<0.010
pyrene	129-00-0	E641A-L	0.010	mg/kg		<0.010	<0.010	----	<0.010	<0.010
B(a)P total potency equivalents [B(a)P TPE]	----	E641A-L	0.020	mg/kg		<0.020	<0.020	----	<0.020	<0.020
IACR AB (coarse)	----	E641A-L	0.10	-		<0.10	<0.10	----	<0.10	<0.10
IACR AB (fine)	----	E641A-L	0.10	-		<0.10	<0.10	----	<0.10	<0.10
Polycyclic Aromatic Hydrocarbons Surrogates										
acridine-d9	34749-75-2	E641A-L	0.1	%		77.9	74.7	----	72.6	76.3
chrysene-d12	1719-03-5	E641A-L	0.1	%		92.5	93.4	----	126	128
naphthalene-d8	1146-65-2	E641A-L	0.1	%		88.0	84.8	----	115	116
phenanthrene-d10	1517-22-2	E641A-L	0.1	%		86.5	85.8	----	91.2	89.8

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	22AR-CS3.N7 5-20	22AR-CS4 5-20	22AR-CS4.N6 5-20	22AR-CS5 5-20	22AR-CS5.N9 5-20
					Client sampling date / time	10-Jun-2022	10-Jun-2022	10-Jun-2022	10-Jun-2022	10-Jun-2022
						EO2204388-030	EO2204388-032	EO2204388-034	EO2204388-036	EO2204388-038
						Result	Result	Result	Result	Result
Physical Tests										
moisture	----	E144	0.25	%		15.6	17.1	14.3	23.2	22.6
Metals										
antimony	7440-36-0	E440	0.10	mg/kg		0.32	0.40	0.28	----	0.37
arsenic	7440-38-2	E440	0.10	mg/kg		6.21	8.57	5.76	----	8.33
barium	7440-39-3	E440	0.50	mg/kg		156	136	125	----	278
beryllium	7440-41-7	E440	0.10	mg/kg		0.46	0.66	0.45	----	0.60
cadmium	7440-43-9	E440	0.020	mg/kg		0.162	0.191	0.147	----	0.185
chromium	7440-47-3	E440	0.50	mg/kg		18.1	26.0	19.6	----	26.7
cobalt	7440-48-4	E440	0.10	mg/kg		7.78	12.8	6.34	----	11.7
copper	7440-50-8	E440	0.50	mg/kg		13.8	19.2	13.1	----	19.5
lead	7439-92-1	E440	0.50	mg/kg		6.79	9.70	6.67	----	9.51
molybdenum	7439-98-7	E440	0.10	mg/kg		0.69	0.83	0.69	----	0.95
nickel	7440-02-0	E440	0.50	mg/kg		24.8	29.8	19.3	----	34.0
selenium	7782-49-2	E440	0.20	mg/kg		<0.20	<0.20	<0.20	----	<0.20
silver	7440-22-4	E440	0.10	mg/kg		<0.10	0.11	<0.10	----	0.12
thallium	7440-28-0	E440	0.050	mg/kg		0.153	0.210	0.142	----	0.213
tin	7440-31-5	E440	2.0	mg/kg		<2.0	<2.0	<2.0	----	<2.0
uranium	7440-61-1	E440	0.050	mg/kg		1.24	0.981	1.10	----	1.42
vanadium	7440-62-2	E440	0.20	mg/kg		27.8	39.1	27.1	----	36.8
zinc	7440-66-6	E440	2.0	mg/kg		44.9	62.6	45.0	----	64.1
Polycyclic Aromatic Hydrocarbons										
acenaphthene	83-32-9	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
acenaphthylene	208-96-8	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
anthracene	120-12-7	E641A-L	0.0040	mg/kg		<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
benz(a)anthracene	56-55-3	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
benzo(a)pyrene	50-32-8	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
benzo(b+j)fluoranthene	n/a	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
benzo(g,h,i)perylene	191-24-2	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
benzo(k)fluoranthene	207-08-9	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
chrysene	218-01-9	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
dibenz(a,h)anthracene	53-70-3	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
fluoranthene	206-44-0	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	22AR-CS3.N7 5-20	22AR-CS4 5-20	22AR-CS4.N6 5-20	22AR-CS5 5-20	22AR-CS5.N9 5-20
					Client sampling date / time	10-Jun-2022	10-Jun-2022	10-Jun-2022	10-Jun-2022	10-Jun-2022
						EO2204388-030	EO2204388-032	EO2204388-034	EO2204388-036	EO2204388-038
						Result	Result	Result	Result	Result
Polycyclic Aromatic Hydrocarbons										
fluorene	86-73-7	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
naphthalene	91-20-3	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
phenanthrene	85-01-8	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
pyrene	129-00-0	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
B(a)P total potency equivalents [B(a)P TPE]	----	E641A-L	0.020	mg/kg		<0.020	<0.020	<0.020	<0.020	<0.020
IACR AB (coarse)	----	E641A-L	0.10	-		<0.10	<0.10	<0.10	<0.10	<0.10
IACR AB (fine)	----	E641A-L	0.10	-		<0.10	<0.10	<0.10	<0.10	<0.10
Polycyclic Aromatic Hydrocarbons Surrogates										
acridine-d9	34749-75-2	E641A-L	0.1	%		72.0	70.5	66.7	62.4	63.4
chrysene-d12	1719-03-5	E641A-L	0.1	%		108	121	125	123	108
naphthalene-d8	1146-65-2	E641A-L	0.1	%		115	101	108	86.8	98.6
phenanthrene-d10	1517-22-2	E641A-L	0.1	%		89.8	90.4	84.6	81.3	81.5

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	22AR-CS6 5-20	22AR-CS6.N7 5-20	22AR-CS7 5-20	22AR-CS7.N7 30-50	22AR-CS8 5-20
					Client sampling date / time	09-Jun-2022	10-Jun-2022	09-Jun-2022	10-Jun-2022	09-Jun-2022
						EO2204388-040	EO2204388-041	EO2204388-042	EO2204388-044	EO2204388-045
						Result	Result	Result	Result	Result
Physical Tests										
moisture	----	E144	0.25	%		13.9	18.5	7.28	17.6	14.1
Metals										
antimony	7440-36-0	E440	0.10	mg/kg		----	0.30	----	0.37	----
arsenic	7440-38-2	E440	0.10	mg/kg		----	7.42	----	8.43	----
barium	7440-39-3	E440	0.50	mg/kg		----	154	----	234	----
beryllium	7440-41-7	E440	0.10	mg/kg		----	0.66	----	0.70	----
cadmium	7440-43-9	E440	0.020	mg/kg		----	0.220	----	0.275	----
chromium	7440-47-3	E440	0.50	mg/kg		----	22.4	----	25.4	----
cobalt	7440-48-4	E440	0.10	mg/kg		----	8.28	----	14.6	----
copper	7440-50-8	E440	0.50	mg/kg		----	14.4	----	24.5	----
lead	7439-92-1	E440	0.50	mg/kg		----	9.75	----	10.6	----
molybdenum	7439-98-7	E440	0.10	mg/kg		----	0.55	----	0.64	----
nickel	7440-02-0	E440	0.50	mg/kg		----	22.0	----	34.3	----
selenium	7782-49-2	E440	0.20	mg/kg		----	0.64	----	0.74	----
silver	7440-22-4	E440	0.10	mg/kg		----	0.10	----	0.14	----
thallium	7440-28-0	E440	0.050	mg/kg		----	0.214	----	0.222	----
tin	7440-31-5	E440	2.0	mg/kg		----	<2.0	----	<2.0	----
uranium	7440-61-1	E440	0.050	mg/kg		----	1.13	----	0.695	----
vanadium	7440-62-2	E440	0.20	mg/kg		----	39.5	----	41.9	----
zinc	7440-66-6	E440	2.0	mg/kg		----	58.5	----	66.7	----
Polycyclic Aromatic Hydrocarbons										
acenaphthene	83-32-9	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
acenaphthylene	208-96-8	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
anthracene	120-12-7	E641A-L	0.0040	mg/kg		<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
benz(a)anthracene	56-55-3	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
benzo(a)pyrene	50-32-8	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
benzo(b+j)fluoranthene	n/a	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
benzo(g,h,i)perylene	191-24-2	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
benzo(k)fluoranthene	207-08-9	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
chrysene	218-01-9	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
dibenz(a,h)anthracene	53-70-3	E641A-L	0.0050	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
fluoranthene	206-44-0	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	22AR-CS6 5-20	22AR-CS6.N7 5-20	22AR-CS7 5-20	22AR-CS7.N7 30-50	22AR-CS8 5-20
					Client sampling date / time	09-Jun-2022	10-Jun-2022	09-Jun-2022	10-Jun-2022	09-Jun-2022
						EO2204388-040	EO2204388-041	EO2204388-042	EO2204388-044	EO2204388-045
						Result	Result	Result	Result	Result
Polycyclic Aromatic Hydrocarbons										
fluorene	86-73-7	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
naphthalene	91-20-3	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
phenanthrene	85-01-8	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
pyrene	129-00-0	E641A-L	0.010	mg/kg		<0.010	<0.010	<0.010	<0.010	<0.010
B(a)P total potency equivalents [B(a)P TPE]	----	E641A-L	0.020	mg/kg		<0.020	<0.020	<0.020	<0.020	<0.020
IACR AB (coarse)	----	E641A-L	0.10	-		<0.10	<0.10	<0.10	<0.10	<0.10
IACR AB (fine)	----	E641A-L	0.10	-		<0.10	<0.10	<0.10	<0.10	<0.10
Polycyclic Aromatic Hydrocarbons Surrogates										
acridine-d9	34749-75-2	E641A-L	0.1	%		64.1	62.3	65.3	67.3	63.0
chrysene-d12	1719-03-5	E641A-L	0.1	%		120	128	128	128	129
naphthalene-d8	1146-65-2	E641A-L	0.1	%		102	95.9	110	103	103
phenanthrene-d10	1517-22-2	E641A-L	0.1	%		82.0	76.3	84.8	81.2	80.9

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	22AR-CS8.N7 5-20	22AR-CS9 5-20	22AR-CS9.N7 5-20	22AR-CS9.N7 30-50	22AR-CS10 5-20
					Client sampling date / time	10-Jun-2022	09-Jun-2022	10-Jun-2022	10-Jun-2022	09-Jun-2022
						EO2204388-046	EO2204388-047	EO2204388-048	EO2204388-049	EO2204388-050
						Result	Result	Result	Result	Result
Physical Tests										
moisture	----	E144	0.25	%		20.2	----	21.7	----	----
Metals										
antimony	7440-36-0	E440	0.10	mg/kg		0.24	0.29	----	0.35	0.39
arsenic	7440-38-2	E440	0.10	mg/kg		7.47	6.93	----	7.54	7.10
barium	7440-39-3	E440	0.50	mg/kg		225	173	----	201	165
beryllium	7440-41-7	E440	0.10	mg/kg		0.61	0.60	----	0.62	0.54
cadmium	7440-43-9	E440	0.020	mg/kg		0.284	0.187	----	0.236	0.201
chromium	7440-47-3	E440	0.50	mg/kg		25.4	25.5	----	24.6	27.6
cobalt	7440-48-4	E440	0.10	mg/kg		8.57	8.35	----	8.79	8.27
copper	7440-50-8	E440	0.50	mg/kg		14.7	14.6	----	14.8	17.1
lead	7439-92-1	E440	0.50	mg/kg		13.5	7.62	----	8.32	7.94
molybdenum	7439-98-7	E440	0.10	mg/kg		1.10	0.66	----	0.68	0.74
nickel	7440-02-0	E440	0.50	mg/kg		24.1	25.1	----	25.7	27.7
selenium	7782-49-2	E440	0.20	mg/kg		0.63	0.74	----	0.51	0.27
silver	7440-22-4	E440	0.10	mg/kg		0.12	<0.10	----	<0.10	<0.10
thallium	7440-28-0	E440	0.050	mg/kg		0.172	0.174	----	0.175	0.176
tin	7440-31-5	E440	2.0	mg/kg		<2.0	<2.0	----	<2.0	<2.0
uranium	7440-61-1	E440	0.050	mg/kg		1.32	1.46	----	1.60	0.939
vanadium	7440-62-2	E440	0.20	mg/kg		41.8	34.1	----	36.1	31.6
zinc	7440-66-6	E440	2.0	mg/kg		91.1	58.4	----	55.9	51.9
Polycyclic Aromatic Hydrocarbons										
acenaphthene	83-32-9	E641A-L	0.0050	mg/kg		<0.0050	----	<0.0050	----	----
acenaphthylene	208-96-8	E641A-L	0.0050	mg/kg		<0.0050	----	<0.0050	----	----
anthracene	120-12-7	E641A-L	0.0040	mg/kg		<0.0040	----	<0.0040	----	----
benz(a)anthracene	56-55-3	E641A-L	0.010	mg/kg		<0.010	----	<0.010	----	----
benzo(a)pyrene	50-32-8	E641A-L	0.010	mg/kg		<0.010	----	<0.010	----	----
benzo(b+j)fluoranthene	n/a	E641A-L	0.010	mg/kg		<0.010	----	<0.010	----	----
benzo(g,h,i)perylene	191-24-2	E641A-L	0.010	mg/kg		<0.010	----	<0.010	----	----
benzo(k)fluoranthene	207-08-9	E641A-L	0.010	mg/kg		<0.010	----	<0.010	----	----
chrysene	218-01-9	E641A-L	0.010	mg/kg		<0.010	----	<0.010	----	----
dibenz(a,h)anthracene	53-70-3	E641A-L	0.0050	mg/kg		<0.0050	----	<0.0050	----	----
fluoranthene	206-44-0	E641A-L	0.010	mg/kg		<0.010	----	<0.010	----	----

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	22AR-CS8.N7 5-20	22AR-CS9 5-20	22AR-CS9.N7 5-20	22AR-CS9.N7 30-50	22AR-CS10 5-20
					Client sampling date / time	10-Jun-2022	09-Jun-2022	10-Jun-2022	10-Jun-2022	09-Jun-2022
						EO2204388-046	EO2204388-047	EO2204388-048	EO2204388-049	EO2204388-050
						Result	Result	Result	Result	Result
Polycyclic Aromatic Hydrocarbons										
fluorene	86-73-7	E641A-L	0.010	mg/kg		<0.010	----	<0.010	----	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.010	mg/kg		<0.010	----	<0.010	----	----
naphthalene	91-20-3	E641A-L	0.010	mg/kg		<0.010	----	<0.010	----	----
phenanthrene	85-01-8	E641A-L	0.010	mg/kg		<0.010	----	<0.010	----	----
pyrene	129-00-0	E641A-L	0.010	mg/kg		<0.010	----	<0.010	----	----
B(a)P total potency equivalents [B(a)P TPE]	----	E641A-L	0.020	mg/kg		<0.020	----	<0.020	----	----
IACR AB (coarse)	----	E641A-L	0.10	-		<0.10	----	<0.10	----	----
IACR AB (fine)	----	E641A-L	0.10	-		<0.10	----	<0.10	----	----
Polycyclic Aromatic Hydrocarbons Surrogates										
acridine-d9	34749-75-2	E641A-L	0.1	%		71.8	----	67.7	----	----
chrysene-d12	1719-03-5	E641A-L	0.1	%		91.4	----	88.6	----	----
naphthalene-d8	1146-65-2	E641A-L	0.1	%		81.2	----	85.0	----	----
phenanthrene-d10	1517-22-2	E641A-L	0.1	%		81.1	----	82.5	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	22AR-CS10.N7 5-20	22AR-CS10.N7 30-50	22AR-CS11 5-20	22AR-CS11.N7 5-15	22AR-CS11.N7 35-50
					Client sampling date / time	10-Jun-2022	10-Jun-2022	09-Jun-2022	10-Jun-2022	10-Jun-2022
						EO2204388-051	EO2204388-052	EO2204388-053	EO2204388-054	EO2204388-056
						Result	Result	Result	Result	Result
Physical Tests										
moisture	----	E144	0.25	%		10.8	----	----	7.39	----
Particle Size										
sand (>0.075mm)	----	E178	1.0	%		44.6	----	----	----	----
fines (<0.075mm)	----	E178	1.0	%		55.4	----	----	----	----
texture class	----	E178	-	-		Fine	----	----	----	----
Metals										
antimony	7440-36-0	E440	0.10	mg/kg		----	0.35	0.24	----	0.38
arsenic	7440-38-2	E440	0.10	mg/kg		----	7.28	7.05	----	6.55
barium	7440-39-3	E440	0.50	mg/kg		----	135	144	----	169
beryllium	7440-41-7	E440	0.10	mg/kg		----	0.58	0.58	----	0.53
cadmium	7440-43-9	E440	0.020	mg/kg		----	0.156	0.107	----	0.212
chromium	7440-47-3	E440	0.50	mg/kg		----	20.2	25.4	----	18.6
cobalt	7440-48-4	E440	0.10	mg/kg		----	8.00	9.49	----	8.04
copper	7440-50-8	E440	0.50	mg/kg		----	15.6	11.6	----	15.5
lead	7439-92-1	E440	0.50	mg/kg		----	7.57	7.35	----	7.26
molybdenum	7439-98-7	E440	0.10	mg/kg		----	0.49	0.48	----	0.57
nickel	7440-02-0	E440	0.50	mg/kg		----	30.3	21.8	----	23.5
selenium	7782-49-2	E440	0.20	mg/kg		----	0.57	0.71	----	0.40
silver	7440-22-4	E440	0.10	mg/kg		----	0.11	<0.10	----	<0.10
thallium	7440-28-0	E440	0.050	mg/kg		----	0.202	0.177	----	0.166
tin	7440-31-5	E440	2.0	mg/kg		----	<2.0	<2.0	----	<2.0
uranium	7440-61-1	E440	0.050	mg/kg		----	0.830	1.18	----	0.983
vanadium	7440-62-2	E440	0.20	mg/kg		----	32.1	31.6	----	30.3
zinc	7440-66-6	E440	2.0	mg/kg		----	49.3	46.7	----	49.6
Polycyclic Aromatic Hydrocarbons										
acenaphthene	83-32-9	E641A-L	0.0050	mg/kg		<0.0050	----	----	<0.0050	----
acenaphthylene	208-96-8	E641A-L	0.0050	mg/kg		<0.0050	----	----	<0.0050	----
anthracene	120-12-7	E641A-L	0.0040	mg/kg		<0.0040	----	----	<0.0040	----
benz(a)anthracene	56-55-3	E641A-L	0.010	mg/kg		<0.010	----	----	<0.010	----
benzo(a)pyrene	50-32-8	E641A-L	0.010	mg/kg		<0.010	----	----	<0.010	----
benzo(b+j)fluoranthene	n/a	E641A-L	0.010	mg/kg		0.016	----	----	<0.010	----
benzo(g,h,i)perylene	191-24-2	E641A-L	0.010	mg/kg		<0.010	----	----	<0.010	----

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	22AR-CS10.N7 5-20	22AR-CS10.N7 30-50	22AR-CS11 5-20	22AR-CS11.N7 5-15	22AR-CS11.N7 35-50
					Client sampling date / time	10-Jun-2022	10-Jun-2022	09-Jun-2022	10-Jun-2022	10-Jun-2022
						EO2204388-051	EO2204388-052	EO2204388-053	EO2204388-054	EO2204388-056
						Result	Result	Result	Result	Result
Polycyclic Aromatic Hydrocarbons										
benzo(k)fluoranthene	207-08-9	E641A-L	0.010	mg/kg		<0.010	----	----	<0.010	----
chrysene	218-01-9	E641A-L	0.010	mg/kg		0.010	----	----	<0.010	----
dibenz(a,h)anthracene	53-70-3	E641A-L	0.0050	mg/kg		<0.0050	----	----	<0.0050	----
fluoranthene	206-44-0	E641A-L	0.010	mg/kg		0.014	----	----	<0.010	----
fluorene	86-73-7	E641A-L	0.010	mg/kg		<0.010	----	----	<0.010	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.010	mg/kg		<0.010	----	----	<0.010	----
naphthalene	91-20-3	E641A-L	0.010	mg/kg		<0.010	----	----	<0.010	----
phenanthrene	85-01-8	E641A-L	0.010	mg/kg		0.010	----	----	<0.010	----
pyrene	129-00-0	E641A-L	0.010	mg/kg		0.016	----	----	<0.010	----
B(a)P total potency equivalents [B(a)P TPE]	----	E641A-L	0.020	mg/kg		<0.020	----	----	<0.020	----
IACR AB (coarse)	----	E641A-L	0.10	-		<0.10	----	----	<0.10	----
IACR AB (fine)	----	E641A-L	0.10	-		<0.10	----	----	<0.10	----
Polycyclic Aromatic Hydrocarbons Surrogates										
acridine-d9	34749-75-2	E641A-L	0.1	%		67.4	----	----	24.9 SLMI	----
chrysene-d12	1719-03-5	E641A-L	0.1	%		81.0	----	----	82.8	----
naphthalene-d8	1146-65-2	E641A-L	0.1	%		85.5	----	----	84.8	----
phenanthrene-d10	1517-22-2	E641A-L	0.1	%		85.0	----	----	85.8	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **EO2204388**	Page	: 1 of 16
Client	: **Tetra Tech Canada Inc.**	Laboratory	: Edmonton - Environmental
Contact	: Mark Fawcett	Account Manager	: Kieran Tordoff
Address	: North Building 14940 123 Ave NW Edmonton AB Canada T5V 1B4	Address	: 9450 - 17 Avenue NW Edmonton, Alberta Canada T6N 1M9
Telephone	: 780 451 2130	Telephone	: +1 780 413 5227
Project	: SWM.SWOP4348-01.003	Date Samples Received	: 12-Jun-2022 10:00
PO	: ----	Issue Date	: 29-Jun-2022 16:41
C-O-C number	: ----		
Sampler	: ----		
Site	: NE-09-50-17-W4		
Quote number	: ----		
No. of samples received	: 56		
No. of samples analysed	: 40		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- Test sample Surrogate recovery outliers exist for all regular sample matrices - please see following pages for full details.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers occur - please see following pages for full details.

Regular Sample Surrogates

Sub-Matrix: **Soil**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Result	Limits	Comment
Samples Submitted							
Polycyclic Aromatic Hydrocarbons Surrogates	EO2204388-054	22AR-CS11.N7 5-15	acridine-d9	34749-75-2	24.9 %	60.0-130 %	Recovery less than lower data quality objective

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS10.N7 30-50	E440	10-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	13 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS11.N7 35-50	E440	10-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	13 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS2.N7 5-20	E440	10-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	13 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS3.N7 5-20	E440	10-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	13 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS4 5-20	E440	10-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	13 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS4.N6 5-20	E440	10-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	13 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS5.N9 5-20	E440	10-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	13 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS6.N7 5-20	E440	10-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	13 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS7.N7 30-50	E440	10-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	13 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS8.N7 5-20	E440	10-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	13 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS9.N7 30-50	E440	10-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	13 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22-6N 5-20	E440	09-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	14 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22-6N.N6 5-20	E440	09-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	14 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22-8 5-20	E440	09-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	14 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22-8.N9 5-20	E440	09-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	14 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS1 5-20	E440	09-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	14 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS1.N7 5-20	E440	09-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	14 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS10 5-20	E440	09-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	14 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS11 5-20	E440	09-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	14 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS13 5-20	E440	09-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	14 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS13.N6 5-20	E440	09-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	14 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS14 5-20	E440	09-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	14 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS14.N10 5-20	E440	09-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	14 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS15 5-20	E440	09-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	14 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS15.N9 5-20	E440	09-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	14 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS16.N6 5-20	E440	09-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	14 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS18.N8 5-20	E440	09-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	14 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS2 5-20	E440	09-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	14 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS3 5-20	E440	09-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	14 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS9 5-20	E440	09-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	14 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22-6N 30-50	E440	06-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	17 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag 22AR-CS18 5-20	E440	06-Jun-2022	23-Jun-2022	----	----		23-Jun-2022	180 days	17 days	✓
Particle Size : CCME fine/coarse Particle Size Analysis by wet sieve										
LDPE bag 22AR-CS10.N7 5-20	E178	10-Jun-2022	----	----	----		28-Jun-2022	180 days	18 days	✓
Particle Size : CCME fine/coarse Particle Size Analysis by wet sieve										
LDPE bag 22-6N.N6 5-20	E178	09-Jun-2022	----	----	----		28-Jun-2022	180 days	19 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Particle Size : CCME fine/coarse Particle Size Analysis by wet sieve										
LDPE bag 22-8 5-20	E178	09-Jun-2022	----	----	----		28-Jun-2022	180 days	19 days	✓
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap 22-6N 5-20	E144	09-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap 22-6N.N6 5-20	E144	09-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap 22-8 5-20	E144	09-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap 22-8.N9 5-20	E144	09-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap 22AR-CS1 5-20	E144	09-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap 22AR-CS1.N7 5-20	E144	09-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap 22AR-CS10.N7 5-20	E144	10-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap 22AR-CS11.N7 5-15	E144	10-Jun-2022	----	----	----		15-Jun-2022	----	----	

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
22AR-CS13 5-20	E144	09-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
22AR-CS13.N6 5-20	E144	09-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
22AR-CS14 5-20	E144	09-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
22AR-CS14.N10 5-20	E144	09-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
22AR-CS15 5-20	E144	09-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
22AR-CS15.N9 5-20	E144	09-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
22AR-CS16 5-20	E144	09-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
22AR-CS16.N6 5-20	E144	09-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
22AR-CS18.N8 5-20	E144	09-Jun-2022	----	----	----		15-Jun-2022	----	----	

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
22AR-CS2.N7 5-20	E144	10-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
22AR-CS3 5-20	E144	09-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
22AR-CS3.N7 5-20	E144	10-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
22AR-CS4 5-20	E144	10-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
22AR-CS4.N6 5-20	E144	10-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
22AR-CS5 5-20	E144	10-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
22AR-CS5.N9 5-20	E144	10-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
22AR-CS6 5-20	E144	09-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
22AR-CS6.N7 5-20	E144	10-Jun-2022	----	----	----		15-Jun-2022	----	----	

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
22AR-CS7 5-20	E144	09-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
22AR-CS7.N7 30-50	E144	10-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
22AR-CS8 5-20	E144	09-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
22AR-CS8.N7 5-20	E144	10-Jun-2022	----	----	----		15-Jun-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
22AR-CS9.N7 5-20	E144	10-Jun-2022	----	----	----		15-Jun-2022	----	----	
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap										
22AR-CS2.N7 5-20	E641A-L	10-Jun-2022	15-Jun-2022	14 days	5 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap										
22AR-CS3.N7 5-20	E641A-L	10-Jun-2022	15-Jun-2022	14 days	5 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap										
22AR-CS4 5-20	E641A-L	10-Jun-2022	15-Jun-2022	14 days	5 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap										
22AR-CS4.N6 5-20	E641A-L	10-Jun-2022	15-Jun-2022	14 days	5 days	✓	18-Jun-2022	40 days	3 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap										
22-6N 5-20	E641A-L	09-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap										
22-6N.N6 5-20	E641A-L	09-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap										
22-8 5-20	E641A-L	09-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap										
22-8.N9 5-20	E641A-L	09-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap										
22AR-CS1 5-20	E641A-L	09-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap										
22AR-CS1.N7 5-20	E641A-L	09-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap										
22AR-CS10.N7 5-20	E641A-L	10-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap										
22AR-CS11.N7 5-15	E641A-L	10-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap										
22AR-CS13 5-20	E641A-L	09-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap 22AR-CS13.N6 5-20	E641A-L	09-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap 22AR-CS14 5-20	E641A-L	09-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap 22AR-CS14.N10 5-20	E641A-L	09-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap 22AR-CS15 5-20	E641A-L	09-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap 22AR-CS15.N9 5-20	E641A-L	09-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap 22AR-CS16 5-20	E641A-L	09-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap 22AR-CS16.N6 5-20	E641A-L	09-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap 22AR-CS18.N8 5-20	E641A-L	09-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap 22AR-CS3 5-20	E641A-L	09-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap 22AR-CS5 5-20	E641A-L	10-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap 22AR-CS5.N9 5-20	E641A-L	10-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap 22AR-CS6.N7 5-20	E641A-L	10-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap 22AR-CS7.N7 30-50	E641A-L	10-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap 22AR-CS8.N7 5-20	E641A-L	10-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap 22AR-CS9.N7 5-20	E641A-L	10-Jun-2022	15-Jun-2022	14 days	6 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap 22AR-CS6 5-20	E641A-L	09-Jun-2022	15-Jun-2022	14 days	7 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap 22AR-CS7 5-20	E641A-L	09-Jun-2022	15-Jun-2022	14 days	7 days	✓	18-Jun-2022	40 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap 22AR-CS8 5-20	E641A-L	09-Jun-2022	15-Jun-2022	14 days	7 days	✓	18-Jun-2022	40 days	3 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
CCME fine/coarse Particle Size Analysis by wet sieve	E178	541230	1	20	5.0	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	535099	2	35	5.7	5.0	✓
Moisture Content by Gravimetry	E144	524162	2	40	5.0	5.0	✓
PAHs by Hex:Ace GC-MS (Low Level CCME)	E641A-L	524966	0	36	0.0	5.0	×
Laboratory Control Samples (LCS)							
CCME fine/coarse Particle Size Analysis by wet sieve	E178	541230	1	20	5.0	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	535099	4	35	11.4	10.0	✓
Moisture Content by Gravimetry	E144	524162	2	40	5.0	5.0	✓
PAHs by Hex:Ace GC-MS (Low Level CCME)	E641A-L	524966	2	36	5.5	5.0	✓
Method Blanks (MB)							
Metals in Soil/Solid by CRC ICPMS	E440	535099	2	35	5.7	5.0	✓
Moisture Content by Gravimetry	E144	524162	2	40	5.0	5.0	✓
PAHs by Hex:Ace GC-MS (Low Level CCME)	E641A-L	524966	2	36	5.5	5.0	✓
Matrix Spikes (MS)							
PAHs by Hex:Ace GC-MS (Low Level CCME)	E641A-L	524966	2	36	5.5	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Moisture Content by Gravimetry	E144 Edmonton - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	Moisture is measured gravimetrically by drying the sample at 105°C. Moisture content is calculated as the weight loss (due to water) divided by the wet weight of the sample, expressed as a percentage.
CCME fine/coarse Particle Size Analysis by wet sieve	E178 Edmonton - Environmental	Soil/Solid	CCME Vol 4 Analytical Methods	An air-dried sample is reduced to < 2 mm size and mixed with a dispersing agent (sodium hexametaphosphate). The sample is washed through a 200 mesh (0.075 mm) sieve. The retained mass of sample is used to determine % sand fraction. If the percentage of sand is >50%, the soil is considered to be coarse textured soil. If the percentage of sand is <50%, the soil is considered to be fine textured.
Metals in Soil/Solid by CRC ICPMS	E440 Edmonton - Environmental	Soil/Solid	EPA 6020B (mod)	This method is intended to liberate metals that may be environmentally available. Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Silicate minerals are not solubilized. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. This method does not adequately recover elemental sulfur, and is unsuitable for assessment of elemental sulfur standards or guidelines. Analysis is by Collision/Reaction Cell ICPMS.
PAHs by Hex:Ace GC-MS (Low Level CCME)	E641A-L Edmonton - Environmental	Soil/Solid	EPA 8270E (mod)	Polycyclic Aromatic Hydrocarbons (PAHs) are extracted with hexane/acetone and analyzed by GC-MS. If reported, IACR (index of additive cancer risk, unitless) and B(a)P toxic potency equivalent (in soil concentration units) are calculated as per CCME PAH Soil Quality Guidelines fact sheet (2010) or ABT1.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Digestion for Metals and Mercury	EP440 Edmonton - Environmental	Soil/Solid	EPA 200.2 (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl. This method is intended to liberate metals that may be environmentally available.
PHCs and PAHs Hexane-Acetone Tumbler Extraction	EP601 Edmonton - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1 (mod)	Samples are subsampled and Petroleum Hydrocarbons (PHC) and PAHs are extracted with 1:1 hexane:acetone using a rotary extractor.
Dry and Grind	EPP442 Edmonton - Environmental	Soil/Solid	Soil Sampling and Methods of Analysis, Carter 2008	After removal of any coarse fragments and reservation of wet subsamples a portion of homogenized sample is set in a tray and dried at less than 60°C until dry. The sample is then particle size reduced with an automated crusher or mortar and pestle, typically to <2 mm. Further size reduction may be needed for particular tests.

QUALITY CONTROL REPORT

Work Order	: **EO2204388**	Page	: 1 of 14
Client	: Tetra Tech Canada Inc.	Laboratory	: Edmonton - Environmental
Contact	: Mark Fawcett	Account Manager	: Kieran Tordoff
Address	: North Building 14940 123 Ave NW Edmonton AB Canada T5V 1B4	Address	: 9450 - 17 Avenue NW Edmonton, Alberta Canada T6N 1M9
Telephone	: 780 451 2130	Telephone	: +1 780 413 5227
Project	: SWM.SWOP4348-01.003	Date Samples Received	: 12-Jun-2022 10:00
PO	: ----	Date Analysis Commenced	: 15-Jun-2022
C-O-C number	: ----	Issue Date	: 29-Jun-2022 16:41
Sampler	: ----		
Site	: NE-09-50-17-W4		
Quote number	: ----		
No. of samples received	: 56		
No. of samples analysed	: 40		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Dan Nguyen	Team Leader - Inorganics	Edmonton Inorganics, Edmonton, Alberta
Dan Nguyen	Team Leader - Inorganics	Edmonton Metals, Edmonton, Alberta
Geoff Berg	Lab Analyst	Edmonton Organics, Edmonton, Alberta
Uyen Munro	Lab Analyst	Edmonton Organics, Edmonton, Alberta
Yan Zhang	Lab Analyst	Edmonton Organics, Edmonton, Alberta

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include 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 predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 524162)											
EO2204388-001	22-6N 5-20	moisture	----	E144	0.25	%	24.6	24.4	0.768%	20%	----
Physical Tests (QC Lot: 524282)											
EO2204379-028	Anonymous	moisture	----	E144	0.25	%	16.6	19.7	16.9%	20%	----
Particle Size (QC Lot: 541230)											
EO2204505-001	Anonymous	sand (>0.075mm)	----	E178	1.0	%	78.2	80.0	2.17%	10%	----
Metals (QC Lot: 535088)											
EO2204388-001	22-6N 5-20	antimony	7440-36-0	E440	0.10	mg/kg	0.32	0.29	0.04	Diff <2x LOR	----
		arsenic	7440-38-2	E440	0.10	mg/kg	6.78	6.22	8.59%	30%	----
		barium	7440-39-3	E440	0.50	mg/kg	185	176	5.42%	40%	----
		beryllium	7440-41-7	E440	0.10	mg/kg	0.79	0.73	7.97%	30%	----
		cadmium	7440-43-9	E440	0.020	mg/kg	0.371	0.340	8.54%	30%	----
		chromium	7440-47-3	E440	0.50	mg/kg	28.6	29.9	4.40%	30%	----
		cobalt	7440-48-4	E440	0.10	mg/kg	9.17	8.50	7.58%	30%	----
		copper	7440-50-8	E440	0.50	mg/kg	20.2	18.6	8.72%	30%	----
		lead	7439-92-1	E440	0.50	mg/kg	13.4	12.1	10.4%	40%	----
		molybdenum	7439-98-7	E440	0.10	mg/kg	0.29	0.33	0.04	Diff <2x LOR	----
		nickel	7440-02-0	E440	0.50	mg/kg	25.1	23.9	4.86%	30%	----
		selenium	7782-49-2	E440	0.20	mg/kg	0.41	0.37	0.04	Diff <2x LOR	----
		silver	7440-22-4	E440	0.10	mg/kg	0.13	0.12	0.01	Diff <2x LOR	----
		thallium	7440-28-0	E440	0.050	mg/kg	0.256	0.232	0.024	Diff <2x LOR	----
		tin	7440-31-5	E440	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	----
		uranium	7440-61-1	E440	0.050	mg/kg	1.03	1.04	1.15%	30%	----
		vanadium	7440-62-2	E440	0.20	mg/kg	42.6	41.0	3.76%	30%	----
		zinc	7440-66-6	E440	2.0	mg/kg	80.2	74.9	6.79%	30%	----
Metals (QC Lot: 535099)											
EO2204377-001	Anonymous	antimony	7440-36-0	E440	0.10	mg/kg	0.17	0.17	0.0006	Diff <2x LOR	----
		arsenic	7440-38-2	E440	0.10	mg/kg	4.97	5.98	18.3%	30%	----
		barium	7440-39-3	E440	0.50	mg/kg	175	203	15.0%	40%	----
		beryllium	7440-41-7	E440	0.10	mg/kg	0.47	0.57	0.10	Diff <2x LOR	----
		cadmium	7440-43-9	E440	0.020	mg/kg	0.151	0.190	22.8%	30%	----
		chromium	7440-47-3	E440	0.50	mg/kg	16.0	19.1	18.0%	30%	----

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Metals (QC Lot: 535099) - continued											
EO2204377-001	Anonymous	cobalt	7440-48-4	E440	0.10	mg/kg	7.08	8.73	20.8%	30%	----
		copper	7440-50-8	E440	0.50	mg/kg	12.2	13.8	12.1%	30%	----
		lead	7439-92-1	E440	0.50	mg/kg	9.92	11.0	10.1%	40%	----
		molybdenum	7439-98-7	E440	0.10	mg/kg	0.63	0.74	17.1%	40%	----
		nickel	7440-02-0	E440	0.50	mg/kg	17.2	19.6	13.3%	30%	----
		selenium	7782-49-2	E440	0.20	mg/kg	0.38	0.41	0.03	Diff <2x LOR	----
		silver	7440-22-4	E440	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	----
		thallium	7440-28-0	E440	0.050	mg/kg	0.108	0.120	0.013	Diff <2x LOR	----
		tin	7440-31-5	E440	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	----
		uranium	7440-61-1	E440	0.050	mg/kg	1.47	1.62	10.3%	30%	----
		vanadium	7440-62-2	E440	0.20	mg/kg	24.5	28.8	15.9%	30%	----
		zinc	7440-66-6	E440	2.0	mg/kg	65.0	72.8	11.3%	30%	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 524162)						
moisture	----	E144	0.25	%	<0.25	----
Physical Tests (QCLot: 524282)						
moisture	----	E144	0.25	%	<0.25	----
Metals (QCLot: 535088)						
antimony	7440-36-0	E440	0.1	mg/kg	<0.10	----
arsenic	7440-38-2	E440	0.1	mg/kg	<0.10	----
barium	7440-39-3	E440	0.5	mg/kg	<0.50	----
beryllium	7440-41-7	E440	0.1	mg/kg	<0.10	----
cadmium	7440-43-9	E440	0.02	mg/kg	<0.020	----
chromium	7440-47-3	E440	0.5	mg/kg	<0.50	----
cobalt	7440-48-4	E440	0.1	mg/kg	<0.10	----
copper	7440-50-8	E440	0.5	mg/kg	<0.50	----
lead	7439-92-1	E440	0.5	mg/kg	<0.50	----
molybdenum	7439-98-7	E440	0.1	mg/kg	<0.10	----
nickel	7440-02-0	E440	0.5	mg/kg	<0.50	----
selenium	7782-49-2	E440	0.2	mg/kg	<0.20	----
silver	7440-22-4	E440	0.1	mg/kg	<0.10	----
thallium	7440-28-0	E440	0.05	mg/kg	<0.050	----
tin	7440-31-5	E440	2	mg/kg	<2.0	----
uranium	7440-61-1	E440	0.05	mg/kg	<0.050	----
vanadium	7440-62-2	E440	0.2	mg/kg	<0.20	----
zinc	7440-66-6	E440	2	mg/kg	<2.0	----
Metals (QCLot: 535099)						
antimony	7440-36-0	E440	0.1	mg/kg	<0.10	----
arsenic	7440-38-2	E440	0.1	mg/kg	<0.10	----
barium	7440-39-3	E440	0.5	mg/kg	<0.50	----
beryllium	7440-41-7	E440	0.1	mg/kg	<0.10	----
cadmium	7440-43-9	E440	0.02	mg/kg	<0.020	----
chromium	7440-47-3	E440	0.5	mg/kg	<0.50	----
cobalt	7440-48-4	E440	0.1	mg/kg	<0.10	----
copper	7440-50-8	E440	0.5	mg/kg	<0.50	----
lead	7439-92-1	E440	0.5	mg/kg	<0.50	----
molybdenum	7439-98-7	E440	0.1	mg/kg	<0.10	----

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 535099) - continued						
nickel	7440-02-0	E440	0.5	mg/kg	<0.50	----
selenium	7782-49-2	E440	0.2	mg/kg	<0.20	----
silver	7440-22-4	E440	0.1	mg/kg	<0.10	----
thallium	7440-28-0	E440	0.05	mg/kg	<0.050	----
tin	7440-31-5	E440	2	mg/kg	<2.0	----
uranium	7440-61-1	E440	0.05	mg/kg	<0.050	----
vanadium	7440-62-2	E440	0.2	mg/kg	<0.20	----
zinc	7440-66-6	E440	2	mg/kg	<2.0	----
Polycyclic Aromatic Hydrocarbons (QCLot: 524284)						
acenaphthene	83-32-9	E641A-L	0.005	mg/kg	<0.0050	----
acenaphthylene	208-96-8	E641A-L	0.005	mg/kg	<0.0050	----
anthracene	120-12-7	E641A-L	0.004	mg/kg	<0.0040	----
benz(a)anthracene	56-55-3	E641A-L	0.01	mg/kg	<0.010	----
benzo(a)pyrene	50-32-8	E641A-L	0.01	mg/kg	<0.010	----
benzo(b+j)fluoranthene	n/a	E641A-L	0.01	mg/kg	<0.010	----
benzo(g,h,i)perylene	191-24-2	E641A-L	0.01	mg/kg	<0.010	----
benzo(k)fluoranthene	207-08-9	E641A-L	0.01	mg/kg	<0.010	----
chrysene	218-01-9	E641A-L	0.01	mg/kg	<0.010	----
dibenz(a,h)anthracene	53-70-3	E641A-L	0.005	mg/kg	<0.0050	----
fluoranthene	206-44-0	E641A-L	0.01	mg/kg	<0.010	----
fluorene	86-73-7	E641A-L	0.01	mg/kg	<0.010	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.01	mg/kg	<0.010	----
naphthalene	91-20-3	E641A-L	0.01	mg/kg	<0.010	----
phenanthrene	85-01-8	E641A-L	0.01	mg/kg	<0.010	----
pyrene	129-00-0	E641A-L	0.01	mg/kg	<0.010	----
Polycyclic Aromatic Hydrocarbons (QCLot: 524966)						
acenaphthene	83-32-9	E641A-L	0.005	mg/kg	<0.0050	----
acenaphthylene	208-96-8	E641A-L	0.005	mg/kg	<0.0050	----
anthracene	120-12-7	E641A-L	0.004	mg/kg	<0.0040	----
benz(a)anthracene	56-55-3	E641A-L	0.01	mg/kg	<0.010	----
benzo(a)pyrene	50-32-8	E641A-L	0.01	mg/kg	<0.010	----
benzo(b+j)fluoranthene	n/a	E641A-L	0.01	mg/kg	<0.010	----
benzo(g,h,i)perylene	191-24-2	E641A-L	0.01	mg/kg	<0.010	----
benzo(k)fluoranthene	207-08-9	E641A-L	0.01	mg/kg	<0.010	----
chrysene	218-01-9	E641A-L	0.01	mg/kg	<0.010	----
dibenz(a,h)anthracene	53-70-3	E641A-L	0.005	mg/kg	<0.0050	----

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Polycyclic Aromatic Hydrocarbons (QCLot: 524966) - continued						
fluoranthene	206-44-0	E641A-L	0.01	mg/kg	<0.010	----
fluorene	86-73-7	E641A-L	0.01	mg/kg	<0.010	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.01	mg/kg	<0.010	----
naphthalene	91-20-3	E641A-L	0.01	mg/kg	<0.010	----
phenanthrene	85-01-8	E641A-L	0.01	mg/kg	<0.010	----
pyrene	129-00-0	E641A-L	0.01	mg/kg	<0.010	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 524162)									
moisture	----	E144	0.25	%	50 %	99.6	90.0	110	----
Physical Tests (QCLot: 524282)									
moisture	----	E144	0.25	%	50 %	98.7	90.0	110	----
Metals (QCLot: 535088)									
antimony	7440-36-0	E440	0.1	mg/kg	100 mg/kg	102	80.0	120	----
arsenic	7440-38-2	E440	0.1	mg/kg	100 mg/kg	107	80.0	120	----
barium	7440-39-3	E440	0.5	mg/kg	25 mg/kg	108	80.0	120	----
beryllium	7440-41-7	E440	0.1	mg/kg	10 mg/kg	105	80.0	120	----
cadmium	7440-43-9	E440	0.02	mg/kg	10 mg/kg	95.8	80.0	120	----
chromium	7440-47-3	E440	0.5	mg/kg	25 mg/kg	105	80.0	120	----
cobalt	7440-48-4	E440	0.1	mg/kg	25 mg/kg	103	80.0	120	----
copper	7440-50-8	E440	0.5	mg/kg	25 mg/kg	106	80.0	120	----
lead	7439-92-1	E440	0.5	mg/kg	50 mg/kg	102	80.0	120	----
molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	102	80.0	120	----
nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	102	80.0	120	----
selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	104	80.0	120	----
silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	92.1	80.0	120	----
thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	99.8	80.0	120	----
tin	7440-31-5	E440	2	mg/kg	50 mg/kg	95.7	80.0	120	----
uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	105	80.0	120	----
vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	104	80.0	120	----
zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	106	80.0	120	----
Metals (QCLot: 535099)									
antimony	7440-36-0	E440	0.1	mg/kg	100 mg/kg	93.5	80.0	120	----
arsenic	7440-38-2	E440	0.1	mg/kg	100 mg/kg	104	80.0	120	----
barium	7440-39-3	E440	0.5	mg/kg	25 mg/kg	108	80.0	120	----
beryllium	7440-41-7	E440	0.1	mg/kg	10 mg/kg	104	80.0	120	----
cadmium	7440-43-9	E440	0.02	mg/kg	10 mg/kg	102	80.0	120	----
chromium	7440-47-3	E440	0.5	mg/kg	25 mg/kg	104	80.0	120	----
cobalt	7440-48-4	E440	0.1	mg/kg	25 mg/kg	100	80.0	120	----
copper	7440-50-8	E440	0.5	mg/kg	25 mg/kg	102	80.0	120	----
lead	7439-92-1	E440	0.5	mg/kg	50 mg/kg	102	80.0	120	----
molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	96.8	80.0	120	----

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Metals (QCLot: 535099) - continued									
nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	103	80.0	120	----
selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	103	80.0	120	----
silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	89.2	80.0	120	----
thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	96.5	80.0	120	----
tin	7440-31-5	E440	2	mg/kg	50 mg/kg	90.6	80.0	120	----
uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	108	80.0	120	----
vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	102	80.0	120	----
zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	102	80.0	120	----
Polycyclic Aromatic Hydrocarbons (QCLot: 524284)									
acenaphthene	83-32-9	E641A-L	0.005	mg/kg	0.5 mg/kg	88.8	60.0	130	----
acenaphthylene	208-96-8	E641A-L	0.005	mg/kg	0.5 mg/kg	85.0	60.0	130	----
anthracene	120-12-7	E641A-L	0.004	mg/kg	0.5 mg/kg	74.1	60.0	130	----
benz(a)anthracene	56-55-3	E641A-L	0.01	mg/kg	0.5 mg/kg	117	60.0	130	----
benzo(a)pyrene	50-32-8	E641A-L	0.01	mg/kg	0.5 mg/kg	75.4	60.0	130	----
benzo(b+j)fluoranthene	n/a	E641A-L	0.01	mg/kg	0.5 mg/kg	106	60.0	130	----
benzo(g,h,i)perylene	191-24-2	E641A-L	0.01	mg/kg	0.5 mg/kg	100	60.0	130	----
benzo(k)fluoranthene	207-08-9	E641A-L	0.01	mg/kg	0.5 mg/kg	74.2	60.0	130	----
chrysene	218-01-9	E641A-L	0.01	mg/kg	0.5 mg/kg	108	60.0	130	----
dibenz(a,h)anthracene	53-70-3	E641A-L	0.005	mg/kg	0.5 mg/kg	81.6	60.0	130	----
fluoranthene	206-44-0	E641A-L	0.01	mg/kg	0.5 mg/kg	91.8	60.0	130	----
fluorene	86-73-7	E641A-L	0.01	mg/kg	0.5 mg/kg	89.1	60.0	130	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.01	mg/kg	0.5 mg/kg	116	60.0	130	----
naphthalene	91-20-3	E641A-L	0.01	mg/kg	0.5 mg/kg	85.1	60.0	130	----
phenanthrene	85-01-8	E641A-L	0.01	mg/kg	0.5 mg/kg	88.8	60.0	130	----
pyrene	129-00-0	E641A-L	0.01	mg/kg	0.5 mg/kg	90.3	60.0	130	----
Polycyclic Aromatic Hydrocarbons (QCLot: 524966)									
acenaphthene	83-32-9	E641A-L	0.005	mg/kg	0.5 mg/kg	92.5	60.0	130	----
acenaphthylene	208-96-8	E641A-L	0.005	mg/kg	0.5 mg/kg	90.2	60.0	130	----
anthracene	120-12-7	E641A-L	0.004	mg/kg	0.5 mg/kg	76.7	60.0	130	----
benz(a)anthracene	56-55-3	E641A-L	0.01	mg/kg	0.5 mg/kg	110	60.0	130	----
benzo(a)pyrene	50-32-8	E641A-L	0.01	mg/kg	0.5 mg/kg	74.3	60.0	130	----
benzo(b+j)fluoranthene	n/a	E641A-L	0.01	mg/kg	0.5 mg/kg	96.0	60.0	130	----
benzo(g,h,i)perylene	191-24-2	E641A-L	0.01	mg/kg	0.5 mg/kg	94.6	60.0	130	----
benzo(k)fluoranthene	207-08-9	E641A-L	0.01	mg/kg	0.5 mg/kg	76.9	60.0	130	----
chrysene	218-01-9	E641A-L	0.01	mg/kg	0.5 mg/kg	108	60.0	130	----
dibenz(a,h)anthracene	53-70-3	E641A-L	0.005	mg/kg	0.5 mg/kg	78.1	60.0	130	----

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Polycyclic Aromatic Hydrocarbons (QCLot: 524966) - continued									
fluoranthene	206-44-0	E641A-L	0.01	mg/kg	0.5 mg/kg	94.4	60.0	130	----
fluorene	86-73-7	E641A-L	0.01	mg/kg	0.5 mg/kg	92.6	60.0	130	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.01	mg/kg	0.5 mg/kg	104	60.0	130	----
naphthalene	91-20-3	E641A-L	0.01	mg/kg	0.5 mg/kg	87.2	60.0	130	----
phenanthrene	85-01-8	E641A-L	0.01	mg/kg	0.5 mg/kg	91.4	60.0	130	----
pyrene	129-00-0	E641A-L	0.01	mg/kg	0.5 mg/kg	92.1	60.0	130	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Soil/Solid**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Polycyclic Aromatic Hydrocarbons (QCLot: 524284)										
EO2204388-001	22-6N 5-20	acenaphthene	83-32-9	E641A-L	0.397 mg/kg	0.5 mg/kg	99.8	50.0	140	----
		acenaphthylene	208-96-8	E641A-L	0.370 mg/kg	0.5 mg/kg	93.1	50.0	140	----
		anthracene	120-12-7	E641A-L	0.321 mg/kg	0.5 mg/kg	80.8	50.0	140	----
		benz(a)anthracene	56-55-3	E641A-L	0.465 mg/kg	0.5 mg/kg	117	50.0	140	----
		benzo(a)pyrene	50-32-8	E641A-L	0.313 mg/kg	0.5 mg/kg	78.8	50.0	140	----
		benzo(b+j)fluoranthene	n/a	E641A-L	0.412 mg/kg	0.5 mg/kg	104	50.0	140	----
		benzo(g,h,i)perylene	191-24-2	E641A-L	0.457 mg/kg	0.5 mg/kg	115	50.0	140	----
		benzo(k)fluoranthene	207-08-9	E641A-L	0.310 mg/kg	0.5 mg/kg	78.0	50.0	140	----
		chrysene	218-01-9	E641A-L	0.436 mg/kg	0.5 mg/kg	110	50.0	140	----
		dibenz(a,h)anthracene	53-70-3	E641A-L	0.396 mg/kg	0.5 mg/kg	99.6	50.0	140	----
		fluoranthene	206-44-0	E641A-L	0.393 mg/kg	0.5 mg/kg	98.8	50.0	140	----
		fluorene	86-73-7	E641A-L	0.388 mg/kg	0.5 mg/kg	97.6	50.0	140	----
		indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.507 mg/kg	0.5 mg/kg	128	50.0	140	----
		naphthalene	91-20-3	E641A-L	0.394 mg/kg	0.5 mg/kg	99.1	50.0	140	----
		phenanthrene	85-01-8	E641A-L	0.379 mg/kg	0.5 mg/kg	95.2	50.0	140	----
		pyrene	129-00-0	E641A-L	0.383 mg/kg	0.5 mg/kg	96.4	50.0	140	----
Polycyclic Aromatic Hydrocarbons (QCLot: 524966)										
EO2204388-036	22AR-CS5 5-20	acenaphthene	83-32-9	E641A-L	0.411 mg/kg	0.5 mg/kg	97.0	50.0	140	----
		acenaphthylene	208-96-8	E641A-L	0.386 mg/kg	0.5 mg/kg	91.1	50.0	140	----
		anthracene	120-12-7	E641A-L	0.326 mg/kg	0.5 mg/kg	76.9	50.0	140	----
		benz(a)anthracene	56-55-3	E641A-L	0.453 mg/kg	0.5 mg/kg	107	50.0	140	----
		benzo(a)pyrene	50-32-8	E641A-L	0.303 mg/kg	0.5 mg/kg	71.5	50.0	140	----
		benzo(b+j)fluoranthene	n/a	E641A-L	0.418 mg/kg	0.5 mg/kg	98.7	50.0	140	----
		benzo(g,h,i)perylene	191-24-2	E641A-L	0.455 mg/kg	0.5 mg/kg	107	50.0	140	----
		benzo(k)fluoranthene	207-08-9	E641A-L	0.298 mg/kg	0.5 mg/kg	70.3	50.0	140	----
		chrysene	218-01-9	E641A-L	0.425 mg/kg	0.5 mg/kg	100	50.0	140	----
		dibenz(a,h)anthracene	53-70-3	E641A-L	0.396 mg/kg	0.5 mg/kg	93.6	50.0	140	----
		fluoranthene	206-44-0	E641A-L	0.400 mg/kg	0.5 mg/kg	94.4	50.0	140	----
		fluorene	86-73-7	E641A-L	0.398 mg/kg	0.5 mg/kg	94.0	50.0	140	----
		indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.508 mg/kg	0.5 mg/kg	120	50.0	140	----
		naphthalene	91-20-3	E641A-L	0.416 mg/kg	0.5 mg/kg	98.1	50.0	140	----
		phenanthrene	85-01-8	E641A-L	0.381 mg/kg	0.5 mg/kg	90.0	50.0	140	----

Sub-Matrix: **Soil/Solid**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Polycyclic Aromatic Hydrocarbons (QCLot: 524966) - continued										
EO2204388-036	22AR-CS5 5-20	pyrene	129-00-0	E641A-L	0.392 mg/kg	0.5 mg/kg	92.4	50.0	140	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Particle Size (QCLot: 541230)									
	RM	sand (>0.075mm)	----	E178	36.4 %	101	91.0	109	----
Metals (QCLot: 535088)									
	RM	antimony	7440-36-0	E440	3.99 mg/kg	90.4	70.0	130	----
	RM	arsenic	7440-38-2	E440	3.73 mg/kg	110	70.0	130	----
	RM	barium	7440-39-3	E440	105 mg/kg	105	70.0	130	----
	RM	beryllium	7440-41-7	E440	0.349 mg/kg	104	70.0	130	----
	RM	cadmium	7440-43-9	E440	0.91 mg/kg	100	70.0	130	----
	RM	chromium	7440-47-3	E440	101 mg/kg	96.6	70.0	130	----
	RM	cobalt	7440-48-4	E440	6.9 mg/kg	103	70.0	130	----
	RM	copper	7440-50-8	E440	123 mg/kg	105	70.0	130	----
	RM	lead	7439-92-1	E440	267 mg/kg	100	70.0	130	----
	RM	molybdenum	7439-98-7	E440	1.03 mg/kg	104	70.0	130	----
	RM	nickel	7440-02-0	E440	26.7 mg/kg	103	70.0	130	----
	RM	silver	7440-22-4	E440	4.06 mg/kg	87.3	50.0	150	----
	RM	thallium	7440-28-0	E440	0.0786 mg/kg	114	40.0	160	----
	RM	tin	7440-31-5	E440	10.6 mg/kg	96.7	70.0	130	----
	RM	uranium	7440-61-1	E440	0.52 mg/kg	97.4	70.0	130	----
	RM	vanadium	7440-62-2	E440	32.7 mg/kg	97.5	70.0	130	----
	RM	zinc	7440-66-6	E440	297 mg/kg	102	70.0	130	----
Metals (QCLot: 535099)									
	RM	antimony	7440-36-0	E440	3.99 mg/kg	93.6	70.0	130	----
	RM	arsenic	7440-38-2	E440	3.73 mg/kg	107	70.0	130	----
	RM	barium	7440-39-3	E440	105 mg/kg	110	70.0	130	----
	RM	beryllium	7440-41-7	E440	0.349 mg/kg	112	70.0	130	----
	RM	cadmium	7440-43-9	E440	0.91 mg/kg	113	70.0	130	----
	RM	chromium	7440-47-3	E440	101 mg/kg	99.8	70.0	130	----
	RM	cobalt	7440-48-4	E440	6.9 mg/kg	104	70.0	130	----
	RM	copper	7440-50-8	E440	123 mg/kg	108	70.0	130	----
	RM	lead	7439-92-1	E440	267 mg/kg	97.8	70.0	130	----

Sub-Matrix:

Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Reference Material (RM) Report: RM Target Concentration	Recovery (%): RM	Recovery Limits (%): Low	Recovery Limits (%): High	Qualifier
Metals (QCLot: 535099) - continued									
	RM	molybdenum	7439-98-7	E440	1.03 mg/kg	108	70.0	130	----
	RM	nickel	7440-02-0	E440	26.7 mg/kg	105	70.0	130	----
	RM	silver	7440-22-4	E440	4.06 mg/kg	86.3	50.0	150	----
	RM	thallium	7440-28-0	E440	0.0786 mg/kg	109	40.0	160	----
	RM	tin	7440-31-5	E440	10.6 mg/kg	94.5	70.0	130	----
	RM	uranium	7440-61-1	E440	0.52 mg/kg	98.8	70.0	130	----
	RM	vanadium	7440-62-2	E440	32.7 mg/kg	101	70.0	130	----
	RM	zinc	7440-66-6	E440	297 mg/kg	103	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number:

Page 1 of 5

Report To	Contact and company name below will appear on the final report
Company:	Tetra Tech Canada Inc.
Contact:	Mark Fawcett
Phone:	780-818-6352
	Company address below will appear on the final report
Street:	14940 - 123 Avenue
City/Province:	Edmonton, AB
Postal Code:	T5V 1B4
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mark.fawcett@tetratech.com
Email 2:
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mark.fawcett@tetratech.com
Email 2:

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☒ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E1 - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: June 17, 2022

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	Tetra Tech 2022 price sheet	AFE/Cost Center:	PO#
Job #:	SWM.SWOP04348-01 . 003	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:	NE-09-50-17-W4	Location:	
ALS Lab Work Order # (lab use only):	EO2204388	ALS Contact:	Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	S641.A - PAH : ABT1	E440 - Metals	E178 - Particle Size: 75 um	E180 - Particle size % sand, silt, clay	AB03 - Detailed Salinity : ABT1	SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
1	22-6N 5-20	9-Jun-22		Soil	X	X						3
2	22-6N 30-50	9-Jun-22		Soil		X						3
3	22-6N.N6 5-20	9-Jun-22		Soil	X	X	X					3
4	22AR-CS13 5-20	9-Jun-22		Soil	X	X						3
5	22AR-CS13 30-50	9-Jun-22		Soil						X		3
6	22AR-CS13.N6 5-20	9-Jun-22		Soil	X	X						3
7	22AR-CS14 5-20	9-Jun-22		Soil	X	X						3
8	22AR-CS14 30-50	9-Jun-22		Soil						X		3
9	22AR-CS14.N10 5-20	9-Jun-22		Soil	X	X						3
10	22AR-CS15 5-20	9-Jun-22		Soil	X	X						3
11	22AR-CS15 30-50	9-Jun-22		Soil						X		3
12	22AR-CS15.N9 5-20	9-Jun-22		Soil	X	X						3

Environmental Division
Edmonton
Work Order Reference
EO2204388

Telephone : +1 780 413 5227

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human consumption/ use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Frozen
Ice Packs ☐
Cooling Initiated
INITIAL: 6.7

(lab use only) ☐ No ☐ No

COOLER TEMPERATURES °C

SHIPMENT RELEASE (client use)

Released by: Mark Fawcett Date: June 11/22 Time:

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: Date: 12-JUN-22 Time: 10:00

Rece... Date: Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

BERT 2017 FRONT

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 back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number:

Report To	Contact and company name below will appear on the final report
Company:	Tetra Tech Canada Inc.
Contact:	Mark Fawcett
Phone:	780-818-6352
	Company address below will appear on the final report
Street:	14940 - 123 Avenue
City/Province:	Edmonton, AB
Postal Code:	T5V 1B4
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mark.fawcett@tetratech.com
Email 2:
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mark.fawcett@tetratech.com
Email 2:

Oil and Gas Required Fields (client use)

AFE/Cost Center: | PO#:
Major/Minor Code: | Routing Code:
Requisitioner:
Location:

Project Information

ALS Account # / Quote #: Tetra Tech 2022 price sheet
Job #: SWM.SWOP04348-01 . 003
PO / AFE:
LSD: NE-09-50-17-W4

ALS Lab Work Order # (lab use only):

ALS Contact: | **Sampler:**

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☒ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E1 - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200%] (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: June 17, 2022

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	S641.A - PAH : ABT1	E440 - Metals	E178 - Particle Size: 75 um	E180 - Particle size % sand, silt, clay	AB03 - Detailed Salinity : ABT1	SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
13	22AR-CS16 5-20	9-Jun-22		Soil	X							3
14	22AR-CS16 30-50	9-Jun-22		Soil						X		3
15	22AR-CS16.N6 5-20	9-Jun-22		Soil	X	X						3
16	22-8 5-20	9-Jun-22		Soil	X	X	X					3
17	22-8 30-50	9-Jun-22		Soil						X		3
18	22-8.N9 5-20	9-Jun-22		Soil	X	X						3
19	22-8.N9 30-50	9-Jun-22		Soil						X		3
20	22AR-CS18 5-20	9-Jun-22		Soil		X						3
21	22AR-CS18 30-50	9-Jun-22		Soil						X		3
22	22AR-CS18.N8 5-20	9-Jun-22		Soil	X	X						3
23	22AR-CS18.N8 30-50	9-Jun-22		Soil						X		1

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human consumption/ use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ | SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ | Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			

SHIPMENT RELEASE (client use)

Released by: Mark Fawcett | Date: June 11/22 | Time:

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: | Date: | Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by: | Date: | Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

ALS 2017 FRONT

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 back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number:

Report To	Contact and company name below will appear on the final report
Company:	Tetra Tech Canada Inc.
Contact:	Mark Fawcett
Phone:	780-818-6352
	Company address below will appear on the final report
Street:	14940 - 123 Avenue
City/Province:	Edmonton, AB
Postal Code:	T5V 1B4
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mark.fawcett@tetratech.com
Email 2:
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mark.fawcett@tetratech.com
Email 2:

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☒ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E1 - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: June 17, 2022

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #: Tetra Tech 2022 price sheet
Job #: SWM.SWOP04348-01 . 003
PO / AFE:
LSD: NE-09-50-17-W4

Oil and Gas Required Fields (client use)

AFE/Cost Center: | PO#:
Major/Minor Code: | Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only): | ALS Contact: | Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	S641.A - PAH : ABT1	E440 - Metals	E178 - Particle Size: 75 um	E180 - Particle size % sand, silt, clay	AB03 - Detailed Salinity : ABT1	SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
24	22AR-CS1 5-20	9-Jun-22		Soil	X	X						3
25	22AR-CS1.N7 50-20	9-Jun-22		Soil	X	X						3
26	22AR-CS2 5-20	9-Jun-22		Soil		X						3
27	22AR-CS2.N7 5-20	10-Jun-22		Soil	X	X						3
28	22AR-CS2.N7 30-50	10-Jun-22		Soil						X		3
29	22AR-CS3 5-20	9-Jun-22		Soil	X	X						3
30	22AR-CS3.N7 5-20	10-Jun-22		Soil	X	X						3
31	22AR-CS3.N7 30-50	10-Jun-22		Soil						X		3
32	22AR-CS4 5-20	10-Jun-22		Soil	X	X						3
33	22AR-CS4 30-50	10-Jun-22		Soil						X		3
34	22AR-CS4.N6 5-20	10-Jun-22		Soil	X	X						3
35	22AR-CS4.N6 30-50	10-Jun-22		Soil						X		3

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☐ NO
Are samples for human consumption/ use?
☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ | SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ | Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
6.7							

SHIPMENT RELEASE (client use)

Released by: Mark Fawcett | Date: June 11/22 | Time:

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: | Date: 12-JUN-22 | Time: 10:00

FINAL SHIPMENT RECEPTION (lab use only)

Received by: | Date: | Time:

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1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number:

Page 4 of 5

Report To	Contact and company name below will appear on the final report
Company:	Tetra Tech Canada Inc.
Contact:	Mark Fawcett
Phone:	780-818-6352
	Company address below will appear on the final report
Street:	14940 - 123 Avenue
City/Province:	Edmonton, AB
Postal Code:	T5V 1B4
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
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Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mark.fawcett@tetratech.com
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Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☒ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E1 - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: June 17, 2022

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #:	Tetra Tech 2022 price sheet
Job #:	SWM.SWOP04348-01 . 003
PO / AFE:	
LSD:	NE-09-50-17-W4

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only):

ALS Contact:

Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	S641.A - PAH : ABT1	E440 - Metals	E178 - Particle Size: 75 um	E180 - Particle size % sand, silt, clay	AB03 - Detailed Salinity : ABT1	SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
36	22AR-CS5 5-20	10-Jun-22		Soil	X							3
37	22AR-CS5 30-50	10-Jun-22		Soil						X		3
38	22AR-CS5.N9 5-20	10-Jun-22		Soil	X	X						3
39	22AR-CS5.N9 30-50	10-Jun-22		Soil						X		3
40	22AR-CS6 5-20	9-Jun-22		Soil	X							3
41	22AR-CS6.N7 5-20	10-Jun-22		Soil	X	X						3
42	22AR-CS7 5-20	9-Jun-22		Soil	X							3
43	22AR-CS7.N7 5-20	10-Jun-22		Soil						X		3
44	22AR-CS7.N7 30-50	10-Jun-22		Soil	X	X						3
45	22AR-CS8 5-20	9-Jun-22		Soil	X							3
46	22AR-CS8.N7 5-20	10-Jun-22		Soil	X	X						3

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☐ NO

Are samples for human consumption/ use?
☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ | SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ | Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			

SHIPMENT RELEASE (client use)

Released by: Mark Fawcett | Date: June 11/22 | Time:

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: | Date: | Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by: | Date: | Time:

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Canada Toll Free: 1 800 668 9878

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Page 5 of 5

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Contact:	Mark Fawcett
Phone:	780-818-6352
	Company address below will appear on the final report
Street:	14940 - 123 Avenue
City/Province:	Edmonton, AB
Postal Code:	T5V 1B4
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mark.fawcett@tetratech.com
Email 2:
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
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EMERGENCY: 1 Business day [E1 - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: June 17, 2022

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

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Job #: SWM.SWOP04348-01 . 003
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LSD: NE-09-50-17-W4

Oil and Gas Required Fields (client use)

AFE/Cost Center: | PO#:
Major/Minor Code: | Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only): | ALS Contact: | Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

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47	22AR-CS9 5-20	9-Jun-22		Soil		X						3
48	22AR-CS9.N7 5-20	10-Jun-22		Soil	X							3
49	22AR-CS9.N7 30-50	10-Jun-22		Soil		X						3
52	22AR-CS10 5-20	9-Jun-22		Soil		X						3
51	22AR-CS10.N7 5-20	10-Jun-22		Soil	X		X					3
57	22AR-CS10.N7 30-50	10-Jun-22		Soil		X						1
53	22AR-CS11 5-20	9-Jun-22		Soil		X						1
54	22AR-CS11.N7 5-15	10-Jun-22		Soil	X							3
55	22AR-CS11.N7 20-35	10-Jun-22		Soil						X		1
50	22AR-CS11.N7 35-50	10-Jun-22		Soil		X						1

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO
Are samples for human consumption/ use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ | SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ | Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			

SHIPMENT RELEASE (client use)

Released by: Mark Fawcett | Date: June 11/22 | Time:

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Received by: | Date: | Time:

FINAL SHIPMENT RECEPTION (lab use only)

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APPENDIX D

RECORD OF SITE CONDITION FORM

Record of Site Condition

1 REPORT AND FORM INFORMATION

Title of report	Soil Management Program, 2022 Soil Remediation Report		
Report date (*dd-mon-yyyy*)	March 2023	Record of Site Condition (RSC) ID No.[Ψ]	

2 SITE IDENTIFICATION AND PHYSICAL LOCATION

2.1 Site name	Clean Harbors Ryley Industrial Waste Management Facility		
2.2 Address of site	Box 390		
	Municipality	Ryley	**Alberta**

2.3 Legal land description of site *(if multiple, list all.)*

Plan, Block, Lot (PBL)			Alberta Township System (ATS)					
Plan	Block	Lot	LSD	Quarter	Section	Township	Range	Meridian
				SE	09	050	17	4
				NE	09	050	17	4

3 STAKEHOLDERS

3.1 Operator

Company	Clean Harbors Canada, Inc.	Contact person	Stan Yuha
Mailing address	P.O. Box 390 Ryley, AB T0B 4A0	Position held	Facility Manager
		Business phone No.	780-663-2509
		Business fax No.	780-663-3539
		Business e-mail	yuha.stan@cleanharbors.com

3.2 Consultant ☐ Not applicable

Company	Tetra Tech Canada Inc.	Contact person	Mark Fawcett
Mailing address	**14940 - 123 Avenue** **Edmonton, AB T5V 1B4**	Position held	Senior Soil Scientist
		Business phone No.	780-818-6352
		Business fax No.	780-454-5688
		Business e-mail	mark.fawcett@tetratech.com

3.3 Landowner(s)

Land type	☒ Private ☐ Special Areas ☐ Parks and protected area ☐ Public (*if not private, provide Disposition No.: _____)*
Landowner(s)	☒ Same as operator ☐ Other

[Ψ]: Do not fill in. Reserved for internal administrative purposes only.

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

4 OPERATING STATUS

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

5 TYPE OF ACTIVITY AND SITE

5.1 Petroleum Storage Tank Site ☒ Yes

5.1.1 ESRD file No.(s)		PTMAA site No.	6021

5.1.2 Types of activity

☐	Retail gas station	☐	Aviation fuelling station	☒	Bulk fuel	☐	Other *(specify)*: _____

5.2 Upstream Oil and Gas Facility ☐ Yes

5.2.1 ESRD file No.(s)		AER approval No.(s)	

5.2.2 AER authorization type ☐ Approval ☐ License ☐ Permit ☐ Order ☐ Other (*specify*)_____

5.2.3 Types of activity

☐	Wellsite and associated facility	☐	Satellite	☐	Battery	☐	Pipeline
☐	Compressor and pumping station	☐	Other (*specify*): _____				

5.3 Approved Facility Under Environmental Protection and Enhancement Act (EPEA) ☒ Yes

5.3.1 ESRD approval No.(s)	10348-03-00	AER approval No.(s)	

5.3.2 Types of approved activity

☐	Chemical manufacturing plant	☐	Enhanced recovery in-situ oil sands or heavy oil processing plant	☐	Fertilizer manufacturing plant	☒	Landfill
☐	Metal manufacturing plant	☐	Oil refinery	☐	Oilsands processing plant	☐	Oil production site
☐	Pesticide manufacturing plant	☐	Petrochemical manufacturing plant	☐	Pipeline	☐	Power plant
☐	Pulp and paper processing plant	☐	Sour gas processing plant	☐	Sulphur manufacturing or processing plant	☒	Waste management facility
☐	Wood treatment plant	☐	Other *(specify)*: _____				

5.4 Facility Under EPEA Code of Practice	☒ Yes		
5.4.1 ESRD registration No.(s)	10348-03-00	**AER registration No.(s)**	

5.4.2 Type of Code of Practice

☐	Asphalt paving plant	☐	Compressor and pumping station	☐	Concrete producing plant	☒	Landfill
☐	Pesticides	☐	Pipeline	☐	Land treatment of soils containing hydrocarbons	☐	Sand and gravel pit
☐	Small incinerator	☐	Sweet gas processing plant	☐	Other *(specify)*: _____		

5.5 Other Activity ☐ Yes

5.5.1 ESRD file No.(s)		Other site ID No.(s)		Authorized by	

5.5.2 Types of activity

☐	Dry cleaning operation	☐	Highway maintenance yard	☐	Transportation
☐	Other *(specify)*: _____				

6 SITE CHARACTERIZATION

6.1 What Environmental Site Assessments (ESA) Have Been Conducted and Completed to Date?

☐ Phase I ESA
☒ Phase II ESA (*check all that apply.*)
☒ Initial intrusive sampling ☒ delineation completed ☐ post-remediation monitoring ☒ final confirmatory sampling

6.2 Contaminants of Potential Concern (COPC)

6.2.1 Does the site have any of the conditions that require the mandatory use of *Alberta Tier 2 Soil and Groundwater Remediation Guidelines* (ESRD, 2007 and updates)? *(check all that apply in Section 6.2.1.1.)*

☐ Yes ☒ No *(➔proceed to Section 6.2.2.)*

6.2.1.1 Identify any conditions that require the approaches of the Alberta Tier 2 guidelines. *(see Alberta Tier I Soil and Groundwater Remediation Guidelines (ESRD, 2007 and updates), for details.)*

☐	Contamination within 30 cm of building foundation	☐	Unusual building feature (*eg. earthen floor*)	☐	Contamination within 10 m distance of surface water body
☐	Fractured bedrock	☐	Potentially high hydraulic conductivity *(> 10^{-5} m/sec.)*	☐	Other (*see Alberta Tier 1 guidelines and specify):* _____

6.2.1.2 Did the Alberta Tier 2 approach lead to a soil or groundwater guideline that was lower than the corresponding Tier 1 guideline for the same contaminant(s)?

☐ Yes ☐ TBD ☐ No *(➔proceed to Section 6.2.2.)*

6.2.1.3 If you answered 'yes' or 'TBD' to Section 6.2.1.2, identify the group of contaminants for each COPC with a mandatory Tier 2 guideline that is lower than the corresponding Tier 1 guideline (*check all that apply*, *see Alberta Tier 1 guidelines, Tables 1-4 for detailed listing).*

☐	General and inorganic parameters	☐	Metals
☐	Hydrocarbons	☐	Halogenated aliphatics
☐	Chlorinated aromatics	☐	Pesticides
☐	Other organics	☐	Radionuclides
☐	Salt	☐	Other (*specify*): _____

6.2.1.4 Did any past or current ESA relevant to this investigation identify an exceedance of the mandatory Tier 2 guidelines referred to in Section 6.2.1.3 (e.g. Tier 2 guidelines that are lower than the corresponding Tier 1 guidelines)? ☐ Yes ☐ No ☐ TBD

6.2.1.5 If you answered 'yes' in Section 6.2.1.4, have all relevant COPC been remediated to meet the mandatory Tier 2 guidelines? ☐ Yes ☐ No

6.2.2. Did any past or current ESA relevant to this investigation identify a drilling waste disposal area?

☐ Yes ☒ No *(➔proceed to Section 6.2.3.)*

6.2.2.1 If a drilling waste disposal area was identified, did any past or current ESA identify non-compliance with the compliance options outlined in *Assessing Drilling Waste Disposal Areas: Compliance Options for Reclamation Certification* (AER, 2014), as amended?

☐ Yes ☐ No

6.2.2.2 If you answered 'yes' in Section 6.2.2.1, have all COPC been remediated to meet the compliance options outlined in *Assessing Drilling Waste Disposal Areas: Compliance Options for Reclamation Certification* (AER, 2014), as amended?

☐ Yes ☐ No

6.2.2.3 For any COPC that did not meet the compliance options in Assessing Drilling Waste Disposal Areas, identify the group of contaminants (*check of all that apply*, *see the Alberta Tier 1 guidelines, Tables 1-4 for detailed listing).*

☐	General and inorganic parameters	☐	Metals
☐	Hydrocarbons	☐	Halogenated aliphatics
☐	Chlorinated aromatics	☐	Pesticides
☐	Other organics	☐	Radionuclides
☐	Salt	☐	Other (*specify*): _____

6.2.3 For all areas and COPCs not assessed under Sections 6.2.1 or 6.2.2, did any ESA relevant to this investigation identify an exceedance over the Alberta Tier 1 guidelines?

☒ Yes ☐ No *(➔proceed to Section 6.3.)*

6.2.3.1 If you answered 'yes' in Section 6.2.3, have all COPC been remediated to meet the Alberta Tier 1 guidelines?

☐ Yes ☒ No ☐ TBD

6.2.3.2 For any COPC that exceeded Alberta Tier 1 guidelines in Section 6.2.3.1, identify the group of contaminants. (*check all that apply*, *see the Alberta Tier 1 guidelines, Tables 1-4 for detailed listing.)*

☒	General and inorganic parameters	☒	Metals
☐	Hydrocarbons	☐	Halogenated aliphatics
☐	Chlorinated aromatics	☐	Pesticides
☐	Other organics	☐	Radionuclides
☐	Salt	☐	Other (*specify*): _____

6.3 Status of Investigation

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

☒ *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* – 2007 and updates,
☐ Coarse grained ☒ Fine grained

☐ *Alberta Tier 2 Soil and Groundwater Remediation Guidelines* – 2007 and updates,
☐ Pathway exclusion ☐ Guideline adjustment ☐ Site specific remediation objectives

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

☒ Other (*specify*): Typical background concentrations, published soil data, and professional judgement

6.3.2 What land use classification(s) is used?

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

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

☐ For all COPCs on-site and off-site, no exceedance has been found above any applicable soil and groundwater guidelines in any prior and current assessments.

☐ All contamination on-site and off-site has been completely remediated and meets the applicable soil and groundwater guidelines.

☒ One or more COPC still exceeds the applicable soil or groundwater guidelines.

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

4 ☐ None ☐ TBD

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

☐ Yes ☒ No

6.3.6 For all areas of potential environmental concern, list the dates when the contamination was discovered *(specify dd-mon-yyyy)*: **06-Oct-2014; 08-Oct-2014; 10-Oct-2014; 21-Nov-2017; 09-Aug-2018; 24-Sep-2019; 25-Sep-2019; 02-Oct-2019; 08-Aug-2020; 10-Sep-2020; 20-Oct-2021; 01-Nov-2021; 18-April-2022; 19-May-2022**

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

☐ Yes ☒ No ☐ Not applicable

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

_____; _____ ☐ Not assigned

6.3.9 What is the approximate, cumulative amount of land area remaining exceeding applicable remediation guidelines? 1200 (m^2) ☐ None ☐ TBD

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

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

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

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

Direction for Completing the Remainder of the Form

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

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

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

6.4 Key Transport Factors for Existing COPCs

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

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

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

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

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

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

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

☐ Yes ☐ No ☒ TBD ☐ Not required (NR)

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

☐ Yes ☐ No ☒ TBD ☐ NR

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

_____(×10^{-7} m/sec.) ☐ TBD ☐ NR

6.5 On-site Characterization

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

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

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

Shallowest: **-0.06** (m) Deepest: 7.65 (m) ☐ TBD ☐ NR (*specify max. depth assessed*: _____(m))

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

(*N, NW, etc.:* E; NE) ☐ TBD ☐ NR

6.5.4 What is the existing land use classification?

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

6.5.5 What is the end land use classification?

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

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

6.6 Off-site Characterization

6.6.1 Are there COPCs off-site exceeding applicable soil or groundwater guidelines?

☒ No *(➔if on-site contamination was reported, proceed to Section 7, otherwise, proceed to Section 8.)*
☐ Yes ☐ TBD

6.6.2 What is the current land use classification for any off-site area(s) identified in Section 6.6.1?

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

6.6.3 What is the end land use classification for any off-site area(s) identified in Section 6.6.1?

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

6.6.4 Is there any substance concentration under a road allowance exceeding the applicable soil or groundwater guidelines?

☐ Yes ☐ No (➔*proceed to Section 6.6.6.)* ☐ TBD

6.6.5 What is the most sensitive land use classification adjacent to the road allowance?

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

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

7 RISK MANAGEMENT PLAN (RMP)

7.1 What is the Plan for Contaminated Areas Still Remaining on and off the Site? *(check one only.)*

- ☐ Complete remediation *(➔proceed to Section 8).*
- ☐ Partial remediation with risk management for some residual contamination.
- ☒ Risk management for all remaining contamination.

7.2 Key Progress of RMP

7.2.1 If the site needs an on-going RMP, answer all the following questions that apply to the RMP.

☐ Yes	☒ No	Are contaminated areas completely delineated horizontally and vertically in soil?
☒ Yes	☐ No	Are contaminated areas completely delineated horizontally and vertically in groundwater?
☒ Yes	☐ No	Is source identified and completely delineated?
☐ Yes	☒ No	Is source migrating or has migrated off-site?
☒ Yes	☐ No	Is source left as is?
☐ Yes	☒ No	Is source partially removed and residual source being managed?
☒ Yes	☐ No	Is source controlled with physical or administrative methods?
☒ Yes	☐ No	Are all pathways of concern identified?
☒ Yes	☐ No	Have all relevant receptors been identified and protected?
☒ Yes	☐ No	Is there a monitoring program in place to verify RMP success?
☐ Yes	☒ No	Are there third parties related to this RMP? (*if the answer is 'no', skip the next question.*)
☐ Yes	☐ No	If there are third parties, have all of them accepted the RMP?
☒ Yes	☐ No	Is there a commitment from person(s) responsible to implement and monitor the RMP until final remediation guidelines are achieved?
☐ Yes	☒ No	Is there a contingency plan in place should the RMP fail?
☐ Yes	☒ No	Is the RMP implemented for the site?

Public Disclosure and Privacy Notification

The *Record of Site Condition* form is a public record that is disclosed in accordance with section 35 of the *Environmental Protection and Enhancement Act, Disclosure of Information Regulation*, and *Ministerial Order 23/2004*. Reasonable efforts have been made to minimize collection of personal information where possible. Personal information on the form is collected under the authority of section 12(c) and other provisions of the *Environmental Protection and Enhancement Act* and is in compliance with section 33(a) and 33(c) of the *Freedom of Information and Protection of Privacy Act* (FOIP). Personal information collected on this form will be used by Alberta Environment and Sustainable Resource Development (ESRD) or the Alberta Energy Regulator (AER), as the case may be, for the purposes of administering its programs.

Accuracy of Information

The information in this document has been submitted by persons other than ESRD or the AER. The Department, the Government of Alberta, and the AER cannot and do not warrant that the information in this document is current, accurate, complete, or free of errors. Persons accessing the information provided should not rely on it, and any reliance on the information provided is taken at the sole risk of the user. Users of this information are advised to conduct their own due diligence to satisfy themselves of the environmental condition of the property of interest.

8 DECLARATION

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

Clean Harbors Ryley Industrial Waste Management Facility (site name) (the "Site").

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

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

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

Footnote ‡:

"Applicable Standard" means

a) for the purposes of upstream oil and gas sites,

i) *2010 Reclamation Criteria for Wellsites and Associated Facilities Application Guidelines* (ESRD 2011),

ii) CSA Standard Z769, *Phase II Environmental Site Assessment,* as amended, for any Phase II site assessment information used in preparation of this form on all upstream oil and gas sites not included in a) i);

b) for the purposes of all other sites, CSA Standard Z768, *Phase I Environmental Site Assessment,* as amended, for any Phase I site assessment information and with CSA Standard Z769, *Phase II Environmental Site Assessment,* as amended, for any Phase II site assessment information used in preparation of this form.

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

Clean Harbors Canada, Inc.	Stan Yuha	Facility Manager	Stan Yuha	23-03-2023
Name of operator	Name of authorized representative	Title of authorized representative (*e.g. officer, director*)	Signature	Date (*dd-mon-yyyy*)