# 2023 Operations and Monitoring Report

## New Landfill

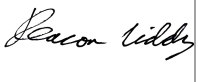
Northwin Environmental and the Ministry of Environment and Climate Change Strategy

27 March 2024

→ **The Power of Commitment**

**GHD**
138 East 7th Avenue, Suite 100
Vancouver, British Columbia V5T 1M6, Canada
**T** +1 604 214 0510 | **F** +1 604 214 0525 | **E** info-northamerica@ghd.com | **ghd.com**

**Document status**

| Status Code | Revision | Author | Reviewer | | Approved for issue | | |
|---|---|---|---|---|---|---|---|
| | | | Name | Signature | Name | Signature | Date |
| S3 | 00 | Kathleen Hasler | Kathryn Lindsay<br>Deacon Liddy | | | | March 22, 2024 |
| S4 | 00 | Kathleen Hasler | Kathryn Lindsay<br>Deacon Liddy | | Deacon Liddy |  | March 27, 2024 |
| | | | | | | | |

*© GHD 2024*

This document is and shall remain the property of GHD. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

# Contents


**1. Introduction** **1**
- 1.1 Limitations 1
- 1.2 Background 1
- 1.3 Site Location 2
- 1.4 Site Security 2

**2. Operations and Development** **2**
- 2.1 New Landfill 2
- 2.2 New Leachate Management Works 2
- 2.3 Summary of DOCP Implementation 3
- 2.4 2024 Significant Works 4
- 2.5 Construction Reports 4
- 2.6 Waste Tonnage and Volume 5
- 2.7 Airspace Consumption, Remaining Volume, and Remaining Life 5
- 2.8 Treated Leachate Effluent Quantity and Quality 5
- 2.9 Non-Compliance 6
- 2.10 Public Complaints 6

**3. Site Physical Setting** **6**
- 3.1 Climate 6
- 3.2 Topography and Drainage 6
- 3.3 Geologic Setting 7
- 3.4 Hydrogeologic Setting 7

**4. 2023 Environmental Monitoring Plan** **8**
- 4.1 Monitoring Locations 8
- 4.2 EMP Specifications 9
- 4.3 Leachate Indicator Parameters 9
- 4.4 Applicable Water Quality Standards 10
- 4.5 Sampling Methodology 10
- 4.6 Laboratory Program 11
- 4.7 Data Quality Assessment and Verification 11

**5. Water Level Monitoring Results** **11**

**6. EMP Results and Water Quality Assessment** **11**
- 6.1 Leachate Quality 11
- 6.2 Landfill Leak Detection System Water Quality 12
- 6.3 Groundwater Quality 13
- 6.4 Stormwater 14
- 6.5 Surface Water 14
- 6.6 Landfill Gas in Soil Quality 15

**7. Conclusions** **15**
**8. Recommendations** **16**

# Table index

Table 2.1 New Landfill Airspace Consumption, Remaining Volume, and Remaining Life 5
Table 2.2 Treated Leachate Effluent Quality Analytical Summary 5
Table 4.1 Leachate Indicator Parameters selected for the Site 9
Table 6.1 2023 Leachate Water Quality Summary of Indicator Parameters – New Landfill (March-November) 12
Table 6.2 Groundwater Quality Summary of Indicator Parameters –March-November 14
Table 6.3 Surface Water Quality Summary of Indicator Parameters (November) 14

# Table Index (following text)

Table 1 Hydraulic Monitoring Results
Table 2 Leachate Analytical Results
Table 3 Groundwater Analytical Results
Table 4 Surface Water Analytical Results
Table 5 Landfill Gas in Soil Analytical Results
Table 6 Analytical Tables Notes

# Figure Index

Figure 2.1 New Leachate Management Works Schematic 3

# Figure Index (following text)

Figure 1 Site Location Map
Figure 2 Site Plan
Figure 3 New Landfill Site Plan
Figure 4 Monitoring Locations
Figure 5 Groundwater Elevation Contours – July 2023
Figure 6 Groundwater Elevation Contours – November 2023

# Appendices


| | |
|---|---|
| Appendix A | Operational Certificate and Amendment |
| Appendix B | Cell 1 West Construction Report |
| Appendix C | Cell 1 East, Cell 1 West and Ponds Commissioning Report |
| Appendix D | 2023 Annual Status Form |
| Appendix E | Borehole Logs |
| Appendix F | 2023 Environmental Monitoring Program Specification |
| Appendix G | EMP Field Sample Keys and Laboratory Reports |
| Appendix H | Data Quality Assessment and Verification Report |
| Appendix I | Concentration Versus Time Plots |
| Appendix J | 2024 Environmental Monitoring Program Specification |

# 1. Introduction

GHD has been retained by Northwin Environment Ltd. (Northwin) to prepare this 2023 Annual Operations and Monitoring Report (Annual Report) for the New Landfill located at 7295 Gold River Highway (Site) approximately 7 kilometres (km) west of Campbell River, British Columbia (BC) city centre. A Site location map is provided as Figure 1. The landfill is operating under the Operational Certificate 107689 (OC 107689), which was issued to Upland Excavating Ltd. (Upland) on August 1, 2019, and an amendment received on April 26, 2022. A copy of the OC and the amendment is provided in Appendix A. The Site is owned by Upland. The landfill is operated by Northwin.

The Annual Report provides a summary of the New Landfill operations carried out on Site and the results of the environmental monitoring program (EMP) implemented from January 1 to December 31 of 2023 (Reporting Period). An evaluation of the operational and environmental performance of the landfill are provided with recommendations made for the ongoing development of the landfill and the EMP.

This Annual Report has been written in accordance with the Landfill Criteria for Municipal Solid Waste (MOE, June 2016) and Section 5.4 of the OC.

## 1.1 Limitations

*This report has been prepared by GHD for Northwin Environmental and the Ministry of Environment and Climate Change Strategy and may only be used and relied on by Northwin Environmental and the Ministry of Environment and Climate Change Strategy and the Ministry of Environment and Climate Change Strategy for the purpose agreed between GHD and Northwin Environmental and the Ministry of Environment and Climate Change Strategy as set out in section 1 of this report.*

*GHD otherwise disclaims responsibility to any person other than Northwin Environmental and the Ministry of Environment and Climate Change Strategy arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.*

*The services undertaken by GHD in connection with preparing this report were limited by the information provided by Northwin Environmental.*

*The opinions, conclusions and any recommendations in this report are based on conditions encountered and reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.*

## 1.2 Background

Prior to the issuance of the OC, the Original Landfill operated under Permit PR-10807 (Permit). This Permit was issued for the Original Landfill on June 1, 1992. In accordance with the approved Comox Valley Regional District Solid Waste Management Plan (SWMP), Upland submitted an application in June 2015 to replace the Permit with a new Operational Certificate.

Prior to the issuance of the OC, annual water quality monitoring results were provided to the Ministry of Environment and Climate Change Strategy (the Ministry) in 2017 and 2018 in response to an e-mail request from the Ministry to Upland and GHD dated November 10, 2017.

The OC was issued on August 1, 2019, authorizing waste management at the Original Landfill and the New Landfill. On April 26, 2022, the OC was amended to include the acceptance of soil that is non-hazardous waste (IL+), a treated leachate holding pond or tank, and conditions related to the decommissioning of the Original Landfill and the Original Leachate Management Works.

The Original Landfill and Original Landfill Leachate Management Works, operated under the OC until they were both decommissioned in 2023. Operations ceased at the Original Landfill in September 2022 and waste was removed and placed into the New Landfill from April to June 2023. Decomissioning activities were completed in June 2023. Details

regarding the Original Landfill decommissioning is provided in the *Original Landfill and Original Landfill Leachate Management Works Decommissioning Report* (GHD, 2023) which was submitted to the Ministry in June 2023.

## 1.3 Site Location

The Site is bound to the north by Gold River Highway (Highway 28), to the east by forested and industrial land parcels and to the west by Rico Lake, a construction storage yard, and an undeveloped industrial lot. The southern boundary of the Site is located on the Campbell River city limit. The area to the south is part of the Strathcona Regional District and includes land parcels used by the forestry industry. The legal description of the Site is Lot A, District Lot 85, Plan 30709, Sayward District.

The Site is approximately 48 hectares in size and is accessed from the north via an entrance from Gold River Highway. In 2023, the Site encompasses a large sand and gravel pit (Pit), the New Landfill including Cell 1 East and Cell 1 West and leachate treatment works. A Site Plan is provided on Figure 2.

## 1.4 Site Security

Signage is erected at the main entrance of the Site. The signage includes all information specified in Section 6.10 of the Landfill Criteria. In addition, there are four signs at property access points that read “Industrial Site, No Trespassing. Property Under Video Surveillance”. The surveillance cameras are monitored 24-hours a day by a security company. An outdoor lighting system also illuminates the Site at night.

# 2. Operations and Development

## 2.1 New Landfill

Presently, the New Landfill includes two cells: Cell 1 East and Cell 1 West. Cell 1 West was constructed in 2022. Both cells include a double liner system, leak detection layer, and leachate management works (see Section 3.2), as shown on Figure 3.

Cell 1 East and Cell 1 West are comprised of a primary and secondary base liner. The primary base liner refers to the composite liner system that consists of an HDPE geomembrane liner and geosynthetic clay liner (GCL) which underlies the leachate collection system. The secondary base liner refers to the composite liner system which is comprised from an HDPE geomembrane liner and GCL which underlies the leak detection system.

The Cell 1 East and Ponds Construction Report was submitted to the Ministry on October 19, 2021. The New Landfill was authorized to accept waste 30-days following submission on November 19, 2021. The New Landfill (Cell 1 East) started accepting waste on November 24, 2021.

The New Landfill is authorized to accept C&D waste, landfill clearing waste, Industrial Quality soil (from January 1 to April 23, 2022), IL+ soil (as of April 24, 2022), and sludge from the leachate management works or water management works.

## 2.2 New Leachate Management Works

The new leachate management works include leachate collection, extraction, storage, treatment, and infiltration. A process schematic of the new leachate management works is provided in Figure 2.1 below.

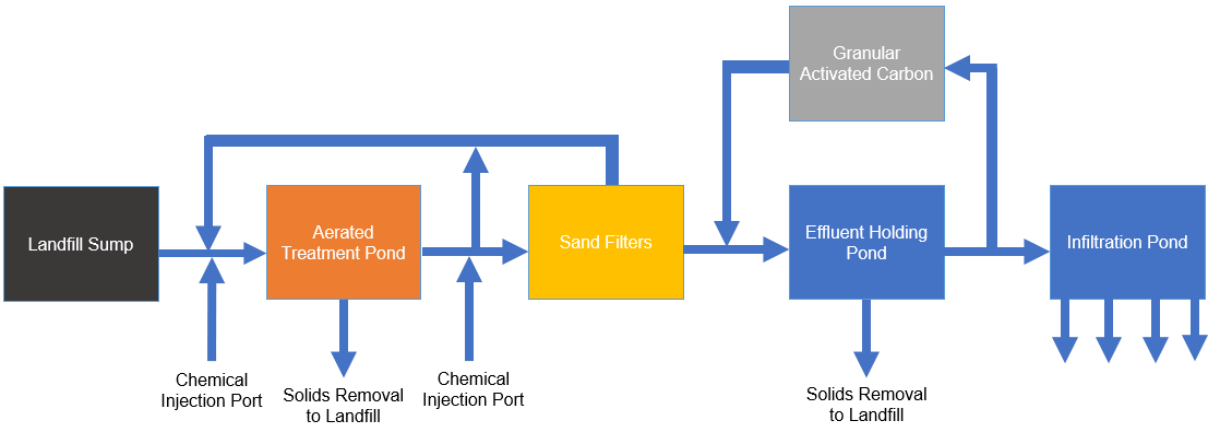



*Figure 2.1 New Leachate Management Works Schematic*

Leachate is collected within Cell 1 East and Cell 1 Westin a series of perforated pipes installed at the base of the cell and discharges to a sump. Leachate is stored temporarily in the landfill and pumped from the sump to the leachate treatment pond for batch treatment as shown in Figure 2.1, on an as-needed basis. The location of the sump is shown on Figure 4. The leachate treatment pond includes a primary and secondary liner, leak detection layer, and leak collection pipes.

To target operation of a weekly batch at the peak daily leachate generation rate, an average batch size is 625 $m^3$, with the maximum batch size to be 1,400 $m^3$. A batch size may vary, requiring operational adjustments to the treatment system.

The process begins with aerated equalization, where the aerated equalization pond is filled, and the aeration system on during the filling process. Following aeration, the leachate is pumped through pipes to the leachate treatment container, where chemicals can be added inline through injection ports. After chemical addition, leachate can be recirculated to the equalization pond or sent through a series of sand filters before entering the effluent holding pond. The effluent batch will be held in the effluent holding pond and sampled with a 3-day turnaround on the laboratory analysis. Following receipt of sample results, the batch will then be pumped to the infiltration pond or recirculated through the Granular Activated Carbon (GAC), if polycyclic aromatic hydrocarbons (PAHs) did not meet discharge criteria. During operations the batches will be tested periodically to confirm discharge criteria are being met. The treatment process will continue until treated effluent concentrations meet the British Columbia Contaminated Sites Regulations (BC CSR) Schedule 3.2 DW standards.

## 2.3 Summary of DOCP Implementation

GHD prepared an updated Design, Operations, and Closure Plan (DOCP) dated July 8, 2022 for the Site. The DOCP provides additional regulatory frameworks for the Site.

A summary of the DOCP components that were implemented within the Reporting Period, include:

- The DOCP was completed by a QP on behalf of Upland and submitted to the Ministry on July 8, 2021.
- Operations Plan: the New Landfill operated in accordance with the Site Operations section presented in the DOCP.
- Soil Acceptance Plan: soil was received in accordance with the soil acceptance plan presented in the DOCP and OC amendment. A GHD QP certified and submitted to Upland a document outlining at minimum the OC requirements under Section 2.7(b).
- Filling: waste was accepted according to the waste acceptance policy and discharged in Cell 1 East and West, including waste excavated from the Original Landfill.

- Cover Placement: cover was placed over waste as a means of landfill nuisance control on an as-needed basis determined by landfill staff. Intermediate soil cover was placed on areas of the landfill that were not scheduled to receive the placement of additional waste for 30-days or more.
- New Leachate Management Plan: leachate management includes leachate collection, extraction, storage, and treatment. Leachate is extracted from the landfill by active pumping from the Cell 1 East for treatment as described in Section 2.2.
- New Surface Water Management Plan: perimeter berms around the cell prevent run-on of stormwater to the landfill footprint. Existing site ditches promote stormwater infiltration into the ground at the base of the Pit. Contact water is managed as leachate. Swales constructed in 2022 outside of the New Landfill gravity drains stormwater away from the footprint to the pit.
- Environmental Monitoring Plan: the EMP described in Section 4 was implemented in 2023. Results of the EMP are presented in Sections 6 and 8.
- Trigger Level Assessment Plan: leachate in the leak detection system triggered the contingency plan outlined in the DOCP.
- Financial Security Plan: the financial security plan (revision 2) was completed on July 2, 2021, and submitted as part of the DOCP.
- Cell 1 West Construction Report is provided in Appendix B and further described in Section 2.5.
- Cell 1 East, Cell 1 West, and Ponds Commissioning Report is provided in Appendix C and described in Section 2.5.

## 2.4 2024 Significant Works

The significant works planned for 2024 at the New Landfill include:

- The installation of the proposed monitoring well MW13.

## 2.5 Construction Reports

**Cell 1 West Construction Report**

The Cell 1 West Construction Report was prepared in 2023 and is provided in Attachment B. The Cell 1 West Construction Report demonstrates that the Cell 1 West has been constructed in accordance with OC and the most recent DOCP, with the changes noted below and approved by the undersigned during construction. Qualified Professionals (QP) completed inspections before and during construction of Cell 1 West.

**Cell 1 East, Cell 1 West, and Ponds Commissioning Report Commissioning Report**

The Cell 1 East, Cell 1 West, and Ponds Commissioning Commissioning Report (commissioning report) was prepared in 2023 is provided in Attachment C. The commissioning report demonstrates that Cell 1 East and Ponds have been commissioned in accordance with the OC and the 2021 DOCP. QPs completed inspections before and during commissioning of Cell 1 East and the Ponds. This commissioning report includes the information described in Section 2.6(b) of the OC, and Leachate Treatment Facility (LTF) Commissioning Plan presented in the 2021 DOCP, specifically:

- Summary of commission activities including sampling activities
- Summary of analytical results of influent leachate and effluent sampling
- Copy of all calibration reports and laboratory analytical reports
- Comments on any observed deficiencies in the LTF design or performance, and a plan for addressing any such deficiencies.
- Maintenance and performance monitoring plan

## 2.6 Waste Tonnage and Volume

In 2023, the New Landfill accepted a total 38,327 tonnes of waste for discharge to the New Landfill:

– 8,205 tonnes of C&D waste
– 25,663 tonnes of non-hazardous waste quality soil
– 4,100 tonnes of asbestos containing material
– 357 tonnes of creosote timbers

No recyclable material was diverted from the landfill in 2023 as the landfill only received residual material.

No hazardous waste, controlled waste, and attractants were received in 2023.

## 2.7 Airspace Consumption, Remaining Volume, and Remaining Life

As shown in Table 2.1, the design capacity of Cell 1 East and Cell 1 West is 207,784 $m^3$. The total airspace consumption from January 1 to December 31, 2023 was approximately 29,482 $m^3$. The remaining airspace capacity of the New Landfill is approximately 482,540 $m^3$.

Using the maximum allowable discharge rate of 45,000 tonnes per year or 34,615 $m^3$ per year, the remaining life of the constructed cells is approximately 2-years.

*Table 2.1 New Landfill Airspace Consumption, Remaining Volume, and Remaining Life*

| | Total New Landfill ($m^3$) |
|---|---|
| Waste accepted January 1 thru December 31, 2022 | 34,472 |
| Waste accepted January 1 thru December 31, 2023 | 29,482 |
| Relocation of Original Landfill | 57,167 |
| Total estimated discharged to Cell 1 East and Cell 1 West | 121,121 |
| Cell 1 East and Cell 1 West Capacity | 207,784 |
| Airspace Remaining | 86,663 |
| Remaining Life in Constructed Cells | 2.5-years |

## 2.8 Treated Leachate Effluent Quantity and Quality

In 2023, Northwin collected, treated, and discharged approximately 4,050,000 litres of leachate. Treated leachate effluent was sampled by Northwin throughout the year, as summarized in Table 2.2 below. Details regarding treated leachate effluent quality is provided in the Cell 1 East, Cell 1 West, & Ponds Commissioning Report (Appendix C)

*Table 2.2 Treated Leachate Effluent Quality Analytical Summary*

| Sample Date | Lab Report No. | Discharge Criteria Results | Treatment Continued or Discharged |
|---|---|---|---|
| February 2, 2023 | VA23A2628 | 001: No exceedances | Discharged |
| February 13, 2023 | VA23A3351 | 001: Boron, quinoline | Treatment continued |
| March 6, 2023 | VA23A4848 | 001: Arsenic, boron, quinoline | Treatment continued |
| March 30, 2023 | VA23A6860 | 001: No exceedances<br>002: No exceedances | Discharged |

| Sample Date | Lab Report No. | Discharge Criteria Results | Treatment Continued or Discharged |
|---|---|---|---|
| April 14, 2023 | VA23A8082 | 001: Boron, sodium | Treatment continued |
| October 23, 2023 | VA23C5387 | 001: Sulfate, boron, benzo(a)pyrene, quinoline | Treatment continued |
| November 21, 2023 | VA23C7975 | 001: No exceedances<br>002: No exceedances | Discharged |
| December 11, 2023 | VA23C0976 | 001: No exceedances | Discharged |
| December 18, 2023 | VA23D0378 | 001: Benzo(a)pyrene, quinoline<br>002: No exceedances | Treatment continued<br>Discharged |
| Notes: * - All samples were collected by Northwin. | | | |

## 2.9 Non-Compliance

According to Northwin, the New Landfill was compliant with the conditions of the OC during the Reporting Period. The annual status form is provided in Appendix D.

## 2.10 Public Complaints

According to Northwin, no public complaints were received during the Reporting Period.

# 3. Site Physical Setting

The following section summarizes the Site setting with respect to climate, topography, stormwater drainage, geology, and hydrogeology.

## 3.1 Climate

Climate data was measured at Environment Canada's Campbell River Airport Climate Station (ID 1021261) located approximately 8 km southeast of the Site. Based on the Canadian Climate Normal 1981 – 2010 Station Data, the area received 1489 millimetres (mm) of precipitation per year with much of the rainfall occurring between November and January.

## 3.2 Topography and Drainage

The Site is located on a terrace that is partially surrounded by mountainous terrain to the south and southwest. The terrace gradually slopes towards the Quinsam River located approximately 3.8 km to the southeast of the east Site boundary. The Quinsam River channel is at an elevation that is greater than 100 m below the Site. There are no natural surface water courses on Site.

Drainage within the New Landfill area is managed according to the stormwater management plan provided in the DOCP, respectively. Perimeter berms have been constructed around the landfill cells to ensure that precipitation that falls on the landfill footprints remains within the footprint and managed as leachate. Precipitation that falls outside of the landfill footprints is considered clean water and infiltrates into the groundwater aquifer below the Site.

## 3.3 Geologic Setting

***Overburden***

Based on regional geologic mapping, the area in the vicinity of the landfill underwent several periods of glaciation during the Pleistocene Epoch. Vancouver Island was glaciated with ice thicknesses to 2 km. During the recession of the last glaciation approximately 14,000 years ago, glacial and glacio-fluvial sediments were deposited, and in some cases reworked and redeposited, to make up many of the present surficial deposits of Vancouver Island. These deposits consist of till that was deposited directly by glacial activity[1] and of glacial outwash composed primarily of poorly sorted, coarse-grained sand and gravel sediments deposited by glacial melt water (Greene, Scoates, and Weis, 2005; McCammon, 1977)[2].

Based on investigations completed by GHD and Site operations, the surficial geology underlying the landfill is native interbedded sand and gravel with occasional seams of sand and silty sand. Directly underlying the landfill, this unit is greater than 40 m in thickness.

***Bedrock***

The Site is underlain by the Karmutsen Formation, which is part of the Wrangellia Terrane. The Karmutsen Formation consists mostly of submarine flood basalts up to 6 km in thickness.

Based on Site investigations completed by GHD, the bedrock underlying the landfill is competent igneous basalt. The surface of the bedrock is greater than 50 m below the ground surface in the Original Landfill area.

A bedrock ridge is present between Rico Lake and the Pit along the western limit of the Site. The presence of the ridge creates a surface water and groundwater flow divide. The approximate location of the watershed and groundwater flow divide is illustrated on Figures 5 and 6.

## 3.4 Hydrogeologic Setting

In general, the geologic units identified in the previous section may be grouped into the following three hydrogeologic units:

1. Sand and gravel aquifer
2. Shallow aquifer
3. Bedrock aquifer

An unconfined aquifer exists within sand and gravel overlying bedrock at the Site. In 2023, the water table was present approximately 13 – 18 meters (m) below top of riser (btor) in the vicinity of the New Landfill. Groundwater flow is interpreted to be from northwest to southeast, towards the Quinsam River. The head waters of the aquifer are from McIvor Lake in the vicinity of the Site.

A relatively thin, discontinuous shallow aquifer is present within the northern portion and in the southwest corner of the

Site. Groundwater flow in this area is largely controlled by bedrock surface topography.

This sand and gravel aquifer is a major aquifer in the region and is identified in the BC Water Resource Atlas (2017) as aquifer 975 IIA (10). This aquifer is interpreted to be the principal groundwater flow zone at the Site. In the context of the landfill, this aquifer represents the only receptor to landfill-related groundwater quality impairments.

GHD completed single well response tests (SWRT) at nine wells screened within the sand and gravel aquifer. The results of the SWRTs show that hydraulic conductivity of the sand and gravel aquifer is approximately $1.8 \times 10^{-2}$ cm/sec. Borehole logs of monitoring wells shown on Figure 2 are provided in Appendix E. Details regarding the Site's

[1] This till consists of larger clasts supported in a matrix of fine-grained sediment.
[2] Greene, A.R., J.S. Scoates and D. Weis, 2005. Wrangellia Terrane on Vancouver Island, British Columbia: Distribution of Flood Basalts with Implications for Potential Ni Cu PGE Mineralization in Southwestern British Columbia.

geological and hydrological setting are provided in the Hydrogeology and Hydrology Characterization Report (HHCR), dated May 27, 2016 and last amended May 4, 2021.

# 4. 2023 Environmental Monitoring Plan

This section presents the 2023 environmental monitoring plan (EMP), sampling methodology, laboratory program, quality assurance/quality control (QA/QC) program, and specification developed for the New Landfill. The quarterly EMP for the New Landfill began in 2023. Monitoring locations are presented in Figure 4.

## 4.1 Monitoring Locations

The EMP was developed for the Site to assess and identify potential landfill derived impacts to the underlying aquifers, to monitor groundwater and surface water levels, and to evaluate Site regulatory compliance (Section 3.5 of the OC).

The EMP consists of the following:

– Quarterly hydraulic monitoring at 18 groundwater locations
– Quarterly field parameter and sample collection at 11 groundwater locations
– Quarterly hydraulic monitoring at 2 surface water locations
– Annual field parameters and sample collection at 2 surface water locations
– Quarterly monitoring, field parameter and sample collection at 3 leachate locations
– Quarterly hydraulic monitoring at 4 leak detection monitoring locations
– Quarterly field parameters and sample collection at 1 leak detection monitoring locations

The objective of each component of the EMP's is provided below.

***Groundwater***

The objective of the groundwater monitoring plan is to detect the extent and magnitude of potential landfill-derived impacts to the underlying overburden aquifer and to monitor the groundwater flow direction across both landfills.

For the new landfill, groundwater quality is monitored at five upgradient (MW6-17, MW9-17, MW1-14, MW4A-15, and MW4B-15), two cross-gradient (MW2-14 and MW2A-16) and four downgradient wells (MW10-17, MW12-22, MW11-19, and MW3-14). A proposed well, MW13 (Figure 4), will be part of the monitoring program once installed. Monitoring wells MW4A-15 and MW4B-15 were buried in 2022 during construction activities and inaccessible during the EMP. MW4A-15 and MW4B-15 are protected by a cover and are recommended to be dug up.

***Surface Water***

Water levels in Rico Lake and McIvor Lake are monitored to assess the hydraulic relationship between these surface water bodies and the underlying aquifers. The water level surface elevation at Rico Lake is measured from a surface water gauge installed in the lake. The hydrometric surface of McIvor Lake is monitored by BC Hydro. GHD records the water level surface elevation from the publicly available BC Hydro Data Records.

***Leachate***

The objective of the leachate monitoring program is to characterize leachate quality generated within the lined cell of the New Landfill. At the New Landfill, leachate is sampled from a sump located in Cell 1 East (S06-21).

Treated leachate is also sampled from the Infiltration Pond if Northwin is discharging treated leachate during the EMP event. The sample collection point (TLIP) is located at the end of the treated leachate discharge pipe/hose.

An additional leachate monitoring location will be added to the EMP to characterize quality from the Leachate Sump in Cell 1 West in 2024.

***Leak Detection Layer***

Leak detection layers are present in the New Landfill. Design variations exist across the leak detection systems; however, the systems are conceptually the same.

The objective of monitoring the leak detection layer is to assess leakage of the primary liner. Water in the leak detection layer is monitored at the leak detection access pipe (LDS) on the north side of the landfill.

Four leak detection monitoring ports (LDMP) monitor leakage at the primer liner of the landfill as part of the Trigger Level Response Plan. Two LDMP are located on the north side of the landfill (LDMP 1-2) and two are located on the on the east side of the landfill (LDMP 3-4).

**Landfill Gas in Soil**

The objective of monitoring landfill gas in soil is to assess its migration from the New Landfill towards the nearest receptors (i.e., workers) who are working in the buildings near the front entrance of the site. Landfill gas in soil is monitored at two probes (LFG1-22 and LFG2-22).

## 4.2 EMP Specifications

The EMP Specification is presented in Appendix F. The specification includes monitoring locations, frequency, and analytical parameters for each sample type. The EMP is updated following a field event or during each year's review of Site operations and environmental data as part of the Annual Report.

## 4.3 Leachate Indicator Parameters

The leachate indicator parameters selected for the Site, presented in Table 4.1, were based on parameters that are typically elevated in construction and demolition landfill leachate as well as IL+ soils. Further details on the selection of leachate indicator parameter concentrations for assessing potential landfill-derived water quality alteration is provided in the HHCR.

*Table 4.1 Leachate Indicator Parameters selected for the Site*

| Parameter | Description |
|---|---|
| **Alkalinity** | Alkalinity typically increases down-gradient of landfills primarily due to elevated levels of dissolved carbon dioxide in affected water (produced by the biological breakdown of organic material) causing the dissolution of carbonate from natural geologic materials within the aquifer. |
| **Ammonia** | High concentrations of ammonia are observed when the landfill enters its anaerobic stage. In the anaerobic stage, anaerobic decomposition dominates, resulting in more ammonia than nitrate or nitrite. |
| **Boron** | Boron is a useful leachate indicator parameter as it is not subject to retardation processes and is therefore a conservative tracer. |
| **Chloride** | Chloride is generally abundant in municipal solid waste, however, is often found at lower concentrations in construction and demolition waste (Townsend, 2000). Chloride is formed in part by the degradation of various wastes and can be a very useful leachate indicator parameter because it is not subject to retardation processes and is therefore a conservative tracer. |
| **Conductivity** | Electrical or specific conductivity increases in leachate-affected groundwater due to the increased conductive capacity of water as a result of increased dissolved ions. |
| **Hardness** | Caused by the increased concentrations of calcium and magnesium ions due to the waste materials and more acidic pH breaking down the native lime-rich soils. |

| Parameter | Description |
|---|---|
| **Hydrogen Sulphide** | Under anaerobic conditions, sulphide (as $H_2S$) is observed through the reduction of sulphur species. The reducing conditions resulting from the presence of buried waste favor the development of sulphide in leachate. |
| **Iron and Manganese** | Concentrations typically increase in landfill-affected groundwater due to the alteration of redox conditions within the groundwater. The breakdown of dissolved organic matter within leachate consumes dissolved oxygen and related oxygen sources in groundwater and creates reducing conditions. Where conditions are reducing, naturally-occurring iron and manganese oxides within the geologic material are reduced to more soluble forms. |
| **Petroleum hydrocarbons (including PAHs)** | Waste in the form of creosote timbers and IL+ soil can contain petroleum hydrocarbons including polycyclic aromatic hydrocarbons (PAHs), which is a useful indicator parameter since petroleum hydrocarbons are not naturally present in groundwater on-site. |
| **Sulphate** | Construction and demolition waste landfills often generate elevated concentrations of sulphate in leachate due to the abundance of sulphate available from gypsum in drywall and other building materials in the waste stream. |
| **TDS** | A measure of the quantity of dissolved ions in solution. TDS increases with the dissolution of waste materials and salts. |

## 4.4 Applicable Water Quality Standards

The groundwater and surface water analytical results have been assessed to the BC CSR Drinking Water (CSR DW) standards as specified in Section 3.5 of the OC.

The CSR DW standards are appropriate for evaluating water quality at permitted landfills as stated in the BC MOE Landfill Criteria for Municipal Solid Waste (Second Edition, June 2016) and based on the following rationale.

***Rationale***

Protocol 21 states that both current and future drinking water use must be considered when determining whether CSR DW standards apply to a site. Future land use in the vicinity of the Site may include potable water supply, therefore the drinking water exposure pathway is applicable for the Site and DW standards apply.

Protocol 21 also states that CSR freshwater aquatic life (FWAL) standards apply to sites located within 500 m of an aquatic receiving environment (i.e., a surface water body containing aquatic life) unless it can be demonstrated that the groundwater discharges into a different surface water body (located greater than 500 m from the site) or that groundwater does not migrate to within 500 m of a surface water body that contains aquatic life. The results of the aquatic life assessment completed down-gradient of the Site as part of the HHCR revealed that no surface water bodies are present within 500 m east of the Site. The assessment identified two watercourses within 500 m of the southeast Site boundary; however, the watercourses are located cross-gradient of the New Landfill and at an elevation well above (at least 24 m) groundwater leaving the Site. In addition, Rico Lake and McIvor Lake are located upgradient based on Site flow patterns (Figures 5 and 6) and are therefore also not considered aquatic receiving environments. Based on these results, the CSR FWAL standards do not apply to groundwater quality at the Site.

Per CSR Schedule 3.2 footnotes, iron and manganese standards only apply to select CSR Schedule 2 activities including specific waste disposal and recycling operations activities (biomedical waste disposal, organic or petroleum material landspreading [landfarming], on-site industrial woodwaste disposal at specific industry sites and municipal or provincial road snow removal dumping). The Site's activities do not trigger the applicability of these standards.

## 4.5 Sampling Methodology

Sampling was conducted in accordance with the BC Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air Emission, Water, Wastewater, Soil, Sediment and Biological Samples (British Columbia, Ministry of Environment, 2013) (BC Field Sampling Manual) and GHD's standard operating procedures.

## 4.6 Laboratory Program

Analytical services were provided by Bureau Veritas Laboratories (BV) of Burnaby, BC. BV is an accredited by the Canadian Association for Laboratory Accreditation (CALA) to perform the analytical tests required as part of the EMP. Laboratory reports and respective field sample keys (FSK) for each monitoring event are provided in Appendix G.

## 4.7 Data Quality Assessment and Verification

A qualified GHD chemist completed data verification to assess laboratory and field QA/QC measures. The QA/QC results presented in the annual data verification report in Appendix H indicate that data exhibits acceptable levels of accuracy and precision with the qualifications noted. All data collected for the 2023 EMP has been determined to be acceptable for use in this Annual Report.

# 5. Water Level Monitoring Results

Water levels were measured from the monitoring wells on-Site in March, July, September, and November. After the March event, the full groundwater monitoring network was added to the hydraulic monitoring program of the EMP.

Water level monitoring data is presented in the attached Table 1. Borehole logs of monitoring wells shown on Figure 2 are provided in Appendix E. Groundwater contours for June and November are presented on Figures 5 and 6.

The inferred groundwater flow direction within the sand and gravel aquifer is directed from the northwest towards the southeast (i.e., from McIvor Lake towards the southeast corner of the Site). McIvor Lake is the headwaters for the sand and gravel aquifer underlying the Site. This groundwater flow direction occurred during each quarterly monitoring event and is consistent with historical results.

# 6. EMP Results and Water Quality Assessment

This section presents the EMP results and an assessment of leachate, groundwater, leak detection layer water, and surface water quality. Groundwater and surface water quality were assessed through an evaluation of the spatial distribution and temporal trends of typical leachate indicator parameters compared to leachate and background quality as well as baseline results. Baseline results were established prior to landfilling as part of the HHCR. Groundwater concentration versus time plots for leachate indicator parameters are presented in Appendix I.

## 6.1 Leachate Quality

Characterization of leachate generated within the New Landfill was completed via sample collection from leachate sump S06-21. Samples were collected in March, July, and November. Sample collection was not possible during the September event as the sump riser pipe was dry. Treated leachate is sampled from the Treated Leachate Infiltration Pond (TLIP) if discharging to assess treatment performance and determine if changes to the treatment process are required. Discharge did not occur during the EMP events.

Leachate samples were analyzed for general chemistry, biological oxygen demand (BOD), nutrients, sulphide, total metals, dissolved hardness, PAHs, light extractable petroleum hydrocarbons (LEPH), heavy extractable petroleum hydrocarbons (HEPH), extractable petroleum hydrocarbons (EPH), benzene, toluene, ethylbenzene and xylene (BTEX), volatile petroleum hydrocarbons (VPH) and phenols. The analytical leachate results are provided in Table 2.

A summary of the indicator parameters concentrations from leachate samples and the 2022 leak detection system is presented in Table 6.1 below.

Based on the leachate analytical results, leachate can be characterized as:

– Characteristic of C&D waste and IL+ soil, containing:
  - High concentrations of select metals, bicarbonate, sulphate, total dissolved solids (TDS), and conductivity
  - Low concentrations of BOD, COD, ammonia, nitrate, and nitrite
– Variable oxidation reduction potential ranging (60 to -376 mV)
– Containing low extractable petroleum hydrocarbons (i.e., $EPH_{C10-C19}$ and LEPH)
– Containing low PAH concentrations with no exceedances above BC CSR DW Standards.

*Table 6.1 2023 Leachate Water Quality Summary of Indicator Parameters – New Landfill (March-November)*

| Leachate Indicator Parameter | Leak Detection System Range[1] (LDS) | 2023 Leachate Concentration Range (S06-21) |
|---|---|---|
| ORP (millivolts) | (-85) - 197 | (-376) – 60 |
| TDS (lab) | 360 - 3800 | 2,300 – 3,700 |
| Dissolved Hardness | 78.8 – 85.3 | 1,010 – 1,560 |
| Conductivity (lab) (µS/cm) | 3800 - 4000 | 3,200 – 4,400 |
| Bicarbonate | 1300 - 1600 | 31 – 1,000 |
| Alkalinity (total) | 1200 - 1500 | 26 – 840 |
| Chloride | 28 - 37 | 190 – 310 |
| Sulphate | 730 - 840 | 720 – 2,000 |
| Hydrogen Sulphide (total) | 0.012 - 0.024 | 0.020 – 13 |
| Boron (µg/L) | 0.652 – 1.28 | 1,240 – 12,200 |
| Iron (µg/L) | 1.2 – 14.8 | 1,970 – 26,500 |
| Manganese (µg/L) | 0.289 – 0.702 | 923 – 4,790 |
| Sulphur (µg/L) | 240,000 – 273,000 | 235,000 – 648,000 |
| Total PAHs (µg/L) | -- | 4.0 – 4.2 |

Notes:

Units are in mg/L unless otherwise noted; --: data not available; Boron, iron, manganese, and sulphur are total for the leak detection system and leachate.

The leak detection system was dry during all monitoring events in 2023 and the range includes data from 2022, the only year with LDS data.

# 6.2 Landfill Leak Detection System Water Quality

Leachate is also monitored quarterly from the primary liner of the landfill as part of the Trigger Level Response Plan at the Leak Detection Sump (LDS). Samples are collected to assess the water quality and potential for leachate leakage through the primary liner of Cell 1 East. Leak detection samples are analyzed for general chemistry, BOD, nutrients, total metals, dissolved hardness, LEPH, HEPH, EPH, PAH, BTEX, VPH and Phenols. Water was not present in the leak detection system during any of the monitoring events and no samples were collected in 2023.

The LDS reporting dry for all monitoring events in 2023 is an indication that the primary liner and secondary base liner are functioning.

A summary of the indicator parameter concentrations reported in the water sampled from the LDS in 2022 are presented in Table 6.1 above for comparison with leachate quality.

## 6.3 Groundwater Quality

Water quality results have been assessed for evidence of leachate derived alterations. Upgradient and cross-gradient groundwater samples were analyzed for general chemistry parameters, nutrients, and dissolved metals. Downgradient groundwater samples were analyzed for general chemistry, nutrients, dissolved metals, EPH, LEPH, HEPH, and PAHs. The 2023 analytical results are presented in Table 3.

A summary of the leachate indicator parameter concentrations reported in the upgradient wells, cross-gradient wells, and downgradient wells are summarized ted in Table 6.2 below.

***Upgradient Groundwater Monitoring Wells***

Water quality at the upgradient monitoring wells (MW1-14, MW4A-15, and MW4B-15, MW6-17, MW9-17) is similar in quality to the cross-gradient wells and is characterized as relatively fresh water with low concentrations of general chemistry, hardness (soft), nutrients, and metals. Monitoring wells MW4A-15 and MW4B-15 were buried and sample collection was not possible in 2023.

Little variation was observed between the 2017 to 2023 monitoring events at the upgradient groundwater monitoring wells, and concentrations of leachate indicator parameters do not appear to be increasing over time.

The 2023 dataset was compared to historical concentrations (Appendix I) and the following observations in regard to water quality at the upgradient groundwater monitoring wells were noted:

– Groundwater from MW9-17 is slightly different in quality based on lower concentrations of the major ions and cations.
– No petroleum hydrocarbons are present in upgradient groundwater.
– Hydrogen sulphide concentrations at monitoring well MW6-17 increased from 0.0025 mg/L to 0.034 mg/L in March. Concentrations have since been low at around 0.001 mg/L indicating that this spike was likely an outlier.

No exceedances of the CSR DW standards occurred in the 2023 monitoring events with the following exception and noted qualifier:

– Benzo(a)pyrene: MW6-17(J+)

The above qualifier (J+) indicates that the result is qualified as estimated due to analytical interference identified by the laboratory which impacted accurate determination of the analyte concentration. This result has been flagged as "tentatively identified" only with a suspected high bias (Appendix H).

***Cross-gradient Groundwater Monitoring Wells***

Water quality at the cross-gradient monitoring wells (MW2-14 and MW2A-16) can be characterized as relatively fresh water with low concentrations of general chemistry, hardness (soft), nutrients, and metals. No petroleum hydrocarbons are present in cross-gradient groundwater.

Groundwater quality at the cross-gradient monitoring wells in 2023 is within historical concentration ranges and leachate indicator parameters are not increasing. No exceedances of the CSR DW standards occurred in 2023.

***Downgradient Groundwater Monitoring Wells***

The water quality at the downgradient wells (MW10-17, MW12-22, MW11-19 and MW3-14) is characterized as unimpacted water with low concentrations of alkalinity, hardness (moderately hard), chloride, nutrients, and dissolved metals. Seasonal variation in analyte concentrations are present. No exceedances of the CSR DW standards occurred in the 2023 monitoring events.

The water quality at downgradient well MW10-17 indicated alteration potentially from site activities in 2022 with elevated chloride, conductivity, sulphate, hardness concentrations. In response to the groundwater impacts at MW10-17, potential sources of alteration were being investigated. Concentrations at MW10-17 returned to historical ranges in 2023.

*Table 6.2 Groundwater Quality Summary of Indicator Parameters –March-November*

| Leachate Indicator Parameter | Upgradient Concentration Range | Cross-Gradient Concentration Range | Downgradient Concentration Range |
|---|---|---|---|
| ORP (millivolts) | 94 – 284 | 105 – 382 | 134 – 288 |
| TDS (lab) | 36 – 370 | 44 – 120 | 80 – 240 |
| Dissolved Hardness | 24.6 – 175 | 32.5 – 85.9 | 44.7 – 145 |
| Conductivity (lab) (µS/cm) | 53 – 530 | 73 – 200 | 130 – 340 |
| Bicarbonate | 28 – 150 | 40 – 94 | 53 – 170 |
| Alkalinity (total) | 23 – 120 | 32 – 77 | 43 – 140 |
| Chloride | ND (1.0) – 86 | ND (1.0) – 6.3 | ND (1.0) – 16 |
| Sulphate | 2.2 – 6.4 | 2.4 – 8.4 | 3.8 – 48 |
| Hydrogen Sulphide | ND (0.0050) – 0.017 | ND (0.0050) | ND (0.0050) |
| Boron (µg/L) | ND (50) | ND (50) | ND (50) – 171 |
| Iron (µg/L) | ND (5.0) – 7.3 | ND (5.0) – 10.7 | ND (5.0) – 7.5 |
| Manganese (µg/L) | ND (1.0) – 28.1 | ND (1.0) | ND (1.0) – 9.6 |
| Sulphur (µg/L) | ND (3,000) | ND (3,000) – 3,000 | ND (3,000) – 16,400 |
| Total PAHs (µg/L) | ND (0.10) – 0.28 | ND (0.10) | ND (0.10) |
| Notes: Units are in mg/L unless otherwise noted; Boron, iron, manganese, and sulphur are dissolved for groundwater. | | | |

# 6.4 Stormwater

The perimeter stormwater ditches will be established and included in the EMP once final cover is placed. While the landfill is active, landfill operational berms separate clean stormwater and contact water. Contact water remains within the lined cell and separate from the clean stormwater runoff. Clean stormwater continues to be directed away from the landfill for infiltration into the groundwater aquifer below the Site. The east and west surface water ditches will be removed from the specification in 2024.

# 6.5 Surface Water

Surface water quality is monitored at McIvor Lake and Rico Lake annually in November. Samples were analyzed for general chemistry parameters, nutrients, total metals, and dissolved hardness. The 2023 analytical results are presented in Table 4.

A summary of the leachate indicator parameter concentrations reported in McIvor are summarized in Table 6.3.

*Table 6.3 Surface Water Quality Summary of Indicator Parameters (November)*

| Leachate Indicator Parameter | Upgradient GW Concentration Range | Surface Water Concentration Range (McIvor Lake) | Surface Water Concentration Range (Rico Lake) |
|---|---|---|---|
| ORP (millivolts) | 94 – 284 | 197 | 207 |
| TDS (lab) | 36 – 370 | 34 | 38 |
| Dissolved Hardness | 24.6 – 175 | 22.6 | 17.5 |
| Conductivity (lab) (µS/cm) | 53 – 530 | 55 | 65 |

| Leachate Indicator Parameter | Upgradient GW Concentration Range | Surface Water Concentration Range (McIvor Lake) | Surface Water Concentration Range (Rico Lake) |
|---|---|---|---|
| Bicarbonate | 28 – 150 | 27 | 22 |
| Alkalinity (total) | 23 – 120 | 22 | 18 |
| Chloride | ND (1.0) – 86 | ND (1.0) | 5.5 |
| Sulphate | 2.2 – 6.4 | 2.6 | 1.0 |
| Hydrogen Sulphide | ND (0.0050) – 0.017 | ND (0.0050) | ND (0.0050) |
| Boron (µg/L) | ND (50) | 351 | 167 |
| Iron (µg/L) | ND (5.0) – 7.3 | ND (10) | 225 |
| Manganese (µg/L) | ND (1.0) – 28.1 | 1.8 | 11.8 |
| Sulphur (µg/L) | ND (3,000) | ND (3000) | ND (3000) |

Notes:
Units are in mg/L unless otherwise noted; -- data not available; Boron, iron, manganese, and sulphur are dissolved for groundwater and total for surface water.

Surface water quality in McIvor and Rico Lakes is similar to that observed in the sand and gravel aquifer and is characterized as being low in alkalinity, hardness, conductivity, and TDS and with low concentrations of nutrients and major ions.

McIvor and Rico Lakes are not interpreted to be receptors of groundwater flow under the area of the New Landfill based on the documented flow direction (Figure 5 and 6). However, as Rico Lake discharges into McIvor Lake and McIvor Lake recharges the sand and gravel aquifer, analytical results from McIvor and Rico Lakes are useful in characterizing water quality upgradient of the Site. Details on the Site's drainage patterns, and surface water divide located right of Rico lake is discussed in the HHCR.

Historically, seasonal variation was evident in water quality at Rico Lake, with higher concentrations evident during the fall monitoring event. Minimal seasonal variation in water quality between the monitoring events was evident at McIvor Lake, which is also consistent with historical results.

## 6.6 Landfill Gas in Soil Quality

Monitoring of landfill gas in soil began following the installation of LFG1-22 and LFG2-22 on July 27, 2022. In November, concentrations of methane were outside of the explosive range of methane (5 – 15 % v/v), which is the compliance criteria per the Landfill Criteria. The landfill gas results are presented in Table 5.

# 7. Conclusions

Based on the results of this Annual Report, the operational and water quality conclusions presented below can be made.

***Operational Conclusions***

– No complaints were received in 2023. According to Northwin, the New Landfill was compliant with the conditions of the OC during the Reporting Period. The annual status form is provided in Appendix D.
– Waste filling began in Cell 1 West. No other significant works occurred in 2023.

– An estimated total of 8,205 tonnes of C&D waste, 25,663 tonnes of non-hazardous waste quality soil, 4,100 tonnes of asbestos containing material, and 357 tonnes of creosote timbers were discharged to the New Landfill.
– The total airspace consumption from January 1 to December 31, 2023, was approximately 29,482 $m^3$. The remaining airspace for the constructed cells is approximately 86,663 $m^3$.
– In 2023, the quantity of leachate collected, treated, and discharged from the New Landfill was approximately 4,050,000 litres of leachate from the New Landfill.
– The leak detection system continues to show no leaks in the primary liner system.

***Water Quality Conclusions***

– Water level monitoring results show that groundwater flow direction is in a general southeasterly direction.
– Groundwater quality at the upgradient and cross-gradient monitoring wells is consistent with previous water quality monitoring results.
– Downgradient groundwater concentrations were well below the applicable CSR DW standards.
– Leachate was characterized by high concentrations of select metals, bicarbonate, sulphate, TDS, and conductivity.
– Surface water quality in McIvor and Rico Lakes is similar to that observed in the sand and gravel aquifer and is characterized as being low in alkalinity, hardness, conductivity, and TDS and with low concentrations of nutrients and major ions.
– McIvor and Rico Lakes are not interpreted to be receptors of groundwater flow under the area of the New Landfill based on the documented flow direction.

# 8. Recommendations

Based on the conclusions presented in this Annual Report, the following operational and water quality recommendations can be made:

***Operational Recommendations***

– Complete a survey of Cell 1 East and Cell 1 West and compare the results to the interim design contours to assess the remaining capacity in Cell 1 East and Cell 1 West.

***Water Quality Recommendations***

– Install downgradient well MW13 in 2024
– Complete the 2024 New Landfill proposed environmental monitoring plan as outlined in Appendix J. Updates include:
    - The addition of Cell 1 West Sump to the quarterly leachate monitoring program following waste discharge (S07).
    - Removal of the east and west ditches. These locations will be constructed and monitored following the placement of final cover.
– Recover MW4A-15 and MW4B-15 which were buried during construction activities.

All of Which is Respectfully Submitted,

GHD

**Kathleen Hasler, B.Sc., GIT**
Hydrogeologist-in-Training

**Kathryn Lindsay, P.Geo, M.Sc.**
Scientist

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
D. J. LIDDY
2024-03-28

**Deacon Liddy, P.Eng, MBA**
Senior Engineer

**PERMIT TO PRACTICE**
**GHD LIMITED**
RR SIGNATURE:
RR EGBC ID #: 141652
DATE: 2024-03-28
**PERMIT NUMBER: 1002509**
Engineers and Geoscientists British Columbia

# Tables

**Table 1**

**Hydraulic Monitoring Results**
**2023 Operations and Monitoring Report**
**New Landfill**
**Campbell River, British Columbia**

| Monitoring Location | Depth to Bottom (m BGS) | Reference Elevation TOR (m AMSL) | Depth to Water (m BTOR) | | | | Water Elevation (m AMSL) | | | | Screened Unit (Aquifer) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Date | March 28 - 29, 2023 | July 17 - 19, 2023 | September 6 - 8, 2023 | November 28, 2023 | March 28, 2023 | July 17 - 19, 2023 | September 6 - 8, 2023 | November 28, 2023 | Primary Constituent |
| MW1-14 | 11.0 | 172.9 | 8.4 | 8.1 | 8.8 | 9.3 | 164.5 | 164.9 | 164.1 | 163.7 | Sand/gravel (S&G Aquifer) |
| MW2-14 | 21.6 | 173.8 | 17.5 | 17.1 | 17.4 | 18.1 | 156.4 | 156.7 | 156.4 | 155.8 | Sand/gravel (S&G Aquifer) |
| MW2A-16 | 45.4 | 173.9 | 17.4 | 17.1 | 17.4 | 18.0 | 156.5 | 156.8 | 156.5 | 155.8 | Sand (S&G Aquifer) |
| MW3-14 | 18.6 | 168.6 | 13.48 | 15.0 | 15.3 | 16.0 | 155.1 | 153.6 | 153.3 | 152.6 | Sand/gravel (S&G Aquifer) |
| MW4A-15 | 21.3 | 169.3 | -[2] | -[2] | -[2] | -[2] | -[2] | -[2] | -[2] | -[2] | Bedrock (Bedrock) |
| MW4B-15 | 18.3 | 169.3 | -[2] | -[2] | -[2] | -[2] | -[2] | -[2] | -[2] | -[2] | Sand (S&G Aquifer) |
| MW5A-15 | 10.7 | 191.9 | - | 8.8 | 9.0 | 8.4 | - | 183.1 | 182.9 | 183.5 | Bedrock (Bedrock) |
| MW5B-15 | 8.2 | 192.0 | - | 8.5 | 8.8 | 7.1 | - | 183.5 | 183.2 | 185.0 | Sand/Silt with clay (Shallow Aquifer) |
| MW6-17 | 11.3 | *185.4* | 8.1 | 8.7 | 9.2 | 8.5 | 177.3 | 176.6 | 176.2 | 176.9 | Sand (S&G Aquifer) |
| MW7-17 | 4.3 | *187.5* | - | 4.0 | 4.2 | 3.2 | - | 183.5 | 183.3 | 184.3 | Gravel (Shallow Aquifer) |
| MW8-17 | 18.8 | *192.5* | - | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Gravel (S&G Aquifer) |
| MW9-17 | 33.5 | *191.7* | 24.6 | 24.4 | 25.3 | 25.7 | 167.1 | 167.3 | 166.4 | 166.0 | Sand/gravel (S&G Aquifer) |
| MW10-17 | 46.3 | *189.1* | 42.0 | 41.6 | 41.7 | 42.5 | 147.0 | 147.4 | 147.4 | 146.6 | Sand (S&G Aquifer) |
| MW15A-18 | 15.2 | 183.1 | - | 7.2 | 7.9 | 7.5 | - | 175.9 | 175.2 | 175.6 | Bedrock (Bedrock) |
| MW15B-18 | 9.0 | 183.2 | - | 7.9 | 8.6 | 8.4 | - | 175.3 | 174.6 | 174.8 | Silty/Clayey Sand (S&G Aquifer) |
| MW11-19 | 54.9 | 194.8 | 48.1 | 47.8 | 47.9 | 48.6 | 146.7 | - | 146.9 | 146.2 | Sand (S&G Aquifer) |
| MW12-22[3] | 45.1 | - | 40.5 | 40.4 | 40.6 | 41.5 | - | - | - | - | Sand (S&G Aquifer) |
| PZ1-19 | 20.4 | 192.1 | - | 20.2 | 20.2 | 19.7 | - | 172.0 | 171.9 | 172.4 | Sand/Silty Gravel (Shallow Aquifer) |
| McIvor Lake* | N/A | N/A | - | - | - | - | 177.4 | 177.1 | 176.7 | 177.2 | N/A |
| SW15-02 [Rico Lake]** | N/A | 180.3 | 1.9 | 2.9 | -[1] | 3.1 | 178.5 | 177.4 | -[1] | 177.2 | N/A |
| East Surface Water Ditch | N/A | N/A | Dry | -[4] | - | - | Dry | - | - | - | N/A |
| West Surface Water Ditch | N/A | N/A | Dry | -[4] | - | - | Dry | - | - | - | N/A |
| S06-213 | N/A | N/A | N/A[5] | N/A[5] | N/A[5] | N/A[5] | N/A[5] | N/A[5] | N/A[5] | N/A[5] | N/A |
| LDS3 | N/A | N/A | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | N/A |
| LDMP-1 | N/A | N/A | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | N/A |
| LDMP-2 | N/A | N/A | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | N/A |
| LDMP-3 | N/A | N/A | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | N/A |
| LDMP-4 | N/A | N/A | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | N/A |

**Notes:**

| | |
|---|---|
| 191.88 | Surveys completed by McElhanney on April 6, 2016 and March 16 and 31, 2017. |
| *185.4* | Survey completed by Upland Excavating Ltd. on January 29th, 2015, March 8, 2016 and April 6th, 2016. Elevations measured with respect to AMSL. |
| * | McIvor Lake elevations are based on BC Hydro record of water elevations at Ladore Dam recorded every three hours. |
| ** | Surface water gauge reference elevation refers to the bottom of the gauge (0 m on gauge = 180.33 m amsl). |
| m BGS | metres below ground surface. |
| m AMSL | metres above mean sea level (WGS1984). |
| TOR | top of riser. |
| S&G | sand and gravel. |
| N/A | not applicable. |
| MW | monitoring well. |
| LDS | leak detection sump |
| LDMP | leak detection monitoring pipe. |
| - | Not included in the EMP event. |
| 1 | Water level below gauge. |
| 2 | Well was burried during construction activities and is inaccessible. |
| 3 | Will be surveyed in 2024. |
| 4 | East and West Ditch removed from EMP in July 2023 until final cover is placed. |
| 5 | Leachate is pumped and depth to water mesurement is not possible, sample collection is completed via tap from riser pipe. |

**Table 2**

**Leachate Analytical Results**
**2023 Operations and Monitoring Report**
**New Landfill**
**Campbell River, British Columbia**

| Sample Location: | | | S06-21 | | | | |
|---|---|---|---|---|---|---|---|
| Sample ID: | | | WL-11222680-280323-KH-01 | WL-11222680-280323-KH-02 | WL-11222680-180723-KH-01 | WL-11222680-180723-KH-02 | WL-11222680-281123-KH-01 |
| Sample Date: | | BC CSR[1] | 03/28/2023 | 03/28/2023 | 07/18/2023 | 07/18/2023 | 11/28/2023 |
| | | DW | | Duplicate | | Duplicate | |
| **Parameters** | **Units** | **a** | | | | | |
| **Field Parameters** | | | | | | | |
| Conductivity, field | µS/cm | -- | 3730 | 3730 | 4150 | 4150 | 3.35 |
| Dissolved oxygen (DO), field | mg/L | -- | 8.59 | 8.59 | 9.08 | 9.08 | 10.47 |
| Oxidation reduction potential (ORP), field | millivolts | -- | -376 | -376 | -2 | -2 | 60 |
| pH, field | s.u. | -- | 7.67 | 7.67 | 6.32 | 6.32 | 6.53 |
| Temperature, field | Deg C | -- | 16.53 | 16.53 | 24.04 | 24.04 | 9.61 |
| Total dissolved solids, field (TDS) | mg/L | -- | 2100 | 2100 | - | - | - |
| Turbidity, field | NTU | -- | 30.3 | 30.3 | 282 | 282 | 9 |
| **General Chemistry** | | | | | | | |
| Alkalinity (as CaCO3 pH=8.3) | mg/L | -- | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Alkalinity, total (as CaCO3) | mg/L | -- | 840 | 830 | 26 | 30 | 690 |
| Biochemical oxygen demand (BOD) | mg/L | -- | 26 | 27 | 8.4 | 8.3 | 5.2 |
| Chemical oxygen demand (COD) | mg/L | -- | 370 | 392 | 208 | 210 | 311 |
| Chloride (dissolved) | mg/L | 250 | 190 | 190 | 310[a] | 310[a] | 290[a] |
| Conductivity | µS/cm | -- | 3200 | 3200 | 4400 | 4400 | 3600 |
| Fluoride (dissolved) | mg/L | -- | - | - | - | - | 0.19 |
| Hardness | mg/L | -- | - | - | 1290 | 1350 | 934 |
| Hardness (dissolved) | mg/L | -- | 1010 | 1040 | 1530 | 1560 | 1090 |
| Hydroxide (as CaCO3) | mg/L | -- | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Orthophosphate | mg/L | -- | 0.18 | 0.19 | ND (0.0030) | ND (0.0030) | 0.013 |
| pH | s.u. | -- | - | - | 5.82 J | 5.96 J | 7.35 J |
| Sulphate (Dissolved) | mg/L | 500 | 730[a] | 720[a] | 2000[a] | 2000[a] | 720[a] |
| Un-ionized Sulphide as H2S | mg/L | 0.05 | 2.4[a] | ND (0.0050) | 0.29[a] | 0.26[a] | 0.021 |
| Total Sulfide as H2S | mg/L | -- | - | - | 0.37 | 0.34 | 0.027 |
| Total Sulfide as H2S (calculated) | mg/L | -- | 13 | 13 | 0.28 | 0.25 | 0.020 |
| Total Sulfide as S | mg/L | -- | 12 | 12 | 0.35 J- | 0.32 J- | 0.025 |
| Total dissolved solids (TDS) | mg/L | -- | 2300 | 2300 | 3700 | 3600 | 2400 |
| Total suspended solids (TSS) | mg/L | -- | 38 | 59 | 140 J | 180 J | 4.8 |
| **Nutrients** | | | | | | | |
| Ammonia-N | mg/L | -- | 61 | 62 | 55 | 55 | 30 |
| Bicarbonate (as CaCO3) | mg/L | -- | 1000 | 1000 | 31 | 36 | 850 |
| Carbonate (as CaCO3) | mg/L | -- | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Nitrate (as N) | mg/L | 10 | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | 7.37 |
| Nitrite (as N) | mg/L | 1 | ND (0.0050) | 0.0053 | ND (0.0050) | ND (0.0050) | 0.0414 |
| Nitrite/Nitrate | mg/L | 10 | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | 7.41 |
| **Dissolved Metals** | | | | | | | |
| Calcium (dissolved) | µg/L | -- | 339000 | 354000 | 486000 | 500000 | 348000 |
| Magnesium (dissolved) | µg/L | -- | 38500 | 38500 | 76700 | 76900 | 54800 |
| **Total Metals** | | | | | | | |
| Aluminum | µg/L | 9500 | 488 | 482 | 1250 | 1170 | 313 |
| Antimony | µg/L | 6 | ND (5.0) | ND (5.0) | ND (2.5) | ND (2.5) | 3.21 |
| Arsenic | µg/L | 10 | 19.3[a] | 19.1[a] | 3.06 | 3.18 | 4.86 |
| Barium | µg/L | 1000 | 124 | 120 | 59.8 | 62.0 | 116 |
| Beryllium | µg/L | 8 | ND (1.0) | ND (1.0) | ND (0.50) | ND (0.50) | ND (0.10) |
| Bismuth | µg/L | -- | ND (10) | ND (10) | ND (5.0) | ND (5.0) | ND (1.0) |
| Boron | µg/L | 5000 | 12200[a] | 11600[a] | 1240 | 1280 | 11500[a] |
| Cadmium | µg/L | 5 | ND (0.10) | ND (0.10) | 0.282 | 0.297 | 0.111 |
| Calcium | µg/L | -- | 366000 | 357000 | 409000 | 426000 | 295000 |
| Chromium | µg/L | 50 | 19 | 20 | 10.4 | 10.2 | 7.8 |
| Cobalt | µg/L | 1 | 2.9[a] | 2.6[a] | 13.9[a] | 14.5[a] | 4.38[a] |
| Copper | µg/L | 1500 | 7.5 | 7.2 | 32.0 | 31.7 | 66.0 |
| Iron | µg/L | 6500 | 2290 | 2160 | 26300[a] | 26500[a] | 1970 |
| Lead | µg/L | 10 | ND (2.0) | ND (2.0) | ND (1.0) | ND (1.0) | 0.29 |
| Lithium | µg/L | 8 | ND (20)[a] | ND (20)[a] | 11[a] | 12[a] | 5.0 |
| Magnesium | µg/L | -- | 41900 | 41100 | 66600 | 69400 | 47700 |
| Manganese | µg/L | 1500 | 957 | 923 | 4600[a] | 4790[a] | 1530[a] |
| Mercury | µg/L | 1 | ND (0.038) | ND (0.038) | 0.0041 | 0.0041 | ND (0.0019) |
| Molybdenum | µg/L | 250 | ND (10) | ND (10) | ND (5.0) | ND (5.0) | 7.7 |
| Nickel | µg/L | 80 | 18 | 27 | 20.3 | 18.8 | 11.5 |
| Phosphorus | µg/L | -- | 572 | 558 | 123 | 106 | 164 |
| Potassium | µg/L | -- | 50000 | 48900 | 48200 | 51000 | 39200 |
| Selenium | µg/L | 10 | ND (1.0) | ND (1.0) | ND (0.50) | ND (0.50) | 0.50 |
| Silicon | µg/L | -- | 15000 | 14600 | 18400 | 19100 | 14500 |
| Silver | µg/L | 20 | ND (0.20) | ND (0.20) | ND (0.10) | ND (0.10) | ND (0.020) |
| Sodium | µg/L | 200000 | 240000[a] | 235000[a] | 304000[a] | 319000[a] | 276000[a] |
| Strontium | µg/L | 2500 | 2370 | 2300 | 2720[a] | 2890[a] | 1890 |
| Sulphur | µg/L | -- | 248000 | 241000 | 593000 | 648000 | 235000 |
| Thallium | µg/L | -- | ND (0.10) | ND (0.10) | ND (0.050) | ND (0.050) | ND (0.010) |
| Tin | µg/L | 2500 | ND (50) | ND (50) | ND (25) | ND (25) | ND (5.0) |
| Titanium | µg/L | -- | ND (50) | ND (50) | 34 | 26 | 16.7 |
| Uranium | µg/L | 20 | ND (1.0) | ND (1.0) | ND (0.50) | ND (0.50) | 1.72 |
| Vanadium | µg/L | 20 | ND (50)[a] | ND (50)[a] | ND (25)[a] | ND (25)[a] | 6.0 |
| Zinc | µg/L | 3000 | 51 | ND (50) | 131 | 132 | 67.0 |
| Zirconium | µg/L | -- | 1.5 | 1.4 | 0.56 | 0.55 | 1.55 |
| **PHCs** | | | | | | | |
| Extractable Petroleum Hydrocarbons (C10-C19) | µg/L | 5000 | 420 | 430 | ND (200) | ND (200) | 210 |
| Extractable Petroleum Hydrocarbons (C19-C32) | µg/L | -- | 230 | 220 | ND (200) | ND (200) | ND (200) |
| HEPH (C19-C32 less PAH) | µg/L | -- | 230 | 220 | ND (200) | ND (200) | ND (200) |
| LEPH (C10-C19 less PAH) | µg/L | -- | 420 | 430 | ND (200) | ND (200) | 210 |
| Total Petroleum Hydrocarbons VPH (C6-C10)LessBTEX | µg/L | -- | - | - | - | - | ND (300) |
| Total Petroleum Hydrocarbons VH (C6-C10) | µg/L | 15000 | - | - | - | - | ND (300) |
| **VOCs** | | | | | | | |
| Benzene | µg/L | 5 | - | - | - | - | ND (0.40) |
| Ethylbenzene | µg/L | 140 | - | - | - | - | ND (0.40) |
| m&p-Xylenes | µg/L | -- | - | - | - | - | 0.63 |
| Methyl tert butyl ether (MTBE) | µg/L | 95 | - | - | - | - | ND (4.0) |
| o-Xylene | µg/L | -- | - | - | - | - | 0.65 |
| Styrene | µg/L | 800 | - | - | - | - | ND (0.40) |
| Toluene | µg/L | 60 | - | - | - | - | ND (0.40) |
| Xylenes (total) | µg/L | 90 | - | - | - | - | 1.3 |
| **PAHs** | | | | | | | |
| 1-Methylnaphthalene | µg/L | 5.5 | 0.19 | 0.19 | - | - | - |
| 2-Methylnaphthalene | µg/L | 15 | 0.27 | 0.28 | - | - | - |
| Acenaphthene | µg/L | 250 | 0.23 | 0.23 | 0.094 | 0.094 | 0.48 |
| Acenaphthylene | µg/L | -- | ND (0.050) | ND (0.050) | - | - | - |
| Acridine | µg/L | -- | 0.093 | 0.096 | ND (0.050) | ND (0.050) | 0.078 |
| Anthracene | µg/L | 1000 | 0.025 | 0.026 | 0.018 | 0.019 | 0.098 |
| Benzo(a)anthracene | µg/L | 0.07 | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | 0.031 |
| Benzo(a)pyrene | µg/L | 0.01 | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) |
| Benzo(b)fluoranthene/Benzo(j)fluoranthene | µg/L | 0.07 | ND (0.030) | ND (0.030) | - | - | - |
| Benzo(b)pyridine (Quinoline) | µg/L | 0.05 | ND (0.037) | ND (0.039) | - | - | - |
| Benzo(g,h,i)perylene | µg/L | -- | ND (0.050) | ND (0.050) | - | - | - |
| Benzo(k)fluoranthene | µg/L | -- | ND (0.050) | ND (0.050) | - | - | - |
| Chrysene | µg/L | 7 | ND (0.020) | ND (0.020) | - | - | - |
| Dibenz(a,h)anthracene | µg/L | 0.01 | ND (0.0030) | ND (0.0030) | - | - | - |
| Fluoranthene | µg/L | 150 | 0.034 | 0.035 | 0.021 | ND (0.020) | 0.25 |
| Fluorene | µg/L | 150 | 0.10 | 0.11 | ND (0.050) | ND (0.050) | 0.37 |
| Indeno(1,2,3-cd)pyrene | µg/L | -- | ND (0.050) | ND (0.050) | - | - | - |
| Naphthalene | µg/L | 80 | 3.0 | 3.1 | 0.78 | 0.82 | 1.6 |
| PAH high molecular weight | µg/L | -- | 0.064 | 0.066 | - | - | - |
| PAH low molecular weight | µg/L | -- | 4.0 | 4.2 | - | - | - |
| Phenanthrene | µg/L | -- | 0.10 | 0.10 | ND (0.050) | ND (0.050) | 0.47 |
| Pyrene | µg/L | 100 | 0.030 | 0.031 | ND (0.020) | ND (0.020) | 0.26 |
| Total PAH | µg/L | -- | 4.0 | 4.2 | - | - | - |
| **Phenols** | | | | | | | |
| 2,3,4,5-Tetrachlorophenol | µg/L | -- | - | - | - | - | ND (0.10) |
| 2,3,4,6-Tetrachlorophenol | µg/L | 100 | - | - | - | - | ND (0.10) |
| 2,3,4-Trichlorophenol | µg/L | -- | - | - | - | - | ND (0.10) |
| 2,3,5,6-Tetrachlorophenol | µg/L | -- | - | - | - | - | ND (0.10) |
| 2,3,5-Trichlorophenol | µg/L | -- | - | - | - | - | ND (0.10) |
| 2,3,6-Trichlorophenol | µg/L | -- | - | - | - | - | ND (0.10) |
| 2,3-Dichlorophenol | µg/L | -- | - | - | - | - | ND (0.10) |
| 2,4,5-Trichlorophenol | µg/L | 400 | - | - | - | - | ND (0.10) |
| 2,4,6-Trichlorophenol | µg/L | 5 | - | - | - | - | 0.16 |
| 2,4/2,5-Dichlorophenol | µg/L | -- | - | - | - | - | ND (0.10) |
| 2,4-Dimethylphenol | µg/L | 80 | - | - | - | - | ND (0.50) |
| 2,4-Dinitrophenol | µg/L | 8 | - | - | - | - | ND (0.50) |
| 2,6-Dichlorophenol | µg/L | -- | - | - | - | - | ND (0.10) |
| 2,6-Dimethylphenol | µg/L | 2.5 | - | - | - | - | ND (0.50) |
| 2-Chlorophenol | µg/L | 45 | - | - | - | - | ND (0.080) |
| 2-Methylphenol | µg/L | 200 | - | - | - | - | ND (0.50) |
| 2-Nitrophenol | µg/L | -- | - | - | - | - | ND (0.50) |
| 3&4-Methylphenol | µg/L | -- | - | - | - | - | ND (0.50) |
| 3,4,5-Trichlorophenol | µg/L | -- | - | - | - | - | ND (0.10) |
| 3,4-Dichlorophenol | µg/L | -- | - | - | - | - | ND (0.10) |
| 3,4-Dimethylphenol | µg/L | 4 | - | - | - | - | ND (0.50) |
| 3,5-Dichlorophenol | µg/L | -- | - | - | - | - | ND (0.10) |
| 3/4-Chlorophenol | µg/L | -- | - | - | - | - | ND (0.080) |
| 4,6-Dinitro-2-methylphenol | µg/L | 1 | - | - | - | - | ND (0.50) |
| 4-Chloro-3-methylphenol | µg/L | 400 | - | - | - | - | ND (1.0) |
| 4-Nitrophenol | µg/L | -- | - | - | - | - | ND (0.50) |
| Catechol | µg/L | -- | - | - | - | - | ND (10) |
| Chlorophenols | µg/L | -- | - | - | - | - | ND (0.080) |
| Chlorophenols (total) | µg/L | -- | - | - | - | - | 0.52 |
| Dichlorophenols | µg/L | -- | - | - | - | - | ND (0.10) |
| Hydroquinone | µg/L | 2.5 | - | - | - | - | ND (1.0) |
| Pentachlorophenol | µg/L | 60 | - | - | - | - | 0.37 |
| Phenol | µg/L | 1000 | - | - | - | - | ND (0.50) |
| Phenolics (total) | µg/L | -- | - | - | - | - | ND (10) |
| Resorcinol | µg/L | 4500 | - | - | - | - | ND (10) |
| Tetrachlorophenol | µg/L | -- | - | - | - | - | ND (0.10) |
| Total unchlorinated phenols-OC | µg/L | -- | - | - | - | - | ND (10) |
| Trichlorophenol (DOT) | µg/L | -- | - | - | - | - | 0.16 |

**Table 3**

**Groundwater Analytical Results**
**2023 Operations and Monitoring Report**
**New Landfill**
**Campbell River, British Columbia**

| Sample Location: | | | MW1-14 | | | | MW2-14 | | | | | MW2A-16 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | WG-11222680-280323-KH-03 | WG-11222680-180723-KH-06 | WG-11222680-070923-CXW-07 | WG-11222680-271123-KH-05 | WG-11222680-280323-KH-02 | WG-11222680-180723-KH-07 | WG-11222680-070923-CXW-05 | WG-11222680-070923-CXW-06 | WG-11222680-281123-KH-07 | WG-11222680-280323-KH-01 | WG-11222680-180723-KH-08 | WG-11222680-070923-CXW-04 | WG-11222680-281123-KH-08 |
| Sample Date: | | BC CSR[1] DW | 03/28/2023 | 07/18/2023 | 09/07/2023 | 11/27/2023 | 03/28/2023 | 07/18/2023 | 09/07/2023 | 09/07/2023 Duplicate | 11/28/2023 | 03/28/2023 | 07/18/2023 | 09/07/2023 | 11/28/2023 |
| **Parameters** | **Units** | **a** | | | | | | | | | | | | | |
| **Field Parameters** | | | | | | | | | | | | | | | |
| Conductivity, field | µS/cm | -- | 199 | 132 | 86 | 102 | 110 | 191 | 165 | 165 | 164 | 62 | 66 | 83 | 78 |
| Dissolved oxygen (DO), field | mg/L | -- | 8.96 | 10.30 | 10.67 | 9.77 | - | 11.94 | 7.92 | 7.92 | 11.37 | - | 10.12 | 3.50 | 10.82 |
| Oxidation reduction potential (ORP), field | millivolts | -- | 105 | 148 | 103 | 284 | 382 | 195 | 105 | 105 | 219 | 318 | 118 | 150 | 201 |
| pH, field | s.u. | -- | 7.58 | 7.65 | 7.32 | 7.54 | 6.80 | 6.99 | 6.74 | 6.74 | 7.73 | 7.65 | 8.59 | 8.20 | 8.38 |
| Temperature, field | Deg C | -- | 13.87 | 16.90 | 12.36 | 13.12 | 9.9 | 14.96 | 11.84 | 11.84 | 10.55 | 12.12 | 15.95 | 10.56 | 10.97 |
| Total dissolved solids, field (TDS) | mg/L | -- | 129 | - | 56 | - | 70 | - | 107 | 107 | - | 40 | - | 54 | - |
| Turbidity, field | NTU | -- | 24 | 9.1 | 4.4 | 37.1 | 2.8 | 8.5 | 4.1 | 4.1 | 1.2 | 3.5 | 4.3 | 5.0 | 2.0 |
| **General Chemistry** | | | | | | | | | | | | | | | |
| Alkalinity (as CaCO3 pH=8.3) | mg/L | -- | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Alkalinity, total (as CaCO3) | mg/L | -- | 52 | 41 | 35 | 41 | 50 | 77 | 67 | 67 | 72 | 34 | 32 | 39 | 36 |
| Chloride (dissolved) | mg/L | 250 | 14 | 12 | 3.3 | 3.3 | 3.3 | 6.3 | 4.5 | 4.7 | 4.1 | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Conductivity | µS/cm | -- | 170 | 130 | 88 | 100 | 130 | 200 | 170 | 170 | 180 | 74 | 73 | 87 | 84 |
| Fluoride (dissolved) | mg/L | -- | - | - | - | - | - | - | - | - | ND (0.050) | - | - | - | ND (0.050) |
| Hardness (dissolved) | mg/L | -- | 78.4 | 30.7 | 33.2 | 41.7 | 55.2 | 85.9 | 69.2 | 68.8 | 78.1 | 33.8 | 32.5 | 36.2 | 37.4 |
| Hydroxide (as CaCO3) | mg/L | -- | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Orthophosphate | mg/L | -- | 0.0057 | 0.0040 J | 0.0047 | 0.0042 | 0.0051 | 0.0035 | 0.0033 | ND (0.0030) | ND (0.0030) | 0.030 | 0.026 | 0.021 | 0.022 |
| pH | s.u. | -- | - | 7.15 J | - | - | - | 7.54 J | - | - | 7.32 J | - | 7.61 J | - | 7.25 J |
| Sulfate (dissolved) | mg/L | 500 | 2.8 | 3.1 | 3.0 | 2.9 | 7.0 | 8.4 | 7.3 | 7.4 | 7.1 | 2.4 | 2.7 | 2.8 | 2.6 |
| Un-ionized Sulphide as H2S | mg/L | 0.05 | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) |
| Total Sulfide as H2S | mg/L | -- | ND (0.0020) | ND (0.0020) | ND (0.0020) | ND (0.0020) | ND (0.0020) | ND (0.0020) | ND (0.0020) | ND (0.0020) | ND (0.0020) | ND (0.0020) | ND (0.0020) | ND (0.0020) | ND (0.0020) |
| Total Sulfide as H2S (calculated) | mg/L | -- | - | ND (0.0050) | ND (0.0050) | ND (0.0050) | - | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | - | ND (0.0050) | ND (0.0050) | ND (0.0050) |
| Total Sulfide as S | mg/L | -- | ND (0.0018) | ND (0.0018) J | ND (0.0018) | ND (0.0018) | ND (0.0018) | ND (0.0018) J | ND (0.0018) | ND (0.0018) | ND (0.0018) | ND (0.0018) | ND (0.0018) J | ND (0.0018) | ND (0.0018) |
| Total dissolved solids (TDS) | mg/L | -- | 94 | 54 | 54 | 78 | 92 | 120 | 96 | 100 | 88 | 64 | 56 | 60 | 44 |
| **Nutrients** | | | | | | | | | | | | | | | |
| Ammonia-N | mg/L | -- | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) |
| Bicarbonate (as CaCO3) | mg/L | -- | 63 | 50 | 43 | 50 | 62 | 94 | 81 | 82 | 87 | 41 | 40 | 48 | 44 |
| Carbonate (as CaCO3) | mg/L | -- | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Nitrate (as N) | mg/L | 10 | 1.68 | 0.190 J | 0.127 | 0.416 | 0.245 | 0.720 | 0.325 | 0.326 | 0.237 | 0.037 | 0.082 | 0.062 | 0.043 |
| Nitrite (as N) | mg/L | 1 | 0.0171 | 0.0055 J | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) |
| Nitrite/Nitrate | mg/L | 10 | 1.70 | 0.195 J | 0.127 | 0.416 | 0.245 | 0.720 | 0.325 | 0.326 | 0.237 | 0.037 | 0.082 | 0.062 | 0.043 |
| **Dissolved Metals** | | | | | | | | | | | | | | | |
| Aluminum (dissolved) | µg/L | 9500 | ND (3.0) | 3.6 | ND (3.0) | ND (3.0) | ND (3.0) | 41.3 | ND (3.0) | ND (3.0) | ND (3.0) | 9.2 | 4.1 | ND (3.0) | 3.9 |
| Antimony (dissolved) | µg/L | 6 | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) |
| Arsenic (dissolved) | µg/L | 10 | ND (0.10) | ND (0.10) | ND (0.10) | 0.13 | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | 0.96 | 0.83 | 0.72 | 0.85 |
| Barium (dissolved) | µg/L | 1000 | 1.5 | ND (1.0) | ND (1.0) | 1.2 | 1.4 | 2.4 | 2.0 | 1.9 | 2.2 | 2.0 | 1.8 | 2.0 | 1.9 |
| Beryllium (dissolved) | µg/L | 8 | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) |
| Bismuth (dissolved) | µg/L | -- | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Boron (dissolved) | µg/L | 5000 | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) |
| Cadmium (dissolved) | µg/L | 5 | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) |
| Calcium (dissolved) | µg/L | -- | 26100 | 10100 | 11000 | 13800 | 17300 | 26900 | 21900 | 21500 | 24700 | 11000 | 10500 | 11800 | 12100 |
| Chromium (dissolved) | µg/L | 50 | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Cobalt (dissolved) | µg/L | 1 | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) |
| Copper (dissolved) | µg/L | 1500 | ND (0.20) | ND (0.20) | ND (0.20) | 1.30 | 0.26 | 0.37 | ND (0.20) | ND (0.20) | 0.26 | 0.26 | ND (0.20) | ND (0.20) | ND (0.20) |
| Iron (dissolved) | µg/L | 6500 | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | 10.7 | ND (5.0) | ND (5.0) | ND (5.0) |
| Lead (dissolved) | µg/L | 10 | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) |
| Lithium (dissolved) | µg/L | 8 | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) |
| Magnesium (dissolved) | µg/L | -- | 3230 | 1350 | 1360 | 1740 | 2910 | 4540 | 3540 | 3650 | 4000 | 1500 | 1550 | 1650 | 1730 |
| Manganese (dissolved) | µg/L | 1500 | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Mercury (dissolved) | µg/L | 1 | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) |
| Molybdenum (dissolved) | µg/L | 250 | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Nickel (dissolved) | µg/L | 80 | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Phosphorus (dissolved) | µg/L | -- | 11 | ND (10) | ND (10) | ND (10) | ND (10) | ND (10) | ND (10) | ND (10) | ND (10) | 34 | 29 | 25 | 29 |
| Potassium (dissolved) | µg/L | -- | 264 | 139 | 124 | 176 | 201 | 271 | 225 | 238 | 254 | 177 | 174 | 165 | 178 |
| Selenium (dissolved) | µg/L | 10 | 0.14 | ND (0.10) | ND (0.10) | 0.12 | 0.18 | 0.14 | 0.14 | 0.11 | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) |
| Silicon (dissolved) | µg/L | -- | 5860 | 3810 | 3430 | 4990 | 5590 | 6480 | 5960 | 5750 | 6950 | 4210 | 3880 | 3380 | 4250 |
| Silver (dissolved) | µg/L | 20 | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) |
| Sodium (dissolved) | µg/L | 200000 | 4670 | 2070 | 1210 | 1860 | 3160 | 4010 | 3570 | 3610 | 3840 | 1020 | 990 | 932 | 1050 |
| Strontium (dissolved) | µg/L | 2500 | 41.9 | 16.1 | 16.1 | 21.0 | 28.0 | 44.5 | 36.9 | 37.3 | 40.2 | 13.7 | 13.2 | 15.5 | 15.2 |
| Sulfur (dissolved) | µg/L | -- | ND (3000) | ND (3000) | ND (3000) | ND (3000) | ND (3000) | 3000 | ND (3000) | ND (3000) | ND (3000) | ND (3000) | ND (3000) | ND (3000) | ND (3000) |
| Thallium (dissolved) | µg/L | -- | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) |
| Tin (dissolved) | µg/L | 2500 | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) |
| Titanium (dissolved) | µg/L | -- | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) |
| Uranium (dissolved) | µg/L | 20 | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) |
| Vanadium (dissolved) | µg/L | 20 | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | 7.5 | 6.8 | 5.9 | 7.2 |
| Zinc (dissolved) | µg/L | 3000 | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) |
| Zirconium (dissolved) | µg/L | -- | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) |
| **PHCs** | | | | | | | | | | | | | | | |
| EPHw10-19 | µg/L | 5000 | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) |
| EPHw19-32 | µg/L | -- | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) |
| HEPHw | µg/L | -- | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) |
| LEPHw | µg/L | -- | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) |
| **PAHs** | | | | | | | | | | | | | | | |
| 1-Methylnaphthalene | µg/L | 5.5 | ND (0.050) | - | ND (0.050) | ND (0.050) | ND (0.050) | - | ND (0.050) | ND (0.050) | - | ND (0.050) | - | ND (0.050) | - |
| 2-Methylnaphthalene | µg/L | 15 | ND (0.10) | - | ND (0.10) | ND (0.10) | ND (0.10) | - | ND (0.10) | ND (0.10) | - | ND (0.10) | - | ND (0.10) | - |
| Acenaphthene | µg/L | 250 | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) |
| Acenaphthylene | µg/L | -- | ND (0.050) | - | ND (0.050) | ND (0.050) | ND (0.050) | - | ND (0.050) | ND (0.050) | - | ND (0.050) | - | ND (0.050) | - |
| Acridine | µg/L | -- | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) |
| Anthracene | µg/L | 1000 | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) |
| Benzo(a)anthracene | µg/L | 0.07 | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) |
| Benzo(a)pyrene | µg/L | 0.01 | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) |
| Benzo(b)fluoranthene/Benzo(j)fluoranthene | µg/L | 0.07 | ND (0.030) | - | ND (0.030) | ND (0.030) | ND (0.030) | - | ND (0.030) | ND (0.030) | - | ND (0.030) | - | ND (0.030) | - |
| Benzo(b)pyridine (Quinoline) | µg/L | 0.05 | ND (0.020) | - | ND (0.020) | ND (0.020) | ND (0.020) | - | ND (0.020) | ND (0.020) | - | ND (0.020) | - | ND (0.020) | - |
| Benzo(g,h,i)perylene | µg/L | -- | ND (0.050) | - | ND (0.050) | ND (0.050) | ND (0.050) | - | ND (0.050) | ND (0.050) | - | ND (0.050) | - | ND (0.050) | - |
| Benzo(k)fluoranthene | µg/L | -- | ND (0.050) | - | ND (0.050) | ND (0.050) | ND (0.050) | - | ND (0.050) | ND (0.050) | - | ND (0.050) | - | ND (0.050) | - |
| Chrysene | µg/L | 7 | ND (0.020) | - | ND (0.020) | ND (0.020) | ND (0.020) | - | ND (0.020) | ND (0.020) | - | ND (0.020) | - | ND (0.020) | - |
| Dibenz(a,h)anthracene | µg/L | 0.01 | ND (0.0030) | - | ND (0.0030) | ND (0.0030) | ND (0.0030) | - | ND (0.0030) | ND (0.0030) | - | ND (0.0030) | - | ND (0.0030) | - |
| Fluoranthene | µg/L | 150 | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) |
| Fluorene | µg/L | 150 | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) |
| Indeno(1,2,3-cd)pyrene | µg/L | -- | ND (0.050) | - | ND (0.050) | ND (0.050) | ND (0.050) | - | ND (0.050) | ND (0.050) | - | ND (0.050) | - | ND (0.050) | - |
| Naphthalene | µg/L | 80 | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) |
| PAH high molecular weight | µg/L | -- | ND (0.050) | - | ND (0.050) | ND (0.050) | ND (0.050) | - | ND (0.050) | ND (0.050) | - | ND (0.050) | - | ND (0.050) | - |
| PAH low molecular weight | µg/L | -- | ND (0.10) | - | ND (0.10) | ND (0.10) | ND (0.10) | - | ND (0.10) | ND (0.10) | - | ND (0.10) | - | ND (0.10) | - |
| Phenanthrene | µg/L | -- | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) |
| Pyrene | µg/L | 100 | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) |
| Total PAH | µg/L | -- | ND (0.10) | - | ND (0.10) | ND (0.10) | ND (0.10) | - | ND (0.10) | ND (0.10) | - | ND (0.10) | - | ND (0.10) | - |

**Table 3**

**Groundwater Analytical Results**
**2023 Operations and Monitoring Report**
**New Landfill**
**Campbell River, British Columbia**

| Sample Location: | | | MW3-14 | | | MW6-17 | | | | MW9-17 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | WG-11222680-180723-KH-09 | WG-11222680-070923-CXW-03 | WG-11222680-291123-KH-10 | WG-11222680-290323-KH-10 | WG-11222680-180723-KH-10 | WG-11222680-070923-CXW-08 | WG-11222680-281123-KH-09 | WG-11222680-280323-KH-04 | WG-11222680-170723-KH-03 | WG-11222680-170723-KH-04 | WG-11222680-070923-CXW-10 | WG-11222680-271123-KH-01 |
| Sample Date: | | BC CSR[1] DW | 07/18/2023 | 09/07/2023 | 11/29/2023 | 03/29/2023 | 07/19/2023 | 09/07/2023 | 11/28/2023 | 03/28/2023 | 07/17/2023 | 07/17/2023 Duplicate | 09/07/2023 | 11/27/2023 |
| **Parameters** | **Units** | **a** | | | | | | | | | | | | |
| **Field Parameters** | | | | | | | | | | | | | | |
| Conductivity, field | µS/cm | -- | 117 | 131 | 135 | 432 | 484 | 428 | 420 | 45 | 57 | 57 | 74 | 70 |
| Dissolved oxygen (DO), field | mg/L | -- | 12.09 | 8.14 | 7.26 | - | 3.33 | 1.56 | 11.53 | 10.82 | 12.4 | 12.4 | 4.46 | 9.13 |
| Oxidation reduction potential (ORP), field | millivolts | -- | 160 | 258 | 249 | 171 | 152 | 129 | 210 | 150 | 189 | 189 | 94 | 252 |
| pH, field | s.u. | -- | 7.37 | 6.61 | 6.50 | 7.09 | 6.99 | 6.74 | 7.19 | 7.51 | 7.84 | 7.84 | 7.73 | 7.63 |
| Temperature, field | Deg C | -- | 15.26 | 11.02 | 9.54 | 10.58 | 14.59 | 18.24 | 9.64 | 7.41 | 19.42 | 19.42 | 12.35 | 17.08 |
| Total dissolved solids, field (TDS) | mg/L | -- | - | 85 | - | 2810 | - | 279 | - | 29 | - | - | 48 | - |
| Turbidity, field | NTU | -- | 3.1 | 4.5 | 1.5 | 800 | 300 | 122 | 37.8 | 3.3 | 3.0 | 3.0 | 0.1 | 3.9 |
| **General Chemistry** | | | | | | | | | | | | | | |
| Alkalinity (as CaCO3 pH=8.3) | mg/L | -- | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Alkalinity, total (as CaCO3) | mg/L | -- | 44 | 45 | 43 | 120 | 94 | 78 | 78 | 23 | 25 | 26 | 34 | 29 |
| Chloride (dissolved) | mg/L | 250 | 1.9 | 2.2 | 2.6 | 84 | 86 | 85 | 85 | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Conductivity | µS/cm | -- | 130 | 140 | 130 | 530 | 500 | 450 | 490 | 53 | 60 | 60 | 76 | 68 |
| Fluoride (dissolved) | mg/L | -- | - | - | ND (0.050) | - | - | - | ND (0.050) | - | - | - | - | - |
| Hardness (dissolved) | mg/L | -- | 49.2 | 47.7 | 44.7 | 175 | 155 | 134 | 145 | 24.6 | 26.4 | 26.0 | 32.0 | 32.0 |
| Hydroxide (as CaCO3) | mg/L | -- | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Orthophosphate | mg/L | -- | 0.0047 | 0.0048 | 0.0039 | 0.0069 | 0.0075 | 0.0045 | 0.0052 | 0.0037 | ND (0.0030) | ND (0.0030) | 0.0055 | ND (0.0030) |
| pH | s.u. | -- | 7.14 J | - | 6.91 J | - | 7.49 J | - | 7.12 J | - | - | - | - | - |
| Sulfate (dissolved) | mg/L | 500 | 8.6 | 8.4 | 6.7 | 5.1 | 6.4 | 5.8 | 5.3 | 2.4 | 2.2 | 2.2 | 2.9 | 2.9 |
| Un-ionized Sulphide as H2S | mg/L | 0.05 | ND (0.0050) | ND (0.0050) | ND (0.0050) | 0.018 | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) |
| Total Sulfide as H2S | mg/L | -- | ND (0.0020) | ND (0.0020) | ND (0.0020) | 0.034 | ND (0.0020) | ND (0.0020) | ND (0.0020) | ND (0.0020) | ND (0.0020) | ND (0.0020) | ND (0.0020) | ND (0.0020) |
| Total Sulfide as H2S (calculated) | mg/L | -- | ND (0.0050) | ND (0.0050) | ND (0.0050) | 0.017 | ND (0.0050) | ND (0.0050) | ND (0.0050) | - | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) |
| Total Sulfide as S | mg/L | -- | ND (0.0018) J | ND (0.0018) | ND (0.0018) | 0.032 | ND (0.0018) J | ND (0.0018) | ND (0.0018) | ND (0.0018) | ND (0.0018) | ND (0.0018) | ND (0.0018) | ND (0.0018) |
| Total dissolved solids (TDS) | mg/L | -- | 100 | 84 | 80 | 340 | 370 | 300 | 280 | 46 | 42 | 46 | 36 | 56 |
| **Nutrients** | | | | | | | | | | | | | | |
| Ammonia-N | mg/L | -- | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | 0.020 | ND (0.015) | ND (0.015) |
| Bicarbonate (as CaCO3) | mg/L | -- | 54 | 55 | 53 | 150 | 110 | 95 | 96 | 28 | 31 | 32 | 42 | 36 |
| Carbonate (as CaCO3) | mg/L | -- | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Nitrate (as N) | mg/L | 10 | 2.66 | 2.33 | 1.52 | 0.680 | 0.901 | 0.740 | 0.610 | 0.027 | 0.046 | 0.045 | 0.079 | 0.044 |
| Nitrite (as N) | mg/L | 1 | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) |
| Nitrite/Nitrate | mg/L | 10 | 2.66 | 2.33 | 1.52 | 0.680 | 0.901 | 0.740 | 0.610 | 0.027 | 0.046 | 0.045 | 0.079 | 0.044 |
| **Dissolved Metals** | | | | | | | | | | | | | | |
| Aluminum (dissolved) | µg/L | 9500 | ND (3.0) | ND (3.0) | ND (3.0) | 13.4 | 6.9 | ND (3.0) | ND (3.0) | ND (3.0) | 8.8 J | ND (3.0) J | ND (3.0) | ND (3.0) |
| Antimony (dissolved) | µg/L | 6 | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) |
| Arsenic (dissolved) | µg/L | 10 | ND (0.10) | ND (0.10) | ND (0.10) | 0.25 | 0.20 | 0.12 | 0.14 | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) |
| Barium (dissolved) | µg/L | 1000 | 1.1 | 1.1 | ND (1.0) | 18.1 | 18.0 | 11.4 | 13.2 | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | 1.3 |
| Beryllium (dissolved) | µg/L | 8 | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) |
| Bismuth (dissolved) | µg/L | -- | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Boron (dissolved) | µg/L | 5000 | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) |
| Cadmium (dissolved) | µg/L | 5 | ND (0.010) | ND (0.010) | ND (0.010) | 0.077 J- | 0.015 | 0.011 | 0.012 | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) |
| Calcium (dissolved) | µg/L | -- | 14200 | 13800 | 12800 | 46300 | 39300 | 33800 | 35700 | 8300 | 8750 | 8640 | 10800 | 10700 |
| Chromium (dissolved) | µg/L | 50 | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Cobalt (dissolved) | µg/L | 1 | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) |
| Copper (dissolved) | µg/L | 1500 | 0.23 | ND (0.20) | ND (0.20) | 0.66 | 0.35 | ND (0.20) | 0.45 | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) |
| Iron (dissolved) | µg/L | 6500 | 7.5 | ND (5.0) | ND (5.0) | ND (16.5) | 7.3 | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) |
| Lead (dissolved) | µg/L | 10 | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) |
| Lithium (dissolved) | µg/L | 8 | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) |
| Magnesium (dissolved) | µg/L | -- | 3370 | 3230 | 3070 | 14400 | 13900 | 12200 | 13500 | 940 | 1110 | 1070 | 1240 | 1300 |
| Manganese (dissolved) | µg/L | 1500 | ND (1.0) | ND (1.0) | ND (1.0) | 28.1 | 19.0 | 13.8 | 15.7 | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Mercury (dissolved) | µg/L | 1 | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) |
| Molybdenum (dissolved) | µg/L | 250 | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Nickel (dissolved) | µg/L | 80 | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Phosphorus (dissolved) | µg/L | -- | ND (10) | ND (10) | ND (10) | 23 | 23 | ND (10) | ND (10) | ND (10) | ND (10) | ND (10) | ND (10) | ND (10) |
| Potassium (dissolved) | µg/L | -- | 223 | 190 | 175 | 1050 | 1190 | 976 | 1040 | 112 | 115 | 111 | 135 | 208 |
| Selenium (dissolved) | µg/L | 10 | 0.17 | 0.23 | 0.13 | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) |
| Silicon (dissolved) | µg/L | -- | 7370 | 6650 | 7420 | 13600 | 12800 | 13300 | 14500 | 2610 | 2570 | 2580 | 2930 | 4550 |
| Silver (dissolved) | µg/L | 20 | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) |
| Sodium (dissolved) | µg/L | 200000 | 5910 | 6270 | 6770 | 26300 | 26500 | 22900 | 26900 | 653 | 688 | 698 | 765 | 1100 |
| Strontium (dissolved) | µg/L | 2500 | 29.0 | 29.5 | 24.8 | 107 | 102 | 96.6 | 98.7 | 10.6 | 11.5 | 11.5 | 14.8 | 15.5 |
| Sulfur (dissolved) | µg/L | -- | ND (3000) | ND (3000) | ND (3000) | ND (3000) | ND (3000) | ND (3000) | ND (3000) | ND (3000) | ND (3000) | ND (3000) | ND (3000) | ND (3000) |
| Thallium (dissolved) | µg/L | -- | ND (0.010) | ND (0.010) | ND (0.010) | 0.018 | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) |
| Tin (dissolved) | µg/L | 2500 | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) |
| Titanium (dissolved) | µg/L | -- | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) |
| Uranium (dissolved) | µg/L | 20 | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) |
| Vanadium (dissolved) | µg/L | 20 | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) |
| Zinc (dissolved) | µg/L | 3000 | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | 8.0 | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) |
| Zirconium (dissolved) | µg/L | -- | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) |
| **PHCs** | | | | | | | | | | | | | | |
| EPHw10-19 | µg/L | 5000 | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) |
| EPHw19-32 | µg/L | -- | ND (200) | ND (200) | ND (200) | ND (200) | 290 | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) |
| HEPHw | µg/L | -- | ND (200) | ND (200) | ND (200) | ND (200) | 290 | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) |
| LEPHw | µg/L | -- | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) |
| **PAHs** | | | | | | | | | | | | | | |
| 1-Methylnaphthalene | µg/L | 5.5 | - | ND (0.050) | - | ND (0.050) | - | ND (0.050) | - | ND (0.050) | - | - | ND (0.050) | ND (0.050) |
| 2-Methylnaphthalene | µg/L | 15 | - | ND (0.10) | - | 0.11 | - | ND (0.10) | - | ND (0.10) | - | - | ND (0.10) | ND (0.10) |
| Acenaphthene | µg/L | 250 | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) |
| Acenaphthylene | µg/L | -- | - | ND (0.050) | - | ND (0.050) | - | ND (0.050) | - | ND (0.050) | - | - | ND (0.050) | ND (0.050) |
| Acridine | µg/L | -- | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) |
| Anthracene | µg/L | 1000 | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) |
| Benz(a)anthracene | µg/L | 0.07 | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) |
| Benzo(a)pyrene | µg/L | 0.01 | ND (0.0050) | ND (0.0050) | ND (0.0050) | 0.0062 | **0.013 J+[2]** | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) |
| Benzo(b)fluoranthene/Benzo(j)fluoranthene | µg/L | 0.07 | - | ND (0.030) | - | ND (0.030) | - | ND (0.030) | - | ND (0.030) | - | - | ND (0.030) | ND (0.030) |
| Benzo(b)pyridine (Quinoline) | µg/L | 0.05 | - | ND (0.020) | - | ND (0.020) | - | ND (0.020) | - | ND (0.020) | - | - | ND (0.020) | ND (0.020) |
| Benzo(g,h,i)perylene | µg/L | -- | - | ND (0.050) | - | ND (0.050) | - | ND (0.050) | - | ND (0.050) | - | - | ND (0.050) | ND (0.050) |
| Benzo(k)fluoranthene | µg/L | -- | - | ND (0.050) | - | ND (0.050) | - | ND (0.050) | - | ND (0.050) | - | - | ND (0.050) | ND (0.050) |
| Chrysene | µg/L | 7 | - | ND (0.020) | - | ND (0.020) | - | ND (0.020) | - | ND (0.020) | - | - | ND (0.020) | ND (0.020) |
| Dibenz(a,h)anthracene | µg/L | 0.01 | - | ND (0.0030) | - | ND (0.0030) | - | ND (0.0030) | - | ND (0.0030) | - | - | ND (0.0030) | ND (0.0030) |
| Fluoranthene | µg/L | 150 | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) |
| Fluorene | µg/L | 150 | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) |
| Indeno(1,2,3-cd)pyrene | µg/L | -- | - | ND (0.050) | - | ND (0.050) | - | ND (0.050) | - | ND (0.050) | - | - | ND (0.050) | ND (0.050) |
| Naphthalene | µg/L | 80 | ND (0.10) | ND (0.10) | ND (0.10) | 0.15 | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) |
| PAH high molecular weight | µg/L | -- | - | ND (0.050) | - | ND (0.050) | - | ND (0.050) | - | ND (0.050) | - | - | ND (0.050) | ND (0.050) |
| PAH low molecular weight | µg/L | -- | - | ND (0.10) | - | 0.26 | - | ND (0.10) | - | ND (0.10) | - | - | ND (0.10) | ND (0.10) |
| Phenanthrene | µg/L | -- | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) |
| Pyrene | µg/L | 100 | ND (0.020) | ND (0.020) | ND (0.020) | 0.021 | 0.030 | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) |
| Total PAH | µg/L | -- | - | ND (0.10) | - | 0.28 | - | ND (0.10) | - | ND (0.10) | - | - | ND (0.10) | ND (0.10) |

**Table 3**

**Groundwater Analytical Results**
**2023 Operations and Monitoring Report**
**New Landfill**
**Campbell River, British Columbia**

| Sample Location: | | | MW10-17 | | | | MW11-19 | | | | MW12-22 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | WG-11222680-290323-KH-09 | WG-11222680-170723-KH-02 | WG-11222680-060923-CXW-01 | WG-11222680-271123-KH-02 | WG-11222680-290323-KH-07 | WG-11222680-180723-KH-05 | WG-11222680-070923-CXW-09 | WG-11222680-281123-KH-06 | WG-11222680-290323-KH-05 | WG-11222680-290323-KH-06 | WG-11222680-170723-KH-01 | WG-11222680-060923-CXW-02 | WG-11222680-271123-KH-03 | WG-11222680-271123-KH-04 |
| Sample Date: | | BC CSR[1] DW | 03/29/2023 | 07/17/2023 | 09/06/2023 | 11/27/2023 | 03/29/2023 | 07/18/2023 | 09/07/2023 | 11/28/2023 | 03/29/2023 | 03/29/2023 Duplicate | 07/17/2023 | 09/06/2023 | 11/27/2023 | 11/27/2023 Duplicate |
| **Parameters** | **Units** | **a** | | | | | | | | | | | | | | |
| **Field Parameters** | | | | | | | | | | | | | | | | |
| Conductivity, field | µS/cm | -- | 159 | 148 | 169 | 350 | 171 | 191 | 250 | 286 | 124 | 124 | 149 | 189 | 323 | 323 |
| Dissolved oxygen (DO), field | mg/L | -- | - | 11.40 | 7.66 | 10.20 | - | 6.39 | 3.63 | 5.81 | 11.53 | 11.53 | 8.93 | 11.64 | 6.63 | 6.63 |
| Oxidation reduction potential (ORP), field | millivolts | -- | 140 | 202 | 178 | 256 | 150 | 139 | 134 | 251 | 173 | 173 | 196 | 194 | 288 | 288 |
| pH, field | s.u. | -- | 7.65 | 7.75 | 7.89 | 7.98 | 7.67 | 7.70 | 6.74 | 7.37 | 7.56 | 7.56 | 7.24 | 7.37 | 7.25 | 7.25 |
| Temperature, field | Deg C | -- | 12.33 | 13.68 | 12.57 | 10.84 | 16.54 | 16.92 | 18.72 | 10.72 | 10.37 | 10.37 | 16.19 | 10.61 | 9.48 | 9.48 |
| Total dissolved solids, field (TDS) | mg/L | -- | 103 | - | 109 | - | 111 | - | 163 | - | 80 | 80 | - | 124 | - | - |
| Turbidity, field | NTU | -- | 2.5 | 2.7 | 62.0 | 3.4 | 18 | 45.9 | 73.7 | 5.6 | 0.5 | 0.5 | 3.8 | 22.4 | 2.6 | 2.6 |
| **General Chemistry** | | | | | | | | | | | | | | | | |
| Alkalinity (as CaCO3 pH=8.3) | mg/L | -- | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Alkalinity, total (as CaCO3) | mg/L | -- | 77 | 63 | 72 | 110 | 90 | 74 | 100 | 140 | 66 | 65 | 73 | 85 | 90 | 89 |
| Chloride (dissolved) | mg/L | 250 | 6.0 | 3.4 | 4.2 | 14 | 6.2 | 16 | 8.6 | 4.7 | 2.3 | 2.3 | ND (1.0) | 1.9 | 8.2 | 8.3 |
| Conductivity | µS/cm | -- | 200 | 150 | 180 | 360 | 210 | 220 | 250 | 320 | 150 | 150 | 160 | 200 | 340 | 340 |
| Fluoride (dissolved) | mg/L | -- | - | - | - | - | - | - | - | ND (0.050) | - | - | - | - | - | - |
| Hardness (dissolved) | mg/L | -- | 85.8 | 59.1 | 70.5 | 156 | 95.1 | 87.7 | 103 | 145 | 65.3 | 65.3 | 65.3 | 81.5 | 143 | 144 |
| Hydroxide (as CaCO3) | mg/L | -- | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Orthophosphate | mg/L | -- | 0.010 | 0.010 | 0.012 | 0.0069 | 0.011 | 0.0099 | 0.025 | 0.0081 | 0.0049 | 0.0054 | 0.0048 | 0.0048 | 0.0032 | 0.0031 |
| pH | s.u. | -- | - | - | - | - | - | 7.76 J | - | 7.40 J | - | - | - | - | - | - |
| Sulfate (dissolved) | mg/L | 500 | 7.2 | 7.0 | 9.4 | 40 | 6.3 | 6.6 | 7.3 | 7.7 | 4.4 | 4.4 | 3.8 | 9.2 | 48 | 47 |
| Un-ionized Sulphide as H2S | mg/L | 0.05 | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) |
| Total Sulfide as H2S | mg/L | -- | ND (0.0020) | ND (0.0020) | ND (0.0020) | ND (0.0020) | 0.0023 | ND (0.0020) | ND (0.0020) | ND (0.0020) | ND (0.0020) | ND (0.0020) | ND (0.0020) | ND (0.0020) | ND (0.0020) | ND (0.0020) |
| Total Sulfide as H2S (calculated) | mg/L | -- | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) |
| Total Sulfide as S | mg/L | -- | ND (0.0018) | ND (0.0018) | ND (0.0018) | ND (0.0018) | 0.0022 | ND (0.0018) J | ND (0.0018) | ND (0.0018) | ND (0.0018) | ND (0.0018) | ND (0.0018) | ND (0.0018) | ND (0.0018) | ND (0.0018) |
| Total dissolved solids (TDS) | mg/L | -- | 100 | 38 | 110 | 220 | 140 | 130 | 140 | 180 | 130 | 100 | 92 | 120 | 220 | 240 |
| **Nutrients** | | | | | | | | | | | | | | | | |
| Ammonia-N | mg/L | -- | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015) |
| Bicarbonate (as CaCO3) | mg/L | -- | 94 | 77 | 87 | 140 | 110 | 90 | 130 | 170 | 80 | 80 | 89 | 100 | 110 | 110 |
| Carbonate (as CaCO3) | mg/L | -- | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Nitrate (as N) | mg/L | 10 | 1.17 | 0.298 | 0.637 | 0.804 | 0.408 | 0.365 | 0.521 | 0.719 | 0.700 | 0.699 | 0.653 | 1.06 | 3.51 | 3.49 |
| Nitrite (as N) | mg/L | 1 | 0.0166 | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) |
| Nitrite/Nitrate | mg/L | 10 | 1.19 | 0.298 | 0.637 | 0.804 | 0.408 | 0.365 | 0.521 | 0.719 | 0.700 | 0.699 | 0.653 | 1.06 | 3.51 | 3.49 |
| **Dissolved Metals** | | | | | | | | | | | | | | | | |
| Aluminum (dissolved) | µg/L | 9500 | 3.7 | ND (3.0) | ND (3.0) | ND (3.0) | ND (3.0) | ND (3.0) | ND (3.0) | ND (3.0) | 11.4 J | ND (3.0) J | ND (3.0) | ND (3.0) | ND (3.0) | ND (3.0) |
| Antimony (dissolved) | µg/L | 6 | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) | ND (0.50) |
| Arsenic (dissolved) | µg/L | 10 | 0.40 | 0.39 | 0.32 | 0.34 | 0.25 | 0.23 | 0.17 | 0.21 | 0.24 J | ND (0.10) J | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) |
| Barium (dissolved) | µg/L | 1000 | 3.7 | 2.7 | 3.3 | 6.8 | 5.7 | 5.3 | 7.0 | 9.2 | 3.5 | 3.1 | 2.4 | 3.1 | 4.4 | 4.4 |
| Beryllium (dissolved) | µg/L | 8 | 0.15 | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | 0.19 | 0.12 | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) |
| Bismuth (dissolved) | µg/L | -- | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Boron (dissolved) | µg/L | 5000 | 490 | 92 | 52 | 742 | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | 171 | 167 |
| Cadmium (dissolved) | µg/L | 5 | ND (0.034) | ND (0.010) | ND (0.010) | 0.012 | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | 0.167 J | ND (0.010) J | ND (0.010) | ND (0.010) | ND (0.010) | 0.010 |
| Calcium (dissolved) | µg/L | -- | 27500 | 18700 | 22800 | 49800 | 30200 | 27800 | 32600 | 46000 | 20400 | 20300 | 20000 | 24800 | 43200 | 43700 |
| Chromium (dissolved) | µg/L | 50 | 1.6 | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | 1.0 | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Cobalt (dissolved) | µg/L | 1 | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) |
| Copper (dissolved) | µg/L | 1500 | 2.34 | 0.79 | 0.79 | 1.92 | 0.70 | 0.53 | ND (0.20) | ND (0.20) | 2.17 J | ND (0.20) J | ND (0.20) | ND (0.20) | ND (0.20) | 0.66 |
| Iron (dissolved) | µg/L | 6500 | ND (11.9) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (24.1) | ND (11.5) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) |
| Lead (dissolved) | µg/L | 10 | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) | ND (0.20) |
| Lithium (dissolved) | µg/L | 8 | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) | ND (2.0) |
| Magnesium (dissolved) | µg/L | -- | 4160 | 3020 | 3320 | 7590 | 4770 | 4450 | 5130 | 7350 | 3470 | 3530 | 3700 | 4730 | 8540 | 8520 |
| Manganese (dissolved) | µg/L | 1500 | 1.0 | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | 2.8 | ND (1.0) | 9.6 | 5.8 | 2.5 | 2.4 | 1.8 | 1.9 |
| Mercury (dissolved) | µg/L | 1 | ND (0.0019) | ND (0.0019) | 0.0019 | 0.0055 | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) | ND (0.0019) |
| Molybdenum (dissolved) | µg/L | 250 | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Nickel (dissolved) | µg/L | 80 | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Phosphorus (dissolved) | µg/L | -- | 20 | 14 | 14 | 13 | 15 | 13 | 26 | 14 | 31 J | ND (10) J | ND (10) | ND (10) | ND (10) | ND (10) |
| Potassium (dissolved) | µg/L | -- | 365 | 338 | 361 | 529 | 392 | 405 | 476 | 467 | 326 | 275 | 278 | 315 | 404 | 402 |
| Selenium (dissolved) | µg/L | 10 | ND (0.23) | ND (0.10) | ND (0.10) | 0.14 | ND (0.20) | 0.19 | 0.16 | 0.13 | ND (0.28) | ND (0.18) | 0.11 | ND (0.10) | 0.23 | 0.22 |
| Silicon (dissolved) | µg/L | -- | 6950 | 6410 | 6490 | 7400 | 8900 | 8440 | 9540 | 13000 | 7630 | 7690 | 7520 | 7250 | 8240 | 8280 |
| Silver (dissolved) | µg/L | 20 | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) |
| Sodium (dissolved) | µg/L | 200000 | 5790 | 6210 | 6890 | 10200 | 5670 | 6100 | 4940 | 5880 | 5220 | 5030 | 5180 | 5940 | 8670 | 8670 |
| Strontium (dissolved) | µg/L | 2500 | 37.6 | 27.7 | 33.5 | 74.8 | 45.2 | 42.3 | 53.2 | 74.7 | 32.4 | 27.5 | 28.2 | 38.7 | 76.2 | 76.1 |
| Sulfur (dissolved) | µg/L | -- | ND (3000) | ND (3000) | ND (3000) | 13400 | ND (3000) | ND (3000) | ND (3000) | ND (3000) | ND (3000) | ND (3000) | ND (3000) | ND (3000) | 16400 | 16400 |
| Thallium (dissolved) | µg/L | -- | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | 0.032 J | ND (0.010) J | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) |
| Tin (dissolved) | µg/L | 2500 | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) |
| Titanium (dissolved) | µg/L | -- | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) |
| Uranium (dissolved) | µg/L | 20 | ND (0.10) | ND (0.10) | ND (0.10) | 0.17 | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | 0.16 | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) |
| Vanadium (dissolved) | µg/L | 20 | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) |
| Zinc (dissolved) | µg/L | 3000 | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) | ND (5.0) |
| Zirconium (dissolved) | µg/L | -- | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) |
| **PHCs** | | | | | | | | | | | | | | | | |
| EPHw10-19 | µg/L | 5000 | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) |
| EPHw19-32 | µg/L | -- | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) |
| HEPHw | µg/L | -- | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) |
| LEPHw | µg/L | -- | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) | ND (200) |
| **PAHs** | | | | | | | | | | | | | | | | |
| 1-Methylnaphthalene | µg/L | 5.5 | ND (0.050) | - | ND (0.050) | ND (0.050) | ND (0.050) | - | ND (0.050) | - | ND (0.050) | ND (0.050) | - | ND (0.050) | ND (0.050) | ND (0.050) |
| 2-Methylnaphthalene | µg/L | 15 | ND (0.10) | - | ND (0.10) | ND (0.10) | ND (0.10) | - | ND (0.10) | - | ND (0.10) | ND (0.10) | - | ND (0.10) | ND (0.10) | ND (0.10) |
| Acenaphthene | µg/L | 250 | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) |
| Acenaphthylene | µg/L | -- | ND (0.050) | - | ND (0.050) | ND (0.050) | ND (0.050) | - | ND (0.050) | - | ND (0.050) | ND (0.050) | - | ND (0.050) | ND (0.050) | ND (0.050) |
| Acridine | µg/L | -- | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) |
| Anthracene | µg/L | 1000 | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) |
| Benzo(a)anthracene | µg/L | 0.07 | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) | ND (0.010) |
| Benzo(a)pyrene | µg/L | 0.01 | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) | ND (0.0050) |
| Benzo(b)fluoranthene/Benzo(j)fluoranthene | µg/L | 0.07 | ND (0.030) | - | ND (0.030) | ND (0.030) | ND (0.030) | - | ND (0.030) | - | ND (0.030) | ND (0.030) | - | ND (0.030) | ND (0.030) | ND (0.030) |
| Benzo(b)pyridine (Quinoline) | µg/L | 0.05 | ND (0.020) | - | ND (0.020) | ND (0.020) | ND (0.020) | - | ND (0.020) | - | ND (0.020) | ND (0.020) | - | ND (0.020) | ND (0.020) | ND (0.020) |
| Benzo(g,h,i)perylene | µg/L | -- | ND (0.050) | - | ND (0.050) | ND (0.050) | ND (0.050) | - | ND (0.050) | - | ND (0.050) | ND (0.050) | - | ND (0.050) | ND (0.050) | ND (0.050) |
| Benzo(k)fluoranthene | µg/L | -- | ND (0.050) | - | ND (0.050) | ND (0.050) | ND (0.050) | - | ND (0.050) | - | ND (0.050) | ND (0.050) | - | ND (0.050) | ND (0.050) | ND (0.050) |
| Chrysene | µg/L | 7 | ND (0.020) | - | ND (0.020) | ND (0.020) | ND (0.020) | - | ND (0.020) | - | ND (0.020) | ND (0.020) | - | ND (0.020) | ND (0.020) | ND (0.020) |
| Dibenz(a,h)anthracene | µg/L | 0.01 | ND (0.0030) | - | ND (0.0030) | ND (0.0030) | ND (0.0030) | - | ND (0.0030) | - | ND (0.0030) | ND (0.0030) | - | ND (0.0030) | ND (0.0030) | ND (0.0030) |
| Fluoranthene | µg/L | 150 | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) |
| Fluorene | µg/L | 150 | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) |
| Indeno(1,2,3-cd)pyrene | µg/L | -- | ND (0.050) | - | ND (0.050) | ND (0.050) | ND (0.050) | - | ND (0.050) | - | ND (0.050) | ND (0.050) | - | ND (0.050) | ND (0.050) | ND (0.050) |
| Naphthalene | µg/L | 80 | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) | ND (0.10) |
| PAH high molecular weight | µg/L | -- | ND (0.050) | - | ND (0.050) | ND (0.050) | ND (0.050) | - | ND (0.050) | - | ND (0.050) | ND (0.050) | - | ND (0.050) | ND (0.050) | ND (0.050) |
| PAH low molecular weight | µg/L | -- | ND (0.10) | - | ND (0.10) | ND (0.10) | ND (0.10) | - | ND (0.10) | - | ND (0.10) | ND (0.10) | - | ND (0.10) | ND (0.10) | ND (0.10) |
| Phenanthrene | µg/L | -- | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) | ND (0.050) |
| Pyrene | µg/L | 100 | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) | ND (0.020) |
| Total PAH | µg/L | -- | ND (0.10) | - | ND (0.10) | ND (0.10) | ND (0.10) | - | ND (0.10) | - | ND (0.10) | ND (0.10) | - | ND (0.10) | ND (0.10) | ND (0.10) |

# Table 4

## Surface Water Analytical Results
## 2023 Operations and Monitoring Report
## New Landfill
## Campbell River, British Columbia

| Sample Location: | | | SW15-01 [McIvor Lake] | SW15-02 [Rico Lake] |
|---|---|---|---|---|
| Sample ID: | | | WS-11222680-281123-KH-01 | WS-11222680-281123-KH-02 |
| Sample Date: | | BC CSR[1] DW | 11/28/2023 | 11/28/2023 |
| **Parameters** | **Units** | **a** | | |
| **Field Parameters** | | | | |
| Dissolved Oxygen, Field | mg/L | -- | 7.12 | 6.99 |
| ORP, Field | millivolts | -- | 197 | 207 |
| pH, Field | s.u. | -- | 8.12 | 7.57 |
| Specific Conductance, Field | µS/cm | -- | 58 | 62 |
| Temperature, Field | Deg C | -- | 8.26 | 6.33 |
| Turbidity, Field | NTU | -- | 0 | 2.0 |
| **General Chemistry** | | | | |
| Alkalinity (as CaCO3 pH=8.3) | mg/L | -- | ND (1.0) | ND (1.0) |
| Alkalinity, total (as CaCO3) | mg/L | -- | 22 | 18 |
| Chloride (dissolved) | mg/L | 250 | ND (1.0) | 5.5 |
| Conductivity | µS/cm | -- | 55 | 65 |
| Fluoride (dissolved) | mg/L | -- | ND (0.050) | ND (0.050) |
| Hardness | mg/L | -- | 19.8 | 16.0 |
| Hardness (dissolved) | mg/L | -- | 22.6 | 17.5 |
| Hydroxide (as CaCO3) | mg/L | -- | ND (1.0) | ND (1.0) |
| Orthophosphate | mg/L | -- | ND (0.0030) | ND (0.0030) |
| pH | s.u. | -- | 6.85 J | 6.47 J |
| Sulphate (Dissolved) | mg/L | 500 | 2.6 | 1.0 |
| Un-ionized Sulphide as H2S | mg/L | 0.05 | ND (0.0050) | ND (0.0050) |
| Total Sulfide as H2S | mg/L | -- | ND (0.0020) | ND (0.0020) |
| Total Sulfide as H2S (calculated) | mg/L | -- | ND (0.0050) | ND (0.0050) |
| Total Sulfide as S | mg/L | -- | ND (0.0018) | ND (0.0018) |
| Total dissolved solids (TDS) | mg/L | -- | 34 | 38 |
| Total suspended solids (TSS) | mg/L | -- | ND (1.1) | 2.3 |
| **Nutrients** | | | | |
| Ammonia-N | mg/L | -- | ND (0.015) | 0.063 |
| Bicarbonate (as CaCO3) | mg/L | -- | 27 | 22 |
| Carbonate (as CaCO3) | mg/L | -- | ND (1.0) | ND (1.0) |
| Nitrate (as N) | mg/L | 10 | ND (0.020) | 0.357 |
| Nitrite (as N) | mg/L | 1 | ND (0.0050) | ND (0.0050) |
| Nitrite/Nitrate | mg/L | 10 | ND (0.020) | 0.357 |
| **Dissolved Metals** | | | | |
| Calcium (dissolved) | µg/L | -- | 7720 | 5050 |
| Magnesium (dissolved) | µg/L | -- | 800 | 1190 |
| **Total Metals** | | | | |
| Aluminum | µg/L | 9500 | 5.8 | 19.9 |
| Antimony | µg/L | 6 | ND (0.50) | ND (0.50) |
| Arsenic | µg/L | 10 | ND (0.10) | ND (0.10) |
| Barium | µg/L | 1000 | 2.3 | 2.4 |
| Beryllium | µg/L | 8 | ND (0.10) | ND (0.10) |
| Bismuth | µg/L | -- | ND (1.0) | ND (1.0) |
| Boron | µg/L | 5000 | 351 | 167 |
| Cadmium | µg/L | 5 | ND (0.010) | ND (0.010) |
| Calcium | µg/L | -- | 6780 | 4560 |
| Chromium | µg/L | 50 | ND (1.0) | ND (1.0) |
| Cobalt | µg/L | 1 | ND (0.20) | ND (0.20) |
| Copper | µg/L | 1500 | ND (0.50) | 0.51 |
| Iron | µg/L | 6500 | ND (10) | 225 |
| Lead | µg/L | 10 | ND (0.20) | ND (0.20) |
| Lithium | µg/L | 8 | ND (2.0) | ND (2.0) |
| Magnesium | µg/L | -- | 696 | 1110 |
| Manganese | µg/L | 1500 | 1.8 | 11.8 |
| Mercury | µg/L | 1 | ND (0.0019) | ND (0.0019) |
| Molybdenum | µg/L | 250 | ND (1.0) | ND (1.0) |
| Nickel | µg/L | 80 | ND (1.0) | ND (1.0) |
| Phosphorus | µg/L | -- | ND (10) | ND (10) |
| Potassium | µg/L | -- | 69 | 130 |
| Selenium | µg/L | 10 | ND (0.10) | ND (0.10) |
| Silicon | µg/L | -- | 1590 | 956 |
| Silver | µg/L | 20 | ND (0.020) | ND (0.020) |
| Sodium | µg/L | 200000 | 699 | 3770 |
| Strontium | µg/L | 2500 | 9.4 | 13.9 |
| Sulphur | µg/L | -- | ND (3000) | ND (3000) |
| Thallium | µg/L | -- | ND (0.010) | ND (0.010) |
| Tin | µg/L | 2500 | ND (5.0) | ND (5.0) |
| Titanium | µg/L | -- | ND (5.0) | ND (5.0) |
| Uranium | µg/L | 20 | ND (0.10) | ND (0.10) |
| Vanadium | µg/L | 20 | ND (5.0) | ND (5.0) |
| Zinc | µg/L | 3000 | ND (5.0) | ND (5.0) |
| Zirconium | µg/L | -- | ND (0.10) | ND (0.10) |

**Table 5**

**Landfill Gas in Soil Analytical Results**
**2023 Operations and Monitoring Report**
**New Landfill**
**Campbell River, British Columbia**

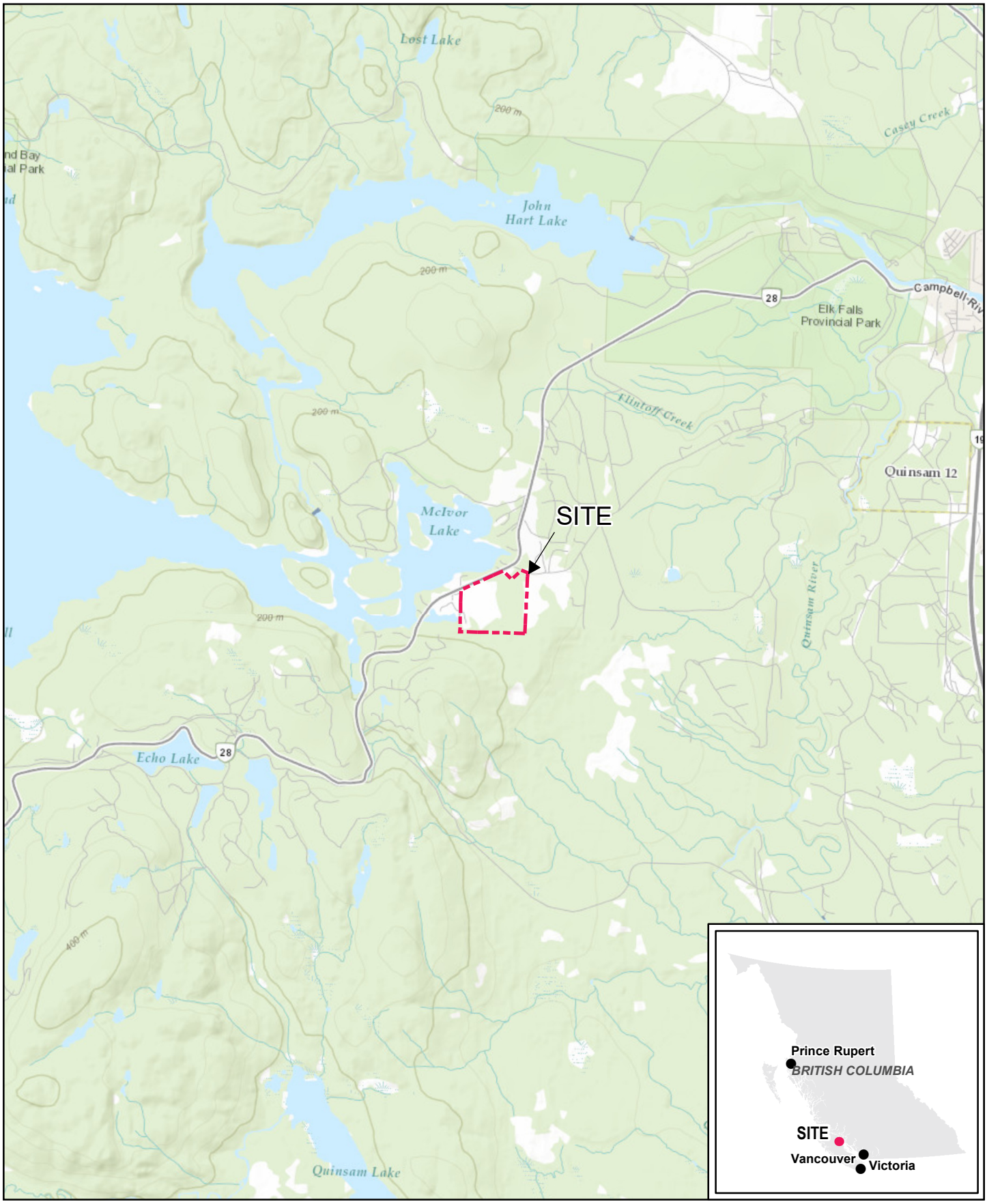
| Time Purged (min) | Monometer (kPa) (+/-) | Balance (% v/v) | $CH_4$ (% v/v) | $CO_2$ (% v/v) | $O_2$ (% v/v) | $H_2S$ (ppm) | CO (ppm) |
|---|---|---|---|---|---|---|---|
| **LFG1-22** | | | | | | | |
| Initial | -0.00<br>+0.00 | 79.4 | 0.0 | 0.0 | 20.6 | 0.0 | 0.0 |
| 1st Purge | -0.00<br>+0.00 | 79.3 | 0.0 | 0.0 | 20.7 | 0.0 | 0.0 |
| 2nd Purge | -0.00<br>+0.00 | 79.2 | 0.0 | 0.0 | 20.8 | 0.0 | 0.0 |
| 3rd Purge | -0.00<br>+0.00 | 79.2 | 0.0 | 0.0 | 20.8 | 0.0 | 0.0 |
| **LFG2-22** | | | | | | | |
| Initial | -0.00<br>+0.00 | 79.2 | 0.0 | 0.1 | 20.8 | 0.0 | 0.0 |
| 1st Purge | -0.00<br>+0.00 | 79.1 | 0.0 | 0.0 | 20.9 | 0.0 | 0.0 |
| 2nd Purge | -0.00<br>+0.00 | 79.0 | 0.0 | 0.0 | 20.8 | 0.0 | 0.0 |
| 3rd Purge | -0.00<br>+0.00 | 79.1 | 0.0 | 0.0 | 20.9 | 0.0 | 0.0 |

**Table 6**

**Analytical Tables Notes**
**2023 Operations and Monitoring Report**
**New Landfill**
**Campbell River, British Columbia**

| | |
|---|---|
| 1 - British Columbia Approved Water Quality Guidelines, 2018 Edition or Canadian Drinking Guidelines unless otherwise stated. | |
| ND - Not detected at the associated reporting limit. | |
| J - Estimated concentration. | |
| + | - Bias high |
| - | - Bias low |
| **ND (50)[a]** | - Laboratory detection limit exceeds guideline |
| **2890[a]** | - Concentration exceeds standard. |
| -- | - Currently no standard. |
| LDS | - Leak Detection Sump |
| - | - Not analyzed. |
| µS/cm | - Microsiemens per centimetre |
| mg/L | - Milligrams per litre |
| s.u. | - Standard units |
| Deg C | - Degrees Celcius |
| NTU | - Nephelometric turbidity units |
| ppm | - parts per million |
| *%v/v* | - Percent volume. |
| [2] | - The volume of the well was used to calculate purge volume. |

# Figures




Paper Size ANSI A

0 400 800 1,200 1,600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 10N

N

GHD

**UPLAND EXCAVATING PROPERTY**
**2023 ANNUAL OPERATIONS AND MONITORING REPORT**
**NEW LANDFILL**

Project No. **11222680**
Revision No. **-**
Date **Feb 21, 2024**

## SITE LOCATION MAP

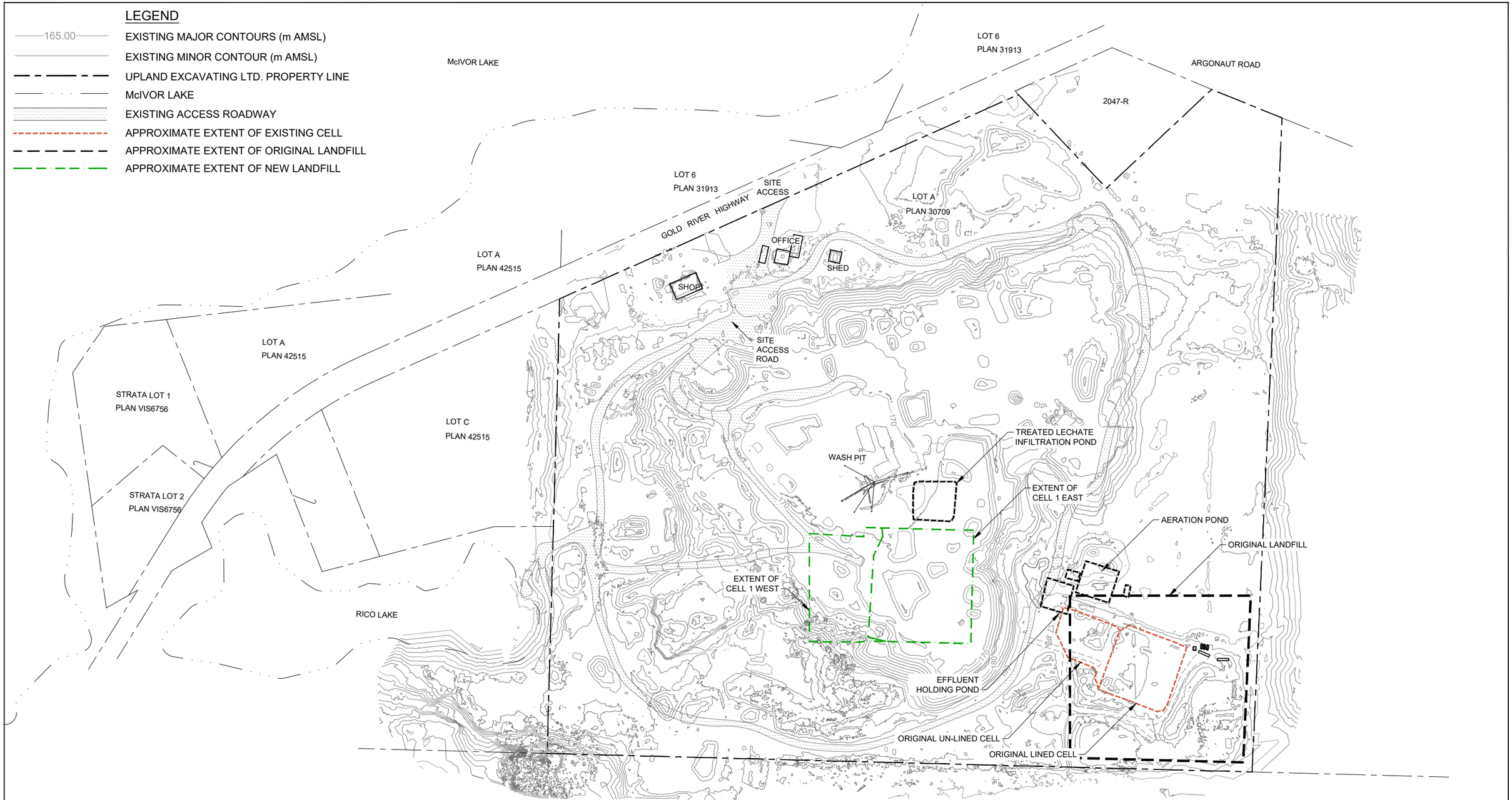
# FIGURE 1

O:\GIS\PROJECTS\11222000s\11222680\Layouts\202402_RPT2023\11222680_202302_RPT2023_GIS001.mxd
Print date: 21 Feb 2024 - 14:08

Data source: ESRI Topographic Basemap, Accessed 2024; ESRI Data & Maps 2008 Data Distribution Application (DDA); GHD.

## LEGEND

- 165.00 — EXISTING MAJOR CONTOURS (m AMSL)
- EXISTING MINOR CONTOUR (m AMSL)
- UPLAND EXCAVATING LTD. PROPERTY LINE
- McIVOR LAKE
- EXISTING ACCESS ROADWAY
- APPROXIMATE EXTENT OF EXISTING CELL
- APPROXIMATE EXTENT OF ORIGINAL LANDFILL
- APPROXIMATE EXTENT OF NEW LANDFILL




0 40 80 120m

1:4000

Coordinate System: UTM ZONE 10

N

GHD

**UPLAND EXCAVATING PROPERTY**
**NEW LANDFILL**
**2023 ANNUAL OPERATIONS AND MONITORING REPORT**

**SITE PLAN**

Project No. **11222680**
Date **February 2024**

# FIGURE 2

Filename: N:\CA\Vancouver\Projects\663\11222680\Digital_Design\ACAD\Figures\RPT006\11222680-GHD-00-00-RPT-EN-D101_SC-006.dwg
Plot Date: 22 February 2024 1:04 PM

Data Source: TOPOGRAPHICAL SURVEY MARCH 2, 2020

## LEGEND

- 192 — MAJOR CONTOURS (m AMSL)
- ACCESS ROADWAY
- TOP OF BERM
- EXTENT OF CELLS
- LEACHATE COLLECTION SYSTEM
- MW6-17 — EXISTING MONITORING WELL
- RW-98020 — EXISTING RESIDENTIAL WELL
- PZ1-19 — EXISTING PIEZOMETER
- BH1-16 — EXISTING BOREHOLE
- SW15-01 — EXISTING SURFACE WATER SAMPLE LOCATION
- RICO GAUGE — EXISTING SURFACE WATER GAUGE
- MW13 — PROPOSED MONITORING WELL
- SVP-1 — SOIL VAPOUR PROBE

SVP-1
LEAK DETECTION MONITORING PORT
LEACHATE COLLECTION SYSTEM SUMP RISER PIPE
MW2-14
MW2A-16
LEACHATE SUMP
MW4A-15
MW4B-15
LEAK DETECTION MONITORING PORT (TYP)
BH1-16
BH16-19
AERATION POND
EXTENT OF CELL 1 WEST
EXTENT OF CELL 1 EAST
BH2-16
MW13
EFFLUENT HOLDING POND
MW3-14
PZ1-19
MW12-22
MW5A-15
MW5B-15
BH5-15

0 15 30 45m

1:1500

Coordinate System: UTM ZONE 10

N

GHD

**UPLAND EXCAVATING PROPERTY**
**NEW LANDFILL**
**2023 ANNUAL OPERATIONS AND MONITORING REPORT**

**NEW LANDFILL SITE PLAN**

Project No. **11222680**
Date **March 2024**

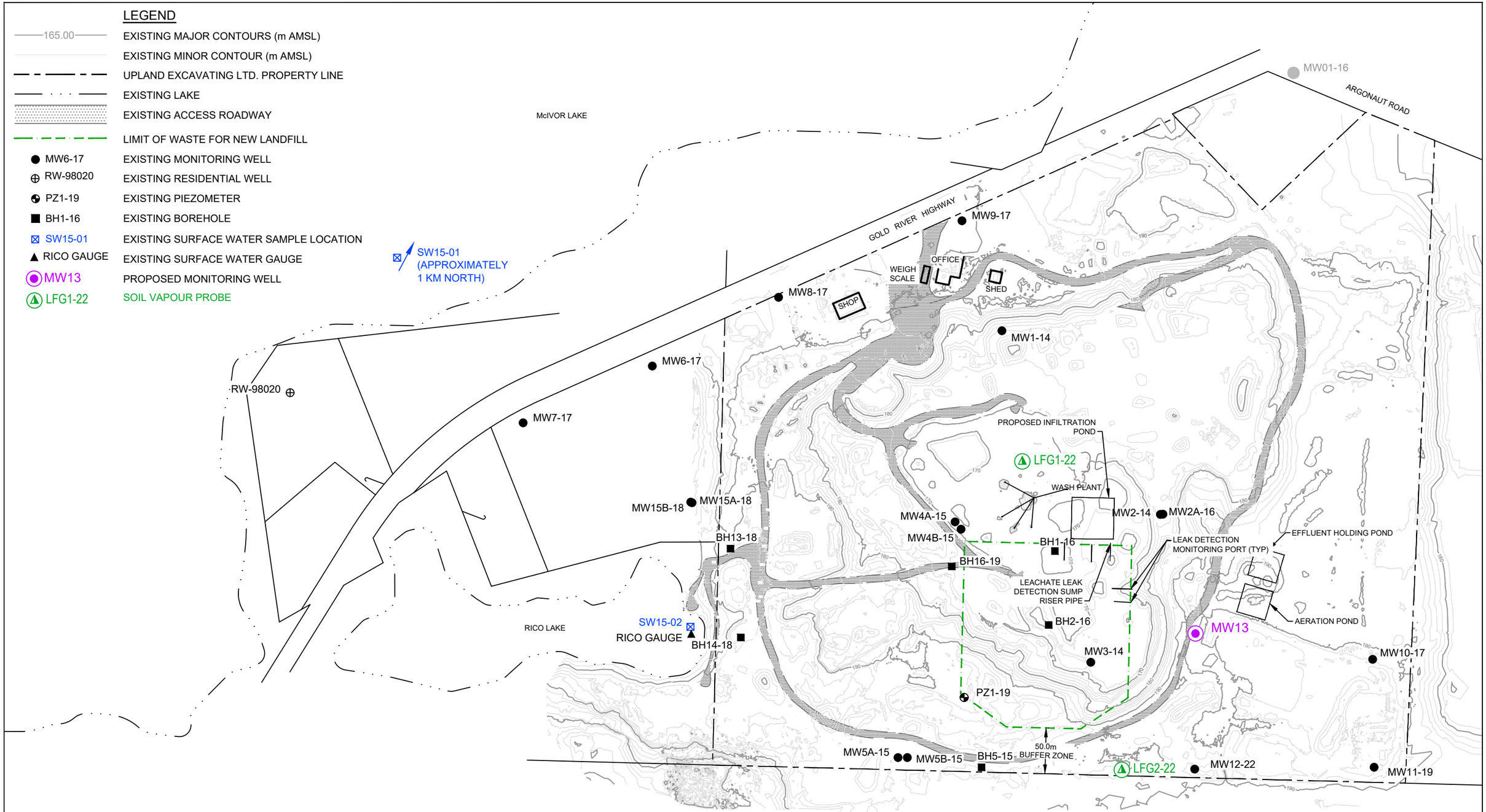
**FIGURE 3**

Filename: N:\CA\Vancouver\Projects\663\11222680\Digital_Design\ACAD\Figures\RPT006\11222680-GHD-00-00-RPT-EN-D105_OT006.dwg
Plot Date: 15 March 2024 1:51 PM

Data Source: TOPOGRAPHICAL SURVEY MARCH 2, 2020 AND SEPTEMBER 2020. AS-BUILT SURVEY OCTOBER 19, 2021

## LEGEND

- 165.00 — EXISTING MAJOR CONTOURS (m AMSL)
- EXISTING MINOR CONTOUR (m AMSL)
- UPLAND EXCAVATING LTD. PROPERTY LINE
- EXISTING LAKE
- EXISTING ACCESS ROADWAY
- LIMIT OF WASTE FOR NEW LANDFILL
- MW6-17 — EXISTING MONITORING WELL
- RW-98020 — EXISTING RESIDENTIAL WELL
- PZ1-19 — EXISTING PIEZOMETER
- BH1-16 — EXISTING BOREHOLE
- SW15-01 — EXISTING SURFACE WATER SAMPLE LOCATION
- RICO GAUGE — EXISTING SURFACE WATER GAUGE
- MW13 — PROPOSED MONITORING WELL
- LFG1-22 — SOIL VAPOUR PROBE




SOURCE: TOPOGRAPHICAL SURVEY CONDUCTED BY McELHANNEY ASSOCIATES LAND SURVEYING LTD., NOVEMBER 21, 2016.

0 40 80 120m

1:4000

Coordinate System:
UTM ZONE 10

N

GHD

**UPLAND EXCAVATING PROPERTY**
**NEW LANDFILL**
**2023 ANNUAL OPERATIONS AND MONITORING REPORT**

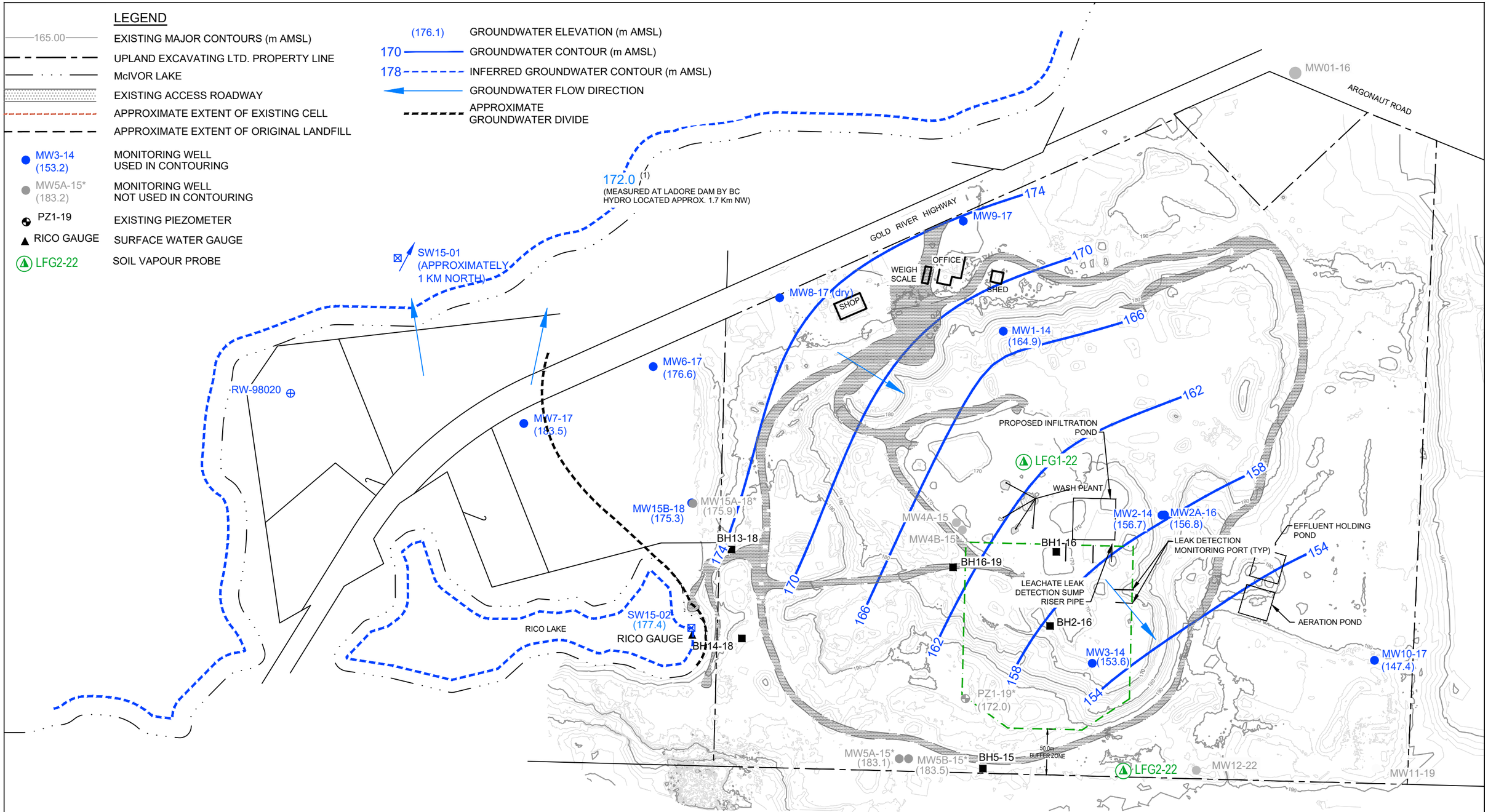
**MONITORING LOCATIONS**

Project No. **88877**
Date **March 2024**

**FIGURE 4**

Filename: N:\CA\Vancouver\Projects\663\11222680\Digital_Design\ACAD\Figures\RPT006\88877-11(014)GN-WA007.DWG
Plot Date: 22 March 2024 10:13 AM

Data Source: TOPOGRAPHICAL SURVEY MARCH 2, 2020




SOURCE: TOPOGRAPHICAL SURVEY CONDUCTED BY McELHANNEY ASSOCIATES LAND SURVEYING LTD., NOVEMBER 21, 2016.

NOTE:
1. BASED ON BC HYDRO RECORD OF WATER ELEVATIONS AT LADORE DAM RECORDED EVERY 3 HOURS. (https://www.bchydro.com/energy-in-bc/our_system/transmission_reservoir_data/previous_reservoir_elevations/vancouver_island/ladore_ldr.html)

0 40 80 120m
1:4000
Coordinate System: UTM ZONE 10

N

GHD

**UPLAND EXCAVATING PROPERTY**
**NEW LANDFILL**
**2023 ANNUAL MONITORING REPORT**

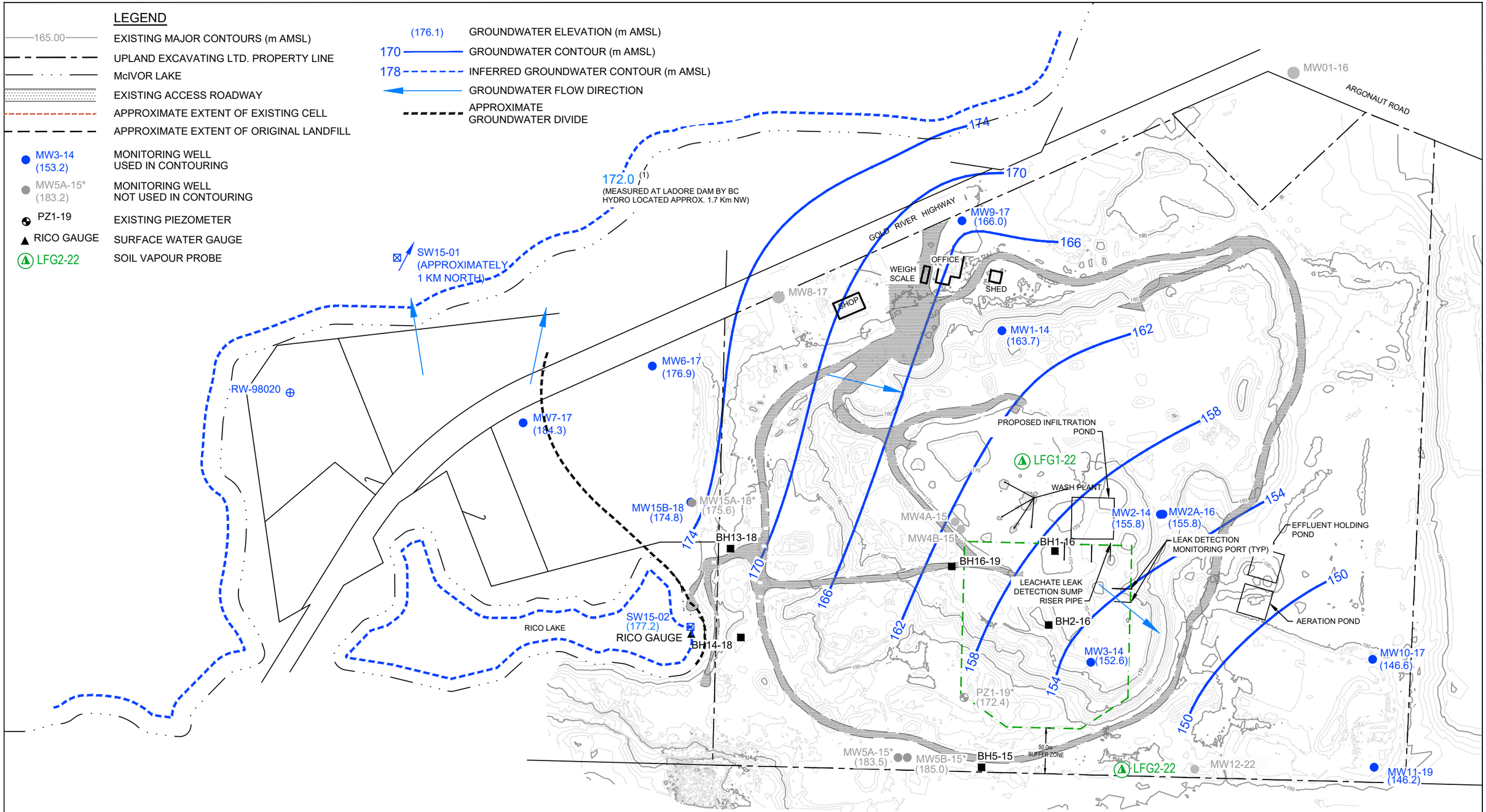
**GROUNDWATER ELEVATION CONTOURS**
**JULY 2023**

Project No. **11222680**
Date **March 2024**

**FIGURE 5**

Filename: N:\CA\Vancouver\Projects\663\11222680\Digital_Design\ACAD\Figures\OM Report\11222680-GHD-00-00-RPT-EN-D101_VA-001.dwg
Plot Date: 22 March 2024 10:11 AM

Data Source: TOPOGRAPHICAL SURVEY MARCH 2, 2020




SOURCE: TOPOGRAPHICAL SURVEY CONDUCTED BY McELHANNEY ASSOCIATES LAND SURVEYING LTD., NOVEMBER 21, 2016.

NOTE:
1. BASED ON BC HYDRO RECORD OF WATER ELEVATIONS AT LADORE DAM RECORDED EVERY 3 HOURS. (https://www.bchydro.com/energy-in-bc/our_system/transmission_reservoir_data/previous_reservoir_elevations/vancouver_island/ladore_ldr.html)

0 40 80 120m
1:4000
Coordinate System: UTM ZONE 10

N

GHD

**UPLAND EXCAVATING PROPERTY**
**NEW LANDFILL**
**2023 ANNUAL MONITORING REPORT**

**GROUNDWATER ELEVATION CONTOURS**
**NOVEMBER 2023**

Project No. **11222680**
Date **March 2024**

**FIGURE 6**

Filename: N:\CA\Vancouver\Projects\663\11222680\Digital_Design\ACAD\Figures\OM Report\11222680-GHD-00-00-RPT-EN-D102_VA-001.dwg
Plot Date: 21 March 2024 4:21 PM

Data Source: TOPOGRAPHICAL SURVEY MARCH 2, 2020

# Appendices

# Appendix A

## Operational Certificate and Amendment

August 1, 2019

Tracking Number: 335965
Authorization Number: 107689

**REGISTERED MAIL**

UPLAND EXCAVATING LTD.
#201-909 ISLAND HIGHWAY
CAMPBELL RIVER BC V9W 2C2

Dear operational certificate holder:

Enclosed is Operational Certificate 107689 issued under the provisions of the *Environmental Management Act*. Your attention is respectfully directed to the terms and conditions outlined in the operational certificate. An annual fee will be determined according to the Permit and Approval Fees and Charges Regulation.

This operational certificate does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority rests with the operational certificate holder. It is also the responsibility of the operational certificate holder to ensure that all activities conducted under this authorization are carried out with regard to the rights of third parties, and comply with other applicable legislation that may be in force.

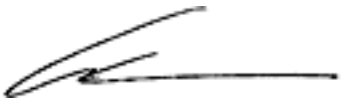
Requirements may also be specified by the *Environmental Management Act* and regulations including, but not limited to, the Contaminated Sites Regulation, Environmental Data Quality Assurance Regulation, Hazardous Waste Regulation, Landfill Gas Management Regulation, Organic Matter Recycling Regulation, Ozone Depleting Substances and Other Halocarbons Regulation, Recycling Regulation, Spill Reporting Regulation, Storage of Recyclable Material Regulation, Waste Discharge Regulation and Codes of Practice.

This decision may be appealed to the Environmental Appeal Board in accordance with Part 8 of the *Environmental Management Act*. An appeal must be delivered within 30 days from the date that notice of this decision is given. For further information, please contact the Environmental Appeal Board at (250) 387-3464.

Administration of this operational certificate will be carried out by staff from the Environmental Protection Division's Regional Operations Branch. Documents pertinent to the operational certificate are to be submitted by email or electronic transfer to the director, in accordance with the ministry Data & Report Submissions website at: http://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/data-and-report-submissions, or as further instructed.

If you have any questions or concerns, please contact Authorizations - South at Authorizations.South@gov.bc.ca.

Yours truly,



Luc Lachance, P.Eng
for Director, *Environmental Management Act*
Authorizations - South Region

Enclosure

**MINISTRY OF ENVIRONMENT &**
**CLIMATE CHANGE STRATEGY**

# OPERATIONAL CERTIFICATE

107689

*Under the Provisions of the Environmental Management Act*

*Pursuant to the Approved*

*Comox Valley Regional District Solid Waste Management Plan*

**UPLAND EXCAVATING LTD.**

**#201-909 ISLAND HIGHWAY**
**CAMPBELL RIVER BC V9W 2C2**

Is authorized to manage waste at the Facility located in Campbell River, British Columbia, subject to the requirements listed below. Contravention of any of these requirements is a violation of the *Environmental Management Act* and may lead to prosecution.

Pursuant to section 24(10) of the *Environmental Management Act*, this operational certificate supersedes and cancels Permit PR-10807 issued under section 14 of the *Environmental Management Act*.

## 1. AUTHORIZED DISCHARGES, FACILITIES AND WORKS

### 1.1 Original Landfill

This section applies to the Original Landfill.

1.1.1 The maximum rate of waste discharge to the Original Lined Cell is 45,000 tonnes per calendar year.

1.1.2 The characteristics of the waste discharge to the Original Lined Cell must be:

(a) demolition waste,
(b) construction waste,
(c) land clearing waste,
(d) soil in which the concentrations of all substances are less than the lowest applicable industrial land use standard specified for those substances in
(i) the generic numerical soil standards,
(ii) the matrix numerical soil standards, or

Date issued: August 1, 2019

Luc Lachance, P.Eng
for Director, *Environmental Management Act*
Authorizations - South Region

(iii) a director's interim standard for soil,
referred to in section 41(1)(a) of the Contaminated Sites Regulation, B.C. Reg. 375/96,
(e) sludge from the Original Leachate Management Works, or,
(f) other waste as authorized in writing by the director,
but does not include:
(g) hazardous waste except as authorized pursuant to the Hazardous Waste Regulation, controlled waste, Attractants, and,
(h) waste and/or recyclable material prohibited in writing by the director.

1.1.3 The waste discharge is authorized to the Original Lined Cell approximately located as shown on Site Plan A. Waste discharge to the Original Un-Lined Cell is not authorized.

1.1.4 Authorization to discharge waste to the Original Lined Cell ceases on the earlier of:
(i) the date the Original Lined Cell is filled to capacity with grades not steeper than 3H:1V (33%),
(ii) the date of commencement of waste discharge to the New Landfill.

1.1.5 The authorized works are:
(i) a lined landfill footprint with a maximum area of 0.72 ha (85 m x 85 m) including from bottom to top a base with perimeter berm, 0.3 m sand cushion layer, 0.5 mm thick coated woven polyethylene liner, 0.3 m granular leak detection layer, leak detection riser pipe, 0.5 mm thick coated woven polyethylene liner, 0.3 m sand protection layer, leachate extraction chamber, final cover, and,
(ii) an un-lined landfill footprint with an approximate area of 0.7 ha, final cover,
and related appurtenances, approximately located as shown on Site Plan A.

1.1.6 The operational certificate holder must ensure the Original Landfill, excluding final cover, is complete and fully operational on or before the date of issuance of this operational certificate, and at all times thereafter, until the Original Landfill is decommissioned in compliance with the plan referred to in section 2.9(a) (plan to remove all waste from the Original Landfill) of this operational certificate.

## 1.2 **Original Leachate Management Works**

This section applies to the management of leachate from the Original Lined Cell.

1.2.1 The operational certificate holder must convey the leachate from the Original Lined Cell, that is to be discharged on the Facility site, to the Original Leachate Management Works.

1.2.2 The maximum rate of treated leachate effluent discharge to the treated leachate infiltration pond is 7,139 $m^3$ per calendar year.

Date issued: August 1, 2019

Luc Lachance, P.Eng
for Director, *Environmental Management Act*
Authorizations - South Region

1.2.3 The concentration of any substance in the treated leachate effluent discharge to the treated leachate infiltration pond must not be greater than the Contaminated Sites Regulation Generic Numerical Water Standards for Drinking Water (DW), for that substance.

1.2.4 The treated leachate effluent is authorized to be discharged to the treated leachate infiltration pond and infiltrated into the ground. This authorization ceases on the date the Original Leachate Management Works are decommissioned in compliance with the plan referred to in section 2.9(a) (plan to remove all waste from the Original Landfill) of this operational certificate.

1.2.5 The authorized works are leachate conveyance, storage, treatment and discharge works including pumps, pipes, leachate storage and treatment tanks, treated leachate infiltration pond, flow monitoring works, and related appurtenances approximately located as shown on Site Plan A.

1.2.6 Minimum Freeboard must be maintained at all times as follows:
treated leachate infiltration pond: 0.6 m

1.2.7 The operational certificate holder must ensure the Original Leachate Management Works are complete and fully operational on or before the date of commencement of discharge to the treated leachate infiltration pond, and at all times thereafter, until the Original Leachate Management Works are decommissioned in compliance with the plan referred to in section 2.9(a) (plan to remove all waste from the Original Landfill) of this operational certificate.

## 1.3 **New Landfill**

This section applies to the New Landfill.

1.3.1 The maximum rate of waste discharge to the New Landfill is: (45,000 minus the waste discharge to the Original Lined Cell) tonnes per calendar year.

1.3.2 The characteristics of the waste discharge to the New Landfill must be:
(a) demolition waste,
(b) construction waste,
(c) land clearing waste,
(d) soil in which the concentrations of all substances are less than the lowest applicable industrial land use standard specified for those substances in
(i) the generic numerical soil standards,
(ii) the matrix numerical soil standards, or
(iii) a director's interim standard for soil,
referred to in section 41(1)(a) of the Contaminated Sites Regulation, B.C. Reg. 375/96,
(e) sludge from the New Leachate Management Works or the New Stormwater

Management Works, or,

(f) other waste as authorized in writing by the director,

but does not include:

(g) hazardous waste except as authorized pursuant to the Hazardous Waste Regulation, controlled waste, Attractants, and,

(h) waste and/or recyclable material prohibited in writing by the director.

1.3.3 The waste discharge is authorized to the New Landfill approximately located as shown on Site Plan A.

1.3.4 The authorized works are a lined landfill footprint with a maximum area of 3.60 ha including from bottom to top a base with perimeter berm, secondary base liner, leak detection drainage layer and leak collection pipes and sump, primary base liner, leachate collection drainage layer and leachate collection pipes and sump, pumps, pipes, final cover, and related appurtenances, approximately located as shown on Site Plan A.

1.3.5 The secondary base liner and the primary base liner must each include an upper high density polyethylene double sided textured geomembrane of minimum 1.5 mm thickness and a lower geosynthetic clay liner of hydraulic conductivity less than or equal to $1 \times 10^{-7}$ cm/s. However, on the south slope of the base more than 1 m above the primary base liner, the geosynthetic clay liners are not required.

1.3.6 The operational certificate holder must ensure the New Landfill, excluding final cover, is complete and fully operational on or before the date of commencement of waste discharge to the New Landfill, and at all times thereafter.

## 1.4 New Leachate Management Works

This section applies to the management of leachate from the New Landfill.

1.4.1 The operational certificate holder must convey the leachate from the New Landfill, that is to be discharged on the Facility site, to the New Leachate Management Works.

1.4.2 The maximum rate of treated leachate effluent discharge to the treated leachate infiltration pond is 24,633 $m^3$ per calendar year.

1.4.3 The concentration of any substance in the treated leachate effluent discharge to the treated leachate infiltration pond must not be greater than the Contaminated Sites Regulation Generic Numerical Water Standards for Drinking Water (DW), for that substance.

1.4.4 The treated leachate effluent is authorized to be discharged to the treated leachate infiltration

pond and infiltrated into the ground.

1.4.5 The authorized works are leachate conveyance, treatment and discharge works including pumps, pipes, leachate treatment pond(s), treated leachate infiltration pond, flow monitoring works, and related appurtenances approximately located as shown on Site Plan A.

1.4.6 The leachate treatment pond(s) must include from bottom to top a secondary base liner, leak detection drainage layer and leak collection pipe(s), and a primary base liner. The secondary base liner and the primary base liner must each include an upper high density polyethylene double sided textured geomembrane of minimum 1.5 mm thickness and a lower geosynthetic clay liner of hydraulic conductivity less than or equal to $1 \times 10^{-7}$ cm/s.

1.4.7 Minimum Freeboard must be maintained at all times as follows:
leachate treatment pond(s): 0.6 m
treated leachate infiltration pond: 0.6 m

1.4.8 The operational certificate holder must ensure the New Leachate Management Works are complete and fully operational on or before the date of commencement of waste discharge to the New Landfill, and at all times thereafter.

## 1.5 **New Stormwater Management Works**

This section applies to the management of stormwater from the New Landfill.

1.5.1 The operational certificate holder must manage stormwater from the New Landfill such that stormwater is infiltrated into the ground with the authorized works.

1.5.2 The stormwater must not include leachate and the concentration of any substance in the stormwater must not be greater than the Contaminated Sites Regulation Generic Numerical Water Standards for Drinking Water (DW), for that substance.

1.5.3 The authorized works are diversion berm, perimeter berm, mid slope swales, drop down channels, ditches, energy dissipation and sediment traps, stormwater infiltration area, and related appurtenances approximately located as shown on Site Plan A.

1.5.4 Minimum Freeboard must be maintained at all times as follows:
stormwater infiltration area: 0.6 m
all other authorized works: 0.3 m

1.5.5 The operational certificate holder must ensure that adequate authorized works to manage stormwater, such that stormwater is infiltrated into the ground with the authorized works, are

complete and fully operational on or before the date of commencement of waste discharge to the New Landfill, and at all times thereafter.

### 1.6 Facility Entrance

This section applies to the Facility entrance.

1.6.1 The authorized works are sign(s), gate, fence, weigh scale, and related appurtenances approximately located as shown on Site Plan A.

1.6.2 The operational certificate holder must ensure the authorized works are complete and fully operational on or before the date of issuance of this operational certificate and at all times thereafter.

### 1.7 Location of Facility

This section applies to the location of the Facility.

1.7.1 The location of the Facility is PID 001-223-321, LOT A, DISTRICT LOT 85, SAYWARD DISTRICT, PLAN 30709 EXCEPT PART IN PLAN EPP15087, approximately located as shown on Site Plan A.

## 2. GENERAL REQUIREMENTS

### 2.1 Glossary

The following capitalized terms referred to in this authorization are defined in the Glossary below. Other terms used in this authorization have the same meaning as those defined in the *Environmental Management Act*, applicable regulations, and the Landfill Criteria;

"Attractant" means food or food waste, compost, carcass or part of an animal, fish, or other meat, or other waste or garbage, that could attract bears, birds, rodents, insects, vectors or wildlife, but does not include grass, leaves, weeds, branches and woodwaste;

"Facility" means the Original Landfill, Original Leachate Management Works, New Landfill, New Leachate Management Works, New Stormwater Management Works and the authorized works in section 1.6.1 (Facility Entrance) of this operational certificate;

"Freeboard" means the difference in elevation between the contained liquid level and the top of the containment works at its lowest point;

"Landfill Criteria" means the Landfill Criteria for Municipal Solid Waste Second Edition June 2016, as amended or replaced from time to time;

"New Landfill" means the authorized works in section 1.3.4 of this operational certificate;

"New Leachate Management Works" means the authorized works in section 1.4.5 of this operational certificate;

"New Stormwater Management Works" means the authorized works in section 1.5.3 of this operational certificate;

"Original Landfill" means the Original Lined Cell and the Original Un-Lined Cell;

"Original Leachate Management Works" means the authorized works in section 1.2.5 of this operational certificate;

"Original Lined Cell" means the authorized works in section 1.1.5(i) of this operational certificate;

"Original Un-Lined Cell" means the authorized works in section 1.1.5(ii) of this operational certificate;

"Province" means Her Majesty the Queen in right of British Columbia;

"Regulatory Document" means any document that the operational certificate holder is required to cause to be prepared, prepare or submit to the director or the Province, pursuant to: (i) this authorization; (ii) any regulation made under the *Environmental Management Act* that regulates the Facility described in this authorization or the discharge of waste from that Facility; or (iii) any order issued under the *Environmental Management Act* directed against the operational certificate holder that is related to the Facility described in this authorization or the discharge of waste from that Facility;

"Significant Works" means the Facility excluding the authorized works in section 1.6.1 (Facility Entrance) of this operational certificate.

## 2.2 **Use of Qualified Professional(s)**

The operational certificate holder must cause a Qualified Professional to:

(a) Design and inspect the construction of the Facility, and,

(b) Certify documents related to the Facility including plans, specifications, drawings, construction

reports, assessments, reviews, investigations, studies, surveys, programs, reports and as-built record drawings.

(d) Submit a completed Declaration of Competency and a Conflict of Interest Disclosure Statement with each document.

## 2.3 Operations and Closure Plan (OCP)

(a) The operational certificate holder must cause a Qualified Professional to certify and submit an up to date OCP for the Original Landfill and the Original Leachate Management Works, to the director, on or before the earlier of:

(i) 30 days before the date of commencement of waste discharge to the Original Lined Cell,
(ii) 30 days after the date of issuance of this operational certificate.

(b) The OCP must comply with the requirements of this operational certificate, include information specified in relevant items listed in the Landfill Criteria Section 10.3 Design, Operations and Closure Plan including a site layout plan, a filling plan, a lifespan analysis table, a stormwater management plan, a leachate management plan, an environmental monitoring plan, an operations plan, a closure plan, and the information specified in the following sections of this operational certificate:

2.7(a) (soil acceptance plan), and,
2.10(a) (financial security plan).

(c) The operational certificate holder must carry out the most recent OCP and design, construct, operate, inspect, maintain, monitor and close the Original Landfill and the Original Leachate Management Works, in compliance with the most recent OCP and this operational certificate, until the Original Landfill and the Original Leachate Management Works are decommissioned in compliance with the plan referred to in section 2.9(a) (plan to remove all waste from the Original Landfill) of this operational certificate.

## 2.4 Hydrogeology and Hydrology Characterization Report (HHCR)

(a) The operational certificate holder must cause a Qualified Professional to certify and submit an up to date HHCR, to the director, on or before 90 days before the date of commencement of waste discharge to the New Landfill.

(b) The HHCR must include characterization of the geology, hydrogeology, and surface hydrology at and near the Facility site, and the information specified in all the items listed in the Landfill Criteria, section 10.1 Hydrogeology and Hydrology Characterization Report.

(c) The operational certificate holder must cause a Qualified Professional to certify and submit an updated HHCR to the director, at least once every five years after the date of commencement of waste

discharge to the New Landfill.

## 2.5 Design, Operations and Closure Plan (DOCP)

(a) The operational certificate holder must cause a Qualified Professional to certify and submit an up to date DOCP, for the Facility, to the director, on or before 90 days before the date of commencement of waste discharge to the New Landfill.

(b) The DOCP must comply with the requirements of this operational certificate, include the information specified in all the items listed in the Landfill Criteria Section 10.3 Design, Operations and Closure Plan, and the information specified in the following sections of this operational certificate:

2.6(a) (New Leachate Management Works commissioning plan),
2.7(a) (soil acceptance plan),
2.8(a) (trigger level assessment plan),
2.9(a) (plan to remove all waste from the Original Landfill), and,
2.10(b) (financial security plan).

(c) The operational certificate holder must cause a Qualified Professional to certify and submit an updated DOCP to the director, as necessary to keep the DOCP up to date, at least once every five years after the date of commencement of waste discharge to the New Landfill.

(d) The operational certificate holder must carry out the most recent DOCP and design, construct, operate, inspect, maintain, monitor, and close the Facility, in compliance with most recent DOCP and this operational certificate.

## 2.6 New Leachate Management Works Commissioning Plan and Report

(a) The DOCP submitted pursuant to section 2.5 of this operational certificate must include a New Leachate Management Works commissioning plan that includes:

(i) the expected duration of the New Leachate Management Works commissioning period,
(ii) description of the New Leachate Management Works and design, including treatment of leachate from soil and treated leachate infiltration pond design and infiltration tests,
(iii) the monitoring, sampling and analyses that will be carried out during the New Leachate Management Works commissioning period including the quantity and quality of leachate and treated leachate effluent, and confirmatory sampling before the discharge of any treated leachate effluent to the treated leachate infiltration pond,
(iv) operating procedures that will be carried out during the New Leachate Management Works commissioning period including review of confirmatory sampling results before the discharge of any treated leachate effluent to the treated leachate infiltration pond,
(v) contingency measures that will be carried out during the New Leachate Management Works

commissioning period if the treated leachate effluent quality does not comply with this operational certificate, including storage, retreatment, and transport to an off-site authorized treatment facility,
(vi) New Leachate Management Works commissioning report description, table of contents and summary of contents.

(b) The operational certificate holder must cause a Qualified Professional to certify and submit a New Leachate Management Works commissioning report, that includes the information contemplated in section 2.6(a)(vi) of this operational certificate, to the director, on or before 30 days after the completion of the New Leachate Management Works commissioning period, or as specified by the director.

## 2.7 Soil Acceptance Plan

(a) The OCP submitted pursuant to section 2.3, and the DOCP submitted pursuant to section 2.5, of this operational certificate, must include a soil acceptance plan that includes procedures that will be carried out before soil is accepted at the Facility including receipt and review of documents required by section 2.7(b) of this operational certificate, and consideration of the applicable Original Leachate Management Works or New Leachate Management Works adequacy to treat leachate from the soil.

(b) Before a specific quantity of soil is accepted at the Facility, the operational certificate holder must cause a Qualified Professional to certify and submit to the operational certificate holder, a document pertaining to the specific quantity of soil that includes:
(i) the soil tonnage(s) and soil quality class(es) as described in the most recent version of Technical Guidance 1 on Contaminated Sites Site Characterization and Confirmation Testing,
(ii) the soil origin including applicable civic address, site identification number, parcel identifier, parcel identification number, legal description, and,
(iii) characterization of the soil in accordance with ministry procedures and applicable Contaminated Sites Regulation Guidance, Protocols and Procedures.

## 2.8 Trigger Level Assessment Plan

(a) The DOCP submitted pursuant to section 2.5 of this operational certificate must include a trigger level assessment plan that includes:
(i) Description of the routine monitoring of the quantity and quality of leachate leakage through the primary liner and into the leak detection layer for the New Landfill, and for the leachate treatment pond(s), and related leachate leakage quantities and qualities that will trigger corresponding described increased monitoring, investigations, contingency measures and actions.
(ii) Description of the routine monitoring of groundwater quality immediately downgradient of the New Landfill, the leachate treatment pond(s), and the treated leachate infiltration pond, and related groundwater substance concentrations that will trigger corresponding described increased

monitoring, investigations, contingency measures and actions.

## 2.9 Plan to Remove all Waste from the Original Landfill

(a) The DOCP submitted pursuant to section 2.5 of this operational certificate must include a plan to remove all waste from the Original Landfill, categorize such waste, discharge all such waste to the New Landfill or to other identified and authorized waste management facility(ies), carry out sampling to confirm all such waste has been removed, and decommission the Original Landfill and the Original Leachate Management Works.

(b) Subject to section 1.3.2 of this operational certificate, waste removed from the Original Landfill is authorized to be discharged to the New Landfill. The tonnage of such waste must not be included for the purpose of determining compliance with section 1.3.1 of this operational certificate.

(c) The director may require the operational certificate holder to carry out and complete the plan referred to in section 2.9(a) of this operational certificate, in accordance with the director's requirements.

(d) If the plan referred to in section 2.9(a) of this operational certificate is carried out, the operational certificate holder must cause a Qualified Professional to certify and submit a report to the director that confirms that the plan has been carried out and completed in accordance with the director's requirements, describes the plan implementation, describes and provides the waste categorization, describes and provides the sampling and results, describes the decommissioning of the Original Landfill and the Original Leachate Management Works, provides photos documenting the implementation of the plan referred to in section 2.9(a) of this operational certificate, and lists the tonnages or volumes, and categories of waste removed and discharged to the New Landfill and to other identified and authorized waste management facility(ies), on or before 60 days after the plan referred to in section 2.9(a) of this operational certificate has been carried out and completed.

## 2.10 Financial Security

(a) The OCP submitted pursuant to section 2.3 of this operational certificate must include a financial security plan that includes:

(i) the calculations of the amounts of financial security and time periods for each phase of development for the Original Landfill in accordance with the Landfill Criteria Section 8.0 Financial Security, and,

(ii) the amounts of financial security for the corresponding time periods.

(b) The DOCP submitted pursuant to section 2.5 of this operational certificate must include a financial security plan that includes:

(i) the tasks, estimated costs, contingency costs, calculations of the amounts of financial security

and time periods, to carry out and complete the plan referred to in section 2.9(a) of this operational certificate (plan to remove all waste from the Original Landfill),
(ii) the calculations of the amounts of financial security and time periods for each phase of development for the New Landfill in accordance with the Landfill Criteria Section 8.0 Financial Security, and,
(iii) the amounts of financial security for the corresponding time periods.

(c) The operational certificate holder must provide the director with financial security, on or before the earlier of:
(i) 30 days before the date of commencement of waste discharge to the Original Lined Cell,
(ii) 30 days after the date of issuance of this operational certificate,
(iii) 90 days before the date of commencement of waste discharge to the New Landfill,
and at all times thereafter.

(d) The amount of financial security at any time must be equal to or greater than:
(i) Before the report referred to in section 2.9(d) (report that confirms that the plan referred to in section 2.9(a) of this operational certificate has been carried out and completed) of this operational certificate is submitted to the director, the greater amount specified for the corresponding time period in:
- the financial security plan in the most recent OCP,
- the financial security plan in the most recent DOCP.
(ii) On and after the report referred to in section 2.9(d) (report that confirms that the plan referred to in section 2.9(a) of this operational certificate has been carried out and completed) of this operational certificate is submitted to the director, the amount specified for the corresponding time period in the financial security plan in the most recent DOCP.

(e) The form of financial security must be satisfactory to the director.

(f) At the discretion of the director, such financial security may be used among other things:
(i) to correct any inadequacy of the Facility relating to its design, construction, operation, inspection, maintenance, monitoring, closure, and post-closure;
(ii) to correct any default in compliance with this operational certificate or the *Environmental Management Act*; and,
(iii) for remediation of the Facility.

(g) The operational certificate holder must replenish any amounts drawn from the posted financial security within 60 days of such amounts being drawn or as otherwise specified by the director.

## 2.11 **Construction Report(s)**

(a) The operational certificate holder must cause a Qualified Professional to carry out inspections

Date issued: August 1, 2019

Luc Lachance, P.Eng
for Director, *Environmental Management Act*
Authorizations - South Region

before and during the construction or modification of Significant Works, and, after the completion of construction or modification of Significant Works, to certify and submit construction report(s) to the director:

(i) for construction of the New Landfill and the New Leachate Management Works, on or before 30 days before the date of commencement of waste discharge to those new Significant Works, and,
(ii) for all Significant Works, on or before 60 days after the completion of construction or modification of the Significant Works.

(b) The construction report(s) must demonstrate that the Significant Works have been constructed in accordance with this operational certificate and the applicable most recent OCP or DOCP, describe any technical concerns that arose from the inspections and testing and how they were addressed, and include as-built record drawings of the constructed Significant Works, all the inspection and testing reports and results including geologic inspection report, quality control and quality assurance testing, soil test data including field and laboratory data, as described in the Landfill Criteria section 10.2 Construction Report(s).

2.12 **Notification of Commencement of Waste Discharge**

The operational certificate holder must notify the director of:
(a) the date of commencement of waste discharge to the Original Lined Cell, on that date,
(b) the date of commencement of waste discharge to the New Landfill, on that date,
(c) the date the Original Lined Cell has reached capacity, on that date, and,
(d) the date the plan referred to in section 2.9(a) of this operational certificate has been carried out and completed, on that date.

2.13 **Buffer Zone**

The operational certificate holder must ensure that the New Landfill, New Leachate Management Works, and New Stormwater Management Works, are located a minimum of 50 m from the Facility site boundary.

2.14 **Depth to Groundwater**

The operational certificate holder must ensure that the New Landfill secondary base liner, and the New Leachate Management Works leachate treatment pond(s) secondary base liner, are a minimum of 1.5 m above groundwater at all times.

2.15 **Covenant**

On or before the date of commencement of waste discharge to the New Landfill, the operational certificate holder must register a covenant under section 219 (1) of the *Land Title Act*, in a form

acceptable to the director, that binds successors in title to uphold the continued implementation of the closure plan in the most recent DOCP, and prohibits development of the Facility other than as contemplated by this operational certificate or approved by the director. Such covenant must include an acknowledgement that the property was used for the purpose of waste disposal, must be registered as a charge against title to the property on which the facility is located and must be registered in priority to all charges except charges which do not give the holders any rights which might conflict with the covenant.

### 2.16 Additional Requirements

The director may require the operational certificate holder to:

(a) Cause a Qualified Professional to certify and submit to the director additional, amended or improved documents of the Facility including plans, specifications, drawings, construction reports, assessments, reviews, investigations, studies, surveys, programs, reports and as-built record drawings.

(b) Carry out actions in accordance with the additional, amended or improved documents submitted, and additional actions as specified.

(c) Repair, alter, remove, improve or add to existing facilities and works, or construct new facilities and works, at the Facility.

(d) Temporarily or permanently cease waste discharge to the Original Lined Cell and/or the New Landfill, cover part(s) or all of the Original Landfill and/or the New Landfill with final cover, and close and decommission the Facility, as specified.

### 2.17 Authorization Requirements

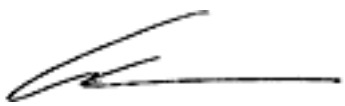
Where this authorization provides that the director may specify a matter or require an action to be carried out, the operational certificate holder must comply with the specification and carry out the action in accordance with the requirements of the director.

## 3. OPERATING AND PERFORMANCE REQUIREMENTS

### 3.1 Multiple and/or Spare Works and Auxiliary Power Facilities

The operational certificate holder must provide and install multiple and/or spare works and auxiliary power facilities to ensure the Original Lined Cell, Original Leachate Management Works, New Landfill, New Leachate Management Works, and New Stormwater Management Works, are complete and fully operational as specified in this operational certificate, including during maintenance, breakdowns and electrical power outages.

Date issued: August 1, 2019



Luc Lachance, P.Eng
for Director, *Environmental Management Act*
Authorizations - South Region

## 3.2 Maintenance of the Facility

(a) The operational certificate holder must cause persons that are qualified and trained to operate, regularly inspect, and maintain the Facility, in good working order. If components of the Facility have a manufacturer's recommended maintenance schedule, then those components must, at a minimum, be maintained in accordance with that schedule.

(b) The operational certificate holder must prepare documents of the qualification and training of the persons operating, inspecting and maintaining the Facility, and of Facility inspections, operation and maintenance.

## 3.3 Facility Manager and Operator Certification

(a) The operational certificate holder must ensure that at least one person responsible for the management of the Facility is certified, and maintains certification, by The Solid Waste Association of North America (SWANA) as a Manager of Landfill Operations, and at least one person responsible for the operation of the Facility has, within the preceding five years, successfully completed the SWANA Landfill Operations Basics course, on or before the earlier of:

(i) the date of commencement of waste discharge to the Original Lined Cell,

(ii) the date of commencement of waste discharge to the New Landfill,

and at all times thereafter.

(b) The operational certificate holder must prepare documents of the SWANA certification and training of the person(s) responsible for the management and operation of the Facility.

## 3.4 New Leachate Management Works Classification and Operator Certification

(a) The operational certificate holder must have the New Leachate Management Works classified by the Environmental Operators Certification Program (EOCP), on or before the date of commencement of waste discharge to the New Landfill, and at all times thereafter.

(b) The operational certificate holder must ensure that the person(s) responsible for the operation and maintenance of the New Leachate Management Works is(are) certified at an EOCP certification level equivalent to or higher than the EOCP classification level of the New Leachate Management Works, on or before the date of commencement of waste discharge to the New Landfill, and at all times thereafter.

(c) The operational certificate holder must prepare documents of the EOCP classification level of the New Leachate Management Works and the EOCP certification level(s) of the person(s) responsible for the operation and maintenance of the New Leachate Management Works.

Date issued: August 1, 2019

Luc Lachance, P.Eng
for Director, *Environmental Management Act*
Authorizations - South Region

## 3.5 Groundwater Quality

(a) The operational certificate holder must ensure that the Facility does not cause the concentration of any substance in groundwater flowing from the Facility site boundary to be greater than:

(i) the Contaminated Sites Regulation Generic Numerical Water Standards for Drinking Water (DW), for that substance,

or,

(ii) if the local background concentration of any substance is greater than (i), the local background concentration of that substance.

(b) If section 3.5(a)(ii) of this operational certificate is being used, the operational certificate holder must cause a Qualified Professional to determine the local background concentration of substance(s) in (a), in accordance with the latest approved version of Protocol 9 for Contaminated Sites, Determining Background Groundwater Quality, and include such determination(s) in the Annual Operations and Monitoring Report.

(c) The director may specify more stringent groundwater quality standards than those set out in this section.

## 3.6 Landfill Gas Management

The operational certificate holder must ensure that:

(a) The Facility does not cause:

(i) combustible gas concentrations to exceed the lower explosive limit of methane (5 percent by volume), or a lower concentration specified by the director, in soil at the Facility site boundary;

(ii) combustible gas concentrations to exceed 20 percent of the lower explosive limit of methane (1 percent by volume) in any building; and

(iii) federal, provincial, or local ambient air quality objectives and standards to be exceeded in air at the Facility site boundary.

(b) Landfill gas is managed in accordance with all migration and health and safety requirements.

## 3.7 Nuisance

The operational certificate holder must ensure that the Facility does not cause a nuisance including with regard to birds, rodents, insects, odour, noise, dust, litter, vector and wildlife attraction.

## 3.8 Complaints

Date issued: August 1, 2019

Luc Lachance, P.Eng
for Director, *Environmental Management Act*
Authorizations - South Region

The operational certificate holder must prepare documents of complaints with regard to matters relevant to this operational certificate, including environmental and nuisance complaints. These documents must include the source and nature of the complaint, actions, responses, and corresponding dates and times.

### 3.9 Regulatory Documents

(a) The operational certificate holder must retain all Regulatory Documents.

(b) The operational certificate holder must retain all Regulatory Documents for the last seven years at the Facility and such documents must be available for immediate inspection at the Facility by a director or an officer.

(c) If requested by a director or an officer, the operational certificate holder must submit the requested Regulatory Documents to the director or officer within 14 days of the request.

## 4. SAMPLING REQUIREMENTS

### 4.1 Sampling Procedures

The operational certificate holder must carry out required sampling in accordance with the procedures described in the "British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples, 2013 Edition (Permittee)" or most recent edition, or by alternative procedures as authorized by the director. A copy of the above manual is available on the Ministry web page at https://www2.gov.bc.ca/gov/content/environment/research-monitoring-reporting/monitoring/laboratory-standards-quality-assurance.

### 4.2 Analytical Procedures

The operational certificate holder must carry out required analyses in accordance with procedures described in the "British Columbia Laboratory Manual (2015 Permittee Edition)", or the most recent edition or by alternative procedures as authorized by the director. A copy of the above manual is available on the Ministry web page at https://www2.gov.bc.ca/gov/content/environment/research-monitoring-reporting/monitoring/laboratory-standards-quality-assurance.

### 4.3 Quality Assurance

(a) The operational certificate holder must obtain from the analytical laboratory(ies) their precision, accuracy and blank data for each sample set submitted by the operational certificate holder and an evaluation of the data acceptability, based on criteria set by such laboratory.

Date issued: August 1, 2019

Luc Lachance, P.Eng
for Director, *Environmental Management Act*
Authorizations - South Region

(b) The operational certificate holder must submit samples to analytical laboratory(ies) that meet the definition of a qualified laboratory under the Environmental Data Quality Assurance Regulation.

(c) The operational certificate holder must collect, prepare and submit for analysis by the analytical laboratory(ies) quality control (QC) samples for each parameter. As a minimum,

(i) The number of QC samples should be 20% of all samples collected (environmental + QC samples) within 48 hours of each other, and

(ii) Include duplicate, field and trip blank samples for each parameter.

## 5. REPORTING REQUIREMENTS

### 5.1 Routine Reporting

The operational certificate holder must submit all routine Regulatory Documents required by this operational certificate by email to the Ministry's Routine Environmental Reporting Submission Mailbox at EnvAuthorizationsReporting@gov.bc.ca or as otherwise instructed by the director. For guidelines on how to properly name the files and email subject lines or for more information visit the Ministry website http://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/data-and-report-submissions/routine-environmental-reporting-submission-mailbox.

### 5.2 Non-compliance Notification

(a) The operational certificate holder must immediately notify the director or designate by email at EnvironmentalCompliance@gov.bc.ca, or as otherwise instructed by the director of any non-compliance with the requirements of this authorization by the operational certificate holder and must take remedial action to remedy any effects of such non-compliance.

(b) The operational certificate holder must provide the director with written confirmation of all such non-compliance events, including available test results within 24 hours of the original notification by email at EnvironmentalCompliance@gov.bc.ca, or as otherwise instructed by the director.

### 5.3. Non-compliance Reporting

(a) If the operational certificate holder fails to comply with any of the requirements of this authorization, the operational certificate holder must, within 30 days of such non-compliance, submit to the director a written report that is satisfactory to the director and includes, but is not necessarily limited to, the following:

(i) all relevant test results obtained by the operational certificate holder related to the non-compliance,

Date issued: August 1, 2019

Luc Lachance, P.Eng
for Director, *Environmental Management Act*
Authorizations - South Region

(ii) an explanation of the most probable cause(s) of the non-compliance, and
(iii) a description of remedial action planned and/or taken by the operational certificate holder to prevent similar non-compliance(s) in the future.

(b) The operational certificate holder must submit all non-compliance reporting required to be submitted under this section by email to the Ministry's Compliance Reporting Submission Mailbox at EnvironmentalCompliance@gov.bc.ca or as otherwise instructed by the director. For guidelines on how to report a non-compliance or for more information visit the Ministry website http://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/data-and-report-submissions/non-compliance-reporting-mailbox.

## 5.4 Annual Operations and Monitoring Report

(a) The operational certificate holder must cause a Qualified Professional to certify and submit an Annual Operations and Monitoring Report in a format suitable for public release, for the preceding calendar year, to the director on or before March 31 of each year. On or before March 31 of each year, the operational certificate holder must post a copy of the Annual Operations and Monitoring Report online, on a website accessible to the public, and in accordance with any requirements of the director.

(b) The Annual Operations and Monitoring Report must include the following information:
Operations Report:
(i) Summary of OCP implementation that addresses the information in section 2.3(b), and summary of DOCP implementation that addresses the information in 2.5(b), of this operational certificate,
(ii) Summary of construction report(s),
(iii) Annual and cumulative tonnages and categories of waste including soil tonnage(s) and soil quality class(es) discharged to the Original Lined Cell and to the New Landfill,
(iv) Remaining volume and life of the Original Lined Cell and of the New Landfill,
(v) Summary of treated leachate effluent quantity and quality discharged to the treated leachate infiltration pond,
(vi) Summary of complaints and nuisances and description of remedial action planned and/or taken by the operational certificate holder to prevent similar complaints and nuisances in the future,
(vii) Summary of non-compliance notifications and non-compliance reporting and description of remedial action planned and/or taken by the operational certificate holder to prevent similar non-compliance(s) in the future ,
(viii) Annual status form in accordance with the instructions and template at the ministry website https://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/data-and-report-submissions/annual-status-form
(ix) Summary of OCP and DOCP implementation, and construction of Significant Works, planned for the next calendar year,

Date issued: August 1, 2019

Luc Lachance, P.Eng
for Director, *Environmental Management Act*
Authorizations - South Region

Environmental Monitoring Plan Report:

(x) Site plan(s), sampling locations, stormwater flow paths, groundwater elevations, gradients and flow directions,
(xi) Sampling facilities, frequencies, substances, sampling and analytical procedures,
(xii) Data including laboratory analysis and quality assurance and quality control results,
(xiii) Data tabulation, trend analysis, graphs, diagrams, and interpretation,
(xiv) Trigger level assessment plan monitoring, data, results and interpretation,
(xv) Any determination(s) of the local background concentration of substance(s) in accordance with section 3.5 of this operational certificate,
(xvi) Comparison of the data with the standards for treated leachate effluent discharge, stormwater quality, groundwater quality, and landfill gas management, specified in sections 1.2, 1.4, 1.5, 3.5 and 3.6 of this operational certificate, and identification of any non-compliance and predicted future non-compliance,
(xvii) Results, conclusions, recommendations and changes to the environmental monitoring plan.

(c) The operational certificate holder must upload monitoring data associated with this operational certificate to the Ministry's Environmental Monitoring System (EMS) database, within 45 days of the end of the 3 month period in which the data is collected.

## 5.5 **Licence to Publish Documents**

(a) Subject to paragraph (b), the operational certificate holder authorizes the Province to publish on the Ministry of Environment and Climate Change Strategy website the entirety of any Regulatory Document.

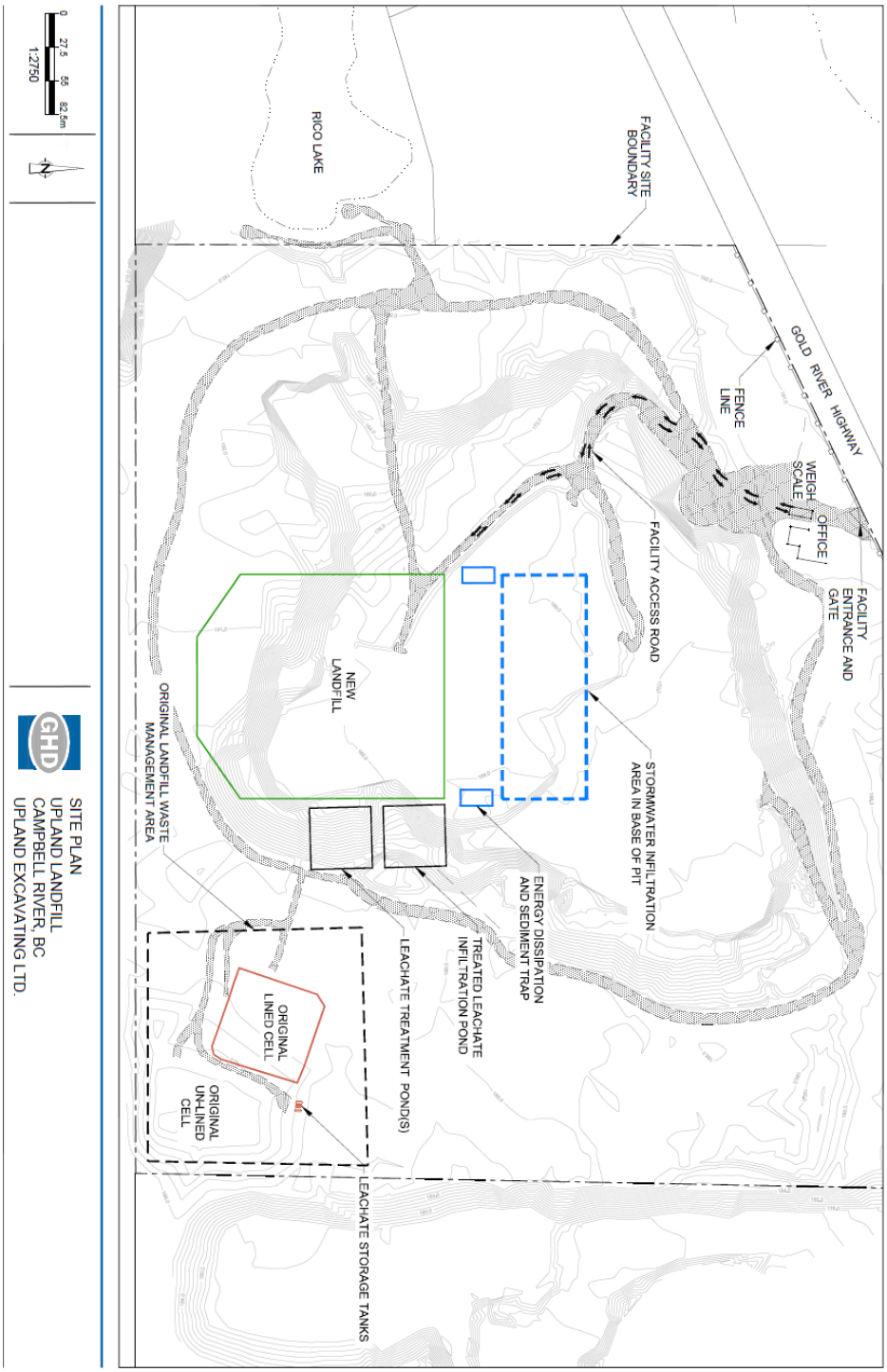
(b) The Province will not publish any information that could not, if it were subject to a request under section 5 of the *Freedom of Information and Protection of Privacy Act*, be disclosed under that Act.

(c) The operational certificate holder will indemnify and save harmless the Province and the Province's employees and agents from any claim for infringement of copyright or other intellectual property rights that the Province or any of the Province's employees or agents may sustain, incur, suffer or be put to at any time that arise from the publication of a Regulatory Document.

Date issued: August 1, 2019

Luc Lachance, P.Eng
for Director, *Environmental Management Act*
Authorizations - South Region

# Site Plan A




Date issued: August 1, 2019

Luc Lachance, P.Eng
for Director, *Environmental Management Act*
Authorizations - South Region

April 26, 2022

Tracking Number: 405141
Authorization Number: 107689

UPLAND EXCAVATING LTD.
#201-909 ISLAND HIGHWAY
CAMPBELL RIVER BC V9W 2C2

**Re: Your application dated June 07, 2021, for amendments to Operational Certificate 107689, under the *Environmental Management Act***

In response to the subject application, and pursuant to Section 16 of the *Environmental Management Act*, Operational Certificate 107689 is hereby amended as follows:

The subject part of the preamble page 1 is amended from:

> Is authorized to manage waste at the Facility located in Campbell River, British Columbia, subject to the requirements listed below. Contravention of any of these requirements is a violation of the *Environmental Management Act* and may lead to prosecution.

to:

> Is authorized to manage waste at the Facility located in Campbell River, British Columbia, provided that the operational certificate holder complies with all provisions of this operational certificate. Unless a contrary intention appears, the provisions of this operational certificate are requirements that must be complied with regardless of whether the operational certificate holder introduces waste to the environment. Contravention of any of these requirements, and any discharge of waste while out of compliance with any provisions of this operational certificate, is a violation of the *Environmental Management Act*, and may lead to prosecution.

Sub-section 1.3.2 (d) is amended to:

> (d) soil that is not hazardous waste,

Sub-section 1.4.5 is amended after "leachate treatment pond(s)" by adding:

> treated leachate holding pond or tank,

Sub-section 1.4.6 is amended after "1x $10^{-7}$ cm/s." by adding:

> The treated leachate holding pond must include from bottom to top a secondary base liner, leak detection drainage layer and leak collection pipe(s), and a primary base liner. The treated leachate holding pond secondary base liner and the primary base liner must each include a coated woven polyethylene geomembrane of minimum 0.75 mm thickness.

Sub-section 1.4.7 is amended after “treated leachate infiltration pond: 0.6 m” by adding:

treated leachate holding pond: 0.6 m.

4. Sub-sections 2.9(c) and 2.9(d) are amended to:

(c) The operational certificate holder must carry out and complete the plan referred to in section 2.9(a) of this operational certificate, on or before one year after the date of this letter.

(d) The operational certificate holder must cause a Qualified Professional to certify and submit a report to the director that confirms that the plan referred to in section 2.9(a) of this operational certificate has been carried out and completed, describes the plan implementation, describes and provides the waste categorization, describes and provides the sampling and results, describes the decommissioning of the Original Landfill and the Original Leachate Management Works, provides photos documenting the implementation of the plan referred to in section 2.9(a) of this operational certificate, and lists the tonnages or volumes, and categories of waste removed and discharged to the New Landfill and to other identified and authorized waste management facility(ies), on or before 60 days after the plan referred to in section 2.9(a) of this operational certificate has been carried out and completed.

5. Site Plan A is amended to the enclosed Site Plan A.

All other terms and conditions of the operational certificate remain in full force and effect.

Please note that although a revised operational certificate document has not been produced at this time a copy of this letter is being placed on the operational certificate file, as an addendum to the operational certificate, to formally reflect the change.

This operational certificate does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority rests with the operational certificate holder. This operational certificate is issued pursuant to the provisions of the *Environmental Management Act* to ensure compliance with Section 120(3) of that statute, which makes it an offence to discharge waste, from a prescribed industry or activity, without proper authorization. It is also the responsibility of the operational certificate holder to ensure that all activities conducted under this operational certificate are carried out with regard to the rights of third parties, and comply with other applicable legislation that may be in force.

This decision may be appealed to the Environmental Appeal Board in accordance with Part 8 of the *Environmental Management Act*. An appeal must be delivered within 30 days from the date that notice of this decision is given. For further information, please contact the Environmental Appeal Board at (250) 387-3464.

Administration of this operational certificate will be carried out by staff from the Environmental Protection Division's Regional Operations Branch. For guidance regarding how to comply with a waste discharge authorization including submitting reports and reporting non-compliance, please refer to the ministry website at: https://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/comply, or as further instructed.

For more information about how the Ministry will assess compliance with your operational certificate please refer to gov.bc.ca/environmentalcompliance.

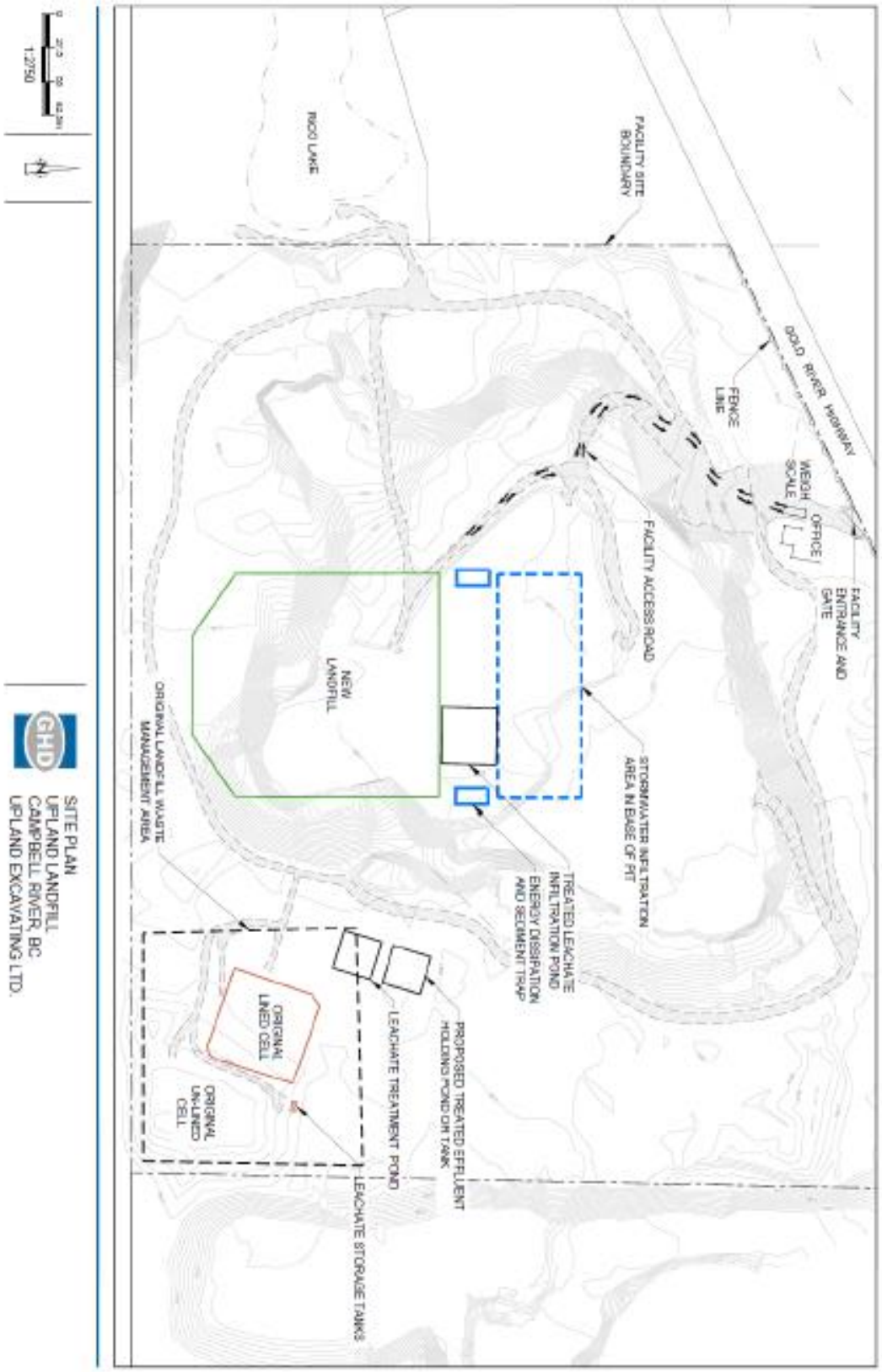
For more information about how to make changes to your operational certificate and to access waste discharge amendment forms and guidance, please refer to gov.bc.ca/wastedischarge-authorizations.

Sincerely,

Carol Danyluk, P.Eng.
Director's Designate
Environmental Management Act

ENCL: None

# Site Plan A


1:2750
RIGG LAKE
FACILITY SITE BOUNDARY
GOLD RIVER HIGHWAY
FENCE LINE
WEIGH SCALE
OFFICE
FACILITY ENTRANCE AND GATE
FACILITY ACCESS ROAD
NEW LANDFILL
ORIGINAL LAND FILL WASTE MANAGEMENT AREA
STORMWATER INFILTRATION AREA IN BASE OF PIT
TREATED LEACHATE INFILTRATION POND ENERGY DISSIPATION AND SEDIMENT TRAP
ORIGINAL LINED CELL
ORIGINAL UNLINED CELL
LEACHATE TREATMENT POND
PROPOSED TREATED EFFLUENT HOLDING POND OR TANK
LEACHATE STORAGE TANKS
GHD
SITE PLAN
UPLAND LANDFILL
CAMPBELL RIVER, BC
UPLAND EXCAVATING LTD.

# Appendix B

## Cell 1 West Construction Report

# Cell 1 West Construction Report

## Northwin Landfill

Upland Excavating Ltd.

19 March 2024

DRAFT

→ The Power of Commitment

DRAFT

**GHD Limited 735**
138 East 7th Avenue, Suite 100
Vancouver, BC V5T 1M6, Canada

**Document status**

| Status Code | Revision | Author | Reviewer | | Approved for issue | | |
|---|---|---|---|---|---|---|---|
| | | | Name | Signature | Name | Signature | Date |
| S3 | 00 | David Barbour | Roxy Hasior | | Rose Marie Rocca | | March 19, 2024 |
| [Status code] | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

*© GHD 2024*

This document is and shall remain the property of GHD. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

# Contents


**1. Introduction** **1**
1.1 Project Scope 1
**2. Construction Narrative** **1**
2.1 Site Preparation & Excavation 2
2.2 Cell 1 West - Composite Double Liner 2
2.3 Leachate Collection System 3
2.4 Close-Out 3
**3. Construction Quality Assurance & Quality Control** **3**
3.1 Earthworks 3
3.2 Leachate Collection System & Leak Detection Piping 3
3.3 Geosynthetics QA/QC 4
**4. Conformance with Design** **4**
4.1 Earthworks 4
4.2 Leachate Collection System & Leak Detection Piping 4
4.3 Geosynthetics 5
**5. Certification** **5**


## Appendices


Appendix A Record Drawings
Appendix B Photograph Log
Appendix C Material Test Results
Appendix D Product Data
Appendix E Geosynthetics QA/QC Information
Appendix F Field Inspection Notes


DRAFT



This document is in draft form. The contents, including any opinions, conclusions or recommendations contained in, or which may be implied from, this draft document must not be relied upon. GHD reserves the right, at any time, without notice, to modify or retract any part or all of the draft document. To the maximum extent permitted by law, GHD disclaims any responsibility or liability arising from or in connection with this draft document.

# 1. Introduction

The Northwin Landfill (Landfill or Site) is owned by Upland Excavating Ltd. (Upland) and operated by Northwin Environmental (Northwin). The Site has an area of approximately 48 hectares (ha) and is located at civic address 7295 and 7311 Gold River Highway, Campbell River, BC, approximately 7 kilometres (km) southwest of Campbell River city centre. The Site operates as a sand, gravel and rock quarry and a waste management facility.

This Construction Report (Report) documents the construction of Cell 1 West carried out by Upland Contracting Ltd. (Contractor), Northwin and other contractors hired by Upland.

The Report has been prepared by GHD for Upland for submission to the Ministry of Environment and Climate Change Strategy (ENV) as required by Section 2.11 of the Landfill's OC and also satisfies the requirements of Section 10.2 of the Landfill Criteria for Municipal Solid Waste (Second Edition), BC Ministry of Environment, June 2016 (the Criteria).

Upland, as the OC holder retained GHD to act as the Qualified Professional (QP) for this project scope. In this capacity, GHD designed the civil work for Cell 1 West, carried out inspections during construction, and completed this construction report.

## 1.1 Project Scope

Cell 1 West is the second cell constructed in the Landfill. In accordance with the 2022 Design Operations and Closure Plan (DOCP) for the Landfill and the detailed design, the Cell 1 West base consists of a double liner system and includes a leak detection layer. Leachate generated from the Landfill will be collected within the cell and conveyed to the existing Cell 1 East sump, and then to the leachate treatment system. The leachate treatment system is a batch treatment system and includes the leachate collection system, aerated equalization pond, a treated leachate holding pond and an infiltration pond, which were initially designed and constructed in 2021.

The composite double liner system for Cell 1 West is comprised of a primary and secondary base liner. The primary base liner refers to the composite liner system that consists of an HDPE geomembrane liner and geosynthetic clay liner (GCL) which underlies the leachate collection system, and the secondary base liner refers to the composite liner system comprised from of an HDPE geomembrane liner and GCL which underlies the leak detection system.

The leachate collection system includes perforated leachate collection pipes within a stone drainage blanket sloped towards the leachate sump, with the following components:

- 300 mm thick, 50 mm diameter, clear, round stone drainage blanket, with minimal fines
- Perforated leachate collection pipes (LCP) with minimum diameter of 200 mm
- Maximum 15 m lateral spacing between leachate collection pipes (LCP) running south to north
- Maximum 50 m drainage path for leachate to travel before it is intercepted by the LCPs
- Clean-outs at each end of the LCPs
- Leachate collection header pipe at the east end of the Landfill running towards the leachate collection sump at a minimum slope of 2 percent
- Leachate sump at elevation 164 m AMSL with two leachate sump riser pipes with diameters of 450 mm
- Leak detection system with four 50 mm leak detection monitoring riser pipes

# 2. Construction Narrative

The following sections provide the construction narrative for Cell 1 West. Record drawings are provided in Appendix A.

Construction activities began on October 12, 2022, and were completed on September 22, 2023

In general, construction generally progressed as follows:

- Site preparation and excavation

DRAFT

– Cell 1 West double liner installation
– Cell 1 West leachate collection and leak detection system installation

## 2.1 Site Preparation & Excavation

Site preparation activities including excavation of the Cell 1 West base, preparation of subgrade contours, and construction of berms around the Cell 1 West perimeter began in September 2022 and continued through October 12, 2022. Site preparation works were completed prior to GHD arriving on site.

## 2.2 Cell 1 West - Composite Double Liner

Joe Cassidy (Liner Installer) was hired as an independent contractor to oversee the geosynthetic installation. Mr. Cassidy is an experienced liner installer with over thirty years of experience in the industry. Several experienced liner technicians were also hired for the installation and worked alongside Upland (the Contractor) employees with Mr. Cassidy overseeing the work. The geosynthetic installation crew mobilized to site on October 12, 2022 and the installers met with GHD to confirm QA/QC requirements.

Installation of geosynthetics in the Cell 1 West began on October 14, 2022. The QA/QC program for the construction of the base liner systems included non-destructive testing of each seam. Details of the QA/QC program are described in Section 3.

The geosynthetic deployment began with the placement of a non-woven geotextile on the slopes and floor of the landfill cell, starting at the Cell 1 East tie in berm. Geosynthetic rolls were deployed using a telehandler forklift. An excavator was used to deploy geosynthetics for the rest of the Landfill cell.

GCL was placed over top of the non-woven geotextile. Rolls in the east section of the cell were installed in a north-south direction working from the east end of the landfill to the west. For the west section of the cell, rolls were installed in a west-east direction working from the north end of the landfill to the south. The seams of the GCL were overlapped, with the crew using factory provided indicating lines that marked the minimum overlap. The seams were heat seamed shortly after the GCL deployment. In general, the geomembrane was installed on top of the GCL as soon as the width of GCL panels would allow. This process continued until the primary GCL and geomembrane layer was installed across the landfill floor.

Geocomposite installation began after the primary geomembrane installation on the landfill floor. The geocomposite was installed with panels in the same direction starting near the north toe working south. A skid-steer with smooth rubber tracks was used to deploy the geocomposite on the liner while an excavator held the rolls. GHD observed the procedures being followed by the operators and determined they were acceptable to avoid damage to the liner. The deployment procedure involved using a leaf blower to remove any debris from the area being driven on, having a spotter observe the geomembrane between the skid-steer tracks and the geo-composite, and skid steer operator never turning the equipment on the exposed geomembrane. Nylon cable ties were applied at 1.5 m intervals at the edge netting and the overlapping geotextile was heat seamed.

As the geocomposite was being placed on the base of the landfill, the crew began deploying non-woven geotextile on the slopes of the landfill. The geotextile rolls were held with an excavator while the crew placed the material manually on the slopes. The geotextile was heat seamed shortly after deployment.

The GCL was placed on the slopes after the geotextile using the same method. GCL was heat seamed shortly after it was placed and covered with the second layer of Geomembrane. The primary layer of GCL and geomembrane was completed and tied into the geosynthetics on the floor of the landfill before the secondary containment layers were installed. The same procedures were followed to install the secondary geomembrane. The smooth tracked skid steer was used to pull the geosynthetics on the base of the landfill and while the excavator held the rolls and materials were pulled by hand down the slopes. Installation of geosynthetics was completed on November 20, 2022, with the final placement of non-woven geotextile on the floor of the landfill.

Some damage to the liner was observed and repaired on November 18, 2022. Photos of the repairs are provided in the Appendix B (photo log).

DRAFT

## 2.3 Leachate Collection System

The Contractor began installing the leachate collection pipes and the stone drainage layer in November of 2022 after completion of the geosynthetics work, however construction was postponed for the winter and resumed on June 7, 2023.

The leachate collection system was installed per the drawings with one 300 mm HDPE leachate collection header pipe running south to north, and seven 300 mm HDPE leachate collection pipes running west to east. To facilitate installation of the leachate collection system over the liner, the Contractor initially placed the stone drainage layer in 3 rows of 900 mm high lifts to form roadways from the south to the north side of the landfill cell. The material was hauled with rock trucks and placed with an excavator. Traffic cones were used for visual aids to ensure the minimum 900 mm depth of material was placed. After the drain rock roads were built the Contractor fused and placed perforated leachate collection pipe on the base of the landfill. A Caterpillar mini excavator was then used to spread the drain rock in 300 mm lifts across the floor of the landfill. The Contractor placed woven geotextile on top of the drain rock, completing the leachate collection system installation.

## 2.4 Close-Out

GHD performed an inspection of the Cell 1 West Works on July 7, 2023, and created a deficiency list which was provided to the Contractor. All deficiencies were addressed to the satisfaction of GHD and Upland by September 22, 2023.

# 3. Construction Quality Assurance & Quality Control

GHD carried out regular inspections throughout the duration of the construction to assure construction quality and quality control (QA/QC). The QA/QC program included product data review and geosynthetics installation QA/QC according to the design specifications.

A photo log with select photographs from throughout the construction is provided in Appendix B. Appendix C provides the material test results. Product data sheets and reviewed submittals are provided in Appendix D. Appendix E provides geosynthetics QA/QC information including the results of destructive and non-destructive quality testing. GHD's inspection notes from select field inspections during liner installation are included in Appendix F.

## 3.1 Earthworks

Site preparation and excavation activities were completed by the contractor prior to GHD's first inspection. Based on GHD's earthworks inspection was conducted prior to geosynthetics placement, the materials installed were in conformance with design specifications and drawings (refer to Section 4.1).

## 3.2 Leachate Collection System & Leak Detection Piping

QA/QC activities carried out during leachate collection system installation include the following:

– Inspection to witness placement of materials
– Review of submittals for pipe materials
– Review of results of sieve analysis performed on a sample of drain rock material collected by Contractor. A total of 1 sample was collected and analysed (results are presented in Appendix C).

DRAFT

## 3.3 Geosynthetics QA/QC

The Liner Installer performed QA/QC according to the design specifications on all geomembrane installed. QC included performing field sheer and peel on a test weld before welding began and whenever conditions changed, pressure testing each welded seam, recording roll number and location of each panel placed, location of each repair. After each repair was made the weld was tested with a vacuum box.

GHD collected samples of welds at intervals less than 300 m of seams. The samples were sent to TRI Environmental Inc. for peel and sheer testing and the results were reviewed by GHD. Laboratory results are presented in Appendix E.

Geotextile material met the specifications and was installed both on the side slopes per the design and the landfill base. The geotextile on the landfill based was installed in place of the bedding sand in the design and was approved by GHD.

Geocomposite material met the specifications and was installed both on the side slopes per the design, and on a portion of the west berm of the cell base, a design change that was approved by GHD. The affected area is shown on the record drawings and notes are provided in the June 13 inspection report.

# 4. Conformance with Design

In general, the construction of the Cell 1 West landfill cell was carried out according to the design and specifications prepared by GHD. The below documents conformance with the original design.

## 4.1 Earthworks

A berm was constructed on the north end of Cell 1 West, along the road from approximately the middle of Cell 1 West to the western edge. This berm was not included in the design or inspected by GHD.

Material was left on a portion of the cell base along the western edge of Cell 1 West to cover a bedrock outcrop. This was completed to protect the liner and achieve minimum depth to groundwater. The remainder of the earthworks were carried out in accordance with the design.

## 4.2 Leachate Collection System & Leak Detection Piping

The 300 mm HDPE leak detection system riser was constructed as shown on Detail 15 of Drawing CI-0104.The perforated portion of the pipe was wrapped in geo-composite and sandbags were placed on the east side of the pipe to secure the pipe in place. Wrapping the pipe in geo-composite ensured there was hydraulic connectivity around the pipe.

A sample of the drain rock was collected to carry out sieve analysis and confirm whether gradation met design specifications. The results of the sieve analysis showed gravel larger than 50 mm and fines content above the design specification. The fines content was less than or equal to 1% and the material was accepted by GHD.

The stone drainage layer was placed on the non-woven geotextile layer. The Contractor exposed the top of leachate pipe by hand to confirm pipe location prior to mounding drainage rock overtop to a depth of greater than 300 mm. The area was visually inspected and large rocks were identified and removed from the cell.

During an inspection, GHD noted that 20% of loads placed within a 20 x 30 m area on the southeast section of the cell had silty sand mixed into the drainage rock. Upland discussed with the loading operator to avoid material sitting directly on the pit floor, which resulted in the material meeting specifications and resolving the material issue.

The remaining components of the leachate collection system and leak detection piping were installed in conformance with the design drawings and specifications.

DRAFT

## 4.3 Geosynthetics

Non-woven geotextile was placed on the subgrade in place of bedding sand, on the landfill base as well as the side slopes. The geotextile placed on the landfill base was a deviation from design, which was approved by GHD.

Geocomposite material was placed on an area of the west side of the cell where a grade break was present due to the bedrock outcropping mentioned in Section 4.1. =

All other geosynthetics were installed in conformance with the design.

# 5. Certification

This construction report dated MONTH X, 2024, demonstrates that the Cell 1 West has been constructed in accordance with OC and the most recent DOCP, with the changes noted below and approved by the undersigned during construction. Qualified Professionals completed inspections before and during construction of Cell 1 West.

This construction report includes the information described in Section 10.2 Construction Report(s) of the Landfill Criteria and Section 2.11 of the OC, specifically:

- Changes from the original design that were approved during construction
- As-built record drawings of Cell 1 West
- All inspection and testing reports
- Quality control and quality testing results
- Soil test data including field and laboratory testing

All of Which is Respectfully Certified and Submitted by:

GHD

Deacon Liddy

David Barbour

Roxy Hasior

DRAFT

# Appendices

# Appendix A

## Record Drawings

# UPLAND EXCAVATING LTD.
# CAMPBELL RIVER, B.C.

# NEW LANDFILL (NORTHWIN LANDFILL)
## STAGE 1 WEST - ISSUED FOR RECORD
### NOVEMBER 2023

SOURCE:
BING IMAGERY: MICROSOFT PRODUCT SCREEN SHOT(S) REPRINTED WITH PERMISSION FROM MICROSOFT CORPORATION

SOURCE:
JANUARY 01, 2007. GOVERNMENT OF CANADA, NATURAL RESOURCES CANADA.

## AREA MAP

## LOCATION MAP

| DRAWING LIST | |
|---|---|
| DWG NO | DRAWING TITLE |
| GN-0001 | COVER AND INDEX |
| CI-0101 | EXISTING CONDITIONS |
| CI-0102 | FINAL CONDITIONS |
| CI-0103 | TOP OF SUBGRADE |
| CI-0104 | TOP OF DOUBLE LINER SYSTEM |
| CI-0105 | TOP OF DRAINAGE LAYER |
| CI-0301 | STAGE 1 WEST CROSS-SECTIONS |
| CI-0501 | LINER SYSTEM DETAILS |
| CI-0502 | PERIMETER TIE-IN DETAILS |
| CI-0503 | LEACHATE COLLECTION SUMP DETAILS |
| CI-0504 | LEACHATE LEAK DETECTION SUMP DETAILS |
| CI-0505 | LEACHATE COLLECTION SYSTEM DETAILS |

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED AND FURNISHED BY THE PROJECT CONTRACTOR AND OTHERS. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THIS DOCUMENT AS A RESULT. FIELD VERIFICATION OF FACTS AND DATA SHOULD BE MADE IF THESE DOCUMENTS ARE TO BE USED AS A BASIS FOR FUTURE WORK.

**DRAFT**

GHD
www.ghd.com
GHD Limited
138 East 7th Avenue, Suite 100
Vancouver, British Columbia V5T 1M6 Canada
T 1 604 214 0510 F 1 604 214 0525

Conditions of Use
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD. This document may only be used by GHD's client (and any other person who GHD has agreed can use this document) for the purpose for which it was prepared and must not be used by any other person or for any other purpose.

Bar is 25mm on original size sheet
0 25mm

| No. | Issue | Checked | Approved | Date |
|---|---|---|---|---|
| | | | | |

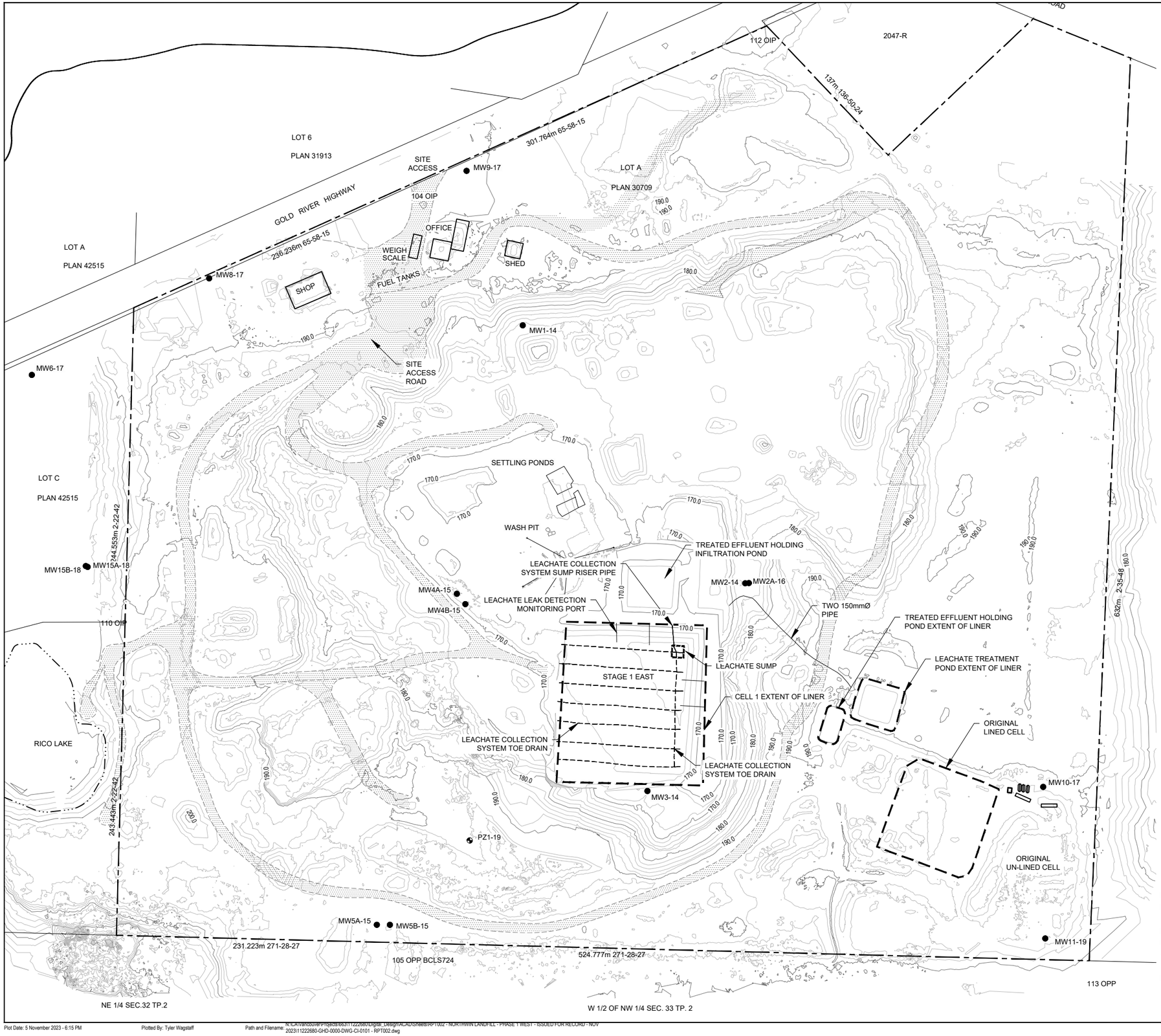
Author T.WAGSTAFF
Designer
Drafting
Design
Check
Check
Project Manager
Project Director

Client
UPLAND EXAVATING LTD.
CAMPBELL RIVER, B.C.

Project
STAGE 1 WEST
ISSUED FOR RECORD

Date 2023-11-06
Scale N.T.S.
Project No. 11222680
Title COVER AND INDEX
Size ANSI D
Status Code
Sheet No GN-0001
Sheet 1 of 10

Plot Date: 5 November 2023 - 6:08 PM
Plotted By: Tyler Wagstaff
Path and Filename: N:\CA\Vancouver\Projects\63\11222680\Digital_Design\ACAD\Sheets\RPT002 - NORTHWIN LANDFILL - PHASE 1 WEST - ISSUED FOR RECORD - NOV 2023\11222680-GHD-0000-DWG-GN-0001 - RPT002.dwg




N

0 15 30 45m

## LEGEND

- 160.0 — EXISTING CONTOUR (MAJOR) - 10m
- EXISTING CONTOUR (MINOR) - 2m
- PROPERTY BOUNDARY
- EXISTING LAKE SHORELINE
- EXISTING ROADWAY
- MW1-14 — EXISTING MONITORING WELL

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED AND FURNISHED BY THE PROJECT CONTRACTOR AND OTHERS. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THIS DOCUMENT AS A RESULT. FIELD VERIFICATION OF FACTS AND DATA SHOULD BE MADE IF THESE DOCUMENTS ARE TO BE USED AS A BASIS FOR FUTURE WORK.

**DRAFT**

GHD
www.ghd.com
GHD Limited
138 East 7th Avenue, Suite 100
Vancouver, British Columbia V5T 1M6 Canada
T 1 604 214 0510 F 1 604 214 0525

Conditions of Use
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD. This document may only be used by GHD's client (and any other person who GHD has agreed can use this document) for the purpose for which it was prepared and must not be used by any other person or for any other purpose.

Bar is 25mm on original size sheet
0 25mm

| No. | Issue | Checked | Approved | Date |
|---|---|---|---|---|
| - | - | - | - | - |

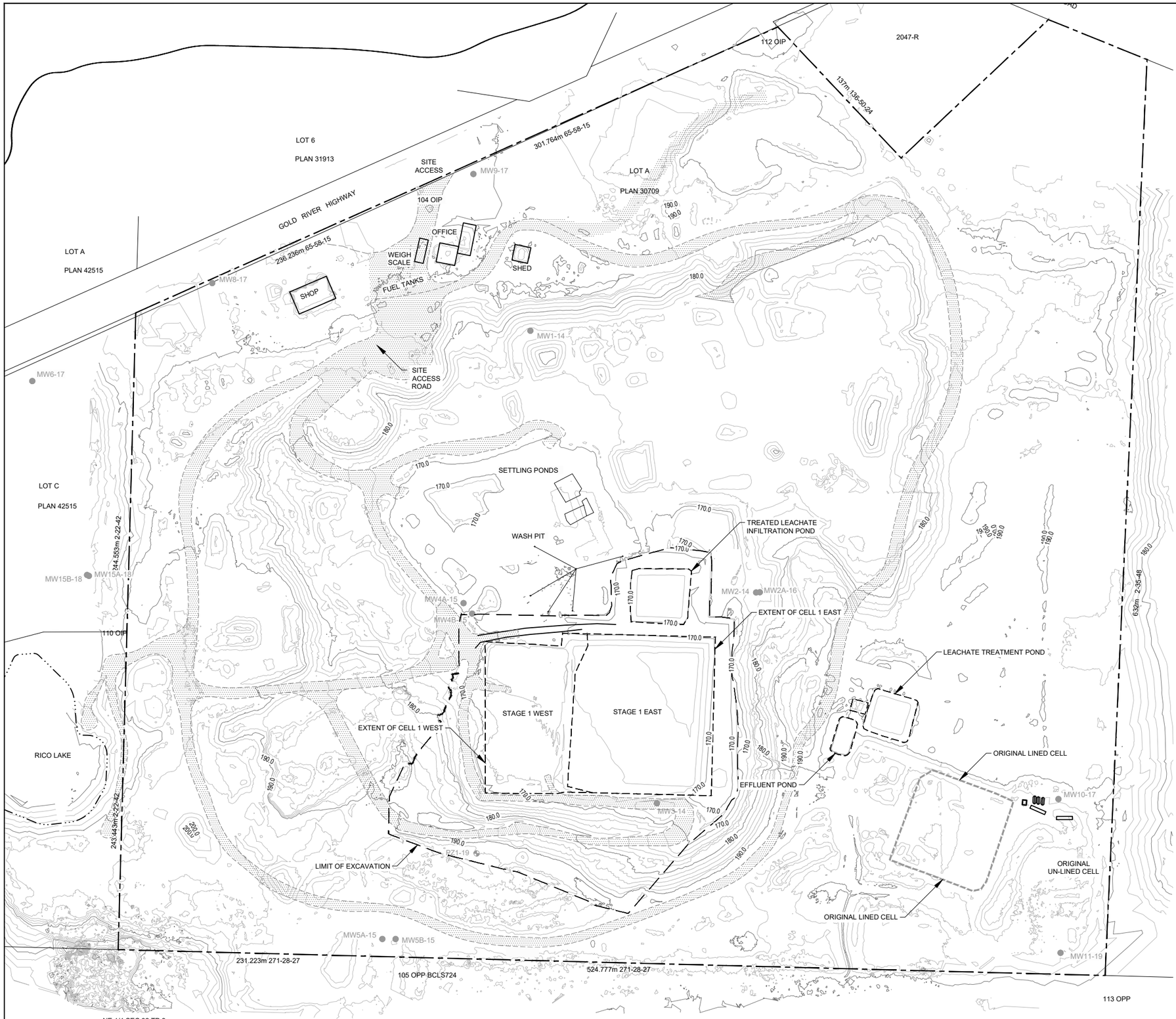
Author T.WAGSTAFF | Designer
Drafting | Design
Check | Check
Project Manager | Project Director

Client
**UPLAND EXAVATING LTD.**
**CAMPBELL RIVER, B.C.**

Project
**STAGE 1 WEST**
**ISSUED FOR RECORD**

Date: **2023-11-06** | Scale: **1:1500**
Project No.: **11222680**
Title: **EXISTING CONDITIONS**
Size: **ANSI D**
Status Code
Sheet No.: **CI-0101** | Sheet: **1 of 10**

Plot Date: 5 November 2023 - 6:15 PM
Plotted By: Tyler Wagstaff
Path and Filename: N:\CA\Vancouver\Projects\65\11222680\Digital_Design\ACAD\Sheets\RPT002 - NORTHWIN LAND\FILE - PHASE 1 WEST - ISSUED FOR RECORD - NOV 2023\11222680-GHD-0000-DWG-CI-0101 - RPT002.dwg




N

0 15 30 45m

## LEGEND

- 180.0 — EXISTING CONTOUR (MAJOR) - 10m
- EXISTING CONTOUR (MINOR) - 2m
- PROPERTY BOUNDARY
- EXISTING LAKE SHORELINE
- EXISTING ROADWAY
- MW1-14 — EXISTING MONITORING WELL
- LIMIT OF EXCAVATION (APPROXIMATE)
- EXTENT OF CELL / POND

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED AND FURNISHED BY THE PROJECT CONTRACTOR AND OTHERS. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THIS DOCUMENT AS A RESULT. FIELD VERIFICATION OF FACTS AND DATA SHOULD BE MADE IF THESE DOCUMENTS ARE TO BE USED AS A BASIS FOR FUTURE WORK.

**DRAFT**

GHD
www.ghd.com
GHD Limited
138 East 7th Avenue, Suite 100
Vancouver, British Columbia V5T 1M6 Canada
T 1 604 214 0510 F 1 604 214 0525

Conditions of Use
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD. This document may only be used by GHD's client (and any other person who GHD has agreed can use this document) for the purpose for which it was prepared and must not be used by any other person or for any other purpose.

Bar is 25mm on original size sheet
0 25mm

| No. | Issue | Checked | Approved | Date |
|---|---|---|---|---|

Author T.WAGSTAFF | Designer
Drafting | Design
Check | Check
Project Manager | Project Director

Client
**UPLAND EXAVATING LTD.**
**CAMPBELL RIVER, B.C.**

Project
**STAGE 1 WEST**
**ISSUED FOR RECORD**

Date: 2023-11-06 | Scale: 1:1500
Project No.: 11222680
Title: **FINAL CONDITIONS**
Size: ANSI D
Status Code
Sheet No: CI-0102 | Sheet: 1 of 10

Plot Date: 5 November 2023 - 6:17 PM
Plotted By: Tyler Wagstaff
Path and Filename: N:\CAN\Courtenay\Projects\65\11222680\Digital_Design\ACAD\Sheets\RPT002 - NORTHWIN LANDFILL - PHASE 1 WEST - ISSUED FOR RECORD - NOV 2023\11222680-GHD-0000-DWG-CI-0102 - RPT002.dwg

N

0 5 10 15m

## LEGEND

- 168.0 — EXISTING CONTOUR (MAJOR) - 4m
- EXISTING CONTOUR (MINOR) - 1m
- 172.0 — TOP OF SUBGRADE CONTOUR (MAJOR) - 4m
- TOP OF SUBGRADE CONTOUR (MINOR) - 1m
- PROPERTY BOUNDARY
- EXISTING ROADWAY
- LIMIT OF WASTE
- EXTENT OF CELL 1 WEST AND EXCAVATION
- SWALE

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED AND FURNISHED BY THE PROJECT CONTRACTOR AND OTHERS. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THIS DOCUMENT AS A RESULT. FIELD VERIFICATION OF FACTS AND DATA SHOULD BE MADE IF THESE DOCUMENTS ARE TO BE USED AS A BASIS FOR FUTURE WORK.

**DRAFT**

GHD Limited
138 East 7th Avenue, Suite 100
Vancouver, British Columbia V5T 1M6 Canada
**T** 1 604 214 0510 **F** 1 604 214 0525
www.ghd.com

Conditions of Use
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD. This document may only be used by GHD's client (and any other person who GHD has agreed can use this document) for the purpose for which it was prepared and must not be used by any other person or for any other purpose.

Bar is 25mm on original size sheet
0 25mm

| No. | Issue | Checked | Approved | Date |
|---|---|---|---|---|
| - | - | - | - | - |

Author **T.WAGSTAFF** Designer

Drafting Design
Check Check

Project Manager Project Director

Client
**UPLAND EXAVATING LTD.**
**CAMPBELL RIVER, B.C.**

Project
**STAGE 1 WEST**
**ISSUED FOR RECORD**

Date **2023-11-06** Scale **1:500**

Project No. **11222680**

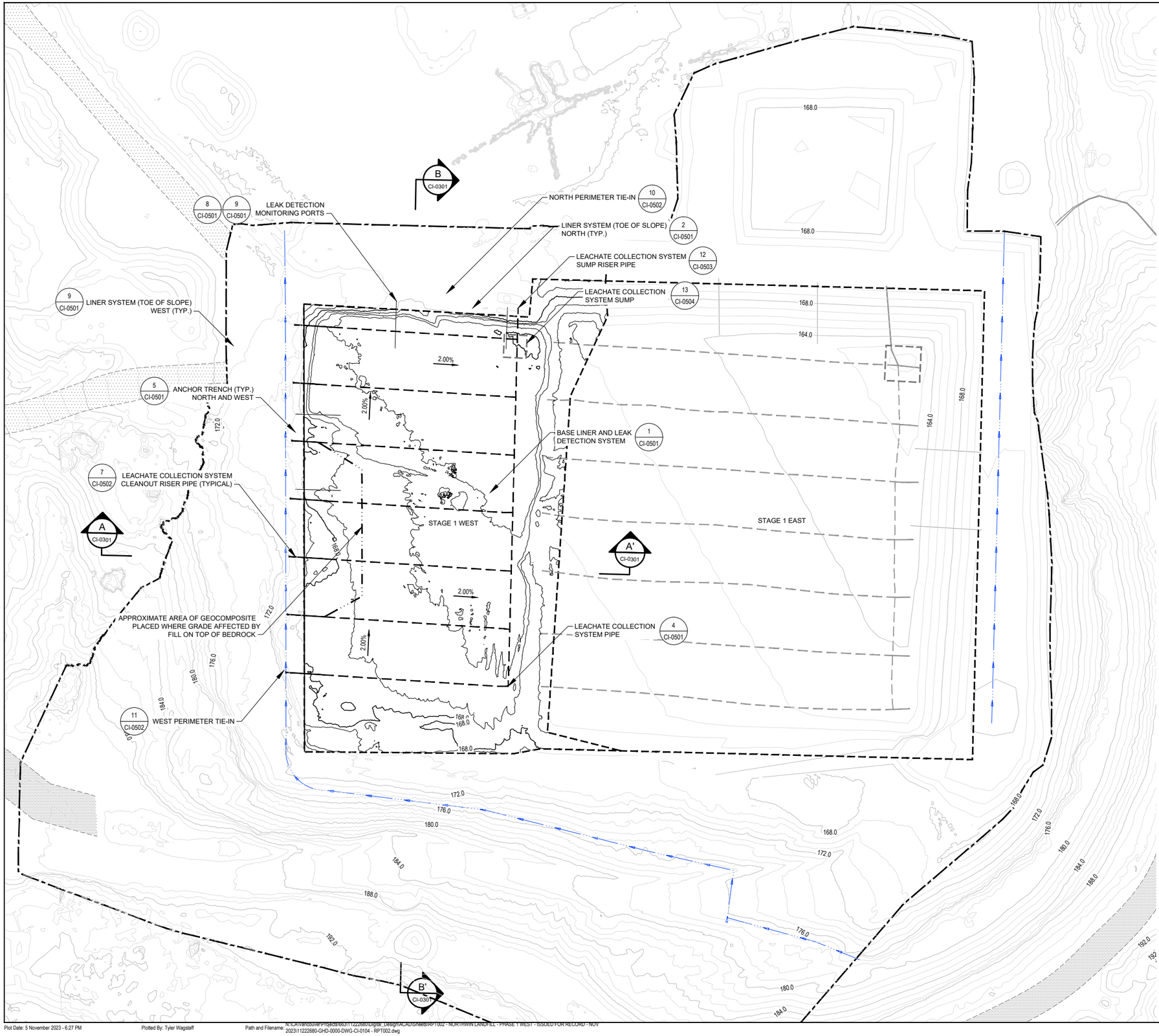
Title **TOP OF SUBGRADE**

Size **ANSI D**

Status Code

Sheet No **CI-0103** Sheet **1 of 10**

Plot Date: 5 November 2023 - 6:19 PM Plotted By: Tyler Wagstaff Path and Filename: N:\CAN\Courtenay\Projects\65\11222680\Digital_Design\ACAD\Sheets\RPT002 - NORTHWIN LANDFILL - PHASE 1 WEST - ISSUED FOR RECORD - NOV 2023\11222680-GHD-0000-DWG-CI-0103 - RPT002.dwg




N

0 5 10 15m

## LEGEND

- 172.0 — EXISTING CONTOUR (MAJOR) - 4m
- EXISTING CONTOUR (MINOR) - 1m
- 168.0 — BOTTOM OF LINER CONTOUR (MAJOR) - 4m
- BOTTOM OF LINER CONTOUR (MINOR) - 1m
- PROPERTY BOUNDARY
- LEACHATE COLLECTION SYSTEM PIPE (PERFORATED)
- LEACHATE COLLECTION SYSTEM PIPE (NON-PERFORATED)
- EXISTING ROADWAY
- LIMIT OF WASTE
- EXTENT OF CELL 1 WEST AND EXCAVATION
- SWALE
- AREA OF GEOCOMPOSITE

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED AND FURNISHED BY THE PROJECT CONTRACTOR AND OTHERS. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THIS DOCUMENT AS A RESULT. FIELD VERIFICATION OF FACTS AND DATA SHOULD BE MADE IF THESE DOCUMENTS ARE TO BE USED AS A BASIS FOR FUTURE WORK.

**DRAFT**

GHD
www.ghd.com
GHD Limited
138 East 7th Avenue, Suite 100
Vancouver, British Columbia V5T 1M6 Canada
T 1 604 214 0510 F 1 604 214 0525

Conditions of Use
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD. This document may only be used by GHD's client (and any other person who GHD has agreed can use this document) for the purpose for which it was prepared and must not be used by any other person or for any other purpose.

Bar is 25mm on original size sheet
0 25mm

| No. | Issue | Checked | Approved | Date |
|---|---|---|---|---|
| - | - | - | - | - |

Author T.WAGSTAFF
Designer
Drafting
Design
Check
Check
Project Manager
Project Director

Client
**UPLAND EXAVATING LTD.**
**CAMPBELL RIVER, B.C.**

Project
**STAGE 1 WEST**
**ISSUED FOR RECORD**

Date **2023-11-06**
Scale **1:500**
Project No. **11222680**
Title **TOP OF DOUBLE LINER SYSTEM**
Size **ANSI D**
Status Code
Sheet No. **CI-0104**
Sheet **1 of 10**

Plot Date: 5 November 2023 - 6:27 PM
Plotted By: Tyler Wagstaff
Path and Filename: N:\CAN\Campbell River\Projects\65\11222680\Digital_Design\ACAD\Sheets\RPT002 - NORTHWIN LANDFILL - PHASE 1 WEST - ISSUED FOR RECORD - NOV 2023\11222680-GHD-0000-DWG-CI-0104 - RPT002.dwg

N

0 5 10 15m

## LEGEND

- 172.0 — EXISTING CONTOUR (MAJOR) - 4m
- EXISTING CONTOUR (MINOR) - 1m
- 168.0 — TOP OF DRAINAGE LAYER CONTOUR (MAJOR) - 4m
- TOP OF DRAINAGE LAYER CONTOUR (MINOR) - 1m
- PROPERTY BOUNDARY
- EXISTING ROADWAY
- LIMIT OF WASTE
- EXTENT OF CELL 1 WEST AND EXCAVATION
- SWALE

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED AND FURNISHED BY THE PROJECT CONTRACTOR AND OTHERS. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THIS DOCUMENT AS A RESULT. FIELD VERIFICATION OF FACTS AND DATA SHOULD BE MADE IF THESE DOCUMENTS ARE TO BE USED AS A BASIS FOR FUTURE WORK.

**DRAFT**

GHD Limited
138 East 7th Avenue, Suite 100
Vancouver, British Columbia V5T 1M6 Canada
**T** 1 604 214 0510 **F** 1 604 214 0525

www.ghd.com

Conditions of Use

This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD. This document may only be used by GHD's client (and any other person who GHD has agreed can use this document) for the purpose for which it was prepared and must not be used by any other person or for any other purpose.

Bar is 25mm on original size sheet
0 25mm

| No. | Issue | Checked | Approved | Date |
|---|---|---|---|---|
| - | - | - | - | - |

Author **T.WAGSTAFF** Designer

Drafting Design
Check Check

Project Manager Project Director

Client

**UPLAND EXAVATING LTD.**
**CAMPBELL RIVER, B.C.**

Project

**STAGE 1 WEST**
**ISSUED FOR RECORD**

Date **2023-11-06** Scale **1:500**

Project No. **11222680**

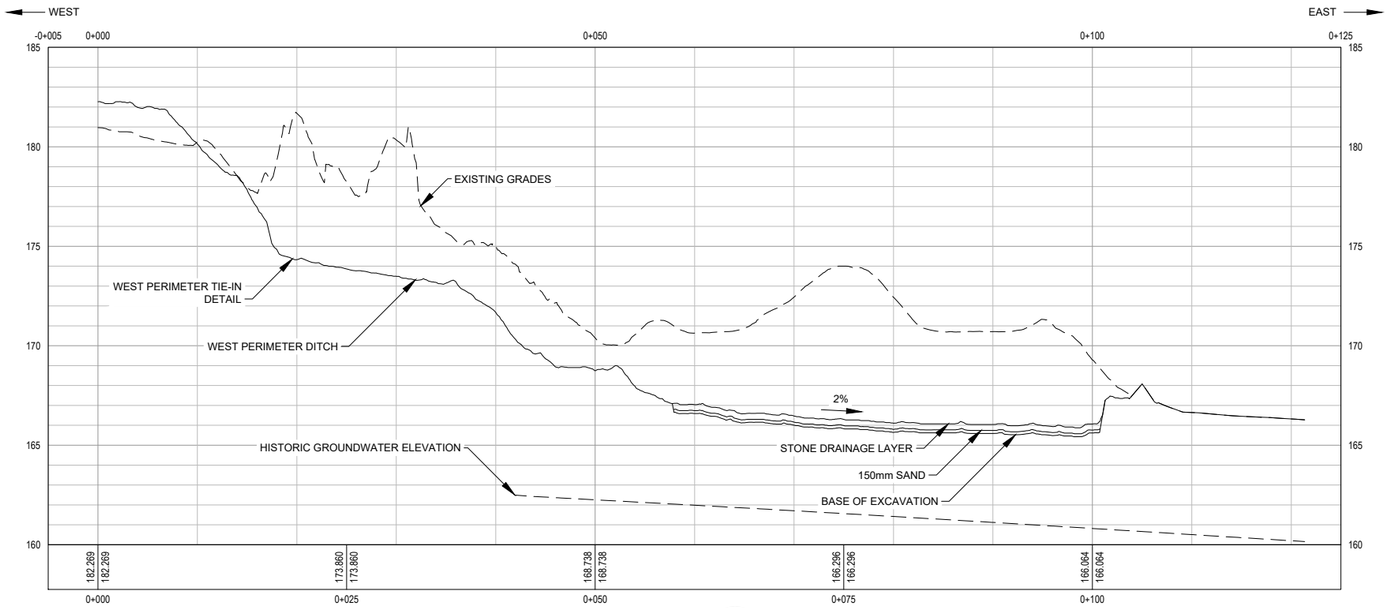
Title **TOP OF DRAINAGE LAYER**

Size **ANSI D**

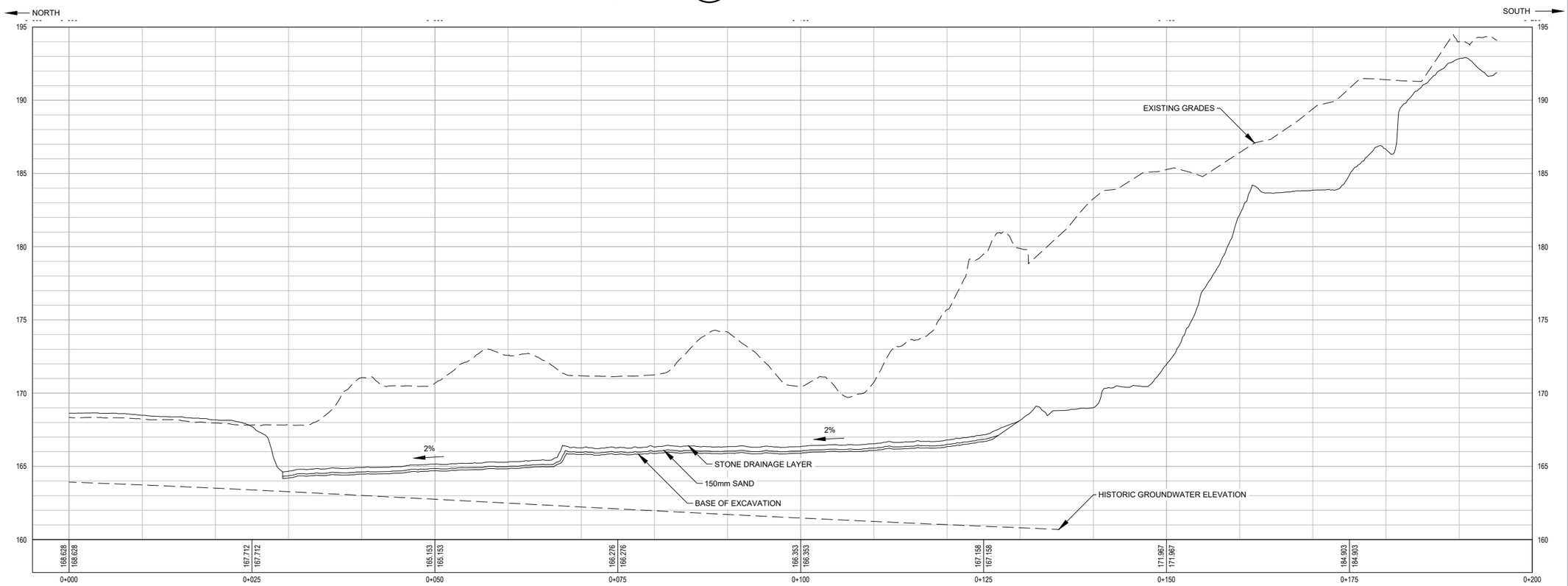
Status Code

Sheet No. **CI-0105** Sheet **1 of 10**

Plot Date: 5 November 2023 - 6:32 PM Plotted By: Tyler Wagstaff Path and Filename: N:\CAN\Campbell River\Projects\65\11222680\Digital_Design\ACAD\Sheets\RPT002 - NORTHWIN LANDFILL - PHASE 1 WEST - ISSUED FOR RECORD - NOV 2023\11222680-GHD-0000-DWG-CI-0105 - RPT002.dwg




SECTION A-A'
HORZ: 1:300
VERT: 1:150
CI-0103




SECTION B-B'
HORZ: 1:300
VERT: 1:150
CI-0103

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED AND FURNISHED BY THE PROJECT CONTRACTOR AND OTHERS. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THIS DOCUMENT AS A RESULT. FIELD VERIFICATION OF FACTS AND DATA SHOULD BE MADE IF THESE DOCUMENTS ARE TO BE USED AS A BASIS FOR FUTURE WORK.

DRAFT

GHD
www.ghd.com
GHD Limited
138 East 7th Avenue, Suite 100
Vancouver, British Columbia V5T 1M6 Canada
**T** 1 604 214 0510 **F** 1 604 214 0525

Conditions of Use
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD. This document may only be used by GHD's client (and any other person who GHD has agreed can use this document) for the purpose for which it was prepared and must not be used by any other person or for any other purpose.

Bar is 25mm on original size sheet
0 25mm

| No. | Issue | Checked | Approved | Date |
|---|---|---|---|---|
| - | - | - | - | - |

Author **T.WAGSTAFF** Designer
Drafting Check
Design Check
Project Manager
Project Director

Client
**UPLAND EXAVATING LTD.**
**CAMPBELL RIVER, B.C.**

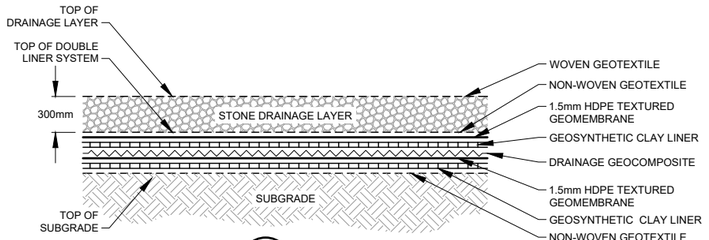
Project
**STAGE 1 WEST**
**ISSUED FOR RECORD**

Date **2023-11-06**
Scale **AS SHOWN**
Project No. **11222680**

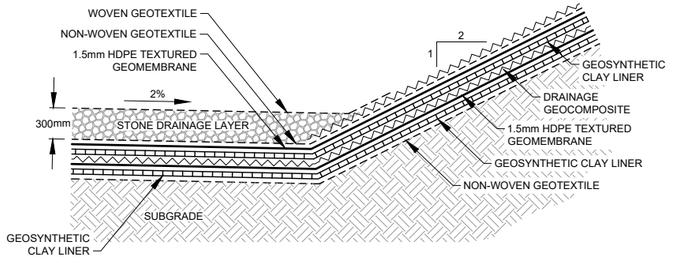
Title
**STAGE 1 WEST**
**CROSS-SECTIONS**

Size **ANSI D**
Status Code
Sheet No. **CI-0301**
Sheet **1 of 10**

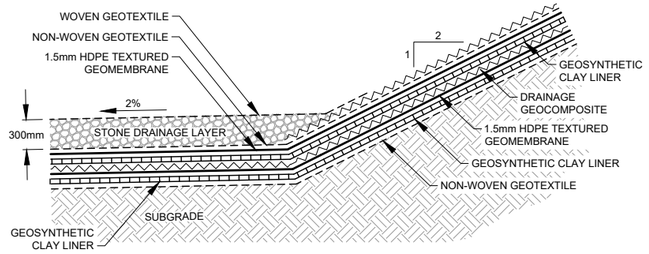
Plot Date: 5 November 2023 - 6:36 PM
Plotted By: Tyler Wagstaff
Path and Filename: N:\CAN\Brisbane\Projects\65\31122\Civil\Digital_Design\CAD\Sheets\RPT002 - NORTHVIEW LANDFILL - PHASE 1 WEST - ISSUED FOR RECORD - NOV 2023\11222680-GHD-0000-DWG-CI-0301 - RPT002.dwg



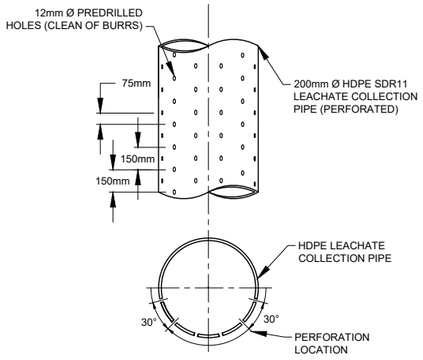

DETAIL 1 (CI-0103) 1:25 — BASE LINER AND LEAK DETECTION SYSTEM



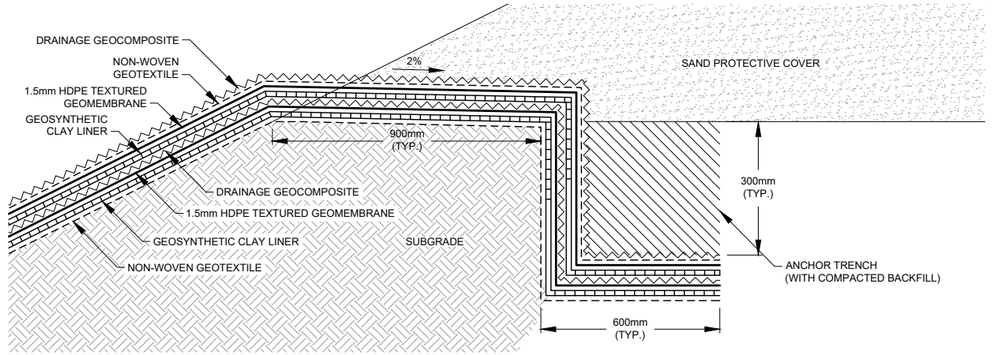

DETAIL 2 (CI-0103) 1:30 — LINER SYSTEM (TOE OF SLOPE) NORTH (TYP.)



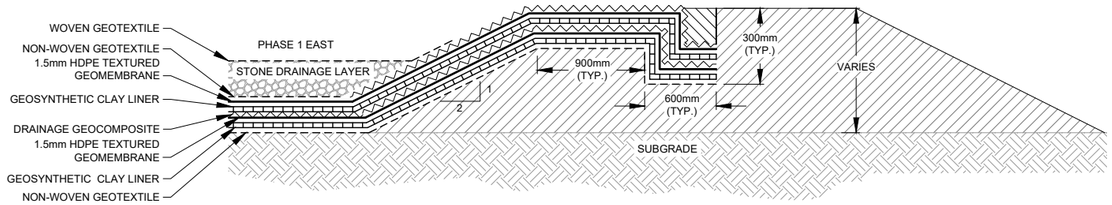

DETAIL 3 (CI-0103) 1:30 — LINER SYSTEM (TOE OF SLOPE) WEST (TYP.)



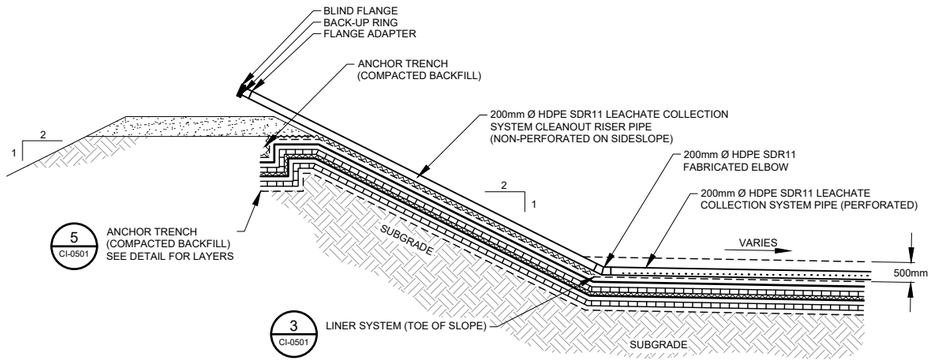

DETAIL 4 (CI-0104) N.T.S. — LEACHATE COLLECTION SYSTEM TOE DRAIN / LEACHATE COLLECTION SYSTEM PIPE PERFORATIONS



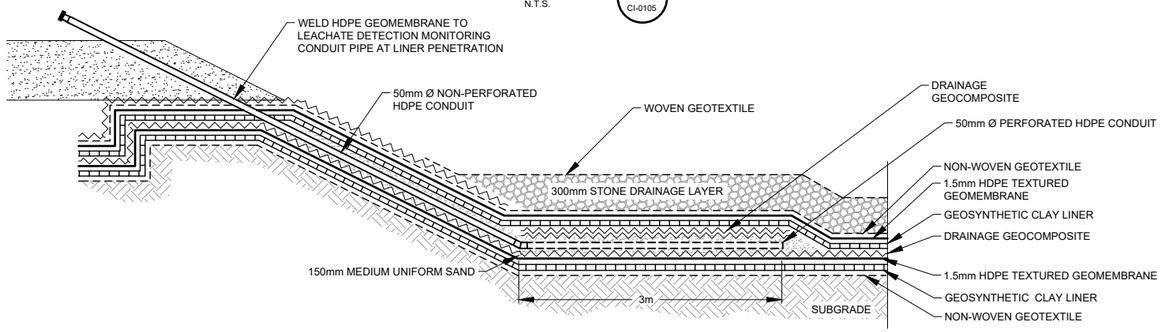

DETAIL 5 (CI-0103) 1:10 — ANCHOR TRENCH (TYPICAL) NORTH AND WEST



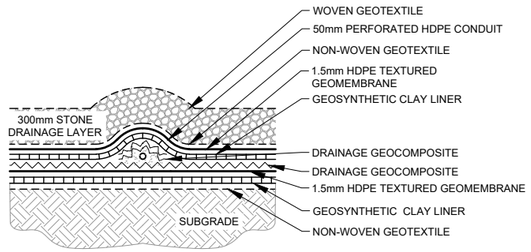

DETAIL 6 (CI-0105) N.T.S. — SOUTHERN TRANSITION BERM




DETAIL 7 (CI-0104) 1:75 — LEACHATE COLLECTION SYSTEM CLEANOUT RISER PIPE (TYPICAL)




DETAIL 8 (CI-0103) N.T.S. — LEAK DETECTION DETECTION PORT (TYP.) PROFILE




DETAIL 9 (CI-0103) 1:25 — LEAK DETECTION MONITORING PORT (TYP.) CROSS-SECTION

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED AND FURNISHED BY THE PROJECT CONTRACTOR AND OTHERS. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THIS DOCUMENT AS A RESULT. FIELD VERIFICATION OF FACTS AND DATA SHOULD BE MADE IF THESE DOCUMENTS ARE TO BE USED AS A BASIS FOR FUTURE WORK.

**DRAFT**

GHD
www.ghd.com
GHD Limited
138 East 7th Avenue, Suite 100
Vancouver, British Columbia V5T 1M6 Canada
T 1 604 214 0510 F 1 604 214 0525

Conditions of Use
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD. This document may only be used by GHD's client (and any other person who GHD has agreed can use this document) for the purpose for which it was prepared and must not be used by any other person or for any other purpose.

Bar is 25mm on original size sheet
0 25mm

| No. | Issue | Checked | Approved | Date |
|---|---|---|---|---|
| Author | T.WAGSTAFF | Designer | | |
| Drafting | | Design | | |
| Check | | Check | | |
| Project Manager | | Project Director | | |

Client
**UPLAND EXAVATING LTD.**
**CAMPBELL RIVER, B.C.**

Project
**STAGE 1 WEST**
**ISSUED FOR RECORD**

| Date | Scale |
|---|---|
| 2023-11-06 | AS SHOWN |

Project No.
**11222680**

Title
**LINER SYSTEM DETAILS**

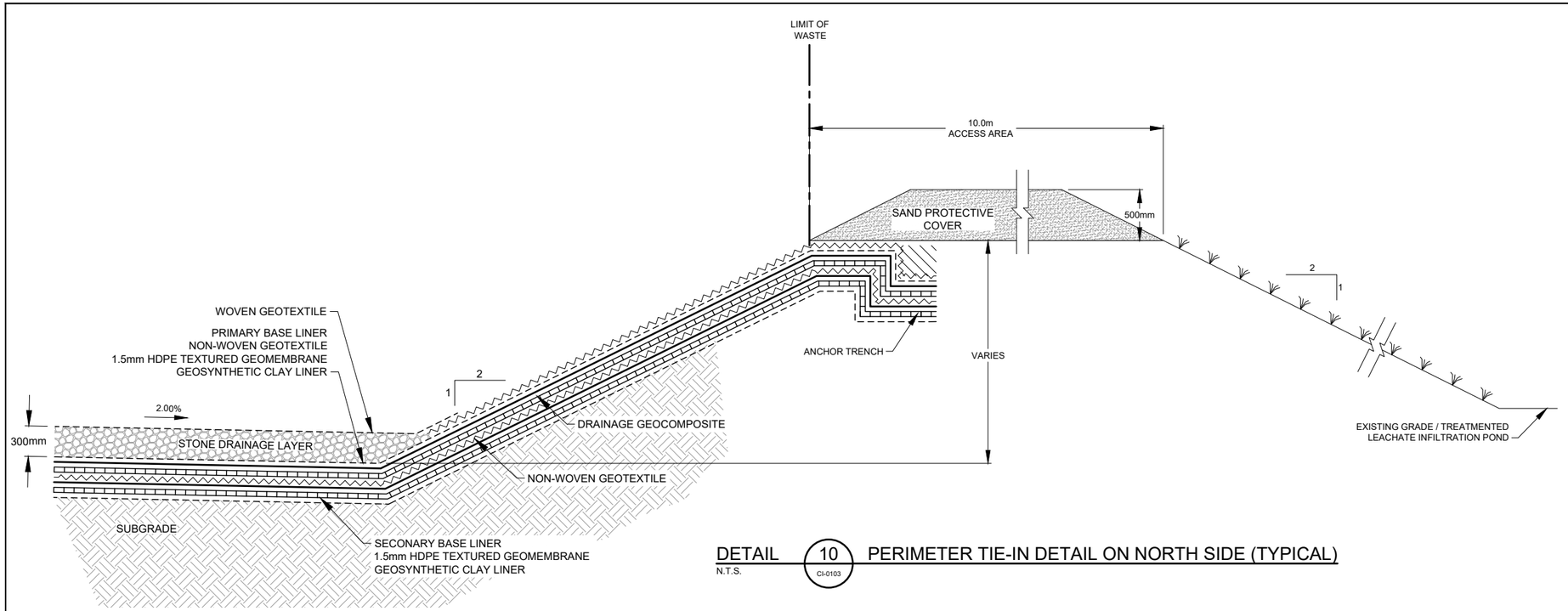
Size
ANSI D

Status Code

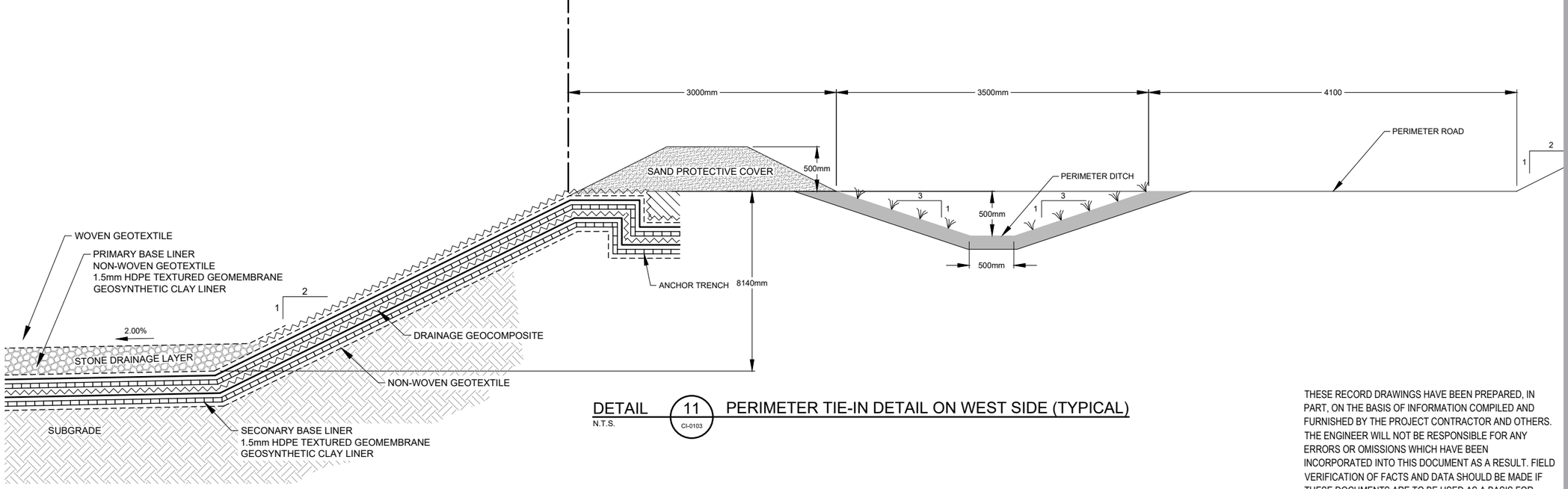
Sheet No.
CI-0501

Sheet
1 of 10

Plot Date: 5 November 2023 - 7:01 PM
Plotted By: Tyler Wagstaff
Path and Filename: N:\CAN\Victoria\Projects\65\11222680\Digital_Design\CAD\Sheets\RPT002 - NORTHWIN LANDFILL - PHASE 1 WEST - ISSUED FOR RECORD - NOV 2023\11222680-GHD-0000-DWG-CI-0501 - RPT002.dwg




DETAIL 10 PERIMETER TIE-IN DETAIL ON NORTH SIDE (TYPICAL)
N.T.S. CI-0103




DETAIL 11 PERIMETER TIE-IN DETAIL ON WEST SIDE (TYPICAL)
N.T.S. CI-0103

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED AND FURNISHED BY THE PROJECT CONTRACTOR AND OTHERS. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THIS DOCUMENT AS A RESULT. FIELD VERIFICATION OF FACTS AND DATA SHOULD BE MADE IF THESE DOCUMENTS ARE TO BE USED AS A BASIS FOR FUTURE WORK.

**DRAFT**

GHD
www.ghd.com
GHD Limited
138 East 7th Avenue, Suite 100
Vancouver, British Columbia V5T 1M6 Canada
**T** 1 604 214 0510 **F** 1 604 214 0525

Conditions of Use
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD. This document may only be used by GHD's client (and any other person who GHD has agreed can use this document) for the purpose for which it was prepared and must not be used by any other person or for any other purpose.

Bar is 25mm on original size sheet
0 25mm

| No. | Issue | Checked | Approved | Date |
|---|---|---|---|---|
| Author | **T.WAGSTAFF** | Designer | | |
| Drafting | | Design | | |
| Check | | Check | | |
| Project Manager | | Project Director | | |

Client
**UPLAND EXAVATING LTD.**
**CAMPBELL RIVER, B.C.**

Project
**STAGE 1 WEST**
**ISSUED FOR RECORD**

| Date | Scale |
|---|---|
| **2023-11-06** | **N.T.S.** |

Project No.
**11222680**

Title
**PERIMETER TIE-IN DETAILS**

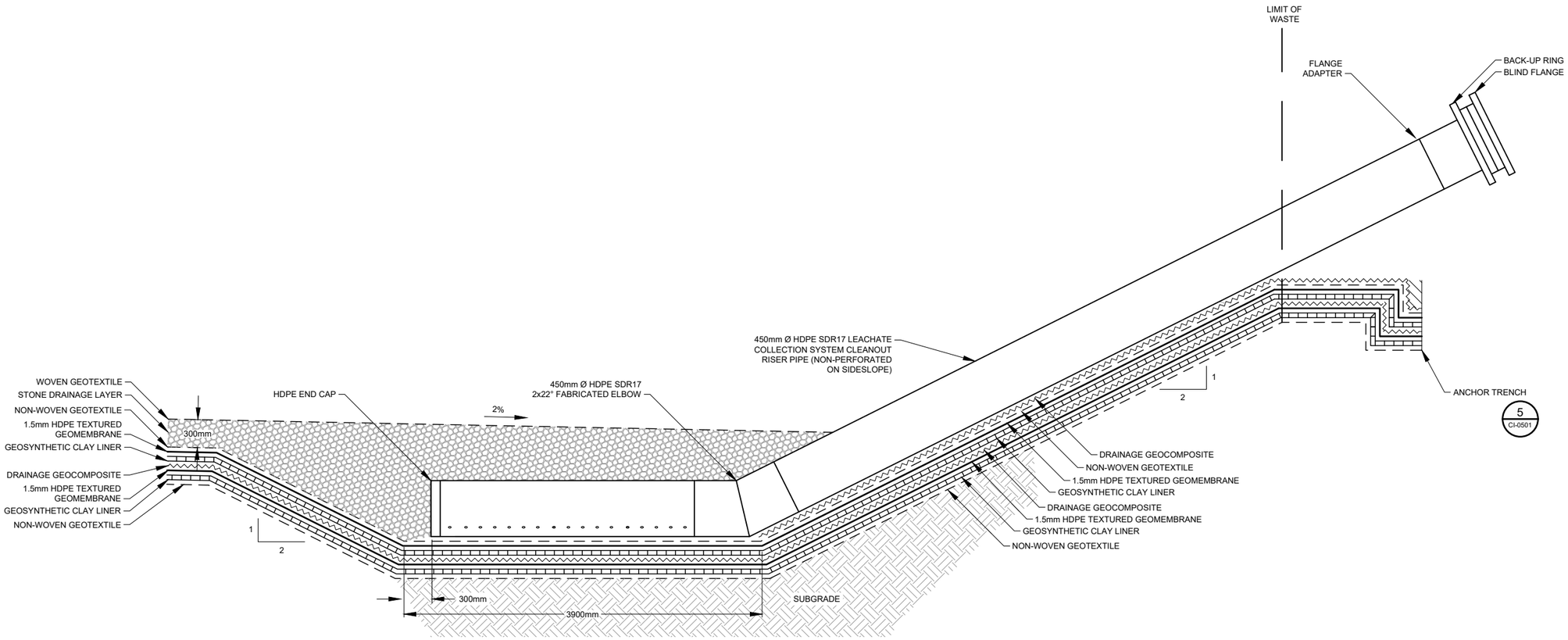
Size **ANSI D**

Status Code

Sheet No. **CI-0502**

Sheet **1 of 10**

Plot Date: 5 November 2023 - 7:05 PM
Plotted By: Tyler Wagstaff
Path and Filename: N:\CA\Vancouver\Projects\65\11222680\Digital_Design\ACAD\Sheets\RPT002 - NORTHVIEW LANDFILL - PHASE 1 WEST - ISSUED FOR RECORD - NOV 2023\11222680-GHD-0000-DWG-CI-0502 - RPT002.dwg




DETAIL 12 (CI-0104) N.T.S. — LEACHATE COLLECTION SYSTEM SUMP, SUMP RISER PIPE, AND LEACHATE LEVEL MONITORING PIPE

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED AND FURNISHED BY THE PROJECT CONTRACTOR AND OTHERS. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THIS DOCUMENT AS A RESULT. FIELD VERIFICATION OF FACTS AND DATA SHOULD BE MADE IF THESE DOCUMENTS ARE TO BE USED AS A BASIS FOR FUTURE WORK.

**DRAFT**


GHD

www.ghd.com

GHD Limited
138 East 7th Avenue, Suite 100
Vancouver, British Columbia V5T 1M6 Canada
**T** 1 604 214 0510 **F** 1 604 214 0525



Conditions of Use

This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD. This document may only be used by GHD's client (and any other person who GHD has agreed can use this document) for the purpose for which it was prepared and must not be used by any other person or for any other purpose.


Bar is 25mm on original size sheet
0 — 25mm

| No. | Issue | Checked | Approved | Date |
|---|---|---|---|---|

Author **T.WAGSTAFF** Designer

Drafting Design
Check Check

Project Manager Project Director

Client

**UPLAND EXAVATING LTD.**
**CAMPBELL RIVER, B.C.**

Project

**STAGE 1 WEST**
**ISSUED FOR RECORD**

Date **2023-11-06** Scale **N.T.S.**

Project No. **11222680**

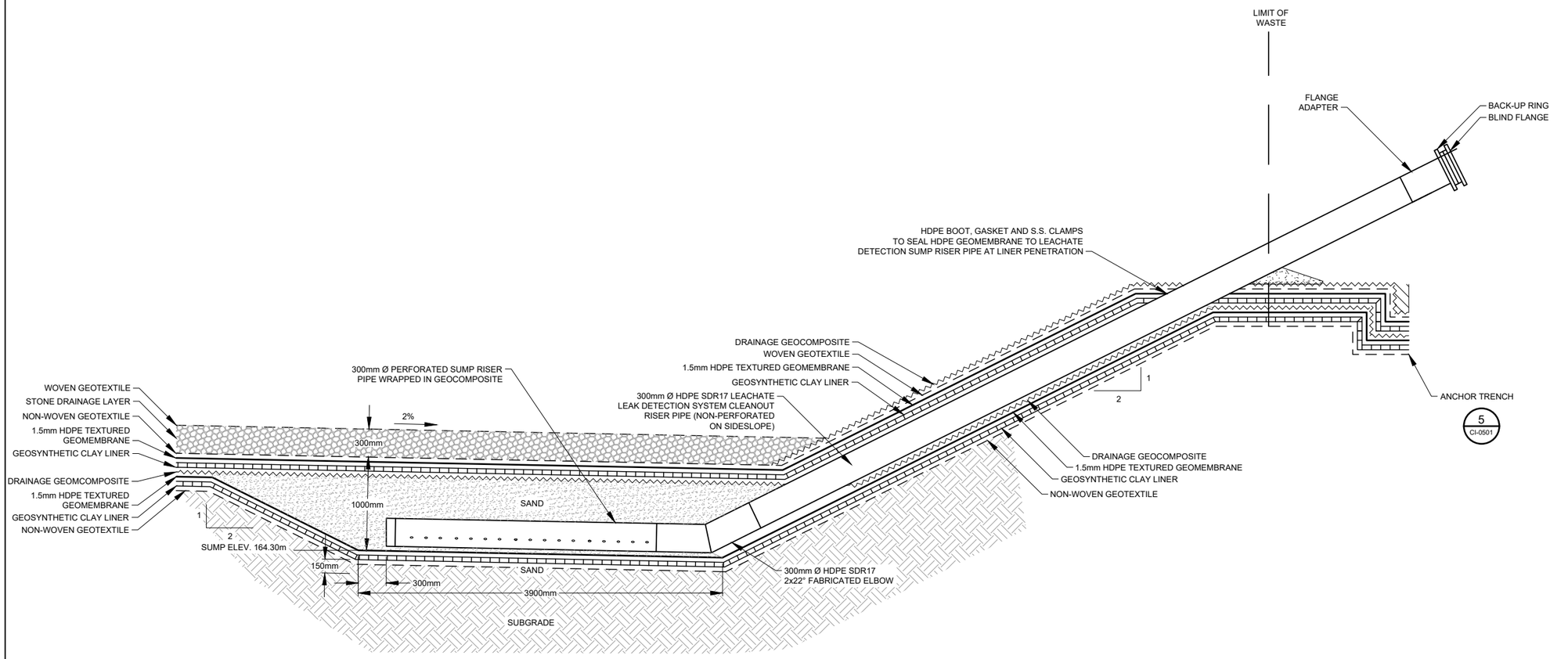
Title **LEACHATE COLLECTION SUMP DETAILS**

Size **ANSI D**

Status Code

Sheet No. **CI-0503** Sheet **1 of 10**


Plot Date: 5 November 2023 - 7:15 PM Plotted By: Tyler Wagstaff Path and Filename: N:\CA\Victoria\Projects\22\11222680\Digital_Design\CAD\Sheets\RPT002 - NORTHWIN LANDFILL - PHASE 1 WEST - ISSUED FOR RECORD - NOV 2023\11222680-GHD-0000-DWG-CI-0503 - RPT002.dwg




DETAIL 13 LEACHATE LEAK DETECTION SUMP, SUMP RISER PIPE
N.T.S. CI-0104

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED AND FURNISHED BY THE PROJECT CONTRACTOR AND OTHERS. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THIS DOCUMENT AS A RESULT. FIELD VERIFICATION OF FACTS AND DATA SHOULD BE MADE IF THESE DOCUMENTS ARE TO BE USED AS A BASIS FOR FUTURE WORK.

**DRAFT**


GHD
www.ghd.com
GHD Limited
138 East 7th Avenue, Suite 100
Vancouver, British Columbia V5T 1M6 Canada
**T** 1 604 214 0510 **F** 1 604 214 0525



Conditions of Use
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD. This document may only be used by GHD's client (and any other person who GHD has agreed can use this document) for the purpose for which it was prepared and must not be used by any other person or for any other purpose.


Bar is 25mm on original size sheet
0 25mm

| No. | Issue | Checked | Approved | Date |
|---|---|---|---|---|

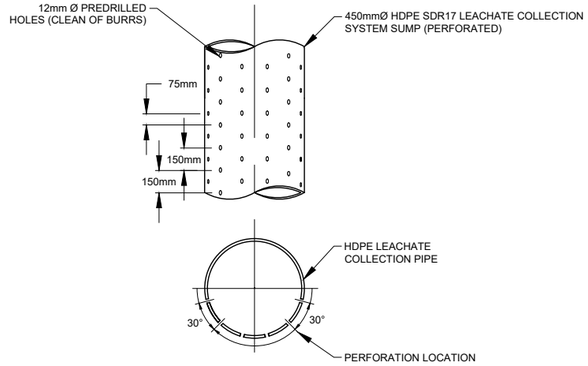
Author **T.WAGSTAFF** Designer
Drafting Design
Check Check
Project Manager Project Director

Client
**UPLAND EXAVATING LTD.**
**CAMPBELL RIVER, B.C.**

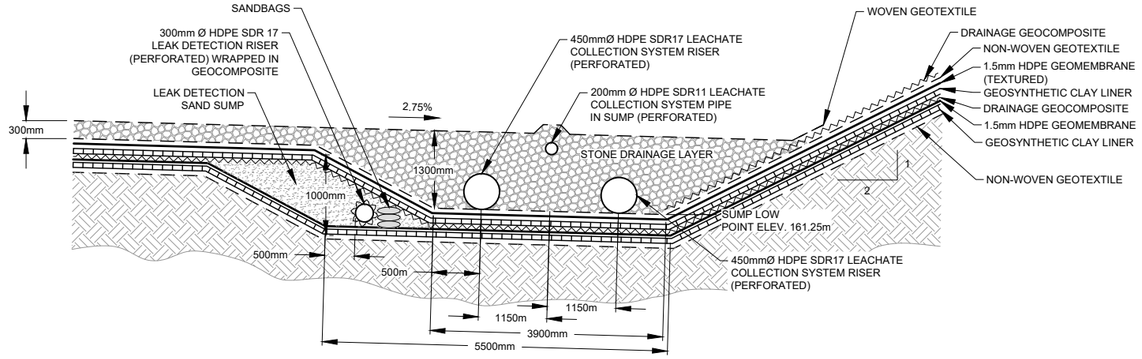
Project
**STAGE 1 WEST**
**ISSUED FOR RECORD**

Date **2023-11-06** Scale **N.T.S.**
Project No. **11222680**
Title **LEACHATE LEAK DETECTION SUMP DETAILS**
Size **ANSI D**
Status Code
Sheet No. **CI-0504** Sheet **1 of 10**

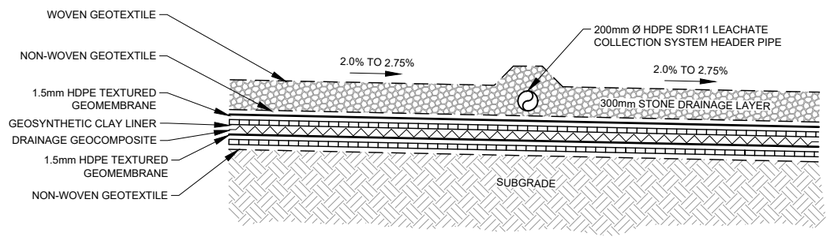

Plot Date: 5 November 2023 - 7:13 PM Plotted By: Tyler Wagstaff Path and Filename: N:\CA\Campbell River\Projects\63\11222680\Digital_Design\ACAD\Sheets\RPT002 - NORTHVIEW LANDFILL - PHASE 1 WEST - ISSUED FOR RECORD - NOV 2023\11222680-GHD-0000-DWG-CI-0503 - RPT002.dwg




DETAIL 14 (CI-0501) NTS — 450mmØ LEACHATE COLLECTION SYSTEM SUMP PIPE PERFORATIONS




DETAIL 15 (CI-0104) N.T.S. — LEACHATE COLLECTION SYSTEM SUMP




DETAIL 16 (CI-0104) N.T.S. — LEACHATE COLLECTION SYSTEM TOE DRAIN/ LEACHATE COLLECTION SYSTEM PIPE

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED AND FURNISHED BY THE PROJECT CONTRACTOR AND OTHERS. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THIS DOCUMENT AS A RESULT. FIELD VERIFICATION OF FACTS AND DATA SHOULD BE MADE IF THESE DOCUMENTS ARE TO BE USED AS A BASIS FOR FUTURE WORK.

**DRAFT**


www.ghd.com

GHD Limited
138 East 7th Avenue, Suite 100
Vancouver, British Columbia V5T 1M6 Canada
**T** 1 604 214 0510 **F** 1 604 214 0525



Conditions of Use

This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD. This document may only be used by GHD's client (and any other person who GHD has agreed can use this document) for the purpose for which it was prepared and must not be used by any other person or for any other purpose.


Bar is 25mm on original size sheet
0 25mm

| No. | Issue | Checked | Approved | Date |
|---|---|---|---|---|

Author **T.WAGSTAFF** Designer

Drafting Design
Check Check

Project Manager Project Director

Client

**UPLAND EXAVATING LTD.**
**CAMPBELL RIVER, B.C.**

Project

**STAGE 1 WEST**
**ISSUED FOR RECORD**

Date **2023-11-06** Scale **N.T.S.**

Project No. **11222680**

Title **LEACHATE COLLECTION SYSTEM DETAILS**

Size **ANSI D**

Status Code

Sheet No. **CI-0505** Sheet **1 of 10**


Plot Date: 5 November 2023 - 7:10 PM Plotted By: Tyler Wagstaff Path and Filename: N:\CA\Vancouver\Projects\65\11222680\Digital_Design\ACAD\Sheets\RPT002 - NORTHWIN LANDFILL - PHASE 1 WEST - ISSUED FOR RECORD - NOV 2023\11222680-GHD-0000-DWG-CI-0503 - RPT002.dwg

# Appendix B

## Photograph Log

*Photo 1* *Installing Non-Woven Geotextile*

*Photo 2* *Typical Destructive Sample of Geomembrane Seam for Lab Testing*

*Photo 3* *HDPE Liner Welding Cell 1 West to Cell 1 East Tie in*

*Photo 4* *Field Tensiometer*

*Photo 5 Primary Geomembrane Installation*

*Photo 6 Seaming GCL and Primary Geomembrane Installation*

*Photo 7 Typical Geomembrane Repair*

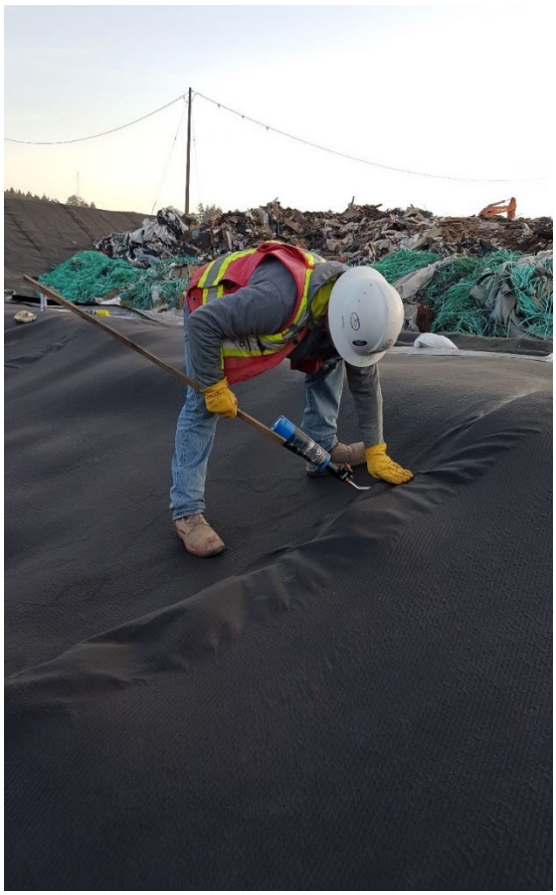


*Photo 8 Seaming Geomembrane*

***Photo 9*** ***Typical Drainage Geocomposite Cable Ties***

***Photo 10*** ***Installing GCL on top of Geocomposite***

***Phot 11*** ***Test Weld***

***Photo 12*** ***Leachate Sump with Primary Geomembrane***

***Photo 13*** ***Deploying Non-Woven Geotextile***

***Photo 14*** ***Geomembrane Welding in Liner Anchor Trench***

***Photo 15*** ***Seaming the Geomembrane***

***Photo 16*** ***Seaming the Geomembrane***

***Photo 17*** ***Seaming Geocomposite on the North Berm***

***Photo 18*** ***HDPE Pipe Fusion Machine***

***Photo 19*** ***50 mm Leak Detection Riser Pipe***

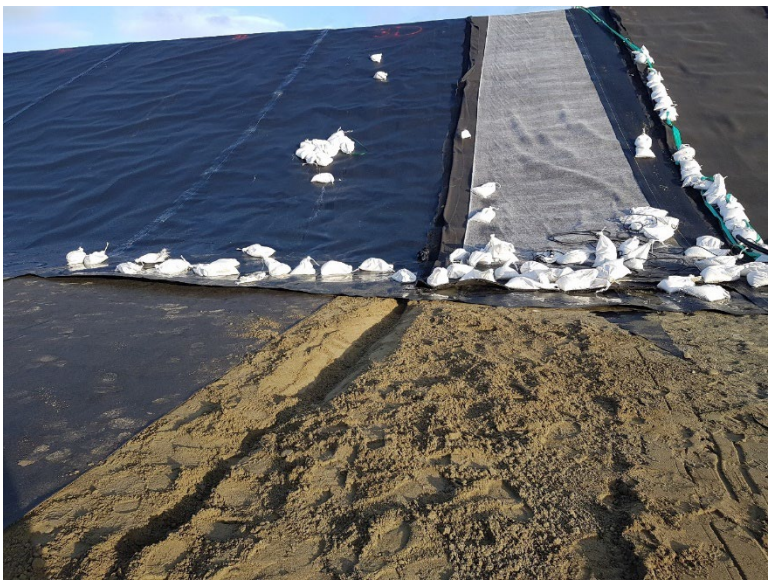


***Photo 20*** ***Deploying the secondary GCL on the North Berm***

***Photo 21*** ***Placing Leachate Collection Pipes***

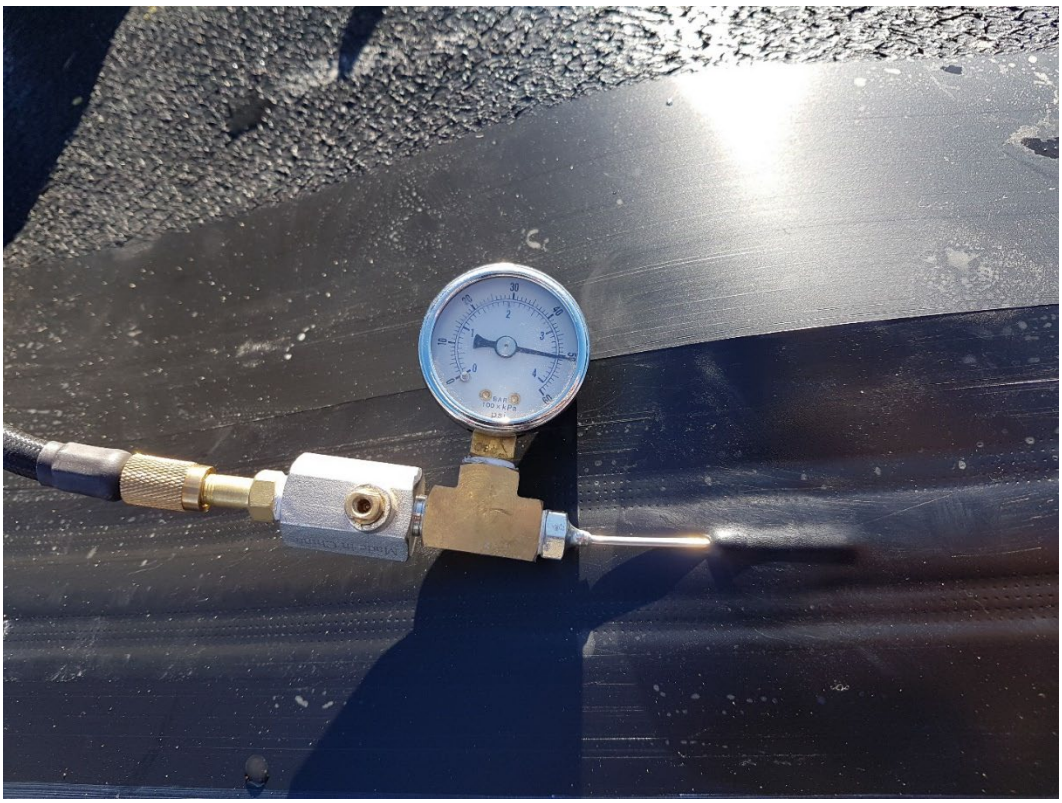


***Photo 22*** ***Geomembrane Seam Pressure Test***

***Photo 23*** ***Deploying Primary GCL on top of*** Geotextile

***Photo 24*** ***Geomembrane Seaming***

*Photo 25* *Completed repair to damaged liner area (November 18, 2022)*

*Photo 24* *Cell 1 West viewed from northwest corner (September 22, 2023)*

*Photo 25* *Leachate and leak detection risers / concrete poured for pump station (September 22, 2023)*

*Photo 26* *Leachate and leak detection risers / concrete poured for pump station (September 22, 2023)*

*Photo 27 Pipe directing leachate to Cell 1 East (September 22, 2023)*

*Photo 28 Cell 1 West from northeast corner (September 22, 2023)*

*Photo 29* *West perimeter road. Berm to prevent surface water run-on visible on right side of photo (September 22, 2023)*

*Photo 30* *South end of Cell 2 (September 22, 2023)*

# Appendix C

## Material Test Results

METRO TESTING + ENGINEERING

CCIL CAR OQM
401-6741 Cariboo Rd., Burnaby, BC V3N 4A3
**t:** 604.436.9111 **tf:** 1.844.732.2638
**e:** info@metrotesting.ca

To: GHD Limited - 735 (Ontario)
455 Phillip Street
Waterloo, ON
N2L 3X2

Date: 28-Nov-22
Project No.: MB41159

Attn: Roxy Hasior, P.Eng.

**Materials Finer than 75-µm (No. 200) Sieve**
**in Mineral Aggregates by Washing**
**ASTM C117**

This test method covers the determination of the amount of material finer than a 75-um sieve in aggregates by washing.

| Product | Date Sampled | Sample Source | Proceedure Used | Percentage of Material Finer than a 75-um (0.1%) |
|---|---|---|---|---|
| 75mm Minus | 2022-11-18 | | **A** | **0.5%** |
| | | | **Contract Requirements:** | n/a |
| | | | **MoT Specified Limit:** | n/a |

Comment:
Percentage of material finer than 75-um sieve is 0.5

Conducted by:

Peregrina Israel
Senior Laboratory Technician
CCIL Certified

Reviewed by:

Andy Bernardino, AScT
Quality Supervisor/Technical Lead
for Asphalt and Aggregate
CCIL Certified

**Metro Testing + Engineering**

401 - 6741 Cariboo Rd, Burnaby, BC V3N 4A3
Tel: (604) 436-9111 Fax: (604) 436-9050

CERTIFIED TESTING LABORATORY

# SIEVE ANALYSIS REPORT
## Series 8 16 30 50

PROJECT NO. MB41159
CLIENT GHD Limited - 735 (Ontario)
CC David Barbour
Airesse MacPhee
David Barbour

TO
GHD Limited - 735 (Ontario)
455 Phillip Street
Waterloo, ON
N2L 3X2

ATTN : Roxy Hasior, P.Eng

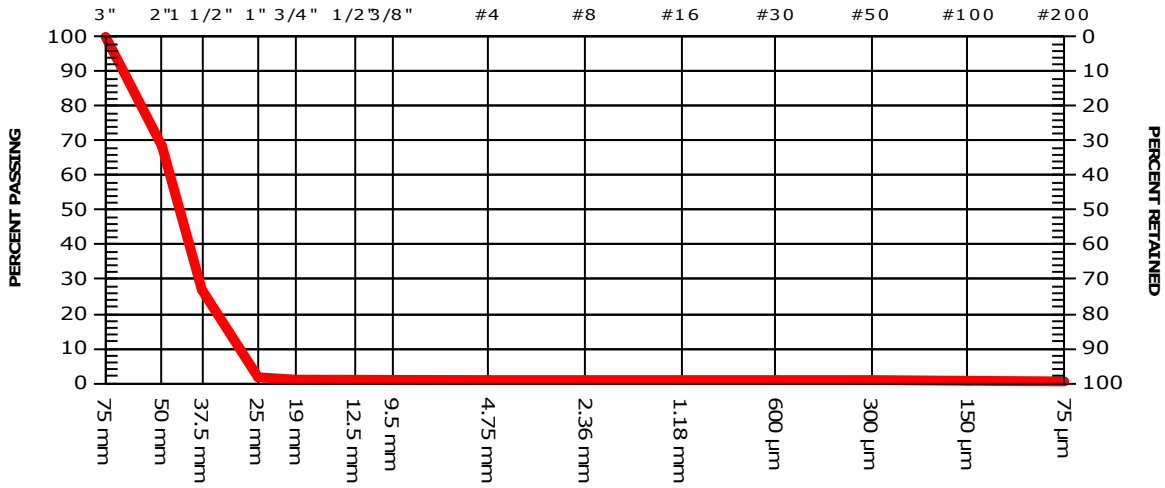
PROJECT Upland Landfill
Materials Testing
7295 Gold River Highway
Campbell River

CONTRACTOR GHD Ltd.

SIEVE TEST NO. 1 DATE RECIEVED 2022.Nov.22 DATE TESTED 2022.Nov.28 DATE SAMPLED 2022.Nov.18

SUPPPLIER N/A
SOURCE N/A
SPECIFICATION
MATERIAL TYPE 75MM MINUS

SAMPLED BY CLIENT
TESTED BY PI
TEST METHOD WASHED




| GRAVEL SIZES | | PERCENT PASSING | GRADATION LIMITS |
|---|---|---|---|
| 3" | 75 mm | 100.0 | |
| 2" | 50 mm | 68.5 | |
| 1 1/2" | 37.5 mm | 27.0 | |
| 1" | 25 mm | 1.7 | |
| 3/4" | 19 mm | 1.0 | |
| 1/2" | 12.5 mm | | |
| 3/8" | 9.5 mm | | |

| SAND SIZES AND FINES | | PERCENT PASSING | GRADATION LIMITS |
|---|---|---|---|
| No. 4 | 4.75 mm | 0.9 | |
| No. 8 | 2.36 mm | 0.9 | |
| No. 16 | 1.18 mm | 0.9 | |
| No. 30 | 600 µm | 0.9 | |
| No. 50 | 300 µm | 0.9 | |
| No. 100 | 150 µm | 0.7 | |
| No. 200 | 75 µm | 0.5 | |

COMMENTS

Page 1 2022.Nov.28

PER.

Reporting of the these test result constitutes a testing service only. Engineering interpretation or evaluation of test results is provided only on written request.

**Metro Testing + Engineering**

401 - 6741 Cariboo Rd, Burnaby, BC V3N 4A3
Tel: (604) 436-9111 Fax: (604) 436-9050

CERTIFIED TESTING LABORATORY

# SIEVE ANALYSIS REPORT
## Series 8 16 30 50

PROJECT NO. MB41159
CLIENT GHD Limited - 735 (Ontario)
CC David Barbour
Airesse MacPhee
David Barbour

TO
GHD Limited - 735 (Ontario)
455 Phillip Street
Waterloo, ON
N2L 3X2

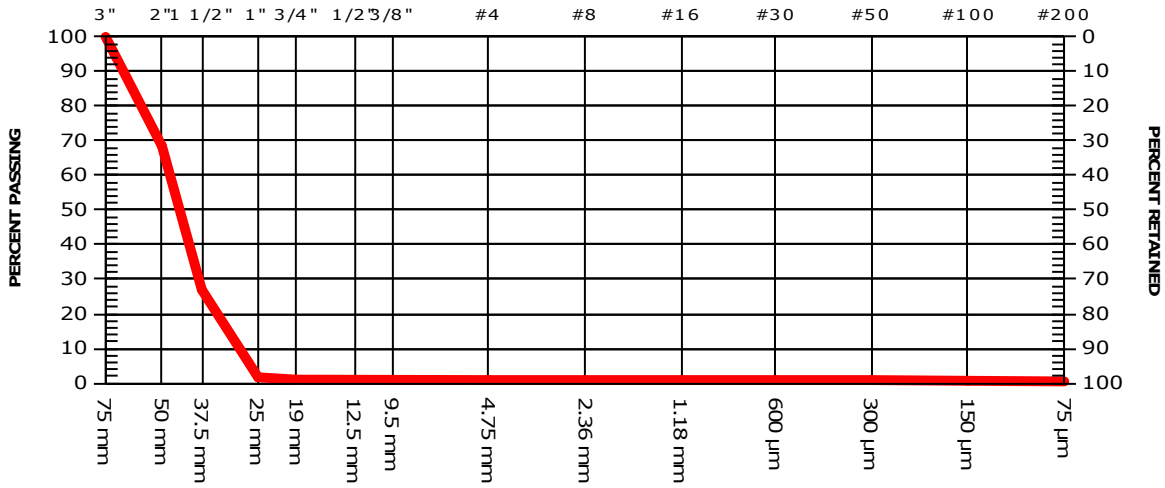
ATTN : David Barbour

PROJECT Upland Landfill
Materials Testing
7295 Gold River Highway
Campbell River
CONTRACTOR GHD Ltd.

SIEVE TEST NO. 1 DATE RECIEVED 2022.Nov.22 DATE TESTED 2022.Nov.28 DATE SAMPLED 2022.Nov.18

SUPPPLIER N/A
SOURCE N/A
SPECIFICATION
MATERIAL TYPE 75MM MINUS

SAMPLED BY CLIENT
TESTED BY PI
TEST METHOD WASHED




| GRAVEL SIZES | | PERCENT PASSING | GRADATION LIMITS |
|---|---|---|---|
| 3" | 75 mm | 100.0 | |
| 2" | 50 mm | 68.5 | |
| 1 1/2" | 37.5 mm | 27.0 | |
| 1" | 25 mm | 1.7 | |
| 3/4" | 19 mm | 1.0 | |
| 1/2" | 12.5 mm | | |
| 3/8" | 9.5 mm | | |

| SAND SIZES AND FINES | | PERCENT PASSING | GRADATION LIMITS |
|---|---|---|---|
| No. 4 | 4.75 mm | 0.9 | |
| No. 8 | 2.36 mm | 0.9 | |
| No. 16 | 1.18 mm | 0.9 | |
| No. 30 | 600 µm | 0.9 | |
| No. 50 | 300 µm | 0.9 | |
| No. 100 | 150 µm | 0.7 | |
| No. 200 | 75 µm | 0.5 | |

COMMENTS

PER.



Reporting of the these test result constitutes a testing service only. Engineering interpretation or evaluation of test results is provided only on written request.

**Metro Testing + Engineering**

401 - 6741 Cariboo Rd, Burnaby, BC V3N 4A3
Tel: (604) 436-9111 Fax: (604) 436-9050

CERTIFIED TESTING LABORATORY

# SIEVE ANALYSIS REPORT
## Series 8 16 30 50

PROJECT NO. MB41159
CLIENT GHD Limited - 735 (Ontario)
CC David Barbour
Airesse MacPhee
David Barbour

TO
GHD Limited - 735 (Ontario)
455 Phillip Street
Waterloo, ON
N2L 3X2

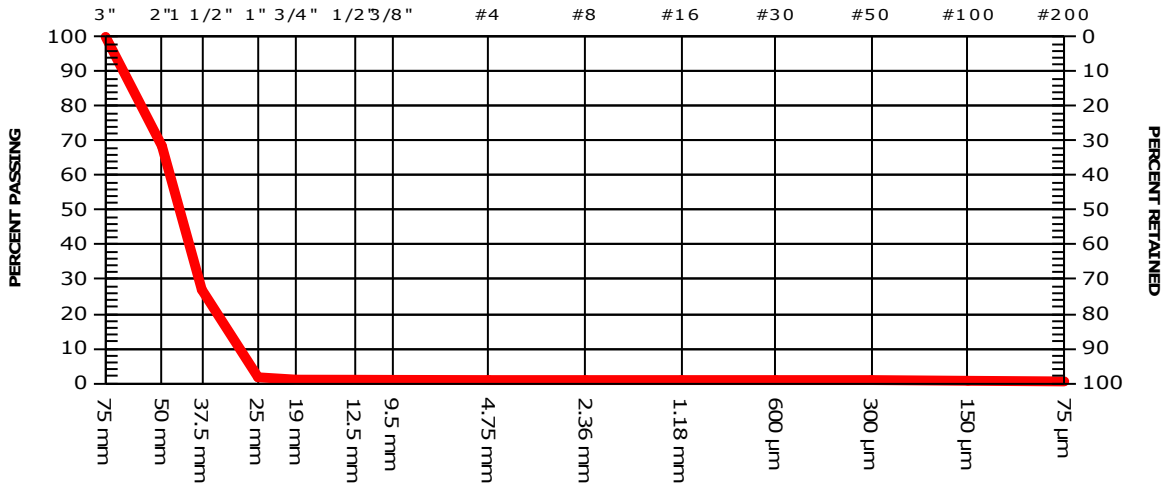
ATTN : Airesse MacPhee

PROJECT Upland Landfill
Materials Testing
7295 Gold River Highway
Campbell River
CONTRACTOR GHD Ltd.

SIEVE TEST NO. 1 DATE RECIEVED 2022.Nov.22 DATE TESTED 2022.Nov.28 DATE SAMPLED 2022.Nov.18

SUPPPLIER N/A
SOURCE N/A
SPECIFICATION
MATERIAL TYPE 75MM MINUS

SAMPLED BY CLIENT
TESTED BY PI
TEST METHOD WASHED




| GRAVEL SIZES | | PERCENT PASSING | GRADATION LIMITS |
|---|---|---|---|
| 3" | 75 mm | 100.0 | |
| 2" | 50 mm | 68.5 | |
| 1 1/2" | 37.5 mm | 27.0 | |
| 1" | 25 mm | 1.7 | |
| 3/4" | 19 mm | 1.0 | |
| 1/2" | 12.5 mm | | |
| 3/8" | 9.5 mm | | |

| SAND SIZES AND FINES | | PERCENT PASSING | GRADATION LIMITS |
|---|---|---|---|
| No. 4 | 4.75 mm | 0.9 | |
| No. 8 | 2.36 mm | 0.9 | |
| No. 16 | 1.18 mm | 0.9 | |
| No. 30 | 600 µm | 0.9 | |
| No. 50 | 300 µm | 0.9 | |
| No. 100 | 150 µm | 0.7 | |
| No. 200 | 75 µm | 0.5 | |

COMMENTS

PER.



Reporting of the these test result constitutes a testing service only. Engineering interpretation or evaluation of test results is provided only on written request.

**Metro Testing + Engineering**

401 - 6741 Cariboo Rd, Burnaby, BC V3N 4A3
Tel: (604) 436-9111 Fax: (604) 436-9050

CERTIFIED TESTING LABORATORY

# SIEVE ANALYSIS REPORT
## Series 8 16 30 50

PROJECT NO. MB41159
CLIENT GHD Limited - 735 (Ontario)
CC David Barbour
Airesse MacPhee
David Barbour

TO
Upland Landfill
455 Phillip Street
Waterloo, ON
N2L 3X2

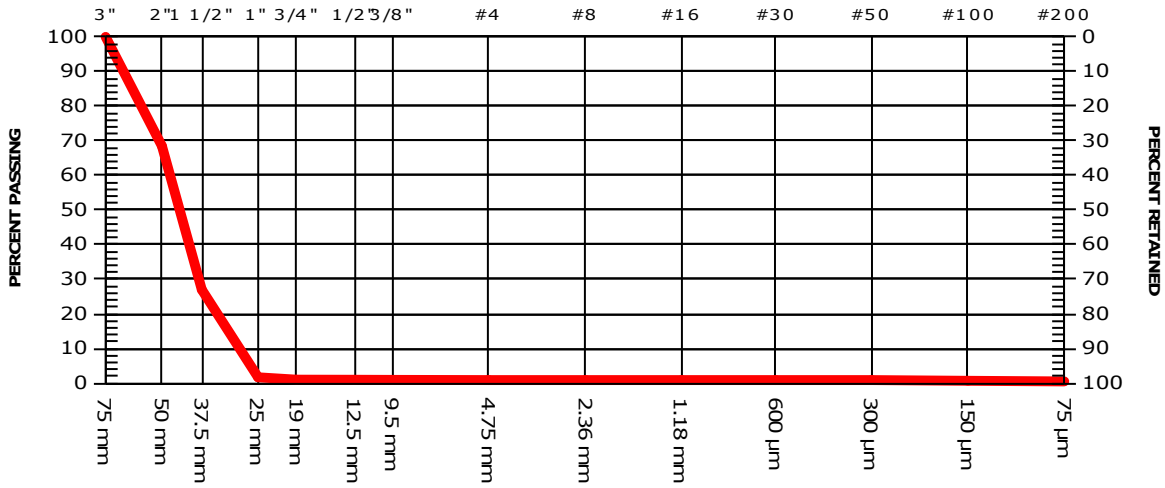
ATTN : David Barbour

PROJECT Upland Landfill
Materials Testing
7295 Gold River Highway
Campbell River
CONTRACTOR GHD Ltd.

SIEVE TEST NO. 1 DATE RECIEVED 2022.Nov.22 DATE TESTED 2022.Nov.28 DATE SAMPLED 2022.Nov.18

SUPPPLIER N/A
SOURCE N/A
SPECIFICATION
MATERIAL TYPE 75MM MINUS

SAMPLED BY CLIENT
TESTED BY PI
TEST METHOD WASHED




| GRAVEL SIZES | | PERCENT PASSING | GRADATION LIMITS |
|---|---|---|---|
| 3" | 75 mm | 100.0 | |
| 2" | 50 mm | 68.5 | |
| 1 1/2" | 37.5 mm | 27.0 | |
| 1" | 25 mm | 1.7 | |
| 3/4" | 19 mm | 1.0 | |
| 1/2" | 12.5 mm | | |
| 3/8" | 9.5 mm | | |

| SAND SIZES AND FINES | | PERCENT PASSING | GRADATION LIMITS |
|---|---|---|---|
| No. 4 | 4.75 mm | 0.9 | |
| No. 8 | 2.36 mm | 0.9 | |
| No. 16 | 1.18 mm | 0.9 | |
| No. 30 | 600 µm | 0.9 | |
| No. 50 | 300 µm | 0.9 | |
| No. 100 | 150 µm | 0.7 | |
| No. 200 | 75 µm | 0.5 | |

COMMENTS

PER.



Reporting of the these test result constitutes a testing service only. Engineering interpretation or evaluation of test results is provided only on written request.

# Appendix D

## Product Data

# Submittal Transmittal

| | | | |
|---|---|---|---|
| **Project Description:** | Northwin Landfill Phase 1 West | **Contract No.:** | Click or tap here to enter text. |
| | | **Project No.:** | 11222680 |
| **Submitted by:** | Upland Contracting Ltd. | **Submittal #:** | **001** |

**Submitted to Consultant by the General Contractor on Date: [Publish Date]**

**Verification by General Contractor:**

**The document attached with this shop drawing transmittal was/were reviewed against following specifications and it complies with following specifications with listed exceptions:**

| Spec No. | Meets following specifications | with Following exceptions |
|---|---|---|
| ASTM D4716 | Transmissivity | |
| ASTM D7005 | Ply Adhesion | |
| ASTM D5199 | Thickness | |
| ASTM D1505 | Density | |
| ASTM D7179 | | Tensile Strength |
| ASTM D4218 | Carbon Black | |
| ASTM D5261 | Mass per Unit Area | |
| ASTM D4632 | Grab Tensile Strength, Grab Elongation | |
| ASTM D6241 | Puncture Strength | |
| ASTM D4533 | Trapezoidal Tear Strength | |
| ASTM D4751 | Apparent Opening Size | |
| ASTM D4491 | Permittivity | |
| ASTM D4491 | | Water Flow Rate |

**Submittal Information: *(Describe the submittal)***

| | |
|---|---|
| Notes: SKAPS TN 330-2-8 (GeoNet) | Contractor's Signature or Stamp |

Email Submittals to: Susan.McPhee@ghd.com; Sandi.Mullins@ghd.com; Kira.Turner@ghd.com and cc:

**For Consultant Use Only**

Notes/Comments:

**Tensile Strength spec: 13.3N/mm, Submittal: 13.12kN/m**
**Minimal difference in tensile strength**

**Water Flow Rate spec: 3865 lpm/m2, Submittal: 4075 lpm/m2**
**Proposed material exceeds the minimum required spec**

REVIEWED BY: Toby Wong

## Shop Drawing Review

Submission No. **001**

Contractor's Reference

ENGINEER's review is for the sole purpose of ascertaining conformance with general design concepts expressed in the contract Documents, and in no way constitutes approval of the detail design inherent in CONTRACTOR's Shop Drawings, responsibility for which remains solely with CONTRACTOR submitting same. Review does not authorize changes to Contract Documents.

- [ ] Reviewed
- [x] Reviewed as Noted
- [ ] Revise and Resubmit
- [ ] Not Subject to Review
- [ ] Other

By: **GHD Limited**

Signed: **Roxy Hasior**

Date: **June 10, 2022**

## SKAPS TRANSNET™ HDPE GEOCOMPOSITE TN 330-2-8

**SKAPS TRANSNET™ geocomposite consists of SKAPS GeoNet made from HDPE resin with nonwoven polypropylene geotextile fabric heat bonded on both sides of geonet.**

| Property | Test Method | Unit | Value | Qualifier |
|---|---|---|---|---|
| **Geonet** | | | | |
| Thickness | ASTM D 5199 | mil (mm) | 300 (7.62) | MAV(3) |
| Carbon Black | ASTM D 4218 | % | 2.0 | MAV |
| Tensile Strength | ASTM D 7179 | lb/in (kN/m) | 75 (13.12) | MAV |
| Melt Flow | ASTM D 1238(2) | g/10 min | 1.0 | Maximum |
| Density | ASTM D 1505 | $g/cm^3$ | 0.94 | MAV |
| Transmissivity(1) | ASTM D 4716 | gal/min/ft ($m^2$/sec) | 38.67 (8.0 x $10^{-3}$) | MAV |
| **Composite** | | | | |
| Ply Adhesion | ASTM D 7005 | lb/in (g/cm) | 1.0 (178) | MAV |
| Transmissivity(1) | ASTM D 4716 | gal/min/ft ($m^2$/sec) | 4.35 (9.0 x $10^{-4}$) | MAV |
| **Geotextile** | | | | |
| Fabric Weight | ASTM D 5261 | $oz/yd^2$ ($gm/m^2$) | 8 (271) | MARV(4) |
| Grab Tensile | ASTM D 4632 | lb (N) | 225 (1001) | MARV |
| Grab Elongation | ASTM D 4632 | % | 50 | MARV |
| Trapezoid Tear | ASTM D 4533 | lb (N) | 90 (400) | MARV |
| CBR Puncture | ASTM D 6241 | lb (N) | 600 (2670) | MARV |
| Water Flow(5) | ASTM D 4491 | gpm/$ft^2$ (l/min/$m^2$) | 100 (4075) | MARV |
| Permittivity(5) | ASTM D 4491 | $sec^{-1}$ | 1.26 | MARV |
| Permeability(5) | ASTM D 4491 | cm/sec | 0.30 | MARV |
| AOS | ASTM D 4751 | US Sieve (mm) | 80 (0.180) | MaxARV |

**Notes:**

(1) Transmissivity measured using water at 21 ± 2 °C (70 ± 4 °F) with a gradient of 0.1 and a confining pressure of 10,000 psf (479 kPa) between steel plates after 15 minutes. Values may vary with individual labs.

(2) Condition 190/2.16

(3) Minimum average value.

(4) MARV is statistically defined as mean minus two standard deviations and it is the value which is exceeded by 97.5% of all the test data.

(5) At the time of manufacturing. Handling may change these properties.

*This information is provided for reference purposes only and is not intended as a warranty or guarantee. SKAPS assumes no liability in connection with the use of this information. Geotextile and Geonet properties are prior to lamination.*

**SKAPS Industries,** 571 Industrial Pkwy., Commerce, GA 30529, **Ph:** (706) 336-7000, **Fax:** (706) 336-7007, **E-mail:** contact@skaps.com

# Submittal Transmittal

| | | | |
|---|---|---|---|
| **Project Description:** | Northwin Landfill Phase 1 West | **Contract No.:** | Click or tap here to enter text. |
| | | **Project No.:** | 11222680 |
| **Submitted by:** | Upland Contracting Ltd. | **Submittal #:** | **002** |

**Submitted to Consultant by the General Contractor on Date: [Publish Date]**

**Verification by General Contractor:**

**The document attached with this shop drawing transmittal was/were reviewed against following specifications and it complies with following specifications with listed exceptions:**

| Spec No. | Meets following specifications | with Following exceptions |
|---|---|---|
| ASTM D5261 | Mass per Unit Area | |
| ASTM D4632 | Grab Tensile Strength, Grab Elongation | |
| ASTM D4833 | | Puncture Strength |
| ASTM D4533 | Trapezoidal Tear Strength | |
| ASTM D4355 | UV Resistance | |

**Submittal Information: *(Describe the submittal)***

| | |
|---|---|
| Notes: SKAPS GE280 (Non-woven Geotextile) | Contractor's Signature or Stamp |

Email Submittals to: Susan.McPhee@ghd.com; Sandi.Mullins@ghd.com; Kira.Turner@ghd.com and cc:

**For Consultant Use Only**

Notes/Comments:

**Puncture strength spec: ASTM D4833, Submittal: ASTM D6241**

ASTM has recently replaced the standard pin puncture strength test, D4833, with the CBR puncture strength test, D6241.

Based on GRI -GT12(a)∗ - ASTM Version Standard Specification Standard Specification for “Test Methods and Properties for Nonwoven Geotextiles Used as Protection (or Cushioning) Materials”, the CBR exceeds the required strength for 949 g/m2 material at 8.914 kN

**S.I. (Metric) Units**

Table 1(b) – Required Properties, Test Methods and Values for Geotextiles Used as Geomembrane Protection (or Cushioning) Materials

| Property(1) | Test Method ASTM | Unit | Mass/Unit Area ($g/m^2$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| Mass per unit area | D5261 | $g/m^2$ | 340 | 406 | 542 | 812 | 1080 | 2000 |
| Grab tensile strength | D4632 | kN | 1.02 | 1.33 | 1.64 | 2.00 | 2.25 | 2.80 |
| Grab tensile elongation | D4632 | % | 50 | 50 | 50 | 50 | 50 | 50 |
| Trap. tear strength | D4533 | kN | 0.42 | 0.51 | 0.64 | 0.89 | 0.96 | 1.27 |
| Puncture (CBR) strength | D6241 | kN | 3.11 | 3.56 | 4.00 | 4.90 | 7.56 | 10.60 |
| UV resistance(2) | D7238 | % | 70 | 70 | 70 | 70 | 70 | 70 |

Notes:
(1) All values are MARV except UV resistance; it is a minimum value.
(2) Evaluation to be on 50 mm strip tensile specimens per ASTM D5035 after 500 lt. hrs. exposure.

REVIEWED BY: Toby Wong

## Shop Drawing Review

Submission No. **002**

Contractor’s Reference

ENGINEER's review is for the sole purpose of ascertaining conformance with general design concepts expressed in the contract Documents, and in no way constitutes approval of the detail design inherent in CONTRACTOR's Shop Drawings, responsibility for which remains solely with CONTRACTOR submitting same. Review does not authorize changes to Contract Documents.

- [ ] Reviewed
- [x] Reviewed as Noted
- [ ] Revise and Resubmit
- [ ] Not Subject to Review
- [ ] Other

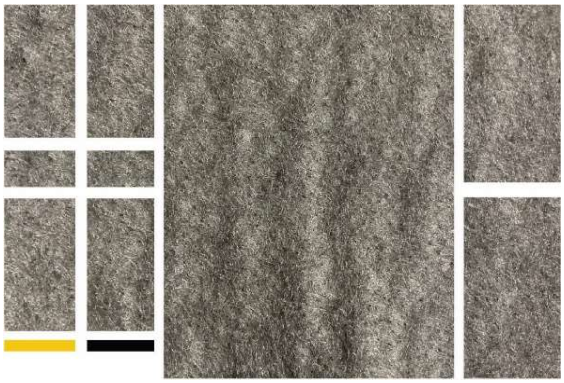
By: **GHD Limited**

Signed: **Roxy Hasior**

Date: **June 10, 2022**

# HEAVY WEIGHT
# NON-WOVEN GEOTEXTILE
## GE - 280

SKAPS GE-280 is a needle-punched nonwoven geotextile made of 100% polypropylene staple fibers, which are formed into a random network for dimensional stability. SKAPS GE-280 resists ultraviolet deterioration, rotting, biological degradation, naturally encountered basics and acids.



Polypropylene is stable within a pH range of 2 to 13. SKAPS GE-280 conforms to the physical property values listed below:

| Property | Method | English (MARV[2]) | Metric (MARV[2]) |
|---|---|---|---|
| Weight | ASTM D 5261 | 28 oz/yd$^2$ | 949 g/m$^2$ |
| Grab Tensile Strength | ASTM D 4632 | 550 lbs | 2.45 kN |
| Grab Elongation | ASTM D 4632 | 50% | 50% |
| Trapezoid Tear Strength | ASTM D 4533 | 250 lbs | 1.11 kN |
| CBR Puncture Resistance | ASTM D 6241 | 2004 lbs | 8.914 kN |
| UV Resistance | ASTM D 4355 | 70%/500 hrs. | 70%/500 hrs. |

At time of manufacturing. Handling may change these properties.

*This information is provided for reference purposes only and is not intended as a warranty or guarantee. SKAPS assumes no liability in connection with the use of this information.*

*335 Athena Drive, Athens, GA 30601*
*Ph: (706)-354-3700, Fax: (706)-354-3737, Email: contact@skaps.com*
**www.skaps.com**

# Submittal Transmittal

| | | | |
|---|---|---|---|
| **Project Description:** | Northwin Landfill Phase 1 West | **Contract No.:** | Click or tap here to enter text. |
| | | **Project No.:** | 11222680 |
| **Submitted by:** | Upland Contracting Ltd. | **Submittal #:** | **003** |

**Submitted to Consultant by the General Contractor on Date: [Publish Date]**

**Verification by General Contractor:**

**The document attached with this shop drawing transmittal was/were reviewed against following specifications and it complies with following specifications with listed exceptions:**

| Spec No. | Meets following specifications | with Following exceptions |
|---|---|---|
| ASTM D4632 | Grab Tensile Strength, Grab Elongation | |
| ASTM D4833 | | Puncture Strength |
| ASTM D4533 | Trapezoidal Tear Strength | |
| ASTM D4751 | Apparent Opening Size | |
| ASTM D4491 | Permittivity | |
| ASTM D4491 | Water Flow Rate | |
| ASTM 4355 | UV Resistance | |

**Submittal Information: *(Describe the submittal)***

| | |
|---|---|
| Notes: SKAPS SW-315 (Woven Geotextile) | Contractor's Signature or Stamp |

Email Submittals to:

**For Consultant Use Only**

Notes/Comments:

**Puncture Strength spec: ASTM D4833, Submittal: ASTM D6241**

GRI GT13(a) – ASTM Version Standard Specification∗ Standard Specification for "Test Methods and Properties for Geotextiles Used as Separation Between Subgrade Soil and Aggregate"

ASTM D6241 is acceptable as an alternative to ASTM D4833.

Product meets GRI standard specification for CBR puncture strength for a high survivability geotextile.

**SI Metric Units**

Table 2(a) – Geotextile Properties Class 1 (High Survivability)

| Property[1] | ASTM Test | Unit | Elongation < 50% | Elongation ≥ 50% |
|---|---|---|---|---|
| Grab Tensile Strength | D 4632 | N | 1400 | 900 |
| Trapezoid Tear Strength | D 4533 | N | 500 | 350 |
| CBR Puncture Strength | D 6241 | N | 2800 | 2000 |
| Permittivity | D 4491 | sec-1 | 0.02 | 0.02 |
| Apparent Opening Size | D 4751 | mm | 0.60 | 0.60 |
| Ultraviolet Stability[2] | D 7238 | % Str. Ret. @ 500 lt. hrs. | 80 | 80 |

REVIEWED BY: Roxy Hasior

## Shop Drawing Review

Submission No. **003**

Contractor's Reference

ENGINEER's review is for the sole purpose of ascertaining conformance with general design concepts expressed in the contract Documents, and in no way constitutes approval of the detail design inherent in CONTRACTOR's Shop Drawings, responsibility for which remains solely with CONTRACTOR submitting same. Review does not authorize changes to Contract Documents.

- ☐ Reviewed
- ☐ Reviewed as Noted
- ☐ Revise and Resubmit
- ☐ Not Subject to Review
- ☐ Other

By: **GHD Limited**

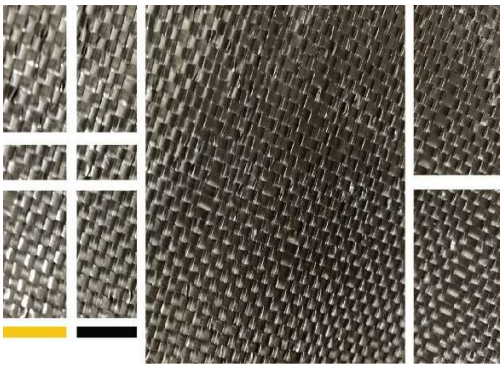
Signed: **Roxy Hasior**

Date: **June 10, 2022**

## WOVEN GEOTEXTILE

# SW - 315

SKAPS woven geotextile fabrics are woven polypropylene materials offering optimum performance when used in stabilization applications. Produced from first quality raw materials, they provide the perfect balance of strength and separation in styles capable of functioning exceptionally well in a wide range of performance requirements.



Unless indicated below, all listed properties are Minimum Average Roll Values

| Property | Method | English (MARV[2]) | Metric (MARV[2]) |
|---|---|---|---|
| Grab Tensile | ASTM D 4632 | 315 lbs. | 1.4 kN |
| Grab Elongation | ASTM D 4632 | 15% | 15% |
| Trapezoid Tear | ASTM D 4533 | 120 lbs. | 0.533 kN |
| CBR Puncture Resistance | ASTM D 6241 | 1000 lbs | 4.45 kN |
| Water Flow[3] | ASTM D 4491 | 4 gpm/sf | 163 l/min/m$^2$ |
| Permittivity[3] | ASTM D 4491 | 0.05 sec$^{-1}$ | 0.05 sec$^{-1}$ |
| AOS[3] | ASTM D 4751 | 40 U.S. Sieve | 0.425 mm |
| UV Resistance | ASTM D 4355 | 70%/500 hrs. | 70%/500 hrs. |

## Packaging

| | | |
|---|---|---|
| **Roll Dimensions (W x L)** | 12.5 x 360 ft.<br>17.5 x 258 ft. | 3.81 m x 110 m<br>5.33 m x 79 m |
| **Area Per Roll** | 500 sq. yards | 420 sq. meters |

## Note

1. The property values listed above are subject to change without notice.
2. Minimum Average Roll Values (MARV) is calculated as the average minus two standard deviations. Statistically, it yields approximately 97.5% degree of confidence that any samples taken from quality assurance testing will meet or exceed the values described above.
3. At time of manufacturing. Handling may change these properties.

*This information is provided for reference purposes only and is not intended as a warranty or guarantee. SKAPS assumes no liability in connection with the use of this information.*

*335 Athena Drive, Athens, GA 30601*
*Ph: (706)-354-3700, Fax: (706)-354-3737, Email: contact@skaps.com*
www.skaps.com

# Submittal Transmittal

| | | | |
|---|---|---|---|
| **Project Description:** | Northwin Landfill Phase 1 West | **Contract No.:** | Click or tap here to enter text. |
| | | **Project No.:** | 11222680 |
| **Submitted by:** | Upland Contracting Ltd. | **Submittal #:** | **004** |

**Submitted to Consultant by the General Contractor on Date: [Publish Date]**

**Verification by General Contractor:**

**The document attached with this shop drawing transmittal was/were reviewed against following specifications and it complies with following specifications with listed exceptions:**

| Spec No. | Meets following specifications | with Following exceptions |
|---|---|---|
| ASTM D5261 | Cap Nonwoven, Mass/Unit Area | |
| ASTM D4643 | | Moisture Content |
| ASTM D5890 | Free Swell | |
| ASTM D5891 | Fluid Loss | |
| ASTM D5993 | Bentonite Mass (Dry) | |
| ASTM D6768 | Grab Tensile Strength | |
| ASTM D6496<br>ASTM D4632 | | Peel Strength |
| ASTM D6243 | Internal Shear Strength | |

**Submittal Information: *(Describe the submittal)***

| | |
|---|---|
| Notes: Bentomat DN TR-401 (Geosynthetic Clay Liner) | Contractor's Signature or Stamp |

Email Submittals to: Susan.McPhee@ghd.com; Sandi.Mullins@ghd.com; Kira.Turner@ghd.com and cc:

**For Consultant Use Only**

Notes/Comments:

**Moisture Content spec: ASTM D4643, Submittal: ASTM D2216**

ASTM D4643 test method can be used as a substitute for test method D2216 when more rapid results are desired to expedite other phases of testing. Test methods are considered equivalent.

**Peel Strength spec: 2100 N/m, Submittal: 1401 N/m**

CETCO's manufacturing process does not include thermal bonding of needle-punched fibers.

REVIEWED BY:

## Shop Drawing Review

Submission No. **004**

Contractor's Reference

ENGINEER's review is for the sole purpose of ascertaining conformance with general design concepts expressed in the contract Documents, and in no way constitutes approval of the detail design inherent in CONTRACTOR's Shop Drawings, responsibility for which remains solely with CONTRACTOR submitting same. Review does not authorize changes to Contract Documents.

- [ ] Reviewed
- [x] Reviewed as Noted
- [ ] Revise and Resubmit
- [ ] Not Subject to Review
- [ ] Other

By: **GHD Limited**

Signed:

Date:

CETCO 2870 Forbs Avenue Hoffman Estates, IL 60192
847.851.1800 800.527.9948 Fax 847.851.1339 www.cetco.com

May 12, 2022

RE: Northwin Landfill ('22)
Geosynthetic Clay Liner

To whom it may concern:

CETCO® was provided with Section 02 56 13.16 - Geosynthetic Clay Liner, pages 02 56 13.15 – 1 through 8, dated August, 2020 of the Technical Specification for the Northwin Landfill Phase 1 East. Based upon our review of this information, CETCO® proposes to supply Bentomat® DN as the geosynthetic clay liner (GCL) for this project. A Technical Data Sheet (TDS) for Bentomat® DN is enclosed, and Bentomat® DN will meet or exceed the project requirements as indicated by the aforementioned document with the exceptions and clarifications identified below.

- **Peel Strength:** The Technical Specification requires a GCL peel strength of 12 lb/in (2100 N/m). This is an index test that can be manipulated by processes such as "thermal bonding." CETCO®'s manufacturing process does not include thermal bonding of needle-punched fibers. Independent research by Bareither et al, 2018 has demonstrated that non heat-treated GCLs exhibit greater shear strength than heat-treated GCLs (of similar peel strengths). This is perhaps due to brittleness caused by the heat-treating process. Accordingly, we are proposing Bentomat® DN with an 8 lb/in peel manufactured using CETCO®'s propriety high-density needle-punching technology. A GCL with a 12 lb/in peel strength can be offered at additional cost.

- **Bentonite Montmorillonite Content:** The Specification requires that the bentonite consist of at least 90 percent sodium montmorillonite. Unfortunately, there are no reliable test methods available for determining sodium montmorillonite content. The available methods can only give a qualitative indication of montmorillonite content. For this reason, the industry uses free swell (ASTM D5890) and fluid loss (ASTM D5891) tests to evaluate sodium bentonite quality. Only bentonite whose primary constituent is the clay mineral sodium montmorillonite will meet the free swell, fluid loss, and hydraulic conductivity values required for Bentomat GCLs. CETCO® certifies that the Bentomat GCL supplied to this project will be manufactured using the finest grade native Wyoming sodium bentonite, whose primary constituent is the mineral sodium montmorillonite, and that the bentonite will meet the minimum fluid loss, free swell, and moisture values required in the Specification.

- **Minimum Average Roll Value:** The GCL Properties table requires that the Bentonite Mass and Peel Strength meet the Minimum Average Roll Value (MARV). However, neither of the governing industry standard specifications: ASTM D5889, *Standard Practice for Quality Control of Geosynthetic Clay Liners*, or GRI-GCL3, *Standard Specification for Test Methods, Required Properties, and Testing Frequencies of Geosynthetic Clay Liners* require manufacturing quality control testing to be reported in MARV. As such, CETCO® testing and reporting conforms to these industry specifications, and reports minimum or maximum average values, as applicable, for our GCLs. Accordingly, CETCO® recommends that the manufacturing quality control testing conform to the current industry standard for this project.

In addition to our Bentomat® DN TDS and the Technical References, please find enclosed our quotation based upon the above-indicated exceptions. Placement of an order in connection with the above-referenced project acknowledges receipt of this letter and acceptance of the proposed product and exceptions and clarifications made herein. We appreciate your interest in CETCO® Environmental Products. Please call Rob Stafford at (970) 749-6118 if you have any further questions.

Best Regards,

**Rob Stafford**
Technical Sales Manager
CETCO® Environmental Products

Enclosures (4)

# BENTOMAT® DN CERTIFIED PROPERTIES

CETCO® Bentomat® DN is a reinforced geosynthetic clay liner (GCL) consisting of a layer of sodium bentonite between two polypropylene nonwoven geotextiles, which are needle-punched together.

| MATERIAL PROPERTY | TEST METHOD | TEST FREQUENCY | CERTIFIED VALUES |
|---|---|---|---|
| Nonwoven Base Geotextile Mass/Area[1] | ASTM D5261 | 200,000 $ft^2$ (20,000 $m^2$) | 6.0 $oz/yd^2$ (203 $g/m^2$) min. |
| Nonwoven Cap Geotextile Mass/Area[1] | ASTM D5261 | 200,000 $ft^2$ (20,000 $m^2$) | 6.0 $oz/yd^2$ (203 $g/m^2$) min. |
| Bentonite Moisture Content[2] | ASTM D2216 | 1 per 50 tonnes | 12% max. |
| Bentonite Swell Index[2] | ASTM D5890 | 1 per 50 tonnes | 24 mL/2g min. |
| Bentonite Fluid Loss[2] | ASTM D5891 | 1 per 50 tonnes | 18 mL max. |
| Bentonite Mass/Area[3] | ASTM D5993 | 40,000 $ft^2$ (4,000 $m^2$) | 0.75 $lb/ft^2$ (3.6 $kg/m^2$) min. |
| Total Mass/Area[3] | ASTM D5993 | 40,000 $ft^2$ (4,000 $m^2$) | 0.83 $lb/ft^2$ (4.1 $kg/m^2$) min. |
| GCL Moisture Content | ASTM D5993 | 40,000 $ft^2$ (4,000 $m^2$) | 35% max. |
| GCL Grab Strength[4] | ASTM D6768 | 200,000 $ft^2$ (20,000 $m^2$) | 50 lbs/in (8.8 kN/m) min. |
| GCL Peel Strength | ASTM D6496 | 40,000 $ft^2$ (4,000 $m^2$) | 8.0 lbs/in (1401 N/m) min. |
| GCL Hydraulic Conductivity[5] | ASTM D5887 | 250,000 $ft^2$ (25,000 $m^2$) | 5 x $10^{-11}$ m/s max. |
| GCL Index Flux[5] | ASTM D5887 | 250,000 $ft^2$ (25,000 $m^2$) | 1 x $10^{-8}$ $m^3/m^2/s$ max. |
| GCL Hydrated Internal Shear Strength[6] | ASTM D6243 | 1,000,000 $ft^2$ (100,000 $m^2$) | 500 psf (24 kPa) typ.@ 200 psf (9.6 kPa) |

Notes:

[1] Geotextile property tests performed on the geotextile components before they are incorporated into the finished GCL product.

[2] Bentonite property tests performed before the bentonite is incorporated into the finished GCL product.

[3] Reported at 0% moisture content.

[4] All tensile strength testing is performed in the machine direction using ASTM D6768.

[5] Index flux and hydraulic conductivity testing with deaired distilled/deionized water at 80 psi (550 kPa) cell pressure, 77 psi (530 kPa) headwater pressure and 75 psi (515 kPa) tailwater pressure.

[6] Peak values measured at 200 psf (9.6 kPa) normal stress for a specimen hydrated for 48 hours. Site-specific materials, GCL products, and test conditions must be used to verify internal and interface strength of the proposed design.



www.CETCO.com | contact@cetco.com

IMPORTANT: The information contained herein supersedes all previous printed versions, and is believed to be accurate and reliable. For the most up-to-date information, please contact CETCO sales team. CETCO accepts no responsibility for the results obtained through application of this product. CETCO reserves the right to update information without notice.

MINERALS TECHNOLOGIES CETCO®

# Submittal Transmittal

| | | | |
|---|---|---|---|
| **Project Description:** | Northwin Landfill Phase 1 West | **Contract No.:** | Click or tap here to enter text. |
| | | **Project No.:** | 11222680 |
| **Submitted by:** | Upland Contracting Ltd. | **Submittal #:** | **005** |

**Submitted to Consultant by the General Contractor on Date: [Publish Date]**

**Verification by General Contractor:**

**The document attached with this shop drawing transmittal was/were reviewed against following specifications and it complies with following specifications with listed exceptions:**

| Spec No. | Meets following specifications | with Following exceptions |
|---|---|---|
| ASTM D5199 | | Thickness |
| ASTM D1505/D792 | Density | |
| ASTM D638 Type IV, 2 pm | | Tensile Strength at Yield<br>Tensile Strength at Break<br>Elongation at Yield<br>Elongation at Break |
| ASTM D5397 | | Stress Crack Resistance |
| ASTM D1603 | Carbon Black Content | |
| ASTM D5596 | Carbon Black Dispersion | |
| ASTM D4833 | Puncturing Resistance | |
| ASTM D1004 | Tear Resistance | |
| GRI Test Method GM12 | | Asperity Height |

**Submittal Information: *(Describe the submittal)***

| | |
|---|---|
| Notes: SKAPS HD-60T2 AVG HDPE Geomembrane | Contractor's Signature or Stamp |

Email Submittals to: Susan.McPhee@ghd.com; Sandi.Mullins@ghd.com; Kira.Turner@ghd.com and cc:

**For Consultant Use Only**

Notes/Comments:

Thickness spec: ASTM D5199, Submittal: ASTM D5994
Tensile Strength at Yield spec: ASTM D638, Submittal: ASTM D6693
Tensile Strength at Break spec: ASTM D638, Submittal: ASTM D6693
Elongation at Yield spec: ASTM D638, Submittal: ASTM D6693
Elongation at Break spec: ASTM D638, Submittal: ASTM D6693
Stress Crack Resistance spec: 200 hour, Submittal: 500 hour
Asperity Height spec: GRI Test Method GM12, Submittal: ASTM D7466

Submittal compared to GRI - GM13 Standard Specification* Standard Specification for "Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes" (attached)

Submittal meets the requirement of GRI Standard Specification for all except the ASTM method for testing geomembrane thickness.

ASTM D5199
Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes (04.08)

ASTM D5994
Test Method for Measuring the Core Thickness of Textured Geomembranes, (04.08)

The two methods can be taken as substantially equivalent.

REVIEWED BY: Toby Wong

## Shop Drawing Review

Submission No. 005

Contractor's Reference

ENGINEER's review is for the sole purpose of ascertaining conformance with general design concepts expressed in the contract Documents, and in no way constitutes approval of the detail design inherent in CONTRACTOR's Shop Drawings, responsibility for which remains solely with CONTRACTOR submitting same. Review does not authorize changes to Contract Documents.

- [ ] Reviewed
- [x] Reviewed as Noted
- [ ] Revise and Resubmit
- [ ] Not Subject to Review
- [ ] Other

By: GHD Limited

Signed: Roxy Hasior

Date: June 10, 2022

**ENGLISH UNITS**

## Table 2(a) – High Density Polyethylene (HDPE) Geomembrane - Textured

| Properties | Test Method | Test Value | | | | | | | Testing Frequency (minimum) |
|---|---|---|---|---|---|---|---|---|---|
| | | 30 mils | 40 mils | 50 mils | 60 mils | 80 mils | 100 mils | 120 mils | |
| Thickness mils (min. ave.) - mils | D 5994 | nom. -5% | nom. -5% | nom. -5% | nom. -5% | nom. -5% | nom. -5% | nom. -5% | per roll |
| • lowest individual for 8 out of 10 values - % | | -10 | -10 | -10 | -10 | -10 | -10 | -10 | |
| • lowest individual for any of the 10 values - % | | -15 | -15 | -15 | -15 | -15 | -15 | -15 | |
| Asperity Height mils (min. ave.) - mils | D 7466 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | every 2nd roll *(1)* |
| Formulated Density (min. ave.) - g/cc | D 1505/D 792 | 0.940 | 0.940 | 0.940 | 0.940 | 0.940 | 0.940 | 0.940 | 200,000 lb |
| Tensile Properties (min. ave.) *(2)* | D 6693 | | | | | | | | 20,000 lb |
| • yield strength - lb/in. | Type IV | 63 | 84 | 105 | 126 | 168 | 210 | 252 | |
| • break strength - lb/in. | | 45 | 60 | 75 | 90 | 120 | 150 | 180 | |
| • yield elongation - % | | 12 | 12 | 12 | 12 | 12 | 12 | 12 | |
| • break elongation - % | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| Tear Resistance (min. ave.) - lb | D 1004 | 21 | 28 | 35 | 42 | 56 | 70 | 84 | 45,000 lb |
| Puncture Resistance (min. ave.) - lb | D 4833 | 45 | 60 | 75 | 90 | 120 | 150 | 180 | 45,000 lb |
| Stress Crack Resistance *(3)* - hr. | D 5397 (App.) | 500 | 500 | 500 | 500 | 500 | 500 | 500 | per GRI GM10 |
| Carbon Black Content (range) - % | D 4218 *(4)* | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 20,000 lb |
| Carbon Black Dispersion | D 5596 | note *(5)* | note *(5)* | note *(5)* | note *(5)* | note *(5)* | note *(5)* | note *(5)* | 45,000 lb |
| Oxidative Induction Time (OIT) (min. ave.) *(6)* | | | | | | | | | 200,000 lb |
| (a) Standard OIT - min. | D 8117 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| — or — | | | | | | | | | |
| (b) High Pressure OIT - min. | D 5885 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | |
| Oven Aging at 85°C *(6), (7)* | D 5721 | | | | | | | | |
| (a) Standard OIT (min. ave.) - % retained after 90 days | D 8117 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | per each formulation |
| — or — | | | | | | | | | |
| (b) High Pressure OIT (min. ave.) - % retained after 90 days | D 5885 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | |
| UV Resistance *(8)* | D 7238 | | | | | | | | |
| (a) Standard OIT (min. ave.) | D 8117 | N.R. *(9)* | N.R. *(9)* | N.R. *(9)* | N.R. *(9)* | N.R. *(9)* | N.R. *(9)* | N.R. *(9)* | per each formulation |
| — or — | | | | | | | | | |
| (b) High Pressure OIT (min. ave.) - % retained after 1600 hrs *(10)* | D 5885 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | |

*(1)* Alternate the measurement side for double sided textured sheet
*(2)* Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction.
Yield elongation is calculated using a gage length of 1.3 inches
Break elongation is calculated using a gage length of 2.0 inches
*(3)* SP-NCTL per ASTM D5397 Appendix, is not appropriate for testing geomembranes with textured or irregular rough surfaces. Test should be conducted on smooth edges of textured rolls or on smooth sheets made from the same formulation as being used for the textured sheet materials.
The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer's mean value via MQC testing.
(4) Other methods such as D 1603 (tube furnace) or D 6370 (TGA) are acceptable if an appropriate correlation to D 4218 (muffle furnace) can be established.
(5) Carbon black dispersion (only near spherical agglomerates) for 10 different views:
9 in Categories 1 or 2 and 1 in Category 3
(6) The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
(7) It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.
(8) The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.
(9) Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.
(10) UV resistance is based on percent retained value regardless of the original HP-OIT value.



**SI (METRIC UNITS)**

## Table 2(b) – High Density Polyethylene (HDPE) Geomembrane - Textured

| Properties | Test Method | Test Value | | | | | | | Testing Frequency (minimum) |
|---|---|---|---|---|---|---|---|---|---|
| | | 0.75 mm | 1.00 mm | 1.25 mm | 1.50 mm | 2.00 mm | 2.50 mm | 3.00 mm | |
| Thickness (min. ave.) - mm | D 5994 | nom. -5% | nom. -5% | nom. -5% | nom. -5% | nom. -5% | nom. -5% | nom. -5% | per roll |
| • lowest individual for 8 out of 10 values - % | | -10 | -10 | -10 | -10 | -10 | -10 | -10 | |
| • lowest individual for any of the 10 values - % | | -15 | -15 | -15 | -15 | -15 | -15 | -15 | |
| Asperity Height mils (min. ave.) - mm | D 7466 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | every 2nd roll *(1)* |
| Formulated Density (min. ave.) - g/cc | D 1505/D 792 | 0.940 | 0.940 | 0.940 | 0.940 | 0.940 | 0.940 | 0.940 | 90,000 kg |
| Tensile Properties (min. ave.) *(2)* | D 6693 | | | | | | | | 9,000 kg |
| • yield strength - kN/m | Type IV | 11 | 15 | 18 | 22 | 29 | 37 | 44 | |
| • break strength - kN/m | | 8 | 10 | 13 | 16 | 21 | 26 | 32 | |
| • yield elongation - % | | 12 | 12 | 12 | 12 | 12 | 12 | 12 | |
| • break elongation - % | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| Tear Resistance (min. ave.) - N | D 1004 | 93 | 125 | 156 | 187 | 249 | 311 | 374 | 20,000 kg |
| Puncture Resistance (min. ave.) - N | D 4833 | 200 | 267 | 333 | 400 | 534 | 667 | 800 | 20,000 kg |
| Stress Crack Resistance *(3)* - hr. | D 5397 (App.) | 500 | 500 | 500 | 500 | 500 | 500 | 500 | per GRI GM10 |
| Carbon Black Content (range) - % | D 4218 *(4)* | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 9,000 kg |
| Carbon Black Dispersion | D 5596 | note *(5)* | note *(5)* | note *(5)* | note *(5)* | note *(5)* | note *(5)* | note *(5)* | 20,000 kg |
| Oxidative Induction Time (OIT) (min. ave.) *(6)* | | | | | | | | | 90,000 kg |
| (a) Standard OIT - min. | D 8117 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| — or — | | | | | | | | | |
| (b) High Pressure OIT - min. | D 5885 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | |
| Oven Aging at 85°C *(6), (7)* | D 5721 | | | | | | | | |
| (a) Standard OIT (min. ave.) - % retained after 90 days | D 8117 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | per each formulation |
| — or — | | | | | | | | | |
| (b) High Pressure OIT (min. ave.) - % retained after 90 days | D 5885 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | |
| UV Resistance *(8)* | D 7238 | | | | | | | | |
| (a) Standard OIT (min. ave.) | D 8117 | N.R. *(9)* | N.R. *(9)* | N.R. *(9)* | N.R. *(9)* | N.R. *(9)* | N.R. *(9)* | N.R. *(9)* | per each formulation |
| — or — | | | | | | | | | |
| (b) High Pressure OIT (min. ave.) - % retained after 1600 hrs *(10)* | D 5885 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | |

*(1)* Alternate the measurement side for double sided textured sheet
*(2)* Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction.
Yield elongation is calculated using a gage length of 33 mm
Break elongation is calculated using a gage length of 50 mm
*(3)* The SP-NCTL test is not appropriate for testing geomembranes with textured or irregular rough surfaces. Test should be conducted on smooth edges of textured rolls or on smooth sheets made from the same formulation as being used for the textured sheet materials.
The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer's mean value via MQC testing.
*(4)* Other methods such as D 1603 (tube furnace) or D 6370 (TGA) are acceptable if an appropriate correlation to D 4218 (muffle furnace) can be established.
*(5)* Carbon black dispersion (only near spherical agglomerates) for 10 different views:
9 in Categories 1 or 2 and 1 in Category 3
*(6)* The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
*(7)* It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.
*(8)* The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.
*(9)* Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.
*(10)* UV resistance is based on percent retained value regardless of the original HP-OIT value.

# SKAPS HD-60T2 AVG
# HDPE GEOMEMBRANE
# Textured Double Sided

**SKAPS INDUSTRIES**
571 Industrial Pkwy
Commerce, GA 30529
Phone: (706) 336-7000
Fax: (706) 336-7007
E-Mail: contact@skaps.com

SKAPS HD-60T2 AVG Geomembrane is manufactured utilizing the highest quality standards to provide the greatest durability in geomembrane applications. The geomembrane is formulated to meet the requirements of GRI GM13 specifications.

| PROPERTY | TEST METHOD | FREQUENCY | VALUE | QUALIFIER |
|---|---|---|---|---|
| Thickness (minimum avg), mils | ASTM D 5994 | Per Roll | 60 | MAV(1) |
| Thickness (minimum), mils | | | 54 | MIN |
| Asperity Height, mils | ASTM D 7466 | 2nd Roll | 16 | MAV |
| Density, g/cc | ASTM D 1505 | 200,000 lb | 0.940 | MIN |
| Tensile Properties (both directions) | ASTM D 6693 Type IV Specimen, 2 in/min | 20,000 lb | | |
| Strength at Yield, lb/in width | | | 126 | MAV |
| Elongation at Yield, % (1.3 in. GL) | | | 12 | MAV |
| Strength at Break, lb/in width | | | 90 | MAV |
| Elongation at Break, % (2 in. GL) | | | 100 | MAV |
| Tear Resistance, lb | ASTM D 1004 | 45,000 lb | 42 | MAV |
| Puncture Resistance, lb | ASTM D 4833 | 45,000 lb | 90 | MAV |
| Carbon Black Content, % | ASTM D 4218 | 20,000 lb | 2-3 | Range |
| Carbon Black Dispersion (Category) | ASTM D 5596 | 45,000 lb | Note (2) | Category |
| Stress Crack Resistance, hr. | ASTM D 5397, Appendix | 200,000 lb | 500 | MIN |
| Oxidative Induction Time, minutes | ASTM D 3895 200°C, 1 atm $O_2$ | 200,000 lb | 100 | MIN |
| **ROLL DIMENSIONS** | | | | |
| Roll Length, ft | | | 490 | NOM |
| Roll Width, ft | | | 23.5 | |
| Roll Area, sf | | | 11,515 | |

**Notes:**

(1) Minimum average value

(2) Carbon black dispersion (only near spherical agglomerates) for 10 different views:
9 in Categories 1 or 2 and 1 in Category 3

*This information is provided for reference purposes only and is not intended as a warranty or guarantee.*
*SKAPS assumes no liability in connection with the use of this information.*

*1/6/2021*

# Appendix E

## Geosynthetics QA/QC Information

C.J. Cassidy

Consulting Inc.

# NORTHWIN LANDFILL - WEST CELL - 2022

## CAMPBELL RIVER, B.C.

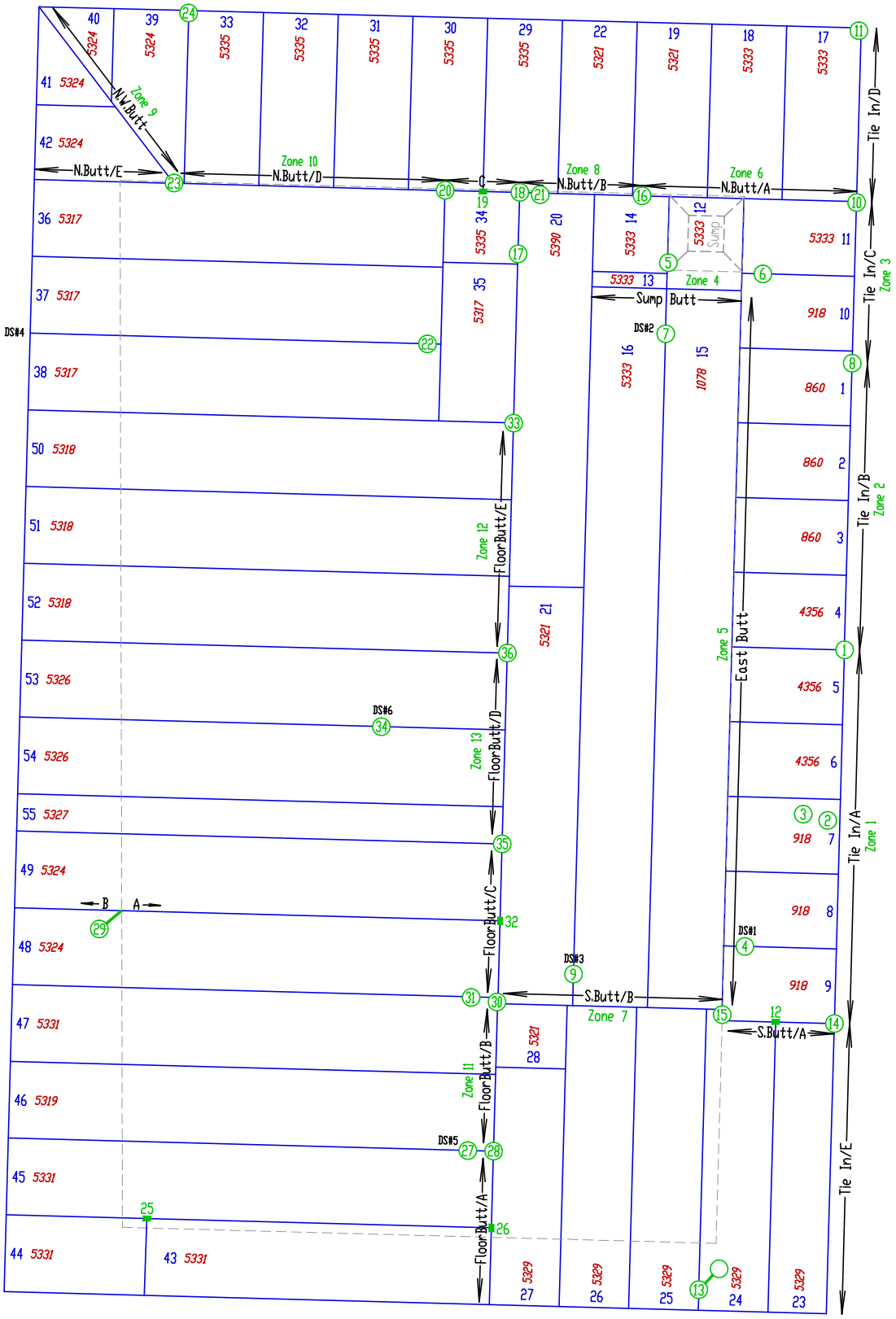
C.J. Cassidy
Consulting Inc.

# NORTHWIN LANDFILL - WEST CELL - 2022

# CAMPBELL RIVER, B.C.


| | Page # |
|---|---|
| Title Page | 1 |
| Table of Contents | 2 |
| Secondary Liner | |
| ~ Representative Drawing | 3 |
| ~ Welder Qualifications | 4 ~ 20 |
| ~ Panel Placement Logs | 21 ~ 36 |
| ~ Non-Destructive Seam Logs | 37 ~ 52 |
| ~ Extrusion Weld Reports | 53 ~ 67 |
| ~ Destructive Testing Reports | 68 |
| Primary Liner | |
| ~ Representative Drawing | 69 |
| ~ Welder Qualifications | 70 ~ 89 |
| ~ Panel Placement Logs | 90 ~ 107 |
| ~ Non-Destructive Seam Logs | 108 ~ 125 |
| ~ Extrusion Weld Reports | 126 ~ 141 |
| ~ Destructive Testing Reports | 142 |

# NORTHWIN LANDFILL WEST CELL
## SECONDARY LINER




Blue = Liner  Red = Roll Numbers  Green = Extrusion Welds

| | | |
|---|---|---|
| DATE: December 19, 2022 | C.J. Cassidy Consulting Inc. | NORTHWIN LANDFILL - 2022 |
| SCALE: NTS | | CAMPBELL RIVER, B.C. |
| FILE NAME: SecondaryRep-2022 | | West Cell Secondary Liner Representative Drawing |
| DRAWN BY: SSC | | |
| CHECKED BY: CJC | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Friday, October 14, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 10:10 | 1 | CJC | | | | 860 | 350 | 1 | 152 | 1 | 149 | 1 | 200 | CC | |
| 10:10 | 1 | CJC | | | | 860 | 350 | 2 | 148 | 2 | 150 | 2 | 191 | CC | |
| 10:10 | 1 | CJC | | | | 860 | 350 | 3 | 130 | 3 | 162 | 3 | 194 | CC | |
| 10:10 | 1 | CJC | | | | 860 | 350 | 4 | 154 | 4 | 161 | 4 | 190 | CC | |
| 10:10 | 1 | CJC | | | | 860 | 350 | 5 | 143 | 5 | 170 | 5 | 200 | CC | |
| 2:45 | X1 | MC | 485 | 485 | | | | 1 | 142 | 1 | | 1 | 184 | CC | |
| 2:45 | X1 | MC | 485 | 485 | | | | 2 | 129 | 2 | | 2 | 181 | CC | |
| 2:45 | X1 | MC | 485 | 485 | | | | 3 | 99 | 3 | | 3 | 184 | CC | |
| 2:45 | X1 | MC | 485 | 485 | | | | 4 | 102 | 4 | | 4 | 180 | CC | |
| 2:45 | X1 | MC | 485 | 485 | | | | 5 | 126 | 5 | | 5 | 177 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Tuesday, October 18, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 9:15 | 1 | JC | | | 860 | | 250 | 1 | 125 | 1 | 130 | 1 | 205 | CC | |
| 9:15 | 1 | JC | | | 860 | | 250 | 2 | 125 | 2 | 129 | 2 | 195 | CC | |
| 9:15 | 1 | JC | | | 860 | | 250 | 3 | 136 | 3 | 140 | 3 | 202 | CC | |
| 9:15 | 1 | JC | | | 860 | | 250 | 4 | 133 | 4 | 122 | 4 | 202 | CC | |
| 9:15 | 1 | JC | | | 860 | | 250 | 5 | 118 | 5 | 132 | 5 | 194 | CC | |
| 10:00 | X1 | RC | 500 | 500 | | | | 1 | 118 | 1 | | 1 | 190 | CC | |
| 10:00 | X1 | RC | 500 | 500 | | | | 2 | 124 | 2 | | 2 | 195 | CC | |
| 10:00 | X1 | RC | 500 | 500 | | | | 3 | 135 | 3 | | 3 | 183 | CC | |
| 10:00 | X1 | RC | 500 | 500 | | | | 4 | 115 | 4 | | 4 | 180 | CC | |
| 10:00 | X1 | RC | 500 | 500 | | | | 5 | 119 | 5 | | 5 | 186 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Wednesday, October 19, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 10:30 | 1 | JC | | | 860 | | 250 | 1 | 143 | 1 | 137 | 1 | 194 | CC | |
| 10:30 | 1 | JC | | | 860 | | 250 | 2 | 134 | 2 | 149 | 2 | 190 | CC | |
| 10:30 | 1 | JC | | | 860 | | 250 | 3 | 147 | 3 | 158 | 3 | 192 | CC | |
| 10:30 | 1 | JC | | | 860 | | 250 | 4 | 158 | 4 | 147 | 4 | 193 | CC | |
| 10:30 | 1 | JC | | | 860 | | 250 | 5 | 146 | 5 | 149 | 5 | 194 | CC | |
| 12:03 | X1 | RC | 500 | 500 | | | | 1 | 117 | 1 | | 1 | 173 | CC | |
| 12:03 | X1 | RC | 500 | 500 | | | | 2 | 117 | 2 | | 2 | 175 | CC | |
| 12:03 | X1 | RC | 500 | 500 | | | | 3 | 111 | 3 | | 3 | 178 | CC | |
| 12:03 | X1 | RC | 500 | 500 | | | | 4 | 121 | 4 | | 4 | 176 | CC | |
| 12:03 | X1 | RC | 500 | 500 | | | | 5 | 110 | 5 | | 5 | 180 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Saturday, October 22, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 10:24 | 1 | RC | | | 860 | | 300 | 1 | 147 | 1 | 132 | 1 | 199 | CC | |
| 10:24 | 1 | RC | | | 860 | | 300 | 2 | 142 | 2 | 132 | 2 | 204 | CC | |
| 10:24 | 1 | RC | | | 860 | | 300 | 3 | 132 | 3 | 126 | 3 | 208 | CC | |
| 10:24 | 1 | RC | | | 860 | | 300 | 4 | 148 | 4 | 136 | 4 | 206 | CC | |
| 10:24 | 1 | RC | | | 860 | | 300 | 5 | 126 | 5 | 143 | 5 | 205 | CC | |
| 12:05 | X1 | RC | 500 | 500 | | | | 1 | 99 | 1 | | 1 | 184 | CC | |
| 12:05 | X1 | RC | 500 | 500 | | | | 2 | 97 | 2 | | 2 | 167 | CC | |
| 12:05 | X1 | RC | 500 | 500 | | | | 3 | 102 | 3 | | 3 | 167 | CC | |
| 12:05 | X1 | RC | 500 | 500 | | | | 4 | 118 | 4 | | 4 | 159 | CC | |
| 12:05 | X1 | RC | 500 | 500 | | | | 5 | 113 | 5 | | 5 | 172 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Tuesday, October 25, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 8:10 | 1 | JC | | | 860 | | 300 | 1 | 125 | 1 | 128 | 1 | 210 | CC | |
| 8:10 | 1 | JC | | | 860 | | 300 | 2 | 126 | 2 | 146 | 2 | 210 | CC | |
| 8:10 | 1 | JC | | | 860 | | 300 | 3 | 141 | 3 | 135 | 3 | 209 | CC | |
| 8:10 | 1 | JC | | | 860 | | 300 | 4 | 142 | 4 | 143 | 4 | 212 | CC | |
| 8:10 | 1 | JC | | | 860 | | 300 | 5 | 128 | 5 | 135 | 5 | 212 | CC | |
| 12:00 | X1 | MC | 500 | 500 | | | | 1 | 109 | 1 | | 1 | 196 | CC | |
| 12:00 | X1 | MC | 500 | 500 | | | | 2 | 112 | 2 | | 2 | 196 | CC | |
| 12:00 | X1 | MC | 500 | 500 | | | | 3 | 100 | 3 | | 3 | 203 | CC | |
| 12:00 | X1 | MC | 500 | 500 | | | | 4 | 109 | 4 | | 4 | 200 | CC | |
| 12:00 | X1 | MC | 500 | 500 | | | | 5 | 95 | 5 | | 5 | 201 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Wednesday, October 26, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 8:39 | 1 | JC | | | 860 | | 300 | 1 | 162 | 1 | 166 | 1 | 206 | CC | |
| 8:39 | 1 | JC | | | 860 | | 300 | 2 | 175 | 2 | 154 | 2 | 218 | CC | |
| 8:39 | 1 | JC | | | 860 | | 300 | 3 | 155 | 3 | 155 | 3 | 205 | CC | |
| 8:39 | 1 | JC | | | 860 | | 300 | 4 | 158 | 4 | 158 | 4 | 204 | CC | |
| 8:39 | 1 | JC | | | 860 | | 300 | 5 | 161 | 5 | 155 | 5 | 211 | CC | |
| 8:09 | X1 | MC | 500 | 500 | | | | 1 | 119 | 1 | | 1 | 212 | CC | |
| 8:09 | X1 | MC | 500 | 500 | | | | 2 | 88 | 2 | | 2 | 207 | CC | |
| 8:09 | X1 | MC | 500 | 500 | | | | 3 | 119 | 3 | | 3 | 210 | CC | |
| 8:09 | X1 | MC | 500 | 500 | | | | 4 | 131 | 4 | | 4 | 213 | CC | |
| 8:09 | X1 | MC | 500 | 500 | | | | 5 | 119 | 5 | | 5 | 206 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Friday, October 28, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 8:14 | 1 | JC | | | 860 | | 300 | 1 | 162 | 1 | 166 | 1 | 206 | CC | |
| 8:14 | 1 | JC | | | 860 | | 300 | 2 | 132 | 2 | 133 | 2 | 201 | CC | |
| 8:14 | 1 | JC | | | 860 | | 300 | 3 | 155 | 3 | 155 | 3 | 205 | CC | |
| 8:14 | 1 | JC | | | 860 | | 300 | 4 | 141 | 4 | 149 | 4 | 204 | CC | |
| 8:14 | 1 | JC | | | 860 | | 300 | 5 | 161 | 5 | 155 | 5 | 204 | CC | |
| 8:40 | X1 | RC | 500 | 500 | | | | 1 | 119 | 1 | | 1 | 211 | CC | |
| 8:40 | X1 | RC | 500 | 500 | | | | 2 | 98 | 2 | | 2 | 207 | CC | |
| 8:40 | X1 | RC | 500 | 500 | | | | 3 | 120 | 3 | | 3 | 210 | CC | |
| 8:40 | X1 | RC | 500 | 500 | | | | 4 | 130 | 4 | | 4 | 213 | CC | |
| 8:40 | X1 | RC | 500 | 500 | | | | 5 | 120 | 5 | | 5 | 211 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Tuesday, November 01, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 12:15 | 1 | JC | | | 860 | | 300 | 1 | 130 | 1 | 133 | 1 | 198 | CC | |
| 12:15 | 1 | JC | | | 860 | | 300 | 2 | 141 | 2 | 140 | 2 | 198 | CC | |
| 12:15 | 1 | JC | | | 860 | | 300 | 3 | 151 | 3 | 145 | 3 | 193 | CC | |
| 12:15 | 1 | JC | | | 860 | | 300 | 4 | 146 | 4 | 148 | 4 | 199 | CC | |
| 12:15 | 1 | JC | | | 860 | | 300 | 5 | 132 | 5 | 137 | 5 | 195 | CC | |
| 11:35 | X1 | RC | 500 | 500 | | | | 1 | 91 | 1 | | 1 | 186 | CC | Warm sample, rain coming. |
| 11:35 | X1 | RC | 500 | 500 | | | | 2 | 98 | 2 | | 2 | 193 | CC | |
| 11:35 | X1 | RC | 500 | 500 | | | | 3 | 93 | 3 | | 3 | 192 | CC | |
| 11:35 | X1 | RC | 500 | 500 | | | | 4 | 88 | 4 | | 4 | 196 | CC | |
| 11:35 | X1 | RC | 500 | 500 | | | | 5 | 87 | 5 | | 5 | 189 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Thursday, November 03, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 9:10 | 1 | JC | | | 860 | | 300 | 1 | 140 | 1 | 123 | 1 | 191 | CC | |
| 9:10 | 1 | JC | | | 860 | | 300 | 2 | 134 | 2 | 129 | 2 | 190 | CC | |
| 9:10 | 1 | JC | | | 860 | | 300 | 3 | 132 | 3 | 132 | 3 | 193 | CC | |
| 9:10 | 1 | JC | | | 860 | | 300 | 4 | 126 | 4 | 141 | 4 | 192 | CC | |
| 9:10 | 1 | JC | | | 860 | | 300 | 5 | 127 | 5 | 137 | 5 | 195 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Tuesday, November 08, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 10:07 | 1 | JC | | | 860 | | 300 | 1 | 138 | 1 | 130 | 1 | 204 | CC | |
| 10:07 | 1 | JC | | | 860 | | 300 | 2 | 146 | 2 | 150 | 2 | 203 | CC | |
| 10:07 | 1 | JC | | | 860 | | 300 | 3 | 135 | 3 | 148 | 3 | 199 | CC | |
| 10:07 | 1 | JC | | | 860 | | 300 | 4 | 136 | 4 | 145 | 4 | 204 | CC | |
| 10:07 | 1 | JC | | | 860 | | 300 | 5 | 149 | 5 | 138 | 5 | 196 | CC | |
| 10:45 | X1 | MC | 500 | 500 | | | | 1 | 116 | 1 | | 1 | 203 | CC | |
| 10:45 | X1 | MC | 500 | 500 | | | | 2 | 99 | 2 | | 2 | 204 | CC | |
| 10:45 | X1 | MC | 500 | 500 | | | | 3 | 101 | 3 | | 3 | 201 | CC | |
| 10:45 | X1 | MC | 500 | 500 | | | | 4 | 102 | 4 | | 4 | 200 | CC | |
| 10:45 | X1 | MC | 500 | 500 | | | | 5 | 113 | 5 | | 5 | 199 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Wednesday, November 09, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 9:50 | 1 | JC | | | 860 | | 300 | 1 | 140 | 1 | 130 | 1 | 204 | CC | |
| 9:50 | 1 | JC | | | 860 | | 300 | 2 | 146 | 2 | 150 | 2 | 197 | CC | |
| 9:50 | 1 | JC | | | 860 | | 300 | 3 | 141 | 3 | 132 | 3 | 199 | CC | |
| 9:50 | 1 | JC | | | 860 | | 300 | 4 | 138 | 4 | 149 | 4 | 204 | CC | |
| 9:50 | 1 | JC | | | 860 | | 300 | 5 | 144 | 5 | 139 | 5 | 196 | CC | |
| 10:10 | X1 | RC | 500 | 500 | | | | 1 | 100 | 1 | | 1 | 204 | CC | |
| 10:10 | X1 | RC | 500 | 500 | | | | 2 | 111 | 2 | | 2 | 204 | CC | |
| 10:10 | X1 | RC | 500 | 500 | | | | 3 | 100 | 3 | | 3 | 200 | CC | |
| 10:10 | X1 | RC | 500 | 500 | | | | 4 | 102 | 4 | | 4 | 200 | CC | |
| 10:10 | X1 | RC | 500 | 500 | | | | 5 | 97 | 5 | | 5 | 201 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Thursday, November 10, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 1:27 | 1 | JC | | | 860 | | 300 | 1 | 140 | 1 | 141 | 1 | 189 | CC | |
| 1:27 | 1 | JC | | | 860 | | 300 | 2 | 167 | 2 | 143 | 2 | 193 | CC | |
| 1:27 | 1 | JC | | | 860 | | 300 | 3 | 154 | 3 | 169 | 3 | 200 | CC | |
| 1:27 | 1 | JC | | | 860 | | 300 | 4 | 145 | 4 | 144 | 4 | 199 | CC | |
| 1:27 | 1 | JC | | | 860 | | 300 | 5 | 161 | 5 | 155 | 5 | 197 | CC | |
| 7:23 | X1 | RC | 500 | 500 | | | | 1 | 99 | 1 | | 1 | 189 | CC | |
| 7:23 | X1 | RC | 500 | 500 | | | | 2 | 101 | 2 | | 2 | 199 | CC | |
| 7:23 | X1 | RC | 500 | 500 | | | | 3 | 97 | 3 | | 3 | 196 | CC | |
| 7:23 | X1 | RC | 500 | 500 | | | | 4 | 98 | 4 | | 4 | 196 | CC | |
| 7:23 | X1 | RC | 500 | 500 | | | | 5 | 102 | 5 | | 5 | 197 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Saturday, November 12, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 11:30 | 1 | JC | | | 860 | | 300 | 1 | 169 | 1 | 155 | 1 | 189 | CC | |
| 11:30 | 1 | JC | | | 860 | | 300 | 2 | 151 | 2 | 126 | 2 | 196 | CC | |
| 11:30 | 1 | JC | | | 860 | | 300 | 3 | 122 | 3 | 140 | 3 | 200 | CC | |
| 11:30 | 1 | JC | | | 860 | | 300 | 4 | 134 | 4 | 145 | 4 | 203 | CC | |
| 11:30 | 1 | JC | | | 860 | | 300 | 5 | 167 | 5 | 129 | 5 | 204 | CC | |
| 7:20 | X1 | RC | 500 | 500 | | | | 1 | 100 | 1 | | 1 | 190 | CC | |
| 7:20 | X1 | RC | 500 | 500 | | | | 2 | 88 | 2 | | 2 | 200 | CC | |
| 7:20 | X1 | RC | 500 | 500 | | | | 3 | 98 | 3 | | 3 | 204 | CC | |
| 7:20 | X1 | RC | 500 | 500 | | | | 4 | 98 | 4 | | 4 | 204 | CC | |
| 7:20 | X1 | RC | 500 | 500 | | | | 5 | 101 | 5 | | 5 | 188 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Monday, November 14, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 11:25 | 1 | JC | | | 860 | | 300 | 1 | 131 | 1 | 143 | 1 | 216 | CC | |
| 11:25 | 1 | JC | | | 860 | | 300 | 2 | 135 | 2 | 145 | 2 | 198 | CC | |
| 11:25 | 1 | JC | | | 860 | | 300 | 3 | 127 | 3 | 145 | 3 | 211 | CC | |
| 11:25 | 1 | JC | | | 860 | | 300 | 4 | 136 | 4 | 153 | 4 | 211 | CC | |
| 11:25 | 1 | JC | | | 860 | | 300 | 5 | 116 | 5 | 147 | 5 | 209 | CC | |
| 10:13 | X1 | RC | 500 | 500 | | | | 1 | 114 | 1 | | 1 | 188 | CC | |
| 10:13 | X1 | RC | 500 | 500 | | | | 2 | 113 | 2 | | 2 | 189 | CC | |
| 10:13 | X1 | RC | 500 | 500 | | | | 3 | 109 | 3 | | 3 | 180 | CC | |
| 10:13 | X1 | RC | 500 | 500 | | | | 4 | 122 | 4 | | 4 | 181 | CC | |
| 10:13 | X1 | RC | 500 | 500 | | | | 5 | 125 | 5 | | 5 | 176 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Tuesday, November 15, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 9:33 | 1 | JC | | | 860 | | 300 | 1 | 128 | 1 | 141 | 1 | 187 | CC | |
| 9:33 | 1 | JC | | | 860 | | 300 | 2 | 134 | 2 | 138 | 2 | 192 | CC | |
| 9:33 | 1 | JC | | | 860 | | 300 | 3 | 136 | 3 | 132 | 3 | 198 | CC | |
| 9:33 | 1 | JC | | | 860 | | 300 | 4 | 122 | 4 | 149 | 4 | 188 | CC | |
| 9:33 | 1 | JC | | | 860 | | 300 | 5 | 120 | 5 | 144 | 5 | 206 | CC | |
| 9:51 | X1 | RC | 500 | 500 | | | | 1 | 119 | 1 | | 1 | 199 | CC | |
| 9:51 | X1 | RC | 500 | 500 | | | | 2 | 116 | 2 | | 2 | 191 | CC | |
| 9:51 | X1 | RC | 500 | 500 | | | | 3 | 122 | 3 | | 3 | 195 | CC | |
| 9:51 | X1 | RC | 500 | 500 | | | | 4 | 108 | 4 | | 4 | 207 | CC | |
| 9:51 | X1 | RC | 500 | 500 | | | | 5 | 124 | 5 | | 5 | 184 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Wednesday, November 16, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 9:45 | 1 | JC | | | 860 | | 300 | 1 | 125 | 1 | 134 | 1 | 184 | CC | |
| 9:45 | 1 | JC | | | 860 | | 300 | 2 | 123 | 2 | 148 | 2 | 182 | CC | |
| 9:45 | 1 | JC | | | 860 | | 300 | 3 | 136 | 3 | 140 | 3 | 191 | CC | |
| 9:45 | 1 | JC | | | 860 | | 300 | 4 | 140 | 4 | 149 | 4 | 201 | CC | |
| 9:45 | 1 | JC | | | 860 | | 300 | 5 | 138 | 5 | 153 | 5 | 189 | CC | |
| 10:26 | X1 | RC | 500 | 500 | | | | 1 | 120 | 1 | | 1 | 187 | CC | |
| 10:26 | X1 | RC | 500 | 500 | | | | 2 | 119 | 2 | | 2 | 196 | CC | |
| 10:26 | X1 | RC | 500 | 500 | | | | 3 | 126 | 3 | | 3 | 192 | CC | |
| 10:26 | X1 | RC | 500 | 500 | | | | 4 | 121 | 4 | | 4 | 203 | CC | |
| 10:26 | X1 | RC | 500 | 500 | | | | 5 | 118 | 5 | | 5 | 199 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Thursday, November 17, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 1:20 | 1 | JC | | | 860 | | 300 | 1 | 139 | 1 | 136 | 1 | 206 | CC | |
| 1:20 | 1 | JC | | | 860 | | 300 | 2 | 134 | 2 | 142 | 2 | 192 | CC | |
| 1:20 | 1 | JC | | | 860 | | 300 | 3 | 140 | 3 | 153 | 3 | 189 | CC | |
| 1:20 | 1 | JC | | | 860 | | 300 | 4 | 138 | 4 | 149 | 4 | 197 | CC | |
| 1:20 | 1 | JC | | | 860 | | 300 | 5 | 145 | 5 | 150 | 5 | 189 | CC | |
| 1:28 | X1 | MC | 500 | 500 | | | | 1 | 120 | 1 | | 1 | 181 | CC | |
| 1:28 | X1 | MC | 500 | 500 | | | | 2 | 117 | 2 | | 2 | 183 | CC | |
| 1:28 | X1 | MC | 500 | 500 | | | | 3 | 118 | 3 | | 3 | 171 | CC | |
| 1:28 | X1 | MC | 500 | 500 | | | | 4 | 119 | 4 | | 4 | 178 | CC | |
| 1:28 | X1 | MC | 500 | 500 | | | | 5 | 120 | 5 | | 5 | 186 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Friday, October 14, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 1 | 860 | East Slope | 11.00 | 7.30 | 80.30 | |
| 2 | 860 | East Slope | 11.00 | 7.30 | 80.30 | |
| 3 | 860 | East Slope | 11.00 | 7.30 | 80.30 | |
| 4 | 4356 | East Slope | 11.00 | 7.30 | 80.30 | |
| 5 | 4356 | East Slope | 11.00 | 7.30 | 80.30 | |
| 6 | 4356 | East Slope | 11.00 | 7.30 | 80.30 | |
| 7 | 918 | East Slope | 11.00 | 7.30 | 80.30 | |
| 8 | 918 | East Slope | 11.00 | 7.30 | 80.30 | |
| 9 | 918 | East Slope | 11.00 | 7.30 | 80.30 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

722.70 **sq m**

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Tuesday, October 18, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 10 | 918 | East Slope | 11.50 | 7.30 | 83.95 | |
| 11 | 5333 | East Slope | 11.50 | 7.30 | 83.95 | |
| 12 | 5333 | Sump | 9.00 | 7.30 | 65.70 | |
| 13 | 5333 | Sump | 1.50 | 7.30 | 10.95 | |
| 14 | 5333 | Sump | 8.00 | 7.30 | 58.40 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

302.95 **sq m**

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Wednesday, October 19, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 15 | 1078 | East Floor | 70.00 | 7.30 | 511.00 | |
| 16 | 5333 | East Floor | 70.00 | 7.30 | 511.00 | |
| 17 | 5333 | North Slope | 23.00 | 7.30 | 167.90 | |
| 18 | 5333 | North Slope | 23.00 | 7.30 | 167.90 | |
| 19 | 5321 | North Slope | 23.00 | 7.30 | 167.90 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

1525.70 **sq m**

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Saturday, October 22, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 20 | 5390 | Floor | 40.00 | 7.30 | 292.00 | |
| 21 | 5321 | Floor | 40.00 | 7.30 | 292.00 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

584.00 **sq m**

C.J. Cassidy
Consulting Inc.

# *PANEL PLACEMENT LOG*

**DATE** Tuesday, October 25, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 22 | 5321 | North Slope | 23.00 | 7.30 | 167.90 | |
| | | | | | | |
| | | | | | | |
| | | | | |

C.J. Cassidy
Consulting Inc.

# *PANEL PLACEMENT LOG*

**DATE** Wednesday, October 26, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 23 | 5329 | S.Slope/Floor | 30.00 | 7.30 | 219.00 | |
| 24 | 5329 | S.Slope/Floor | 30.00 | 7.30 | 219.00 | |
| 25 | 5329 | S.Slope/Floor | 30.00 | 7.30 | 219.00 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

657.00 **sq m**

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Friday, October 28, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 26 | 5329 | S.Slope/Floor | 30.00 | 7.30 | 219.00 | |
| 27 | 5329 | S.Slope/Floor | 23.50 | 7.30 | 171.55 | |
| 28 | 5321 | S.Slope/Floor | 7.00 | 7.30 | 51.10 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

441.65 **sq m**

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Tuesday, November 01, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 29 | 5335 | North Slope | 22.00 | 7.30 | 160.60 | |
| 30 | 5335 | North Slope | 21.00 | 7.30 | 153.30 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | 313.90 | **sq m** |

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Thursday, November 03, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 31 | 5335 | North Slope | 19.00 | 7.30 | 138.70 | |
| 32 | 5335 | North Slope | 19.00 | 7.30 | 138.70 | |
| 33 | 5335 | North Slope | 19.00 | 7.30 | 138.70 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

416.10 **sq m**

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Tuesday, November 08, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 34 | 5335 | North Floor | 7.00 | 7.30 | 51.10 | |
| | | | | | | |
| | | | | | | |
| | | | | |

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Wednesday, November 09, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 35 | 5317 | North Floor | 14.50 | 7.30 | 105.85 | |
| 36 | 5317 | W.Slope/Floor | 40.00 | 7.30 | 292.00 | |
| 37 | 5317 | W.Slope/Floor | 40.00 | 7.30 | 292.00 | |
| 38 | 5317 | W.Slope/Floor | 40.00 | 7.30 | 292.00 | |
| 39 | 5324 | N.W.Corner | 18.00 | 7.30 | 131.40 | |
| 40 | 5324 | N.W.Corner | 9.00 | 7.30 | 65.70 | |
| 41 | 5324 | N.W.Corner | 8.00 | 7.30 | 58.40 | |
| 42 | 5324 | N.W.Corner | 15.00 | 7.30 | 109.50 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

1346.85 **sq m**

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Saturday, November 12, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 43 | 5331 | S.W.Slope/Floor | 33.00 | 7.30 | 240.90 | |
| 44 | 5331 | S.W.Slope/Floor | 15.00 | 7.30 | 109.50 | |
| 45 | 5331 | W.Slope/Floor | 47.00 | 7.30 | 343.10 | |
| | | | | | | |
| | | | | | | |
| | | | | |

C.J. Cassidy
Consulting Inc.

# *PANEL PLACEMENT LOG*

**DATE** Monday, November 14, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 46 | 5319 | W.Slope/Floor | 47.00 | 7.30 | 343.10 | |
| 47 | 5331 | W.Slope/Floor | 47.00 | 7.30 | 343.10 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

686.20 **sq m**

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Tuesday, November 15, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 48 | 5324 | W.Slope/Floor | 47.00 | 7.30 | 343.10 | |
| 49 | 5324 | W.Slope/Floor | 47.00 | 7.30 | 343.10 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

686.20 **sq m**

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Wednesday, November 16, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 50 | 5318 | W.Slope/Floor | 47.00 | 7.30 | 343.10 | |
| 51 | 5318 | W.Slope/Floor | 47.00 | 7.30 | 343.10 | |
| 52 | 5318 | W.Slope/Floor | 47.00 | 7.30 | 343.10 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

1029.30 **sq m**

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Thursday, November 17, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 53 | 5326 | W.Slope/Floor | 47.00 | 7.30 | 343.10 | |
| 54 | 5326 | W.Slope/Floor | 47.00 | 7.30 | 343.10 | |
| 55 | 5327 | W.Slope/Floor | 47.00 | 3.50 | 164.50 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

850.70 **sq m**

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Friday, October 14, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 1/2 | 11.0 | 10:25 | CJC | 1 | 10:40 | 10:45 | 40 | 40 | FTB | FTB | N/A | CC | |
| 2/3 | 11.0 | 10:33 | CJC | 1 | 10:44 | 10:49 | 40 | 40 | FTB | FTB | N/A | CC | |
| 3/4 | 11.0 | 10:39 | CJC | 1 | 11:00 | 11:05 | 40 | 40 | FTB | FTB | N/A | CC | |
| 4/5 | 11.0 | 11:05 | CJC | 1 | 11:20 | 11:25 | 40 | 40 | FTB | FTB | N/A | CC | |
| 5/6 | 11.0 | 11:10 | CJC | 1 | 11:25 | 11:30 | 40 | 40 | FTB | FTB | N/A | CC | |
| 6/7 | 11.0 | 11:18 | CJC | 1 | 11:35 | 11:40 | 40 | 40 | FTB | FTB | N/A | CC | |
| 7/8 | 11.0 | 12:00 | CJC | 1 | 12:15 | 12:20 | 40 | 40 | FTB | FTB | N/A | CC | |
| 8/9 | 11.0 | 12:12 | CJC | 1 | 12:25 | 12:30 | 40 | 40 | FTB | FTB | N/A | CC | |
| TieIn/A | 36.5 | 12:45 | CJC | 1 | 2:20 | 2:25 | 40 | 39 | FTB | FTB | N/A | CC | Panels 5 to 9, Tie In to existing cell. |
| TieIn/B | 29.0 | 12:45 | CJC | 1 | 2:10 | 2:15 | 41 | 39 | FTB | FTB | N/A | CC | Panels 1 to 4, Tie In to existing cell. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Tuesday, October 18, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 1/10 | 11.0 | 9:25 | JC | 1 | 9:50 | 9:55 | 40 | 40 | FTB | FTB | N/A | CC | |
| 10/11 | 11.5 | 10:15 | JC | 1 | 11:16 | 11:21 | 40 | 39 | FTB | FTB | N/A | CC | |
| 10/11/12 | 9.0 | 10:36 | JC | 1 | 10:55 | 11:00 | 40 | 39 | FTB | FTB | N/A | CC | |
| 13/14 | 7.3 | 10:42 | JC | 1 | 10:50 | 10:55 | 40 | 40 | FTB | FTB | N/A | CC | |
| 12/13/14 | 9.0 | 10:51 | JC | 1 | 11:05 | 11:10 | 40 | 40 | FTB | FTB | N/A | CC | |
| TieIn/C | 14.5 | 11:55 | JC | 1 | 12:55 | 1:00 | 40 | 38 | FTB | FTB | N/A | CC | Panels 10 & 11, Tie In to existing cell. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING SEAM LOG

**DATE** Wednesday, October 19, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 15/16 | 70.0 | 10:50 | JC | 1 | 11:35 | 11:40 | 40 | 40 | FTB | FTB | N/A | CC | Floor Panels. |
| 17/18 | 23.0 | 1:36 | JC | 1 | 1:36 | 1:41 | 40 | 40 | FTB | FTB | N/A | CC | North Slope. |
| 18/19 | 23.0 | 1:51 | JC | 1 | 2:01 | 2:06 | 40 | 39 | FTB | FTB | N/A | CC | North Slope. |
| E.Butt | 72.0 | 11:20 | JC | 1 | 12:10 | 12:15 | 40 | 38 | FTB | FTB | N/A | CC | Panels 1 - 10 to Panel 15. |
| SumpButt | 14.5 | 2:22 | JC | 1 | 2:43 | 2:48 | 40 | 40 | FTB | FTB | N/A | CC | Panels 12 & 13 to 15 & 16. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING SEAM LOG

**DATE** Saturday, October 22, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 20/21 | 7.3 | 9:25 | RC | 1 | 11:20 | 11:25 | 40 | 40 | FTB | FTB | N/A | CC | Cross Seam. |
| 20/21/13/14/16 | 79.0 | 10:50 | RC | 1 | 12:03 | 12:08 | 40 | 40 | FTB | FTB | N/A | CC | Floor Panels. |
| N.Butt/A | 21.0 | 11:35 | RC | 1 | 12:24 | 12:29 | 40 | 40 | FTB | FTB | N/A | CC | Panels 17 - 19. |
| TieIn/D | 23.0 | 2:40 | RC | 1 | 3:00 | 3:05 | 40 | 38 | FTB | FTB | N/A | CC | Panel 17, Tie In to existing cell. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Tuesday, October 25, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 19/22 | 23.0 | 8:30 | JC | 1 | 9:02 | 9:07 | 40 | 38 | FTB | FTB | N/A | CC | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Wednesday, October 26, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 23/24 | 30.0 | 12:37 | JC | 1 | 2:00 | 2:05 | 40 | 38 | FTB | FTB | N/A | CC | |
| 24/25 | 30.0 | 1:02 | JC | 1 | 2:10 | 2:15 | 40 | 40 | FTB | FTB | N/A | CC | |
| S.Butt/A | 20.0 | 1:25 | JC | 1 | 2:14 | 2:19 | 40 | 40 | FTB | FTB | N/A | CC | Panels 22 & 23 to Panel 9. |
| TieIn/E | 30.0 | 1:40 | JC | 1 | 2:20 | 2:25 | 40 | 40 | FTB | FTB | N/A | CC | Panel 23, Tie In to existing cell. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING SEAM LOG

**DATE** Friday, October 28, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 25/26 | 30.0 | 8:45 | JC | 1 | 9:38 | 9:43 | 40 | 38 | FTB | FTB | N/A | CC | |
| 27/28 | 7.3 | 9:05 | JC | 1 | 9:46 | 9:51 | 40 | 40 | FTB | FTB | N/A | CC | Cross Seam. |
| 26/27/28 | 30.0 | 9:12 | JC | 1 | 9:48 | 9:53 | 40 | 40 | FTB | FTB | N/A | CC | |
| S.Butt/B | 21.5 | 9:26 | JC | 1 | 10:09 | 10:15 | 40 | 40 | FTB | FTB | N/A | CC | Panels 25,26,28 to Panels 15,16,21. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Tuesday, November 01, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 22/29 | 22.0 | 8:19 | JC | 1 | 8:45 | 8:50 | 40 | 40 | FTB | FTB | N/A | CC | |
| 20/30 | 21.0 | 9:00 | JC | 1 | 9:05 | 9:10 | 40 | 38 | FTB | FTB | N/A | CC | |
| N.Butt/B | 11.0 | 9:25 | JC | 1 | 9:50 | 9:55 | 40 | 40 | FTB | FTB | N/A | CC | Panels 22 & 29. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Thursday, November 03, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 30/31 | 19.0 | 9:34 | JC | 1 | 10:05 | 10:10 | 40 | 40 | FTB | FTB | N/A | CC | |
| 31/32 | 19.0 | 10:03 | JC | 1 | 10:15 | 10:20 | 40 | 40 | FTB | FTB | N/A | CC | |
| 32/33 | 19.0 | 10:15 | JC | 1 | 10:34 | 10:40 | 40 | 40 | FTB | FTB | N/A | CC | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Tuesday, November 08, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 34/20 | 7.0 | 9:29 | JC | 1 | 10:05 | 10:10 | 40 | 40 | FTB | FTB | N/A | CC | |
| N.Butt/C | 7.3 | 9:45 | JC | 1 | 10:21 | 10:26 | 40 | 40 | FTB | FTB | N/A | CC | Panels 29 & 30 to Panel 34. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Wednesday, November 09, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 34/35 | 7.3 | 1:11 | JC | 1 | 1:17 | 1:23 | 40 | 40 | FTB | FTB | N/A | CC | |
| 36/37 | 40.0 | 1:15 | JC | 1 | 1:29 | 1:34 | 40 | 39 | FTB | FTB | N/A | CC | |
| 37/38 | 40.0 | 12:10 | JC | 1 | 12:22 | 12:27 | 40 | 39 | FTB | FTB | N/A | CC | |
| 33/39 | 18.0 | 2:26 | JC | 1 | 2:38 | 2:43 | 40 | 40 | FTB | FTB | N/A | CC | |
| 39/40 | 9.0 | 2:11 | JC | 1 | 2:40 | 2:45 | 40 | 40 | FTB | FTB | N/A | CC | |
| 41/42 | 8.0 | 2:59 | JC | 1 | 3:25 | 3:30 | 40 | 40 | FTB | FTB | N/A | CC | |
| 34/36 | 7.0 | 12:57 | JC | 1 | 1:21 | 1:26 | 40 | 40 | FTB | FTB | N/A | CC | |
| 35/37/38 | 14.0 | 12:43 | JC | 1 | 1:10 | 1:15 | 40 | 40 | FTB | FTB | N/A | CC | |
| 35/20 | 21.0 | 1:35 | JC | 1 | 1:51 | 1:56 | 40 | 38 | FTB | FTB | N/A | CC | |
| N.W.Butt | 21.0 | 3:22 | JC | 1 | 3:55 | 4:00 | 40 | 40 | FTB | FTB | N/A | CC | Panels 39 - 41. |
| N.Butt/D | 25.0 | 3:39 | JC | 1 | 4:11 | 4:16 | 40 | 39 | FTB | FTB | N/A | CC | Panels 30 - 33. |
| N.Butt/E | 15.0 | 3:39 | JC | 1 | 4:15 | 4:20 | 40 | 40 | FTB | FTB | N/A | CC | Panels 36/42. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Saturday, November 12, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 43/44 | 7.3 | 11:20 | JC | 1 | 12:06 | 12:11 | 40 | 40 | FTB | FTB | N/A | CC | Cross Seam. |
| 43/44/45 | 47.0 | 11:40 | JC | 1 | 12:13 | 12:18 | 40 | 40 | FTB | FTB | N/A | CC | |
| FloorButt/A | 14.5 | 12:05 | JC | 1 | 12:40 | 12:45 | 40 | 40 | FTB | FTB | N/A | CC | Panels 43, 45 to Panel 27. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Monday, November 14, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 45/46 | 47.0 | 9:37 | JC | 1 | 11:01 | 11:06 | 40 | 40 | FTB | FTB | N/A | CC | |
| 46/47 | 47.0 | 10:10 | JC | 1 | 11:12 | 11:17 | 40 | 40 | FTB | FTB | N/A | CC | |
| FloorButt/B | 14.5 | 10:40 | JC | 1 | 11:20 | 11:25 | 40 | 40 | FTB | FTB | N/A | CC | Panels 45, 46, 47 to Panels 27 & 28. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Tuesday, November 15, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 47/48 | 47.0 | 10:36 | JC | 1 | 11:17 | 11:22 | 40 | 40 | FTB | FTB | N/A | CC | |
| 48/49/A | 36.5 | 10:15 | JC | 1 | 11:25 | 11:30 | 40 | 40 | FTB | FTB | N/A | CC | |
| 48/49/B | 10.5 | 10:15 | JC | 1 | 11:37 | 11:42 | 40 | 40 | FTB | FTB | N/A | CC | |
| FloorButt/C | 14.5 | 11:11 | JC | 1 | 11:56 | 12:01 | 40 | 40 | FTB | FTB | N/A | CC | Panels 48, 49 to Panel 21. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Wednesday, November 16, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 38/50 | 47.0 | 10:45 | JC | 1 | 12:15 | 12:20 | 40 | 40 | FTB | FTB | N/A | CC | |
| 50/51 | 47.0 | 10:11 | JC | 1 | 12:13 | 12:18 | 40 | 40 | FTB | FTB | N/A | CC | |
| 51/52 | 47.0 | 11:07 | JC | 1 | 12:28 | 12:33 | 40 | 40 | FTB | FTB | N/A | CC | |
| FloorButt/E | 22.5 | 11:40 | JC | 1 | 12:40 | 12:45 | 40 | 40 | FTB | FTB | N/A | CC | Panels 50 - 52 to Panels 20 & 21. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Thursday, November 17, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 52/53 | 47.0 | 1:44 | JC | 1 | 2:53 | 2:58 | 40 | 40 | FTB | FTB | N/A | CC | |
| 53/54 | 47.0 | 9:44 | JC | 1 | 12:10 | 12:15 | 40 | 40 | FTB | FTB | N/A | CC | |
| 54/55 | 47.0 | 10:25 | JC | 1 | 12:30 | 12:35 | 40 | 40 | FTB | FTB | N/A | CC | |
| 55/49 | 47.0 | 11:06 | JC | 1 | 12:35 | 12:40 | 40 | 40 | FTB | FTB | N/A | CC | |
| FloorButt/D | 18.0 | 2:15 | JC | 1 | 3:05 | 3:10 | 40 | 40 | FTB | FTB | N/A | CC | Panels 53 - 55 to Panel 21. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Friday, October 14, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 1 | Patch | 4/5 | Oct 14 | MC | X1 | CG | Pass | At Intersection of TieIn/A & TieIn/B, Tie In to Existing Liner. |
| 2 | Patch | P7 | Oct 14 | MC | X1 | CG | Pass | |
| 3 | Patch | P7 | Oct 14 | MC | X1 | CG | Pass | |
| 4 | Patch | 8/9 | Oct 14 | MC | X1 | CG | Pass | Destruct #1. |
| Zone 1 | Beads | TieIn/A | Oct 14 | MC | X1 | CG | Pass | All "T" Intersections along Tie In A. |
| Zone 2 | Beads | TieIn/B | Oct 14 | MC | X1 | CG | Pass | All "T" Intersections along Tie In B. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Tuesday, October 18, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 5 | Patch | 12/14 | Oct 18 | RC | X1 | CG | Pass | |
| 6 | Patch | 10/11 | Oct 18 | RC | X1 | CG | Pass | |
| Zone 3 | Beads | TieIn/C | Oct 18 | RC | X1 | CG | Pass | All "T" Intersections along Tie In C. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Wednesday, October 19, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 7 | Patch | 15/16 | Oct 19 | RC | X1 | CG | Pass | Destruct #2. |
| 8 | Patch | P1/TieIn | Oct 19 | RC | X1 | CG | Pass | At Intersection of TieIn/B & TieIn/C, Tie In to Existing Liner. |
| Zone 4 | Beads | Sump | Oct 19 | RC | X1 | CG | Pass | All "T" Intersections in Sump Area. |
| Zone 5 | Beads | East Butt | Oct 19 | RC | X1 | CG | Pass | All "T" Intersections along East Butt Seam. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Saturday, October 22, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 9 | Patch | 16/21 | Oct 22 | RC | X1 | CG | Pass | Destruct #3. |
| 10 | Patch | P11/TieIn/C | Oct 22 | RC | X1 | CG | Pass | At Intersection of TieIn/C & TieIn/D, Tie In to Existing Liner. |
| 11 | Patch | P17/TieIn/D | Oct 22 | RC | X1 | CG | Pass | At Intersection of TieIn/D at North Slope of Existing Liner. |
| Zone 6 | Beads | N.Butt/A | Oct 22 | RC | X1 | CG | Pass | All "T" Intersections along North Butt/A. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Wednesday, October 26, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 12 | Bead | S.Butt/A | Oct 26 | MC | X1 | CG | Pass | "T" Intersection along South Butt/A. |
| 13 | Patch/Bead | 24/25 | Oct 26 | MC | X1 | CG | Pass | South Slope, fish mouth repair. |
| 14 | Patch | 9/23 | Oct 26 | MC | X1 | CG | Pass | At Intersection of TieIn/A & TieIn/E, Tie In to Existing Liner. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Friday, October 28, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 15 | Patch | 9/24 | Oct 28 | RC | X1 | CG | Pass | At Intersection of South Butt/A and South Butt/B. |
| Zone 7 | Beads | S.Butt/B | Oct 28 | RC | X1 | CG | Pass | All "T" Intersections along South Butt/B and Seam 27/28. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Tuesday, November 01, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 16 | Patch | N.Butt | Nov 1 | RC | X1 | CG | Pass | At Intersection of N.Butt/A and N.Butt/B. |
| Zone 8 | Beads | N.Butt/B | Nov 1 | RC | X1 | CG | Pass | All "T" Intersections along North Butt/B. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Tuesday, November 08, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 17 | Patch | 20/34 | Nov 8 | MC | X1 | RC | PASS | |
| 18 | Patch | N.Butt | Nov 8 | MC | X1 | RC | PASS | At Intersection of N.Butt/B and N.Butt/C. |
| 19 | Bead | N.Butt | Nov 8 | MC | X1 | RC | PASS | "T" Intersection along N.Butt/C. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Wednesday, November 09, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 20 | Patch | N.Butt | Nov 9 | RC | X1 | MC | PASS | At Intersection of N.Butt/C and N.Butt/D. |
| 21 | Patch | N.Butt | Nov 9 | RC | X1 | MC | PASS | At Panel 20/29. |
| 22 | Patch | 37/38 | Nov 9 | RC | X1 | MC | PASS | Destruct #4. |
| Zone 9 | Beads | N.W.Butt | Nov 9 | RC | X1 | MC | PASS | All "T" Intersections along N.W.Butt. |
| Zone 10 | Beads | N.Butt/D | Nov 9 | RC | X1 | MC | PASS | All "T" Intersections along N.Butt/D and 35/36/37. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Thursday, November 10, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 23 | Patch | N.Butt | Nov 10 | RC | X1 | MC | PASS | At Intersection of N.W.Butt. |
| 24 | Patch | 33/39 | Nov 10 | RC | X1 | MC | PASS | At Anchor Trench. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Saturday, November 12, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 25 | Bead | 43/44/45 | Nov 12 | RC | X1 | CC | PASS | "T" Intersection on Seam 43/44/45. |
| 26 | Bead | F.Butt/A | Nov 12 | RC | X1 | CC | PASS | "T" Intersection on Floor Butt/A. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Monday, November 14, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 27 | Patch | 45/46 | Nov 14 | RC | X1 | CC | PASS | Destruct #5. |
| 28 | Patch | Floor Butt | Nov 14 | RC | X1 | CC | PASS | At Intersection of Floor Butt/A and Floor Butt/B. |
| Zone 11 | Beads | F.Butt/B | Nov 14 | RC | X1 | CC | PASS | All "T" Intersections along Floor Butt/B. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Tuesday, November 15, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 29 | Patch/Bead | 48/49 | Nov 15 | RC | X1 | CC | PASS | Fishmouth at Toe of Slope. |
| 30 | Patch | Floor Butt | Nov 15 | RC | X1 | CC | PASS | At Intersection of Floor Butt/B and Floor Butt/C. |
| 31 | Patch | 47/48 | Nov 15 | RC | X1 | CC | PASS | Near Floor Butt Seam. |
| 32 | Bead | Floor Butt | Nov 15 | RC | X1 | CC | PASS | "T" Intersection on Floor Butt/C. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Wednesday, November 16, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 33 | Patch | Floor Butt | Nov 16 | RC | X1 | MC | PASS | At North End of Floor Butt/E. |
| Zone 12 | Beads | F.Butt/E | Nov 16 | RC | X1 | MC | PASS | All "T" Intersections along Floor Butt/E. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Thursday, November 17, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 34 | Patch | 53/54 | Nov 17 | MC | X1 | RC | PASS | Destruct #6. |
| 35 | Patch | Floor Butt | Nov 17 | MC | X1 | RC | PASS | At Intersection of Floor Butt/C and Floor Butt/D. |
| 36 | Patch | Floor Butt | Nov 17 | MC | X1 | RC | PASS | At Intersection of Floor Butt/D and Floor Butt/E. |
| Zone 13 | Beads | F.Butt/D | Nov 17 | MC | X1 | RC | PASS | All "T" Intersections along Floor Butt/D. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

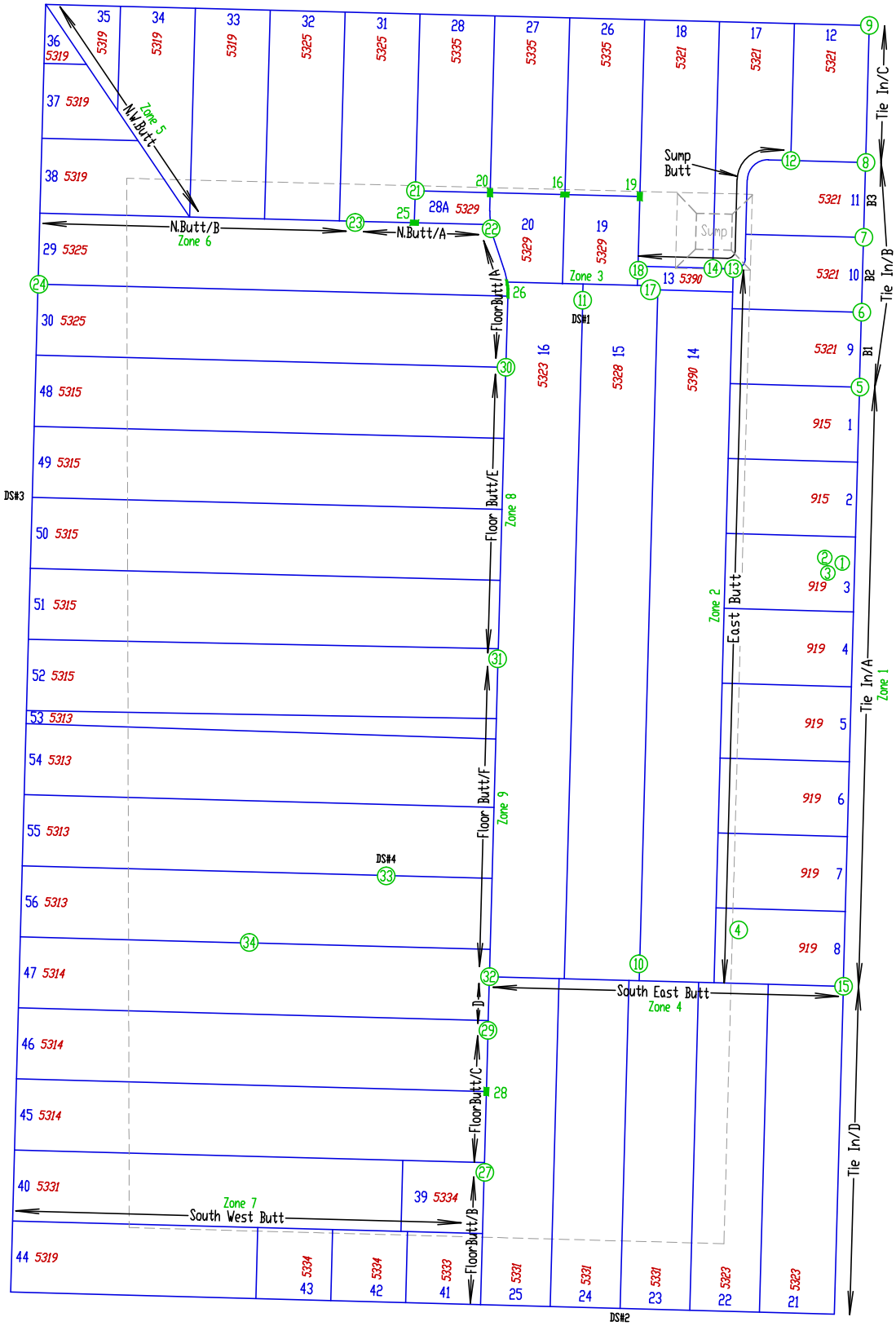
# DESTRUCTIVE TESTING REPORT

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **SECONDARY LINER**

| WELD DATE | D.S. # | SEAM # | TECH INITIAL | WELDER NUMBER | PEEL 1 | | SHEAR | PEEL 2 | | SHEAR | PEEL 3 | | SHEAR | PEEL 4 | | SHEAR | PEEL 5 | | SHEAR | QC INITIAL | COMMENTS / LOCATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | IN | OUT | | IN | OUT | | IN | OUT | | IN | OUT | | IN | OUT | | | |
| 10-14-22 | 1 | 8/9 | JC | 1 | 116 | 123 | 182 | 124 | 124 | 180 | 124 | 110 | 183 | 120 | 112 | 184 | 134 | 133 | 180 | CC | Near Toe. |
| 10-19-22 | 2 | 15/16 | JC | 1 | 145 | 123 | 198 | 139 | 134 | 200 | 121 | 129 | 195 | 133 | 128 | 197 | 121 | 140 | 190 | CC | 3m from the North End. |
| 10-22-22 | 3 | 16/21 | JC | 1 | 149 | 144 | 195 | 124 | 129 | 198 | 103 | 110 | 199 | 124 | 114 | 201 | 132 | 118 | 204 | CC | 7m from the South End. |
| 11-09-22 | 4 | 37/38 | JC | 1 | 147 | 165 | 202 | 144 | 144 | 199 | 156 | 162 | 206 | 160 | 123 | 208 | 121 | 167 | 210 | CC | Run out at Anchor Trench. |
| 11-14-22 | 5 | 45/46 | JC | 1 | 135 | 136 | 207 | 131 | 110 | 208 | 145 | 135 | 200 | 107 | 139 | 207 | 124 | 111 | 200 | CC | On Floor. |
| 11-17-22 | 6 | 53/54 | JC | 2 | 118 | 129 | 204 | 133 | 139 | 211 | 126 | 138 | 195 | 124 | 118 | 191 | 127 | 122 | 203 | CC | On Floor. |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |

# NORTHWIN LANDFILL WEST CELL

## PRIMARY LINER




Blue = Liner  Red = Roll Numbers  Green = Extrusion Welds

| | | |
|---|---|---|
| DATE: December 19, 2022 | C.J. Cassidy Consulting Inc. | NORTHWIN LANDFILL - 2022 |
| SCALE: NTS | | CAMPBELL RIVER, B.C. |
| FILE NAME: WestCellRep-2022 | | West Cell Primary Liner Representative Drawing |
| DRAWN BY: SSC | | |
| CHECKED BY: CJC | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Saturday, October 15, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 11:42 | 1 | JC | | | 860 | | 600 | 1 | 123 | 1 | 142 | 1 | 178 | CC | |
| 11:42 | 1 | JC | | | 860 | | 600 | 2 | 121 | 2 | 152 | 2 | 181 | CC | |
| 11:42 | 1 | JC | | | 860 | | 600 | 3 | 117 | 3 | 150 | 3 | 176 | CC | |
| 11:42 | 1 | JC | | | 860 | | 600 | 4 | 132 | 4 | 141 | 4 | 182 | CC | |
| 11:42 | 1 | JC | | | 860 | | 600 | 5 | 146 | 5 | 124 | 5 | 179 | CC | |
| 9:45 | X1 | RC | 500 | 500 | | | | 1 | 118 | 1 | | 1 | 190 | CC | |
| 9:45 | X1 | RC | 500 | 500 | | | | 2 | 124 | 2 | | 2 | 195 | CC | |
| 9:45 | X1 | RC | 500 | 500 | | | | 3 | 135 | 3 | | 3 | 183 | CC | |
| 9:45 | X1 | RC | 500 | 500 | | | | 4 | 115 | 4 | | 4 | 180 | CC | |
| 9:45 | X1 | RC | 500 | 500 | | | | 5 | 119 | 5 | | 5 | 186 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Monday, October 17, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 7:46 | 1 | JC | | | 860 | | 250 | 1 | 145 | 1 | 156 | 1 | 197 | CC | |
| 7:46 | 1 | JC | | | 860 | | 250 | 2 | 151 | 2 | 171 | 2 | 197 | CC | |
| 7:46 | 1 | JC | | | 860 | | 250 | 3 | 143 | 3 | 138 | 3 | 197 | CC | |
| 7:46 | 1 | JC | | | 860 | | 250 | 4 | 151 | 4 | 135 | 4 | 192 | CC | |
| 7:46 | 1 | JC | | | 860 | | 250 | 5 | 157 | 5 | 139 | 5 | 196 | CC | |
| 9:55 | X1 | RC | 500 | 500 | | | | 1 | 91 | 1 | | 1 | 187 | CC | |
| 9:55 | X1 | RC | 500 | 500 | | | | 2 | 92 | 2 | | 2 | 186 | CC | |
| 9:55 | X1 | RC | 500 | 500 | | | | 3 | 106 | 3 | | 3 | 188 | CC | |
| 9:55 | X1 | RC | 500 | 500 | | | | 4 | 97 | 4 | | 4 | 189 | CC | |
| 9:55 | X1 | RC | 500 | 500 | | | | 5 | 102 | 5 | | 5 | 189 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Friday, October 21, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 10:20 | 1 | JC | | | 860 | | 250 | 1 | 121 | 1 | 143 | 1 | 204 | CC | |
| 10:20 | 1 | JC | | | 860 | | 250 | 2 | 112 | 2 | 140 | 2 | 206 | CC | |
| 10:20 | 1 | JC | | | 860 | | 250 | 3 | 120 | 3 | 120 | 3 | 204 | CC | |
| 10:20 | 1 | JC | | | 860 | | 250 | 4 | 119 | 4 | 119 | 4 | 204 | CC | |
| 10:20 | 1 | JC | | | 860 | | 250 | 5 | 125 | 5 | 125 | 5 | 204 | CC | |
| 11:50 | X1 | RC | 500 | 500 | | | | 1 | 111 | 1 | | 1 | 199 | CC | |
| 11:50 | X1 | RC | 500 | 500 | | | | 2 | 112 | 2 | | 2 | 200 | CC | |
| 11:50 | X1 | RC | 500 | 500 | | | | 3 | 122 | 3 | | 3 | 202 | CC | |
| 11:50 | X1 | RC | 500 | 500 | | | | 4 | 123 | 4 | | 4 | 198 | CC | |
| 11:50 | X1 | RC | 500 | 500 | | | | 5 | 140 | 5 | | 5 | 202 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Monday, October 24, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 11:46 | 1 | JC | | | 860 | | 300 | 1 | 138 | 1 | 125 | 1 | 199 | CC | |
| 11:46 | 1 | JC | | | 860 | | 300 | 2 | 130 | 2 | 133 | 2 | 199 | CC | |
| 11:46 | 1 | JC | | | 860 | | 300 | 3 | 125 | 3 | 128 | 3 | 203 | CC | |
| 11:46 | 1 | JC | | | 860 | | 300 | 4 | 129 | 4 | 122 | 4 | 201 | CC | |
| 11:46 | 1 | JC | | | 860 | | 300 | 5 | 119 | 5 | 130 | 5 | 203 | CC | |
| 12:15 | X1 | MC | 500 | 500 | | | | 1 | 120 | 1 | | 1 | 187 | CC | |
| 12:15 | X1 | MC | 500 | 500 | | | | 2 | 119 | 2 | | 2 | 188 | CC | |
| 12:15 | X1 | MC | 500 | 500 | | | | 3 | 105 | 3 | | 3 | 188 | CC | |
| 12:15 | X1 | MC | 500 | 500 | | | | 4 | 111 | 4 | | 4 | 189 | CC | |
| 12:15 | X1 | MC | 500 | 500 | | | | 5 | 118 | 5 | | 5 | 181 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Tuesday, October 25, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 8:10 | 1 | JC | | | 860 | | 300 | 1 | 125 | 1 | 128 | 1 | 210 | CC | |
| 8:10 | 1 | JC | | | 860 | | 300 | 2 | 126 | 2 | 146 | 2 | 210 | CC | |
| 8:10 | 1 | JC | | | 860 | | 300 | 3 | 141 | 3 | 135 | 3 | 209 | CC | |
| 8:10 | 1 | JC | | | 860 | | 300 | 4 | 142 | 4 | 143 | 4 | 212 | CC | |
| 8:10 | 1 | JC | | | 860 | | 300 | 5 | 128 | 5 | 135 | 5 | 212 | CC | |
| 12:00 | X1 | MC | 500 | 500 | | | | 1 | 109 | 1 | | 1 | 196 | CC | |
| 12:00 | X1 | MC | 500 | 500 | | | | 2 | 112 | 2 | | 2 | 196 | CC | |
| 12:00 | X1 | MC | 500 | 500 | | | | 3 | 100 | 3 | | 3 | 203 | CC | |
| 12:00 | X1 | MC | 500 | 500 | | | | 4 | 109 | 4 | | 4 | 200 | CC | |
| 12:00 | X1 | MC | 500 | 500 | | | | 5 | 95 | 5 | | 5 | 201 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Wednesday, October 26, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 8:39 | 1 | JC | | | 860 | | 300 | 1 | 162 | 1 | 166 | 1 | 206 | CC | |
| 8:39 | 1 | JC | | | 860 | | 300 | 2 | 175 | 2 | 154 | 2 | 218 | CC | |
| 8:39 | 1 | JC | | | 860 | | 300 | 3 | 155 | 3 | 155 | 3 | 205 | CC | |
| 8:39 | 1 | JC | | | 860 | | 300 | 4 | 158 | 4 | 158 | 4 | 204 | CC | |
| 8:39 | 1 | JC | | | 860 | | 300 | 5 | 161 | 5 | 155 | 5 | 211 | CC | |
| 8:09 | X1 | MC | 500 | 500 | | | | 1 | 119 | 1 | | 1 | 212 | CC | |
| 8:09 | X1 | MC | 500 | 500 | | | | 2 | 88 | 2 | | 2 | 207 | CC | |
| 8:09 | X1 | MC | 500 | 500 | | | | 3 | 119 | 3 | | 3 | 210 | CC | |
| 8:09 | X1 | MC | 500 | 500 | | | | 4 | 131 | 4 | | 4 | 213 | CC | |
| 8:09 | X1 | MC | 500 | 500 | | | | 5 | 119 | 5 | | 5 | 206 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Friday, October 28, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 8:14 | 1 | JC | | | 860 | | 300 | 1 | 162 | 1 | 166 | 1 | 206 | CC | |
| 8:14 | 1 | JC | | | 860 | | 300 | 2 | 132 | 2 | 133 | 2 | 201 | CC | |
| 8:14 | 1 | JC | | | 860 | | 300 | 3 | 155 | 3 | 155 | 3 | 205 | CC | |
| 8:14 | 1 | JC | | | 860 | | 300 | 4 | 141 | 4 | 149 | 4 | 204 | CC | |
| 8:14 | 1 | JC | | | 860 | | 300 | 5 | 161 | 5 | 155 | 5 | 204 | CC | |
| 8:40 | X1 | RC | 500 | 500 | | | | 1 | 119 | 1 | | 1 | 211 | CC | |
| 8:40 | X1 | RC | 500 | 500 | | | | 2 | 98 | 2 | | 2 | 207 | CC | |
| 8:40 | X1 | RC | 500 | 500 | | | | 3 | 120 | 3 | | 3 | 210 | CC | |
| 8:40 | X1 | RC | 500 | 500 | | | | 4 | 130 | 4 | | 4 | 213 | CC | |
| 8:40 | X1 | RC | 500 | 500 | | | | 5 | 120 | 5 | | 5 | 211 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Saturday, October 29, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 9:01 | 1 | JC | | | 860 | | 300 | 1 | 162 | 1 | 166 | 1 | 204 | CC | |
| 9:01 | 1 | JC | | | 860 | | 300 | 2 | 165 | 2 | 178 | 2 | 204 | CC | |
| 9:01 | 1 | JC | | | 860 | | 300 | 3 | 155 | 3 | 155 | 3 | 205 | CC | |
| 9:01 | 1 | JC | | | 860 | | 300 | 4 | 139 | 4 | 144 | 4 | 204 | CC | |
| 9:01 | 1 | JC | | | 860 | | 300 | 5 | 166 | 5 | 150 | 5 | 204 | CC | |
| 10:30 | X1 | RC | 500 | 500 | | | | 1 | 121 | 1 | | 1 | 201 | CC | |
| 10:30 | X1 | RC | 500 | 500 | | | | 2 | 100 | 2 | | 2 | 201 | CC | |
| 10:30 | X1 | RC | 500 | 500 | | | | 3 | 100 | 3 | | 3 | 203 | CC | |
| 10:30 | X1 | RC | 500 | 500 | | | | 4 | 125 | 4 | | 4 | 200 | CC | |
| 10:30 | X1 | RC | 500 | 500 | | | | 5 | 119 | 5 | | 5 | 198 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Monday, October 31, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 8:55 | 1 | JC | | | 860 | | 300 | 1 | 131 | 1 | 234 | 1 | 201 | CC | |
| 8:55 | 1 | JC | | | 860 | | 300 | 2 | 116 | 2 | 162 | 2 | 203 | CC | |
| 8:55 | 1 | JC | | | 860 | | 300 | 3 | 134 | 3 | 146 | 3 | 192 | CC | |
| 8:55 | 1 | JC | | | 860 | | 300 | 4 | 134 | 4 | 148 | 4 | 199 | CC | |
| 8:55 | 1 | JC | | | 860 | | 300 | 5 | 144 | 5 | 114 | 5 | 198 | CC | |
| 10:10 | X1 | RC | 500 | 500 | | | | 1 | 121 | 1 | | 1 | 201 | CC | |
| 10:10 | X1 | RC | 500 | 500 | | | | 2 | 127 | 2 | | 2 | 202 | CC | |
| 10:10 | X1 | RC | 500 | 500 | | | | 3 | 124 | 3 | | 3 | 194 | CC | |
| 10:10 | X1 | RC | 500 | 500 | | | | 4 | 116 | 4 | | 4 | 205 | CC | |
| 10:10 | X1 | RC | 500 | 500 | | | | 5 | 123 | 5 | | 5 | 195 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | 5 | | 5 | | 5 | | CC | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Tuesday, November 01, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 12:15 | 1 | JC | | | 860 | | 300 | 1 | 130 | 1 | 133 | 1 | 198 | CC | |
| 12:15 | 1 | JC | | | 860 | | 300 | 2 | 141 | 2 | 140 | 2 | 198 | CC | |
| 12:15 | 1 | JC | | | 860 | | 300 | 3 | 151 | 3 | 145 | 3 | 193 | CC | |
| 12:15 | 1 | JC | | | 860 | | 300 | 4 | 146 | 4 | 148 | 4 | 199 | CC | |
| 12:15 | 1 | JC | | | 860 | | 300 | 5 | 132 | 5 | 137 | 5 | 195 | CC | |
| 11:35 | X1 | RC | 500 | 500 | | | | 1 | 91 | 1 | | 1 | 186 | CC | Warm sample rain coming |
| 11:35 | X1 | RC | 500 | 500 | | | | 2 | 98 | 2 | | 2 | 193 | CC | |
| 11:35 | X1 | RC | 500 | 500 | | | | 3 | 93 | 3 | | 3 | 192 | CC | |
| 11:35 | X1 | RC | 500 | 500 | | | | 4 | 88 | 4 | | 4 | 196 | CC | |
| 11:35 | X1 | RC | 500 | 500 | | | | 5 | 87 | 5 | | 5 | 189 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Wednesday, November 02, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 6:34 | 1 | JC | | | 860 | | 300 | 1 | 129 | 1 | 146 | 1 | 216 | CC | |
| 6:34 | 1 | JC | | | 860 | | 300 | 2 | 153 | 2 | 143 | 2 | 218 | CC | |
| 6:34 | 1 | JC | | | 860 | | 300 | 3 | 145 | 3 | 143 | 3 | 218 | CC | |
| 6:34 | 1 | JC | | | 860 | | 300 | 4 | 143 | 4 | 150 | 4 | 223 | CC | |
| 6:34 | 1 | JC | | | 860 | | 300 | 5 | 156 | 5 | 144 | 5 | 213 | CC | |
| 6:49 | X1 | RC | 500 | 500 | | | | 1 | 115 | 1 | | 1 | 207 | CC | |
| 6:49 | X1 | RC | 500 | 500 | | | | 2 | 113 | 2 | | 2 | 200 | CC | |
| 6:49 | X1 | RC | 500 | 500 | | | | 3 | 133 | 3 | | 3 | 210 | CC | |
| 6:49 | X1 | RC | 500 | 500 | | | | 4 | 99 | 4 | | 4 | 206 | CC | |
| 6:49 | X1 | RC | 500 | 500 | | | | 5 | 98 | 5 | | 5 | 202 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Saturday, November 05, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 1:58 | 1 | JC | | | 860 | | 300 | 1 | 131 | 1 | 124 | 1 | 199 | CC | |
| 1:58 | 1 | JC | | | 860 | | 300 | 2 | 116 | 2 | 143 | 2 | 203 | CC | |
| 1:58 | 1 | JC | | | 860 | | 300 | 3 | 134 | 3 | 146 | 3 | 192 | CC | |
| 1:58 | 1 | JC | | | 860 | | 300 | 4 | 134 | 4 | 148 | 4 | 199 | CC | |
| 1:58 | 1 | JC | | | 860 | | 300 | 5 | 144 | 5 | 129 | 5 | 198 | CC | |
| 2:15 | X1 | RC | 500 | 500 | | | | 1 | 125 | 1 | | 1 | 206 | CC | |
| 2:15 | X1 | RC | 500 | 500 | | | | 2 | 131 | 2 | | 2 | 198 | CC | |
| 2:15 | X1 | RC | 500 | 500 | | | | 3 | 119 | 3 | | 3 | 197 | CC | |
| 2:15 | X1 | RC | 500 | 500 | | | | 4 | 121 | 4 | | 4 | 200 | CC | |
| 2:15 | X1 | RC | 500 | 500 | | | | 5 | 136 | 5 | | 5 | 188 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Thursday, November 10, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 1:27 | 1 | JC | | | 860 | | 300 | 1 | 140 | 1 | 141 | 1 | 189 | CC | |
| 1:27 | 1 | JC | | | 860 | | 300 | 2 | 167 | 2 | 143 | 2 | 193 | CC | |
| 1:27 | 1 | JC | | | 860 | | 300 | 3 | 154 | 3 | 169 | 3 | 200 | CC | |
| 1:27 | 1 | JC | | | 860 | | 300 | 4 | 145 | 4 | 144 | 4 | 199 | CC | |
| 1:27 | 1 | JC | | | 860 | | 300 | 5 | 161 | 5 | 155 | 5 | 197 | CC | |
| 7:23 | X1 | MC | 500 | 500 | | | | 1 | 99 | 1 | | 1 | 189 | CC | |
| 7:23 | X1 | MC | 500 | 500 | | | | 2 | 101 | 2 | | 2 | 199 | CC | |
| 7:23 | X1 | MC | 500 | 500 | | | | 3 | 97 | 3 | | 3 | 196 | CC | |
| 7:23 | X1 | MC | 500 | 500 | | | | 4 | 98 | 4 | | 4 | 196 | CC | |
| 7:23 | X1 | MC | 500 | 500 | | | | 5 | 102 | 5 | | 5 | 197 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Saturday, November 12, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 1:40 | 1 | JC | | | 860 | | 300 | 1 | 142 | 1 | 137 | 1 | 155 | CC | |
| 1:40 | 1 | JC | | | 860 | | 300 | 2 | 132 | 2 | 130 | 2 | 154 | CC | |
| 1:40 | 1 | JC | | | 860 | | 300 | 3 | 152 | 3 | 142 | 3 | 157 | CC | |
| 1:40 | 1 | JC | | | 860 | | 300 | 4 | 133 | 4 | 129 | 4 | 151 | CC | |
| 1:40 | 1 | JC | | | 860 | | 300 | 5 | 143 | 5 | 143 | 5 | 155 | CC | |
| 1:53 | X1 | MC | 500 | 500 | | | | 1 | 114 | 1 | | 1 | 158 | CC | |
| 1:53 | X1 | MC | 500 | 500 | | | | 2 | 120 | 2 | | 2 | 156 | CC | |
| 1:53 | X1 | MC | 500 | 500 | | | | 3 | 112 | 3 | | 3 | 156 | CC | |
| 1:53 | X1 | MC | 500 | 500 | | | | 4 | 114 | 4 | | 4 | 157 | CC | |
| 1:53 | X1 | MC | 500 | 500 | | | | 5 | 115 | 5 | | 5 | 157 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Monday, November 14, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 1:27 | 1 | JC | | | 860 | | 300 | 1 | 131 | 1 | 131 | 1 | 151 | CC | |
| 1:27 | 1 | JC | | | 860 | | 300 | 2 | 130 | 2 | 132 | 2 | 148 | CC | |
| 1:27 | 1 | JC | | | 860 | | 300 | 3 | 132 | 3 | 126 | 3 | 154 | CC | |
| 1:27 | 1 | JC | | | 860 | | 300 | 4 | 131 | 4 | 122 | 4 | 153 | CC | |
| 1:27 | 1 | JC | | | 860 | | 300 | 5 | 127 | 5 | 137 | 5 | 148 | CC | |
| 1:45 | X1 | RC | 500 | 500 | | | | 1 | 116 | 1 | | 1 | 129 | CC | |
| 1:45 | X1 | RC | 500 | 500 | | | | 2 | 125 | 2 | | 2 | 120 | CC | |
| 1:45 | X1 | RC | 500 | 500 | | | | 3 | 121 | 3 | | 3 | 120 | CC | |
| 1:45 | X1 | RC | 500 | 500 | | | | 4 | 123 | 4 | | 4 | 105 | CC | |
| 1:45 | X1 | RC | 500 | 500 | | | | 5 | 129 | 5 | | 5 | 129 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Tuesday, November 15, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 11:20 | 1 | JC | | | 860 | | 300 | 1 | 146 | 1 | 129 | 1 | 183 | CC | |
| 11:20 | 1 | JC | | | 860 | | 300 | 2 | 134 | 2 | 134 | 2 | 156 | CC | |
| 11:20 | 1 | JC | | | 860 | | 300 | 3 | 140 | 3 | 139 | 3 | 161 | CC | |
| 11:20 | 1 | JC | | | 860 | | 300 | 4 | 155 | 4 | 137 | 4 | 165 | CC | |
| 11:20 | 1 | JC | | | 860 | | 300 | 5 | 145 | 5 | 152 | 5 | 159 | CC | |
| 11:38 | X1 | RC | 500 | 500 | | | | 1 | 119 | 1 | | 1 | 167 | CC | |
| 11:38 | X1 | RC | 500 | 500 | | | | 2 | 104 | 2 | | 2 | 199 | CC | |
| 11:38 | X1 | RC | 500 | 500 | | | | 3 | 116 | 3 | | 3 | 160 | CC | |
| 11:38 | X1 | RC | 500 | 500 | | | | 4 | 113 | 4 | | 4 | 174 | CC | |
| 11:38 | X1 | RC | 500 | 500 | | | | 5 | 120 | 5 | | 5 | 155 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Wednesday, November 16, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 9:32 | 1 | JC | | | 860 | | 300 | 1 | 144 | 1 | 137 | 1 | 199 | CC | |
| 9:32 | 1 | JC | | | 860 | | 300 | 2 | 140 | 2 | 142 | 2 | 200 | CC | |
| 9:32 | 1 | JC | | | 860 | | 300 | 3 | 152 | 3 | 150 | 3 | 187 | CC | |
| 9:32 | 1 | JC | | | 860 | | 300 | 4 | 149 | 4 | 150 | 4 | 192 | CC | |
| 9:32 | 1 | JC | | | 860 | | 300 | 5 | 153 | 5 | 148 | 5 | 193 | CC | |
| 10:16 | X1 | RC | 500 | 500 | | | | 1 | 138 | 1 | | 1 | 188 | CC | |
| 10:16 | X1 | RC | 500 | 500 | | | | 2 | 142 | 2 | | 2 | 190 | CC | |
| 10:16 | X1 | RC | 500 | 500 | | | | 3 | 135 | 3 | | 3 | 191 | CC | |
| 10:16 | X1 | RC | 500 | 500 | | | | 4 | 137 | 4 | | 4 | 199 | CC | |
| 10:16 | X1 | RC | 500 | 500 | | | | 5 | 141 | 5 | | 5 | 194 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Thursday, November 17, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 9:49 | 1 | JC | | | 860 | | 300 | 1 | 178 | 1 | 163 | 1 | 202 | CC | |
| 9:49 | 1 | JC | | | 860 | | 300 | 2 | 141 | 2 | 158 | 2 | 209 | CC | |
| 9:49 | 1 | JC | | | 860 | | 300 | 3 | 153 | 3 | 162 | 3 | 214 | CC | |
| 9:49 | 1 | JC | | | 860 | | 300 | 4 | 174 | 4 | 151 | 4 | 216 | CC | |
| 9:49 | 1 | JC | | | 860 | | 300 | 5 | 145 | 5 | 153 | 5 | 211 | CC | |
| 10:05 | X1 | RC | 500 | 500 | | | | 1 | 126 | 1 | | 1 | 189 | CC | |
| 10:05 | X1 | RC | 500 | 500 | | | | 2 | 120 | 2 | | 2 | 205 | CC | |
| 10:05 | X1 | RC | 500 | 500 | | | | 3 | 124 | 3 | | 3 | 196 | CC | |
| 10:05 | X1 | RC | 500 | 500 | | | | 4 | 119 | 4 | | 4 | 191 | CC | |
| 10:05 | X1 | RC | 500 | 500 | | | | 5 | 125 | 5 | | 5 | 187 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Friday, November 18, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 10:33 | 1 | JC | | | 860 | | 300 | 1 | 146 | 1 | 134 | 1 | 210 | CC | |
| 10:33 | 1 | JC | | | 860 | | 300 | 2 | 152 | 2 | 136 | 2 | 207 | CC | |
| 10:33 | 1 | JC | | | 860 | | 300 | 3 | 141 | 3 | 142 | 3 | 208 | CC | |
| 10:33 | 1 | JC | | | 860 | | 300 | 4 | 136 | 4 | 147 | 4 | 213 | CC | |
| 10:33 | 1 | JC | | | 860 | | 300 | 5 | 140 | 5 | 152 | 5 | 210 | CC | |
| 10:40 | X1 | RC | 500 | 500 | | | | 1 | 123 | 1 | | 1 | 201 | CC | |
| 10:40 | X1 | RC | 500 | 500 | | | | 2 | 116 | 2 | | 2 | 187 | CC | |
| 10:40 | X1 | RC | 500 | 500 | | | | 3 | 132 | 3 | | 3 | 191 | CC | |
| 10:40 | X1 | RC | 500 | 500 | | | | 4 | 128 | 4 | | 4 | 200 | CC | |
| 10:40 | X1 | RC | 500 | 500 | | | | 5 | 130 | 5 | | 5 | 195 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Saturday, November 19, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 8:47 | 1 | JC | | | 860 | | 300 | 1 | 144 | 1 | 142 | 1 | 201 | CC | |
| 8:47 | 1 | JC | | | 860 | | 300 | 2 | 124 | 2 | 129 | 2 | 194 | CC | |
| 8:47 | 1 | JC | | | 860 | | 300 | 3 | 152 | 3 | 126 | 3 | 195 | CC | |
| 8:47 | 1 | JC | | | 860 | | 300 | 4 | 130 | 4 | 131 | 4 | 196 | CC | |
| 8:47 | 1 | JC | | | 860 | | 300 | 5 | 129 | 5 | 144 | 5 | 192 | CC | |
| 9:05 | X1 | MC | 500 | 500 | | | | 1 | 122 | 1 | | 1 | 199 | CC | |
| 9:05 | X1 | MC | 500 | 500 | | | | 2 | 117 | 2 | | 2 | 200 | CC | |
| 9:05 | X1 | MC | 500 | 500 | | | | 3 | 119 | 3 | | 3 | 196 | CC | |
| 9:05 | X1 | MC | 500 | 500 | | | | 4 | 118 | 4 | | 4 | 185 | CC | |
| 9:05 | X1 | MC | 500 | 500 | | | | 5 | 129 | 5 | | 5 | 188 | CC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Saturday, October 15, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 1 | 915 | East Slope | 11.50 | 7.30 | 83.95 | |
| 2 | 915 | East Slope | 11.50 | 7.30 | 83.95 | |
| 3 | 919 | East Slope | 11.50 | 7.30 | 83.95 | |
| 4 | 919 | East Slope | 11.50 | 7.30 | 83.95 | |
| 5 | 919 | East Slope | 11.50 | 7.30 | 83.95 | |
| 6 | 919 | East Slope | 11.50 | 7.30 | 83.95 | |
| 7 | 919 | East Slope | 11.50 | 7.30 | 83.95 | |
| 8 | 919 | East Slope | 11.50 | 7.30 | 83.95 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

671.60 **sq m**

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Friday, October 21, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 9 | 5321 | East Slope | 11.50 | 7.30 | 83.95 | |
| 10 | 5321 | East Slope | 11.50 | 7.30 | 83.95 | |
| 11 | 5321 | East Slope | 10.00 | 7.30 | 73.00 | |
| 12 | 5321 | North Slope | 17.00 | 7.30 | 124.10 | |
| 13 | 5390 | Sump | 3.00 | 7.30 | 21.90 | |
| 14 | 5390 | Floor | 67.50 | 7.30 | 492.75 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

879.65 **sq m**

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Monday, October 24, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 15 | 5328 | Floor | 68.00 | 7.30 | 496.40 | |
| 16 | 5323 | Floor | 68.00 | 7.30 | 496.40 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

992.80 **sq m**

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Tuesday, October 25, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 17 | 5321 | North Slope | 27.00 | 7.30 | 197.10 | |
| 18 | 5321 | North Slope | 27.00 | 7.30 | 197.10 | |
| | | | | | | |
| | | | | | | |
| | | | | |

C.J. Cassidy
Consulting Inc.

# *PANEL PLACEMENT LOG*

**DATE** Wednesday, October 26, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 19 | 5329 | Floor | 9.00 | 7.30 | 65.70 | Floor West of Sump |
| 20 | 5329 | Floor | 9.00 | 7.30 | 65.70 | Floor West of Sump |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

131.40 **sq m**

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Friday, October 28, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 21 | 5323 | S.E.Slope | 30.00 | 7.30 | 219.00 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

219.00 **sq m**

C.J. Cassidy
Consulting Inc.

# *PANEL PLACEMENT LOG*

**DATE** Saturday, October 29, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 22 | 5323 | S.Slope/Floor | 30.00 | 7.30 | 219.00 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

219.00 **sq m**

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Monday, October 31, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 23 | 5331 | S.Slope/Floor | 30.00 | 7.30 | 219.00 | |
| 24 | 5331 | S.Slope/Floor | 30.00 | 7.30 | 219.00 | |
| 25 | 5331 | S.Slope/Floor | 30.00 | 7.30 | 219.00 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

657.00 **sq m**

C.J. Cassidy
Consulting Inc.

# *PANEL PLACEMENT LOG*

**DATE** Tuesday, November 01, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 26 | 5335 | North Slope | 19.00 | 7.30 | 138.70 | |
| 27 | 5335 | North Slope | 19.00 | 7.30 | 138.70 | |
| | | | | | | |
| | | | | | | |
| | | | | |

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Saturday, November 05, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 28 | 5335 | North Slope | 19.00 | 7.30 | 138.70 | |
| 28A | 5329 | North Slope | 1.50 | 7.30 | 10.95 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | 149.65 | **sq m** |

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Thursday, November 10, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 29 | 5325 | W.Slope/Floor | 46.00 | 7.30 | 335.80 | |
| 30 | 5325 | W.Slope/Floor | 46.00 | 7.30 | 335.80 | |
| 31 | 5325 | North Slope | 20.00 | 7.30 | 146.00 | |
| 32 | 5325 | North Slope | 20.00 | 7.30 | 146.00 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

963.60 **sq m**

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Saturday, November 12, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 33 | 5319 | W.Slope/Floor | 20.00 | 7.30 | 146.00 | |
| 34 | 5319 | N.W.Corner | 19.00 | 7.30 | 138.70 | |
| 35 | 5319 | N.W.Corner | 11.00 | 7.30 | 80.30 | |
| 36 | 5319 | N.W.Corner | 5.00 | 7.30 | 36.50 | |
| 37 | 5319 | N.W.Corner | 10.00 | 7.30 | 73.00 | |
| 38 | 5319 | N.W.Corner | 15.00 | 7.30 | 109.50 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

584.00 **sq m**

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Monday, November 14, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 39 | 5334 | South Floor | 8.00 | 7.30 | 58.40 | |
| 40 | 5331 | S.Slope/Floor | 40.50 | 7.30 | 295.65 | |
| 41 | 5333 | South Slope | 7.00 | 7.30 | 51.10 | |
| 42 | 5334 | South Slope | 7.00 | 7.30 | 51.10 | |
| 43 | 5334 | South Slope | 7.00 | 7.30 | 51.10 | |
| 44 | 5319 | South Slope | 26.00 | 7.30 | 189.80 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

697.15 **sq m**

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Tuesday, November 15, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 45 | 5314 | W.Slope/Floor | 47.00 | 7.30 | 343.10 | |
| 46 | 5314 | W.Slope/Floor | 47.00 | 7.30 | 343.10 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

686.20 **sq m**

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Wednesday, November 16, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 47 | 5314 | W.Slope/Floor | 47.00 | 7.30 | 343.10 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

343.10 **sq m**

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Thursday, November 17, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 48 | 5315 | W.Slope/Floor | 46.00 | 7.30 | 335.80 | |
| 49 | 5315 | W.Slope/Floor | 46.00 | 7.30 | 335.80 | |
| 50 | 5315 | W.Slope/Floor | 46.00 | 7.30 | 335.80 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

1007.40 **sq m**

C.J. Cassidy
Consulting Inc.

# *PANEL PLACEMENT LOG*

**DATE** Friday, November 18, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 51 | 5315 | W.Slope/Floor | 46.00 | 7.30 | 335.80 | |
| 52 | 5315 | W.Slope/Floor | 47.00 | 7.30 | 343.10 | |
| | | | | | | |
| | | | | | | |
| | | | | |

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Saturday, November 19, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 53 | 5313 | W.Slope/Floor | 47.00 | 2.00 | 94.00 | |
| 54 | 5313 | W.Slope/Floor | 47.00 | 7.30 | 343.10 | |
| 55 | 5313 | W.Slope/Floor | 47.00 | 7.30 | 343.10 | |
| 56 | 5313 | W.Slope/Floor | 47.00 | 7.30 | 343.10 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

1123.30 **sq m**

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING SEAM LOG

**DATE** Saturday, October 15, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seam NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 1/2 | 11.5 | 11:58 | JC | 1 | 12:15 | 12:20 | 40 | 40 | FTB | FTB | N/A | CC | |
| 2/3 | 11.5 | 12:23 | JC | 1 | 12:30 | 12:35 | 40 | 40 | FTB | FTB | N/A | CC | |
| 3/4 | 11.5 | 12:30 | JC | 1 | 12:40 | 12:45 | 40 | 40 | FTB | FTB | N/A | CC | |
| 4/5 | 11.5 | 12:39 | JC | 1 | 12:50 | 12:55 | 40 | 40 | FTB | FTB | N/A | CC | |
| 5/6 | 11.5 | 12:47 | JC | 1 | 1:00 | 1:05 | 40 | 40 | FTB | FTB | N/A | CC | |
| 6/7 | 11.5 | 1:05 | JC | 1 | 2:00 | 2:05 | 40 | 40 | FTB | FTB | N/A | CC | |
| 7/8 | 11.5 | 1:46 | JC | 1 | 2:15 | 2:20 | 40 | 40 | FTB | FTB | N/A | CC | |
| TieIn/A | 68.0 | 8:03 | JC | 1 | 11:20 | 11:25 | 40 | 39 | FTB | FTB | N/A | CC | Panels 1 to 10, Tie In to existing cell. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Friday, October 21, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 1/9 | 11.5 | 10:45 | JC | 1 | 10:59 | 11:04 | 40 | 40 | FTB | FTB | N/A | CC | |
| 9/10 | 11.5 | 10:52 | JC | 1 | 11:05 | 11:10 | 40 | 40 | FTB | FTB | N/A | CC | |
| 10/11 | 10.0 | 10:59 | JC | 1 | 11:30 | 11:35 | 40 | 40 | FTB | FTB | N/A | CC | |
| 11/12 | 7.3 | 11:06 | JC | 1 | 11:11 | 11:16 | 40 | 39 | FTB | FTB | N/A | CC | |
| 13/14 | 7.3 | 12:54 | JC | 1 | 1:21 | 1:26 | 40 | 40 | FTB | FTB | N/A | CC | |
| E.Butt | 68.5 | 1:31 | JC | 1 | 2:12 | 2:17 | 40 | 38 | FTB | FTB | N/A | CC | Panels 1 - 10, E. Floor Butt Seam. |
| TieIn/B1 | 7.2 | 1:11 | JC | 1 | 2:04 | 2:09 | 40 | 40 | FTB | FTB | N/A | CC | Panels 9, Tie In to existing cell. |
| TieIn/B2 | 7.2 | 1:11 | JC | 1 | 2:06 | 2:11 | 40 | 40 | FTB | FTB | N/A | CC | Panel 10, Tie In to existing cell. |
| TieIn/B3 | 7.2 | 1:11 | JC | 1 | 2:10 | 2:15 | 40 | 40 | FTB | FTB | N/A | CC | Panel 11, Tie In to existing cell. |
| TieIn/C | 17.0 | 1:47 | JC | 1 | 2:54 | 2:59 | 40 | 40 | FTB | FTB | N/A | CC | Panel 12, Tie In to existing cell. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Monday, October 24, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 14/15 | 67.5 | 12:30 | JC | 1 | 1:30 | 1:35 | 40 | 39 | FTB | FTB | N/A | CC | Floor Panels |
| 15/16 | 68.0 | 12:00 | JC | 1 | 12:41 | 12:46 | 40 | 40 | FTB | FTB | N/A | CC | Floor Panels |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING SEAM LOG

**DATE** Tuesday, October 25, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 12/17 | 17.0 | 8:30 | JC | 1 | 9:02 | 9:07 | 40 | 38 | FTB | FTB | N/A | CC | |
| 17/18 | 27.0 | 10:31 | JC | 1 | 10:43 | 10:48 | 40 | 40 | FTB | FTB | N/A | CC | |
| Sump Butt | 25.0 | 10:07 | JC | 1 | 10:34 | 10:39 | 41 | 40 | FTB | FTB | N/A | CC | Panels 10, 11, 13, 17 & 18 in Sump. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Wednesday, October 26, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 19/20 | 9.0 | 9:40 | JC | 1 | 10:05 | 10:10 | 40 | 38 | FTB | FTB | N/A | CC | |
| 15/16/19/20 | 14.0 | 9:55 | JC | 1 | 10:16 | 10:21 | 40 | 40 | FTB | FTB | N/A | CC | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Friday, October 28, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| TieIn/D | 30.0 | 4:09 | JC | 1 | 4:21 | 4:26 | 40 | 38 | FTB | FTB | N/A | CC | Panel 21, Tie In to existing cell. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Saturday, October 29, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 21/22 | 30.0 | 10:10 | JC | 1 | 11:35 | 11:40 | 40 | 40 | FTB | FTB | N/A | CC | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Monday, October 31, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 22/23 | 30.0 | 9:45 | JC | 1 | 10:05 | 10:10 | 40 | 40 | FTB | FTB | N/A | CC | |
| 23/24 | 30.0 | 10:13 | JC | 1 | 10:25 | 10:30 | 40 | 38 | FTB | FTB | N/A | CC | |
| 24/25 | 30.0 | 10:31 | JC | 1 | 10:45 | 10:50 | 40 | 40 | FTB | FTB | N/A | CC | |
| S.E.Butt | 36.0 | 10:52 | JC | 1 | 12:01 | 12:06 | 40 | 40 | FTB | FTB | N/A | CC | Panels 21 - 25. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Tuesday, November 01, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seam NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 26/27 | 19.0 | 12:52 | JC | 1 | 1:05 | 1:10 | 40 | 38 | FTB | FTB | N/A | CC | |
| 19/20/26/27 | 14.5 | 1:15 | JC | 1 | 1:31 | 1:36 | 40 | 40 | FTB | FTB | N/A | CC | |
| 18/19/26 | 29.0 | 4:07 | JC | 1 | 4:31 | 4:36 | 40 | 40 | FTB | FTB | N/A | CC | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING SEAM LOG

**DATE** Saturday, November 05, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seam NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 28/28A | 7.3 | 8:55 | JC | 1 | 12:20 | 12:25 | 40 | 40 | FTB | FTB | N/A | CC | Cross Seam |
| 27/28 | 20.0 | 9:12 | JC | 1 | 12:35 | 12:40 | 40 | 39 | FTB | FTB | N/A | CC | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Thursday, November 10, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seam NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 29/30 | 46.0 | 1:45 | JC | 1 | 2:01 | 2:06 | 40 | 40 | FTB | FTB | N/A | CC | |
| 28/31 | 20.0 | 2:32 | JC | 1 | 2:45 | 2:50 | 40 | 40 | FTB | FTB | N/A | CC | |
| 31/32 | 20.0 | 3:10 | JC | 1 | 3:26 | 3:31 | 40 | 40 | FTB | FTB | N/A | CC | |
| N.Butt/A | 11.0 | 2:40 | JC | 1 | 3:05 | 3:10 | 40 | 38 | FTB | FTB | N/A | CC | Panel 31, 28 & 20. |
| FloorButt/A | 12.0 | 2:46 | JC | 1 | 3:15 | 3:20 | 40 | 40 | FTB | FTB | N/A | CC | Panels 29 & 30 to Panel16 & 20. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Saturday, November 12, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seam NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 32/33 | 20.0 | 2:10 | JC | 1 | 3:09 | 3:14 | 40 | 40 | FTB | FTB | N/A | CC | |
| 33/34 | 19.0 | 2:26 | JC | 1 | 3:04 | 3:09 | 40 | 40 | FTB | FTB | N/A | CC | |
| 34/35 | 11.0 | 2:36 | JC | 1 | 2:50 | 2:55 | 40 | 40 | FTB | FTB | N/A | CC | |
| 36/37 | 5.0 | 2:40 | JC | 1 | 2:56 | 3:01 | 40 | 40 | FTB | FTB | N/A | CC | |
| 37/38 | 10.0 | 2:43 | JC | 1 | 3:01 | 3:06 | 40 | 40 | FTB | FTB | N/A | CC | |
| N.W.Butt | 26.0 | 2:59 | JC | 1 | 3:28 | 3:33 | 40 | 38 | FTB | FTB | N/A | CC | Panels 34 - 38. |
| N.Butt/B | 31.0 | 3:16 | JC | 1 | 3:36 | 3:41 | 40 | 39 | FTB | FTB | N/A | CC | Panel 29 to Panels 31 - 33 & 38.. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Monday, November 14, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seam NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 39/40 | 7.3 | 1:45 | JC | 1 | 2:01 | 2:06 | 40 | 40 | FTB | FTB | N/A | CC | |
| 41/42 | 7.0 | 2:32 | JC | 1 | 2:45 | 2:50 | 40 | 40 | FTB | FTB | N/A | CC | |
| 42/43 | 7.0 | 3:10 | JC | 1 | 3:26 | 3:31 | 40 | 40 | FTB | FTB | N/A | CC | |
| 43/44 | 7.0 | 2:40 | JC | 1 | 3:05 | 3:10 | 40 | 40 | FTB | FTB | N/A | CC | |
| S.W.Butt | 47.0 | 3:22 | JC | 1 | 1:24 | 1:29 | 40 | 38 | FTB | FTB | N/A | CC | Panels39 - 44. |
| FloorButt/B | 14.5 | 3:41 | JC | 1 | 1:12 | 1:17 | 40 | 40 | FTB | FTB | N/A | CC | Panels 39 & 41 to Panel 25. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Tuesday, November 15, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seam NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 39/40/45 | 47.0 | 12:15 | JC | 1 | 1:11 | 1:16 | 40 | 40 | FTB | FTB | N/A | CC | |
| 45/46 | 47.0 | 2:30 | JC | 1 | 1:28 | 1:33 | 40 | 40 | FTB | FTB | N/A | CC | |
| FloorButt/C | 14.5 | 3:01 | JC | 1 | 1:40 | 1:45 | 40 | 40 | FTB | FTB | N/A | CC | Panels 45 & 46 to Panel 25. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Wednesday, November 16, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seam NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 46/47 | 47.0 | 11:58 | JC | 1 | 1:30 | 1:35 | 40 | 40 | FTB | FTB | N/A | CC | |
| FloorButt/D | 5.0 | 12:24 | JC | 1 | 1:56 | 2:01 | 40 | 40 | FTB | FTB | N/A | CC | Panell 47 to Panel 25. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Thursday, November 17, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seam NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 30/48 | 46.0 | 10:44 | JC | 1 | 11:16 | 11:21 | 40 | 40 | FTB | FTB | N/A | CC | |
| 48/49 | 46.0 | 10:17 | JC | 1 | 11:23 | 11:23 | 40 | 40 | FTB | FTB | N/A | CC | |
| 49/50 | 46.0 | 11:49 | JC | 1 | 12:35 | 12:40 | 40 | 40 | FTB | FTB | N/A | CC | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Friday, November 18, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022

**MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seam NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 50/51 | 46.0 | 12:02 | JC | 1 | 1:32 | 1:37 | 40 | 40 | FTB | FTB | N/A | CC | |
| 51/52 | 46.0 | 12:36 | JC | 1 | 1:40 | 1:45 | 40 | 39 | FTB | FTB | N/A | CC | |
| FloorButt/E | 30.0 | 1:22 | JC | 1 | 1:51 | 1:56 | 40 | 40 | FTB | FTB | N/A | CC | Panels 48 - 51 to Panel16. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Saturday, November 19, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seam NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 52/53 | 47.0 | 11:25 | JC | 1 | 1:25 | 1:30 | 40 | 40 | FTB | FTB | N/A | CC | |
| 53/54 | 47.0 | 10:15 | JC | 1 | 1:15 | 1:20 | 40 | 39 | FTB | FTB | N/A | CC | |
| 54/55 | 47.0 | 10:36 | JC | 1 | 1:12 | 1:17 | 40 | 40 | FTB | FTB | N/A | CC | |
| 55/56 | 47.0 | 11:03 | JC | 1 | 1:00 | 1:05 | 40 | 40 | FTB | FTB | N/A | CC | |
| 56/47 | 47.0 | 12:04 | JC | 1 | 2:02 | 2:07 | 40 | 40 | FTB | FTB | N/A | CC | |
| FloorButt/F | 31.0 | 12:47 | JC | 1 | 2:39 | 2:44 | 40 | 39 | FTB | FTB | N/A | CC | Panels 47 & 52 - 56 to Panel16. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Saturday, October 15, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| Zone 1 | Beads | Tie In/A | Oct 15 | RC | X1 | CG | Pass | All "T" Intersections along Tie In/A to existing cell.. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Monday, October 17, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 1 | Patch | P3 | Oct 17 | RC | X1 | CG | Pass | Upper Slope. |
| 2 | Patch | P3 | Oct 17 | RC | X1 | CG | Pass | Upper Slope. |
| 3 | Patch | P3 | Oct 17 | RC | X1 | CG | Pass | Upper Slope. |
| 4 | Patch | P8 | Oct 17 | RC | X1 | CG | Pass | Toe of Slope. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Friday, October 21, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 5 | Patch | 1/9 | Oct 21 | RC | X1 | CG | Pass | At Intersection of TieIn/A and TieIn/B1. |
| 6 | Patch | 9/10 | Oct 21 | RC | X1 | CG | Pass | At Intersection of TieIn/B1 and TieIn/B2. |
| 7 | Patch | 10/11 | Oct 21 | RC | X1 | CG | Pass | At Intersection of TieIn/B2 and TieIn/B3. |
| 8 | Patch | 11/12 | Oct 21 | RC | X1 | CG | Pass | At Intersection of TieIn/B3 and TieIn/C. |
| 9 | Patch | TieIn/C | Oct 21 | RC | X1 | CG | Pass | At Achor Trench of Panel 12 and TieIn/C. |
| Zone 2 | Beads | East Butt | Oct 21 | RC | X1 | CG | Pass | All "T" Intersections along East Butt Seam. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Monday, October 24, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 10 | Patch | 14/15 | Oct 24 | MC | X1 | CG | Pass | Near South Butt Seam. |
| 11 | Patch | 15/16 | Oct 24 | MC | X1 | CG | Pass | Destruct #4. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Tuesday, October 25, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 12 | Patch | Sump Butt | Oct 25 | MC | X1 | CG | Pass | At Intersection of 11/12/17. |
| 13 | Patch | Sump Butt | Oct 25 | MC | X1 | CG | Pass | At Intersection of 10/13/17. |
| 14 | Patch | Sump Butt | Oct 25 | MC | X1 | CG | Pass | At Intersection of 13/17/18. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Wednesday, October 26, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| Zone 3 | Beads | 15/16/19/20 | Oct 26 | MC | X1 | CG | Pass | "T" Intersections. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Monday, October 31, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 15 | Patch | 8/21 | Oct 31 2022 | RC | X1 | CG | Pass | At Intersection of TieIn/A and TieIn/D. |
| Zone 4 | Beads | S.E.Butt | Oct 31 2022 | RC | X1 | CG | Pass | All "T" Intersections along South East Butt Seam. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Tuesday, November 01, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 16 | Beads | 19/20/26/27 | Nov 1 | RC | X1 | CG | Pass | "T" Intersection. |
| 17 | Patch | 13/14/15 | Nov 1 | RC | X1 | CG | Pass | At Intersection of 13/14/15. |
| 18 | Patch | 13/18/19 | Nov 1 | RC | X1 | CG | Pass | At Intersection of 13/18/19. |
| 19 | Bead | 18/19/26 | Nov 1 | RC | X1 | CG | Pass | "T" Intersection. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Saturday, November 05, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 20 | Bead | 27/28 | Nov 5 | RC | X1 | RC | Pass | "T" Intersection. |
| 21 | Patch | 28/31 | Nov 5 | RC | X1 | RC | Pass | At Intersection of 28/28A. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Thursday, November 10, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 22 | Patch | 20/28A | Nov 10 | MC | X1 | RC | Pass | At Intersection of North Butt/A and Floor Butt/A. |
| 23 | Patch | North Butt | Nov 10 | MC | X1 | RC | Pass | At Intersection of North Butt/A and North Butt/B. |
| 24 | Patch | 29/30 | Nov 10 | MC | X1 | RC | Pass | At Anchor Trench. |
| 25 | Bead | 28A/31 | Nov 10 | MC | X1 | RC | Pass | "T" Intersection on North Butt/A. |
| 26 | Bead | 29/30 | Nov 10 | MC | X1 | RC | Pass | "T" Intersection on Floor Butt/A. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Saturday, November 12, 2022

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| Zone 5 | Beads | N.W.Butt | Nov 12 | MC | X1 | CG | Pass | All "T" Intersections along North West Butt. |
| Zone 6 | Beads | N.Butt/B | Nov 12 | MC | X1 | CG | Pass | All "T" Intersections along North Butt/B. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Monday, November 14, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| Zone 7 | Beads | S.W.Butt | Nov 14 | RC | X1 | CG | Pass | All "T" Intersections along 39/40, S.W.Butt and Floor Butt/B. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Tuesday, November 15, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 27 | Patch | Floor Butt | Nov 15 | RC | X1 | CG | Pass | At Intersection of Floor Butt/B and Floor Butt/C. |
| 28 | Bead | Floor Butt | Nov 15 | RC | X1 | CG | Pass | "T" Intersections on Floor Butt/C. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Wednesday, November 16, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 29 | Patch | Floor Butt | Nov 16 | RC | X1 | CG | Pass | At Intersection of Floor Butt/C and Floor Butt/D. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Friday, November 18, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 30 | Patch | Floor Butt | Nov 18 | RC | X1 | CG | Pass | At Intersections of Floor Butt/A and Floor Butt/E. |
| Zone 8 | Beads | Foor Butt/E | Nov 18 | RC | X1 | CG | Pass | All "T" Intersections along Floor Butt/E. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Saturday, November 19, 2022

**PROJECT** **NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022** **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 31 | Patch | Floor Butt | Nov 19 | MC | X1 | CG | Pass | At Intersections of Floor Butt/E and Floor Butt/F. |
| 32 | Patch | Foor Butt | Nov 19 | MC | X1 | CG | Pass | At Intersections of Floor Butt/D and Floor Butt/F. |
| 33 | Patch | 55/56 | Nov 19 | MC | X1 | CG | Pass | Destruct #4. |
| 34 | Patch | 47/56 | Nov 19 | MC | X1 | CG | Pass | On Floor. |
| Zone 9 | Beads | Foor Butt/F | Nov 19 | MC | X1 | CG | Pass | All "T" Intersections along Floor Butt/F. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# DESTRUCTIVE TESTING REPORT

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WEST CELL - 2022 **MATERIAL** 60mil HDPE - **PRIMARY LINER**

| WELD DATE | D.S. # | SEAM # | TECH INITIAL | WELDER NUMBER | PEEL 1 | | SHEAR | PEEL 2 | | SHEAR | PEEL 3 | | SHEAR | PEEL 4 | | SHEAR | PEEL 5 | | SHEAR | QC INITIAL | COMMENTS / LOCATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | IN | OUT | | IN | OUT | | IN | OUT | | IN | OUT | | IN | OUT | | | |
| 10-24-22 | 1 | 15/16 | JC | 1 | 124 | 146 | 194 | 142 | 139 | 190 | 126 | 136 | 191 | 130 | 139 | 193 | 128 | 134 | 195 | CC | North end of seam 15/16. |
| 10-31-22 | 2 | 23/24 | JC | 1 | 122 | 132 | 204 | 129 | 145 | 205 | 131 | 119 | 202 | 144 | 154 | 199 | 132 | 154 | 201 | CC | Run out in Anchor Trench. |
| 11-17-22 | 3 | 49/50 | JC | 1 | 134 | 141 | 189 | 137 | 127 | 181 | 137 | 137 | 187 | 131 | 128 | 188 | 124 | 127 | 186 | CC | Run out in Anchor Trench. |
| 11-19-22 | 4 | 55/56 | JC | 1 | 123 | 123 | 182 | 119 | 135 | 190 | 121 | 138 | 197 | 122 | 128 | 200 | 121 | 126 | 191 | CC | 10m from Floor Butt/F. |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Wednesday, July 05, 2023

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WATER TREATMENT POND - 2023 **MATERIAL** 60mil HDPE

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 5:29 | 1 | JC | | | 860 | | 450 | 1 | 108 | 1 | 113 | 1 | 181 | MC | |
| 5:29 | 1 | JC | | | 860 | | 450 | 2 | 132 | 2 | 120 | 2 | 179 | MC | |
| 5:29 | 1 | JC | | | 860 | | 450 | 3 | 138 | 3 | 120 | 3 | 182 | MC | |
| 5:29 | 1 | JC | | | 860 | | 450 | 4 | 131 | 4 | 125 | 4 | 182 | MC | |
| 5:29 | 1 | JC | | | 860 | | 450 | 5 | 119 | 5 | 131 | 5 | 181 | MC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# WELDER QUALIFICATIONS

**DATE** Thursday, July 06, 2023

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WATER TREATMENT POND - 2023 **MATERIAL** 60mil HDPE

| | | | EXTRUDER | | FUSION WELDER | | | TENSIONMETER VALUES LBs/INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFY TIME | WELDER NUMBER | TECH INITIALS | BARREL TEMP °F | PREHEAT TEMP °F | SET TEMP °F | MEASURED SPEED | SPEED SETTINGS | | PEEL INSIDE | | PEEL OUTSIDE | | SHEAR VALUE | QC INITIAL | WEATHER / COMMENTS: |
| 5:15 | 1 | JC | | | 860 | | 450 | 1 | 134 | 1 | 132 | 1 | 176 | MC | |
| 5:15 | 1 | JC | | | 860 | | 450 | 2 | 118 | 2 | 132 | 2 | 171 | MC | |
| 5:15 | 1 | JC | | | 860 | | 450 | 3 | 131 | 3 | 121 | 3 | 182 | MC | |
| 5:15 | 1 | JC | | | 860 | | 450 | 4 | 136 | 4 | 119 | 4 | 179 | MC | |
| 5:15 | 1 | JC | | | 860 | | 450 | 5 | 137 | 5 | 127 | 5 | 180 | MC | |
| 6:47 | Ex1 | JC | 500 | 505 | | | | 1 | 143 | 1 | | 1 | 200 | MC | |
| 6:47 | Ex1 | JC | 500 | 505 | | | | 2 | 143 | 2 | | 2 | 204 | MC | |
| 6:47 | Ex1 | JC | 500 | 505 | | | | 3 | 144 | 3 | | 3 | 208 | MC | |
| 6:47 | Ex1 | JC | 500 | 505 | | | | 4 | 139 | 4 | | 4 | 200 | MC | |
| 6:47 | Ex1 | JC | 500 | 505 | | | | 5 | 124 | 5 | | 5 | 203 | MC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# PANEL PLACEMENT LOG

**DATE** Wednesday, July 05, 2023

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WATER TREATMENT POND - 2023 **MATERIAL** 60mil HDPE

| PANEL NUMBER | ROLL NUMBER | WORK AREA | PANEL LENGTH | PANEL WIDTH | PANEL AREA | COMMENTS: |
|---|---|---|---|---|---|---|
| 1 | 15330 | N.Slope/Floor | 26.00 | 7.30 | 189.80 | |
| 2 | 15330 | N.Slope/Floor | 26.00 | 7.30 | 189.80 | |
| 3 | 15330 | South Slope | 12.00 | 7.30 | 87.60 | |
| 4 | 15330 | South Slope | 12.00 | 7.30 | 87.60 | |
| 5 | 15330 | S.W.Corner | 10.00 | 7.30 | 73.00 | |
| 6 | 15330 | S.W.Corner | 13.00 | 7.30 | 94.90 | |
| 7 | 15330 | West Side | 12.00 | 7.30 | 87.60 | |
| 8 | 15330 | West Side | 12.00 | 7.30 | 87.60 | |
| 9 | 15330 | N.W.Corner | 11.00 | 7.30 | 80.30 | |
| 10 | 15330 | N.W.Corner | 10.20 | 7.30 | 74.46 | |
| 11 | 15320 | N.E.Corner | 12.00 | 7.30 | 87.60 | |
| 12 | 15320 | N.E.Corner | 14.00 | 7.30 | 102.20 | |
| 13 | 15320 | East Side | 14.00 | 7.30 | 102.20 | |
| 14 | 15320 | East Side | 14.00 | 7.30 | 102.20 | |
| 15 | 15320 | S.E.Corner | 13.00 | 7.30 | 94.90 | |
| 16 | 15320 | S.E.Corner | 12.00 | 7.30 | 87.60 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

1629.36 **sq m**

C.J. Cassidy
Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Wednesday, July 05, 2023

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WATER TREATMENT POND - 2023 **MATERIAL** 60mil HDPE

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| 1/2 | 26.0 | 6:02 | JC | 1 | 9:11 | 9:16 | 40 | 40 | FTB | FTB | N/A | MC | |
| 3/4 | 12.0 | 7:12 | JC | 1 | 9:10 | 9:15 | 40 | 40 | FTB | FTB | N/A | MC | |
| 5/6/7 | 10.0 | 9:20 | JC | 1 | 9:57 | 10:02 | 40 | 40 | FTB | FTB | N/A | MC | |
| 6/7 | 12.0 | 9:10 | JC | 1 | 9:56 | 10:01 | 40 | 40 | FTB | FTB | N/A | MC | |
| 7/8 | 12.0 | 7:30 | JC | 1 | 9:48 | 9:53 | 40 | 40 | FTB | FTB | N/A | MC | |
| 8/9 | 11.0 | 8:00 | JC | 1 | 9:27 | 9:32 | 40 | 40 | FTB | FTB | N/A | MC | |
| 9/10 | 10.2 | 8:30 | JC | 1 | 9:25 | 9:30 | 40 | 40 | FTB | FTB | N/A | MC | |
| 11/12 | 12.0 | 10:50 | JC | 1 | 9:00 | 9:05 | 40 | 40 | FTB | FTB | N/A | MC | |
| 12/13 | 14.0 | 10:30 | JC | 1 | 8:55 | 9:00 | 40 | 40 | FTB | FTB | N/A | MC | |
| 13/14 | 14.0 | 10:15 | JC | 1 | 8:55 | 9:00 | 40 | 40 | FTB | FTB | N/A | MC | |
| 14/15 | 13.0 | 12:30 | JC | 1 | 10:45 | 10:50 | 40 | 40 | FTB | FTB | N/A | MC | |
| 15/16 | 12.0 | 1:05 | JC | 1 | 10:30 | 10:35 | 40 | 40 | FTB | FTB | N/A | MC | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

C.J. Cassidy Consulting Inc.

# NON-DESTRUCTIVE TESTING
# SEAM LOG

**DATE** Thursday, July 06, 2023

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WATER TREATMENT POND - 2023 **MATERIAL** 60mil HDPE

| | | | | | AIR PRESSURE TESTING | | | | PEELS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEAM NUMBER | SEAM LENGTH | WELD TIME | TECH INITIAL | WELDER NUMBER | TIME START | TIME FINISH | PSI START | PSI FINISH | PEEL INSIDE | PEEL OUTSIDE | VAC-TEST Pass/FAIL | QC INITIAL | COMMENTS: |
| South Butt | 14.6 | 7:50 | JC | 1 | 8:15 | 8:20 | 40 | 40 | FTB | FTB | N/A | MC | Panels 1 & 2 to Panels 3 & 4. |
| E.Butt/A | 10.0 | 8:14 | JC | 1 | 9:10 | 9"15 | 40 | 40 | FTB | FTB | N/A | MC | Panels 11 & 12 to Panel 2. |
| E.Butt/B | 15.0 | 8:14 | JC | 1 | 9:28 | 9:33 | 40 | 40 | FTB | FTB | N/A | MC | Panels 12 - 14 to Panel 2. |
| E.Butt/C | 7.3 | 8:14 | JC | 1 | 10:07 | 10:12 | 40 | 40 | FTB | FTB | N/A | MC | Panel 15 to Panel 3. |
| E.Butt/D | 4.5 | 8:14 | JC | 1 | 10:07 | 10:12 | 40 | 40 | FTB | FTB | N/A | MC | Panel 16 to Panel 3. |
| W.Butt/A | 16.0 | 8:42 | JC | 1 | 9:19 | 9:24 | 40 | 40 | FTB | FTB | N/A | MC | Panels 8 - 10 to Panel 1. |
| W.Butt/B | 9.0 | 8:42 | JC | 1 | 9:25 | 9:30 | 40 | 40 | FTB | FTB | N/A | MC | Panels 7 & 8 to Panels 1 & 2. |
| W.Butt/C | 12.0 | 8:42 | JC | 1 | 10:02 | 10:07 | 40 | 40 | FTB | FTB | N/A | MC | Panel 4 to 5. |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

C.J. Cassidy
Consulting Inc.

# EXTRUSION WELD REPORT

**DATE** Thursday, July 06, 2023

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WATER TREATMENT POND - 2023 **MATERIAL** 60mil HDPE

| EXTRUSION NUMBER | EXTRUSION TYPE | PANEL/SEAM NUMBER | TEST DATE | TECH INITIAL | MACHINE NUMBER | QC INITIAL | PASS/ FAIL | COMMENTS: |
|---|---|---|---|---|---|---|---|---|
| 1 | Patch | 1/2 | July 6 | JC | Ex1 | MC | Pass | On Floor. |
| 2 | Patch | E.Butt | July 6 | JC | Ex1 | MC | Pass | At Seam 15/16. |
| 3 | Patch | E.Butt | July 6 | JC | Ex1 | MC | Pass | At Intersection of South Butt. |
| 4 | Patch | E.Butt | July 6 | JC | Ex1 | MC | Pass | At Panel 12. |
| 5 | Patch | W.Butt | July 6 | JC | Ex1 | MC | Pass | At Panel 8. |
| 6 | Patch | W.Butt | July 6 | JC | Ex1 | MC | Pass | At Intersection of South Butt. |
| Zone 1 | Beads | S.Butt | July 6 | JC | Ex1 | MC | Pass | All "T" Intersections along South Butt. |
| Zone 2 | Beads | E.Butt | July 6 | JC | Ex1 | MC | Pass | All "T" Intersections along East Butt. |
| Zone 3 | Beads | EW.Butt | July 6 | JC | Ex1 | MC | Pass | All "T" Intersections along West Butt. |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

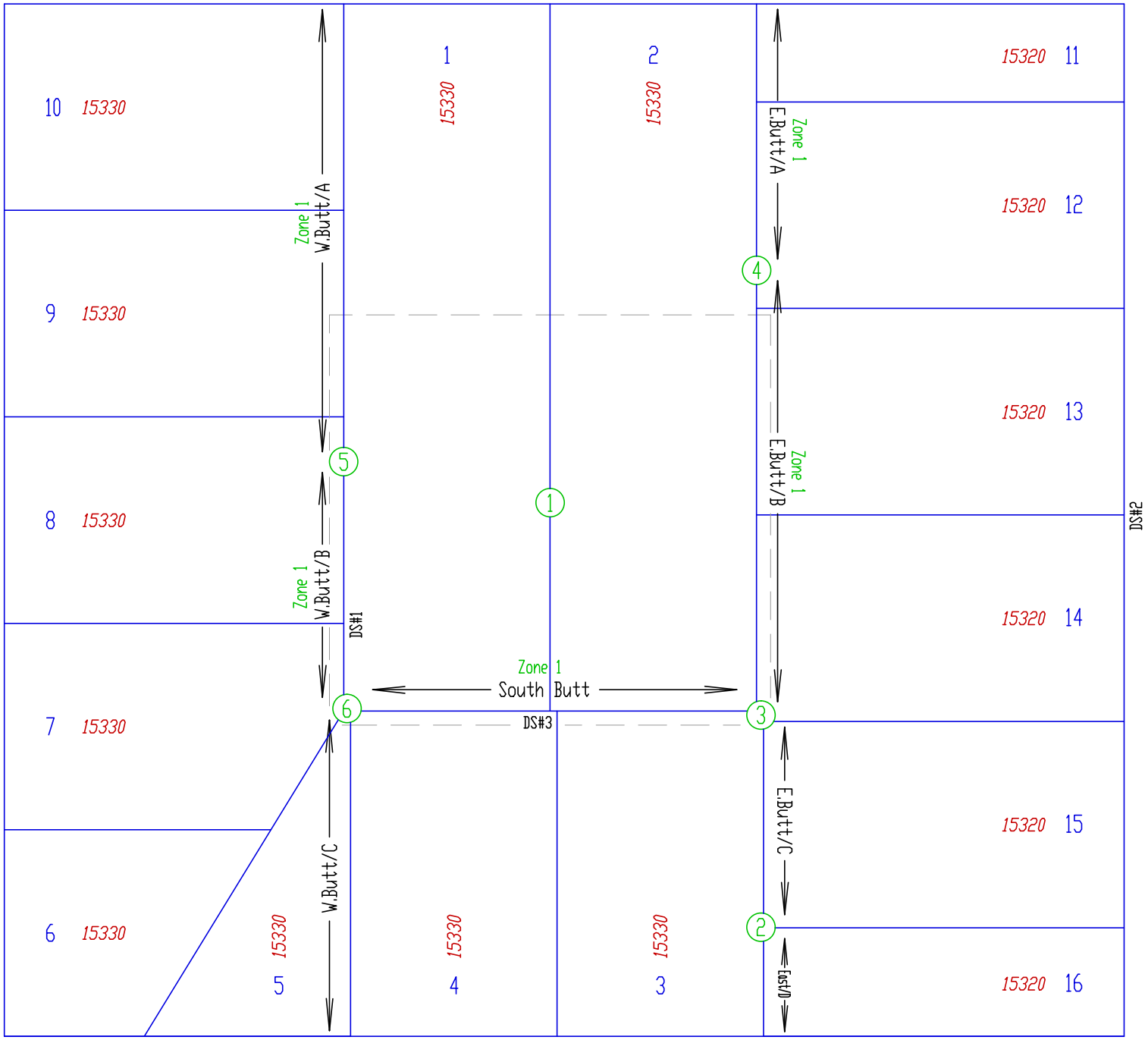
C.J. Cassidy
Consulting Inc.

# DESTRUCTIVE TESTING REPORT

**PROJECT** NORTHWIN ENVIRONMENTAL LANDFILL - WATER TREATMENT POND - 2023 **MATERIAL** 60mil HDPE

| WELD DATE | D.S. # | SEAM # | TECH INITIAL | WELDER NUMBER | PEEL 1 | | SHEAR | PEEL 2 | | SHEAR | PEEL 3 | | SHEAR | PEEL 4 | | SHEAR | PEEL 5 | | SHEAR | QC INITIAL | COMMENTS / LOCATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | IN | OUT | | IN | OUT | | IN | OUT | | IN | OUT | | IN | OUT | | | |
| 7-05-23 | 1 | 7/8 | JC | 1 | 137 | 111 | 216 | 127 | 135 | 216 | 121 | 114 | 209 | 138 | 119 | 210 | 181 | 138 | 207 | MC | At Start of Seam. |
| 7-05-23 | 2 | 13/14 | JC | 1 | 142 | 124 | 201 | 141 | 127 | 203 | 123 | 146 | 203 | 140 | 121 | 208 | 128 | 141 | 202 | MC | In Anchor Trench. |
| 7-06-23 | 3 | S.Butt | JC | 1 | 128 | 129 | 208 | 131 | 136 | 222 | 167 | 133 | 199 | 129 | 132 | 205 | 131 | 127 | 210 | MC | On South Butt Seam. |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |

# NORTHWIN LANDFILL - WATER TREATMENT POND




Blue = Liner  Red = Roll Numbers  Green = Extrusion Welds

| | | |
|---|---|---|
| DATE: July 10, 2023 | C.J. Cassidy Consulting Inc. | NORTHWIN LANDFILL - 2023 |
| SCALE: NTS | | CAMPBELL RIVER, B.C. |
| FILE NAME: CampbellRiverPond-2023 | | Water Treatment Pond Liner Representative Drawing |
| DRAWN BY: SSC | | |
| CHECKED BY: CJC | | |

Date: 2022-10-24

**Mail To:**
**David Barbour**
**GHD Services**

**, ,**

**Bill To:**

**GHD Services**
**11222680**

e-mail:
david.barbour@ghd.com roxanne.hasior@ghd.com rosemarie.rocca@ghd.com

Dear Barbour,

Thank you for consulting with TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

| | |
|---|---|
| **Project:** | **Upland LF Northwin LF Phase 1 West** |
| TRI Job Reference Number: | **76033** |
| Material(s) Tested: | (1) Heat Fusion Weld Seam(s) |
| Test(s) Requested: | SAME DAY Peel and Shear<br>(ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.) |

| Codes: | |
|---|---|
| AD | Adhesion Failure (100% Peel) |
| BRK | Break in sheeting away from Seam edge. |
| SE | Break in sheeting at edge of seam. |
| AD-BRK | Break in sheeting after some adhesion failure - partial peel. |
| SIP | Separation in the plane of the sheet (leaving the bond intact). |
| FTB | Film tearing bond (all non "AD" failures). |
| NON-FTB | 100% peel. |

If you have any questions or require any additional information, please call us at 1-800-880-8378.
Sincerely,

Nicole Saucedo

Geosynthetic Services Division
http://www.geosyntheticstestinc.com

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

## DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
## TRI Client: GHD Services
## Project: Upland LF Northwin LF Phase 1 West

**Material: 60 mil. HDPE**
**SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)**
**TRI Log#: 76033**

| | TEST REPLICATE NUMBER | | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | 1 | 2 | 3 | 4 | 5 | MEAN |
| **Sample ID: DT-2 \| Weld: Heat Fusion** | | | | | | |
| **Side: A** | | | | | | **Peel A** |
| Peel Strength (ppi) | 131 | 127 | 122 | 124 | 142 | **129** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Side: B** | | | | | | **Peel B** |
| Peel Strength (ppi) | 138 | 147 | 169 | 145 | 158 | **151** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Shear** | | | | | | **Shear** |
| Shear Strength (ppi) | 199 | 196 | 190 | 188 | 186 | **192** |
| Shear Elongation @ Break (%) | >50 | >50 | >50 | >50 | >50 | |

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

Date: 2022-10-27

**Mail To:**
**David Barbour**
**GHD Limited**

**, ,**

**Bill To:**

**GHD Limited**
**11222680**

e-mail:
david.barbou@ghd.com roxanne.hasior@ghd.com rosemarie.rocca@ghd.com

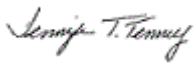
Dear Mr. Barbour,

Thank you for consulting with TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

| | |
|---|---|
| **Project:** | **Upland Landfill - Northwin Landfill Phase 1 East** |
| TRI Job Reference Number: | **76142** |
| Material(s) Tested: | (2) Heat Fusion Weld Seam(s) |
| Test(s) Requested: | SAME DAY Peel and Shear<br>(ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.) |

| Codes: | |
|---|---|
| AD | Adhesion Failure (100% Peel) |
| BRK | Break in sheeting away from Seam edge. |
| SE | Break in sheeting at edge of seam. |
| AD-BRK | Break in sheeting after some adhesion failure - partial peel. |
| SIP | Separation in the plane of the sheet (leaving the bond intact). |
| FTB | Film tearing bond (all non "AD" failures). |
| NON-FTB | 100% peel. |

If you have any questions or require any additional information, please call us at 1-800-880-8378.
Sincerely,



Jennifer Tenney
Project Manager
Geosynthetic Services Division
http://www.geosyntheticstestinc.com

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

## DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
## TRI Client: GHD Limited
## Project: Upland Landfill - Northwin Landfill Phase 1 East

**Material: 60 mil. HDPE**
**SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)**
**TRI Log#: 76142**

| | TEST REPLICATE NUMBER | | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | 1 | 2 | 3 | 4 | 5 | MEAN |
| **Sample ID: DT-3 \| Weld: Heat Fusion** | | | | | | |
| **Side: A** | | | | | | **Peel A** |
| Peel Strength (ppi) | 132 | 133 | 130 | 137 | 138 | **134** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Side: B** | | | | | | **Peel B** |
| Peel Strength (ppi) | 142 | 142 | 145 | 149 | 154 | **146** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Shear** | | | | | | **Shear** |
| Shear Strength (ppi) | 191 | 192 | 192 | 198 | 203 | **195** |
| Shear Elongation @ Break (%) | >50 | >50 | >50 | >50 | >50 | |
| **Sample ID: DT-4 \| Weld: Heat Fusion** | | | | | | |
| **Side: A** | | | | | | **Peel A** |
| Peel Strength (ppi) | 148 | 149 | 145 | 153 | 154 | **150** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Side: B** | | | | | | **Peel B** |
| Peel Strength (ppi) | 146 | 140 | 146 | 151 | 145 | **146** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Shear** | | | | | | **Shear** |
| Shear Strength (ppi) | 192 | 195 | 190 | 203 | 200 | **196** |
| Shear Elongation @ Break (%) | >50 | >50 | >50 | >50 | >50 | |

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

Date: 2024-03-19

**Mail To:**
**David Barbour**
**GHD Limited**

**Bill To:**

**GHD Limited**

**, ,**

e-mail:
david.barbour@ghd.com roxanne.hasior@ghd.com rosemarie.rocca@ghd.com

Dear Mr. Barbour,

Thank you for consulting with TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

| | |
|---|---|
| **Project:** | **Upland LF Northwin Landfill Phase 1 West** |
| TRI Job Reference Number: | **76142** |
| Material(s) Tested: | (2) Heat Fusion Weld Seam(s) |
| Test(s) Requested: | SAME DAY Peel and Shear<br>(ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.) |

| Codes: | |
|---|---|
| AD | Adhesion Failure (100% Peel) |
| BRK | Break in sheeting away from Seam edge. |
| SE | Break in sheeting at edge of seam. |
| AD-BRK | Break in sheeting after some adhesion failure - partial peel. |
| SIP | Separation in the plane of the sheet (leaving the bond intact). |
| FTB | Film tearing bond (all non "AD" failures). |
| NON-FTB | 100% peel. |

If you have any questions or require any additional information, please call us at 1-800-880-8378.
Sincerely,
sigfile
geolab

Geosynthetic Services Division
http://www.geosyntheticstestinc.com

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

## DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
## TRI Client: GHD Limited
## Project: Upland LF Northwin Landfill Phase 1 West

**Material: 60 mil. HDPE**
**SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)**
**TRI Log#: 76142**

| | TEST REPLICATE NUMBER | | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | 1 | 2 | 3 | 4 | 5 | MEAN |
| **Sample ID: DT-3 \| Weld: Heat Fusion** | | | | | | |
| **Side: A** | | | | | | **Peel A** |
| Peel Strength (ppi) | 132 | 133 | 130 | 137 | 138 | **134** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Side: B** | | | | | | **Peel B** |
| Peel Strength (ppi) | 142 | 142 | 145 | 149 | 154 | **146** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Shear** | | | | | | **Shear** |
| Shear Strength (ppi) | 191 | 192 | 192 | 198 | 203 | **195** |
| Shear Elongation @ Break (%) | >50 | >50 | >50 | >50 | >50 | |
| **Sample ID: DT-4 \| Weld: Heat Fusion** | | | | | | |
| **Side: A** | | | | | | **Peel A** |
| Peel Strength (ppi) | 148 | 149 | 145 | 153 | 154 | **150** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Side: B** | | | | | | **Peel B** |
| Peel Strength (ppi) | 146 | 140 | 146 | 151 | 145 | **146** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Shear** | | | | | | **Shear** |
| Shear Strength (ppi) | 192 | 195 | 190 | 203 | 200 | **196** |
| Shear Elongation @ Break (%) | >50 | >50 | >50 | >50 | >50 | |

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

Date: 2022-11-02

**Mail To:**
**David Barbour**
**GHD Limited**

**, ,**

**Bill To:**

**GHD Limited**
**11222680**

e-mail:
david.barbou@ghd.com roxanne.hasior@ghd.com rosemarie.rocca@ghd.com

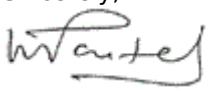
Dear Mr. Barbour,

Thank you for consulting with TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

| | |
|---|---|
| **Project:** | **Upland Landfill - Northwin Landfill Phase 1 East** |
| TRI Job Reference Number: | **76309** |
| Material(s) Tested: | (1) Heat Fusion Weld Seam(s) |
| Test(s) Requested: | SAME DAY Peel and Shear<br>(ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.) |

| Codes: | |
|---|---|
| AD | Adhesion Failure (100% Peel) |
| BRK | Break in sheeting away from Seam edge. |
| SE | Break in sheeting at edge of seam. |
| AD-BRK | Break in sheeting after some adhesion failure - partial peel. |
| SIP | Separation in the plane of the sheet (leaving the bond intact). |
| FTB | Film tearing bond (all non "AD" failures). |
| NON-FTB | 100% peel. |

If you have any questions or require any additional information, please call us at 1-800-880-8378.
Sincerely,



Mansukh Patel
Sr. Laboratory Coordinator
Geosynthetic Services Division
http://www.geosyntheticstestinc.com

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

## DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
## TRI Client: GHD Limited
## Project: Upland Landfill - Northwin Landfill Phase 1 East

**Material: 60 mil. HDPE**
**SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)**
**TRI Log#: 76309**

| | TEST REPLICATE NUMBER | | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | 1 | 2 | 3 | 4 | 5 | MEAN |
| **Sample ID: DT-5 \| Weld: Heat Fusion** | | | | | | |
| **Side: A** | | | | | | **Peel A** |
| Peel Strength (ppi) | 135 | 145 | 136 | 136 | 144 | **139** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Side: B** | | | | | | **Peel B** |
| Peel Strength (ppi) | 149 | 151 | 137 | 146 | 151 | **147** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Shear** | | | | | | **Shear** |
| Shear Strength (ppi) | 198 | 160 | 192 | 194 | 199 | **189** |
| Shear Elongation @ Break (%) | >50 | >50 | >50 | >50 | >50 | |

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

Date: 2024-03-19

**Mail To:**
**David Barbour**
**GHD Limited**

**Bill To:**

**GHD Limited**

**, ,**

e-mail:
david.barbour@ghd.com roxanne.hasior@ghd.com rosemarie.rocca@ghd.com

Dear Mr. Barbour,

Thank you for consulting with TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

| | |
|---|---|
| **Project:** | **Upland LF Northwin Landfill Phase 1 West** |
| TRI Job Reference Number: | **76309** |
| Material(s) Tested: | (1) Heat Fusion Weld Seam(s) |
| Test(s) Requested: | SAME DAY Peel and Shear<br>(ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.) |

| Codes: | |
|---|---|
| AD | Adhesion Failure (100% Peel) |
| BRK | Break in sheeting away from Seam edge. |
| SE | Break in sheeting at edge of seam. |
| AD-BRK | Break in sheeting after some adhesion failure - partial peel. |
| SIP | Separation in the plane of the sheet (leaving the bond intact). |
| FTB | Film tearing bond (all non "AD" failures). |
| NON-FTB | 100% peel. |

If you have any questions or require any additional information, please call us at 1-800-880-8378.
Sincerely,
sigfile
geolab

Geosynthetic Services Division
http://www.geosyntheticstestinc.com

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

## DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
## TRI Client: GHD Limited
## Project: Upland LF Northwin Landfill Phase 1 West

**Material: 60 mil. HDPE**
**SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)**
**TRI Log#: 76309**

| | TEST REPLICATE NUMBER | | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | 1 | 2 | 3 | 4 | 5 | MEAN |
| **Sample ID: DT-5 \| Weld: Heat Fusion** | | | | | | |
| **Side: A** | | | | | | **Peel A** |
| Peel Strength (ppi) | 135 | 145 | 136 | 136 | 144 | **139** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Side: B** | | | | | | **Peel B** |
| Peel Strength (ppi) | 149 | 151 | 137 | 146 | 151 | **147** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Shear** | | | | | | **Shear** |
| Shear Strength (ppi) | 198 | 160 | 192 | 194 | 199 | **189** |
| Shear Elongation @ Break (%) | >50 | >50 | >50 | >50 | >50 | |

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

Date: 2022-11-11

**Mail To:**
**David Barbour**
**GHD Limited**

**, ,**

**Bill To:**

**GHD Limited**
**11222680**

e-mail:
david.barbou@ghd.com roxanne.hasior@ghd.com rosemarie.rocca@ghd.com

Dear Mr. Barbour,

Thank you for consulting with TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

| | |
|---|---|
| **Project:** | **Upland Landfill - Northwin Landfill Phase 1 East** |
| TRI Job Reference Number: | **76556** |
| Material(s) Tested: | (1) Heat Fusion Weld Seam(s) |
| Test(s) Requested: | SAME DAY Peel and Shear<br>(ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.) |

| Codes: | |
|---|---|
| AD | Adhesion Failure (100% Peel) |
| BRK | Break in sheeting away from Seam edge. |
| SE | Break in sheeting at edge of seam. |
| AD-BRK | Break in sheeting after some adhesion failure - partial peel. |
| SIP | Separation in the plane of the sheet (leaving the bond intact). |
| FTB | Film tearing bond (all non "AD" failures). |
| NON-FTB | 100% peel. |

If you have any questions or require any additional information, please call us at 1-800-880-8378.
Sincerely,
sigfile
geolab

Geosynthetic Services Division
http://www.geosyntheticstestinc.com

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

## DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
## TRI Client: GHD Limited
## Project: Upland Landfill - Northwin Landfill Phase 1 East

**Material: 60 mil. HDPE**
**SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)**
**TRI Log#: 76556**

| | TEST REPLICATE NUMBER | | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | 1 | 2 | 3 | 4 | 5 | MEAN |
| **Sample ID: DT-6 \| Weld: Heat Fusion** | | | | | | |
| **Side: A** | | | | | | **Peel A** |
| Peel Strength (ppi) | 158 | 152 | 161 | 161 | 162 | **159** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Side: B** | | | | | | **Peel B** |
| Peel Strength (ppi) | 154 | 154 | 169 | 151 | 148 | **155** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Shear** | | | | | | **Shear** |
| Shear Strength (ppi) | 197 | 194 | 187 | 192 | 196 | **193** |
| Shear Elongation @ Break (%) | >50 | >50 | >50 | >50 | >50 | |

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

Date: 2024-03-19

**Mail To:**
**David Barbour**
**GHD Limited**

**Bill To:**

**GHD Limited**

**, ,**

e-mail:
david.barbour@ghd.com roxanne.hasior@ghd.com rosemarie.rocca@ghd.com

Dear Mr. Barbour,

Thank you for consulting with TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

| | |
|---|---|
| **Project:** | **Upland LF Northwin Landfill Phase 1 West** |
| TRI Job Reference Number: | **76556** |
| Material(s) Tested: | (1) Heat Fusion Weld Seam(s) |
| Test(s) Requested: | SAME DAY Peel and Shear<br>(ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.) |

| Codes: | |
|---|---|
| AD | Adhesion Failure (100% Peel) |
| BRK | Break in sheeting away from Seam edge. |
| SE | Break in sheeting at edge of seam. |
| AD-BRK | Break in sheeting after some adhesion failure - partial peel. |
| SIP | Separation in the plane of the sheet (leaving the bond intact). |
| FTB | Film tearing bond (all non "AD" failures). |
| NON-FTB | 100% peel. |

If you have any questions or require any additional information, please call us at 1-800-880-8378.
Sincerely,
sigfile
geolab

Geosynthetic Services Division
http://www.geosyntheticstestinc.com

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

## DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
## TRI Client: GHD Limited
## Project: Upland LF Northwin Landfill Phase 1 West

**Material: 60 mil. HDPE**
**SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)**
**TRI Log#: 76556**

| | TEST REPLICATE NUMBER | | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | 1 | 2 | 3 | 4 | 5 | MEAN |
| **Sample ID: DT-6 \| Weld: Heat Fusion** | | | | | | |
| **Side: A** | | | | | | **Peel A** |
| Peel Strength (ppi) | 158 | 152 | 161 | 161 | 162 | **159** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Side: B** | | | | | | **Peel B** |
| Peel Strength (ppi) | 154 | 154 | 169 | 151 | 148 | **155** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Shear** | | | | | | **Shear** |
| Shear Strength (ppi) | 197 | 194 | 187 | 192 | 196 | **193** |
| Shear Elongation @ Break (%) | >50 | >50 | >50 | >50 | >50 | |

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

Date: 2022-11-17

**Mail To:**
**David Barbour**
**GHD Limited**

**, ,**

**Bill To:**

**GHD Limited**
**11222680**

e-mail:
david.barbou@ghd.com roxanne.hasior@ghd.com rosemarie.rocca@ghd.com

Dear Mr. Barbour,

Thank you for consulting with TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

| | |
|---|---|
| **Project:** | **Upland Landfill - Northwin Landfill Phase 1 East** |
| TRI Job Reference Number: | **76686** |
| Material(s) Tested: | (1) Heat Fusion Weld Seam(s) |
| Test(s) Requested: | SAME DAY Peel and Shear<br>(ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.) |

| Codes: | |
|---|---|
| AD | Adhesion Failure (100% Peel) |
| BRK | Break in sheeting away from Seam edge. |
| SE | Break in sheeting at edge of seam. |
| AD-BRK | Break in sheeting after some adhesion failure - partial peel. |
| SIP | Separation in the plane of the sheet (leaving the bond intact). |
| FTB | Film tearing bond (all non "AD" failures). |
| NON-FTB | 100% peel. |

If you have any questions or require any additional information, please call us at 1-800-880-8378.
Sincerely,
sigfile
a-login

Geosynthetic Services Division
http://www.geosyntheticstestinc.com

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

## DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
## TRI Client: GHD Limited
## Project: Upland Landfill - Northwin Landfill Phase 1 East

**Material: 60 mil. HDPE**
**SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)**
**TRI Log#: 76686**

| | TEST REPLICATE NUMBER | | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | 1 | 2 | 3 | 4 | 5 | MEAN |
| **Sample ID: DT-7 \| Weld: Heat Fusion** | | | | | | |
| **Side: A** | | | | | | **Peel A** |
| Peel Strength (ppi) | 145 | 145 | 152 | 141 | 171 | **151** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Side: B** | | | | | | **Peel B** |
| Peel Strength (ppi) | 144 | 138 | 149 | 151 | 144 | **145** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Shear** | | | | | | **Shear** |
| Shear Strength (ppi) | 201 | 202 | 193 | 195 | 195 | **197** |
| Shear Elongation @ Break (%) | >50 | >50 | >50 | >50 | >50 | |

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

Date: 2024-03-19

**Mail To:**
**David Barbour**
**GHD Limited**

**Bill To:**

**GHD Limited**

**, ,**

e-mail:
david.barbour@ghd.com roxanne.hasior@ghd.com rosemarie.rocca@ghd.com

Dear Mr. Barbour,

Thank you for consulting with TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

| | |
|---|---|
| **Project:** | **Upland LF Northwin Landfill Phase 1 West** |
| TRI Job Reference Number: | **76686** |
| Material(s) Tested: | (1) Heat Fusion Weld Seam(s) |
| Test(s) Requested: | SAME DAY Peel and Shear<br>(ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.) |

| Codes: | |
|---|---|
| AD | Adhesion Failure (100% Peel) |
| BRK | Break in sheeting away from Seam edge. |
| SE | Break in sheeting at edge of seam. |
| AD-BRK | Break in sheeting after some adhesion failure - partial peel. |
| SIP | Separation in the plane of the sheet (leaving the bond intact). |
| FTB | Film tearing bond (all non "AD" failures). |
| NON-FTB | 100% peel. |

If you have any questions or require any additional information, please call us at 1-800-880-8378.
Sincerely,
sigfile
geolab

Geosynthetic Services Division
http://www.geosyntheticstestinc.com

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

## DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
## TRI Client: GHD Limited
## Project: Upland LF Northwin Landfill Phase 1 West

**Material: 60 mil. HDPE**
**SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)**
**TRI Log#: 76686**

| | TEST REPLICATE NUMBER | | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | 1 | 2 | 3 | 4 | 5 | MEAN |
| **Sample ID: DT-7 \| Weld: Heat Fusion** | | | | | | |
| **Side: A** | | | | | | **Peel A** |
| Peel Strength (ppi) | 145 | 145 | 152 | 141 | 171 | **151** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Side: B** | | | | | | **Peel B** |
| Peel Strength (ppi) | 144 | 138 | 149 | 151 | 144 | **145** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Shear** | | | | | | **Shear** |
| Shear Strength (ppi) | 201 | 202 | 193 | 195 | 195 | **197** |
| Shear Elongation @ Break (%) | >50 | >50 | >50 | >50 | >50 | |

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

Date: 2022-11-21

**Mail To:**
**David Barbour**
**GHD Limited**

**, ,**

**Bill To:**

**GHD Limited**
**11222680**

e-mail:
david.barbour@ghd.com roxanne.hasior@ghd.com rosemarie.rocca@ghd.com

Dear Mr. Barbour,

Thank you for consulting with TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

| | |
|---|---|
| **Project:** | **Upland Landfill - Northwin Landfill Phase 1 East** |
| TRI Job Reference Number: | **76750** |
| Material(s) Tested: | (2) Heat Fusion Weld Seam(s) |
| Test(s) Requested: | SAME DAY Peel and Shear<br>(ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.) |

| Codes: | |
|---|---|
| AD | Adhesion Failure (100% Peel) |
| BRK | Break in sheeting away from Seam edge. |
| SE | Break in sheeting at edge of seam. |
| AD-BRK | Break in sheeting after some adhesion failure - partial peel. |
| SIP | Separation in the plane of the sheet (leaving the bond intact). |
| FTB | Film tearing bond (all non "AD" failures). |
| NON-FTB | 100% peel. |

If you have any questions or require any additional information, please call us at 1-800-880-8378.
Sincerely,

Jennifer Tenney
Project Manager
Geosynthetic Services Division
http://www.geosyntheticstestinc.com

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

## DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
## TRI Client: GHD Limited
## Project: Upland Landfill - Northwin Landfill Phase 1 East

**Material: 60 mil. HDPE**
**SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)**
**TRI Log#: 76750**

| | TEST REPLICATE NUMBER | | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | 1 | 2 | 3 | 4 | 5 | MEAN |
| **Sample ID: DT-8 \| Weld: Heat Fusion** | | | | | | |
| **Side: A** | | | | | | **Peel A** |
| Peel Strength (ppi) | 155 | 153 | 155 | 163 | 158 | **157** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Side: B** | | | | | | **Peel B** |
| Peel Strength (ppi) | 167 | 161 | 168 | 141 | 175 | **162** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Shear** | | | | | | **Shear** |
| Shear Strength (ppi) | 201 | 208 | 200 | 194 | 195 | **200** |
| Shear Elongation @ Break (%) | >50 | >50 | >50 | >50 | >50 | |
| **Sample ID: DT-9 \| Weld: Heat Fusion** | | | | | | |
| **Side: A** | | | | | | **Peel A** |
| Peel Strength (ppi) | 160 | 135 | 145 | 172 | 174 | **157** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Side: B** | | | | | | **Peel B** |
| Peel Strength (ppi) | 161 | 167 | 166 | 171 | 166 | **166** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Shear** | | | | | | **Shear** |
| Shear Strength (ppi) | 193 | 190 | 191 | 191 | 198 | **193** |
| Shear Elongation @ Break (%) | >50 | >50 | >50 | >50 | >50 | |

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

Date: 2024-03-19

**Mail To:**
**David Barbour**
**GHD Limited**

**Bill To:**

**GHD Limited**

**, ,**

e-mail:
david.barbour@ghd.com roxanne.hasior@ghd.com rosemarie.rocca@ghd.com

Dear Mr. Barbour,

Thank you for consulting with TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

| | |
|---|---|
| **Project:** | **Upland LF Northwin Landfill Phase 1 West** |
| TRI Job Reference Number: | **76750** |
| Material(s) Tested: | (2) Heat Fusion Weld Seam(s) |
| Test(s) Requested: | SAME DAY Peel and Shear<br>(ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.) |

| Codes: | |
|---|---|
| AD | Adhesion Failure (100% Peel) |
| BRK | Break in sheeting away from Seam edge. |
| SE | Break in sheeting at edge of seam. |
| AD-BRK | Break in sheeting after some adhesion failure - partial peel. |
| SIP | Separation in the plane of the sheet (leaving the bond intact). |
| FTB | Film tearing bond (all non "AD" failures). |
| NON-FTB | 100% peel. |

If you have any questions or require any additional information, please call us at 1-800-880-8378.
Sincerely,
sigfile
geolab

Geosynthetic Services Division
http://www.geosyntheticstestinc.com

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

# DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
## TRI Client: GHD Limited
## Project: Upland LF Northwin Landfill Phase 1 West

**Material: 60 mil. HDPE**
**SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)**
**TRI Log#: 76750**

| | TEST REPLICATE NUMBER | | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | 1 | 2 | 3 | 4 | 5 | MEAN |
| **Sample ID: DT-8 \| Weld: Heat Fusion** | | | | | | |
| **Side: A** | | | | | | **Peel A** |
| Peel Strength (ppi) | 155 | 153 | 155 | 163 | 158 | **157** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Side: B** | | | | | | **Peel B** |
| Peel Strength (ppi) | 167 | 161 | 168 | 141 | 175 | **162** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Shear** | | | | | | **Shear** |
| Shear Strength (ppi) | 201 | 208 | 200 | 194 | 195 | **200** |
| Shear Elongation @ Break (%) | >50 | >50 | >50 | >50 | >50 | |
| **Sample ID: DT-9 \| Weld: Heat Fusion** | | | | | | |
| **Side: A** | | | | | | **Peel A** |
| Peel Strength (ppi) | 160 | 135 | 145 | 172 | 174 | **157** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Side: B** | | | | | | **Peel B** |
| Peel Strength (ppi) | 161 | 167 | 166 | 171 | 166 | **166** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Shear** | | | | | | **Shear** |
| Shear Strength (ppi) | 193 | 190 | 191 | 191 | 198 | **193** |
| Shear Elongation @ Break (%) | >50 | >50 | >50 | >50 | >50 | |

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

Date: 2022-11-23

**Mail To:**
**David Barbour**
**GHD Services**

**, ,**

**Bill To:**

**GHD Services**
**11222680**

e-mail:
david.barbour@ghd.com roxanne.hasior@ghd.com rosemarie.rocca@ghd.com

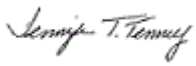
Dear Barbour,

Thank you for consulting with TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

| | |
|---|---|
| **Project:** | **Upland LF Northwin LF Phase 1 West** |
| TRI Job Reference Number: | **76826** |
| Material(s) Tested: | (1) Heat Fusion Weld Seam(s) |
| Test(s) Requested: | SAME DAY Peel and Shear<br>(ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.) |

| Codes: | |
|---|---|
| AD | Adhesion Failure (100% Peel) |
| BRK | Break in sheeting away from Seam edge. |
| SE | Break in sheeting at edge of seam. |
| AD-BRK | Break in sheeting after some adhesion failure - partial peel. |
| SIP | Separation in the plane of the sheet (leaving the bond intact). |
| FTB | Film tearing bond (all non "AD" failures). |
| NON-FTB | 100% peel. |

If you have any questions or require any additional information, please call us at 1-800-880-8378.
Sincerely,



Jennifer Tenney
Project Manager
Geosynthetic Services Division
http://www.geosyntheticstestinc.com

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

## DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
## TRI Client: GHD Services
## Project: Upland LF Northwin LF Phase 1 West

**Material: 60 mil. HDPE**
**SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)**
**TRI Log#: 76826**

| | TEST REPLICATE NUMBER | | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | 1 | 2 | 3 | 4 | 5 | MEAN |
| **Sample ID: DT-10 \| Weld: Heat Fusion** | | | | | | |
| **Side: A** | | | | | | **Peel A** |
| Peel Strength (ppi) | 139 | 150 | 145 | 169 | 147 | **150** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Side: B** | | | | | | **Peel B** |
| Peel Strength (ppi) | 158 | 150 | 156 | 157 | 160 | **156** |
| Peel Incursion (%) | <5 | <5 | <5 | <5 | <5 | |
| Peel Locus Of Failure Code | SE | SE | SE | SE | SE | |
| Peel NSF Failure Code | FTB | FTB | FTB | FTB | FTB | |
| **Shear** | | | | | | **Shear** |
| Shear Strength (ppi) | 203 | 202 | 193 | 195 | 195 | **198** |
| Shear Elongation @ Break (%) | >50 | >50 | >50 | >50 | >50 | |

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

# Appendix F

## Field Inspection Notes

## Matthew Senior

**From:** Roxy Hasior
**Sent:** Friday, October 27, 2023 10:34 AM
**To:** Matthew Senior
**Subject:** FW: Upland Landfill Drainrock Placement June 6th

**CompleteRepository:** 088877
**Description:** Upland Landfill
**JobNo:** 8877
**OperatingCentre:** 08
**RepoEmail:** 088877@ghd.com
**RepoType:** Project

---

**From:** David Barbour <David.Barbour@ghd.com>
**Sent:** Wednesday, June 7, 2023 8:56 AM
**To:** Roxy Hasior <Roxanne.Hasior@ghd.com>; Rose Marie Rocca <RoseMarie.Rocca@ghd.com>
**Subject:** Upland Landfill Drainrock Placement June 6th

Hi Rose and Roxy,

I received a text from Terry Stuart yesterday that they were placing drain rock in the new cell at the Upland Landfill and that I should come do an inspection. I went to site at 3 pm to take a look.

Crew had begun placing drain rock on the cell floor. Terry informed me the material is from the Upland pit and GHD had received sieve analysis results last year.

Activities had stopped for the day when I arrived.

Generally it looked like they were following proper procedures for filling. A roadway higher than1 m high was being used to haul material into the cell before it was spread.

The drain rock contained some large stones some as big as 8". It was mostly clean, but not washed, but it looked like the operators had scoped up some material from the pit floor (4th photo below).

The old landfill has been completely excavated (5th photo) an material moved to the new cell.

Let me know if you have any questions,


**David Barbour**
**P. Eng.**
**Construction Engineering Inspector & Waste Management Engineer**

**GHD**
**Proudly employee-owned | ghd.com**
138 East 7th Avenue Suite 100 Vancouver British Columbia V5T 1M6 Canada
**T** 778 347-1339 **E** david.barbour@ghd.com



➔ **The Power of Commitment**

**Connect**

Please consider the environment before printing this email

CASE
A30D

## David Barbour
**P. Eng.**
**Construction Engineering Inspector & Waste Management Engineer**

## GHD
**Proudly employee-owned | ghd.com**
138 East 7th Avenue Suite 100 Vancouver British Columbia V5T 1M6 Canada
**T** 778 347-1339 **E** david.barbour@ghd.com


**The Power of Commitment**

**Connect**


Please consider the environment before printing this email

## Matthew Senior

**From:** Roxy Hasior
**Sent:** Friday, October 27, 2023 10:33 AM
**To:** Matthew Senior
**Subject:** FW: Upland Landfill June 13

**CompleteRepository:** 088877
**Description:** Upland Landfill
**JobNo:** 8877
**OperatingCentre:** 08
**RepoEmail:** 088877@ghd.com
**RepoType:** Project

---

**From:** David Barbour <David.Barbour@ghd.com>
**Sent:** Friday, June 16, 2023 11:01 AM
**To:** Roxy Hasior <Roxanne.Hasior@ghd.com>; Rose Marie Rocca <RoseMarie.Rocca@ghd.com>
**Subject:** Upland Landfill June 13

Hi Rose and Roxy,

I inspected the Upland landfill on June 13.

I provided direction to excavator operators to have geocomposite installed to the grade break and tied into the drainrock at the cell floor where slopes have been adjusted due to the fill on top of the bedrock on the west side of the cell. (First two photos below)

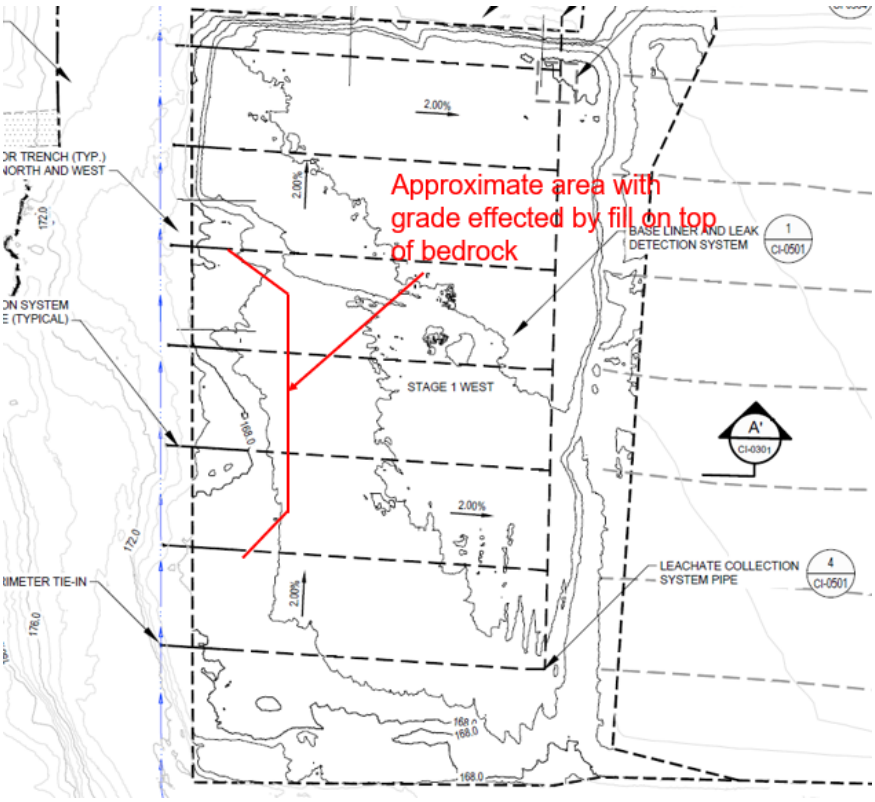
The operators were mounding drain rock on top of the leachate pipes in the bottom of the cell after exposing top of pipe by hand to confirm exact location. Depth of coverage was acceptable >300 mm .

I estimate an area about 20 x 30 m on the south east part of the cell has some silty sand mixed with the drainrock. Approximately 20% of the loads hauled into this area appear to be affected. Northwin has spoken to the operators loading the material and asked them to avoid loading material that is sitting directly on the pit floor..

Most of the oversized rock had been removed from the cell.

The final two photos are of the old landfill. Most of the waste has been remove although some cleanup is required.

Let me know if you have any questions,


Approximate area with grade effected by fill on top of bedrock
2.00%
STAGE 1 WEST
BASE LINER AND LEAK DETECTION SYSTEM
1
CI-0501
A'
CI-0301
LEACHATE COLLECTION SYSTEM PIPE
4
CI-0501
172.0
168.0
176.0

CAT

## David Barbour
**P. Eng.**
**Construction Engineering Inspector & Waste Management Engineer**

## GHD
**Proudly employee-owned | ghd.com**
138 East 7th Avenue Suite 100 Vancouver British Columbia V5T 1M6 Canada
**T** 778 347-1339 **E** david.barbour@ghd.com


**The Power of Commitment**

**Connect**


Please consider the environment before printing this email

## Matthew Senior

**From:** Roxy Hasior
**Sent:** Wednesday, November 1, 2023 2:11 PM
**To:** Matthew Senior
**Cc:** David Barbour
**Subject:** FW: Uplands Landfill Update week of July 3-7

**CompleteRepository:** 088877
**Description:** Upland Landfill
**JobNo:** 8877
**OperatingCentre:** 08
**RepoEmail:** 088877@ghd.com
**RepoType:** Project

---

**From:** David Barbour <David.Barbour@ghd.com>
**Sent:** Sunday, July 9, 2023 5:16 PM
**To:** Roxy Hasior <Roxanne.Hasior@ghd.com>; Rose Marie Rocca <RoseMarie.Rocca@ghd.com>; Riley Kieser <Riley.Kieser@ghd.com>
**Subject:** Uplands Landfill Update week of July 3-7

Hello all,

Uplands is near completion of Cell1 West.

Remaining work is to:

- install drainrock in the sump
- complete woven geotextile installation (95% complete to date)
- Install leachate pump and related infrastructure

Work completed last week included:

- Regraded a portion of the top of effluent holding pond and installed geotextile and HDPE liner on top of existing liner.
- Completed geo-composite installation on west slope of Cell 1 West and tie in to drain rock
- Installed 2 leachate pump out riser pipes

There are a few things we should discuss when I am back after July 18th.

- Uplands has installed a pipe connecting to one of the leachate collection pipes that ties into Cell 1 East sump with the intention of pumping from Cell 1 West sump into the pipe.
- We are waiting for the final QA data from Joe Cassidy which includes the recent work on the effluent pond
- I am not sure what information is outstanding from Uplands such as material submittals and as built surveys

Geotextile on effluent pond before HDPE

HDPE liner with previously installed liner visible

Effluent pond after HDPE installation

Cell 1 West Sump ready for drainrock installation

HDPE pipe connected to leachate collection pipe in Cell 1 East


**David Barbour**
**P. Eng.**
**Construction Engineering Inspector & Waste Management Engineer**

**GHD**
**Proudly employee-owned | ghd.com**
138 East 7th Avenue Suite 100 Vancouver British Columbia V5T 1M6 Canada
**T** 778 347-1339 **E** david.barbour@ghd.com



**The Power of Commitment**

**Connect**

## Matthew Senior

**From:** David Barbour
**Sent:** Tuesday, September 26, 2023 4:50 PM
**To:** Matthew Senior; Rose Marie Rocca; Roxy Hasior
**Cc:** Deacon Liddy
**Subject:** Upland Landfill Site Inspection Sept 22

**CompleteRepository:** 088877
**Description:** Upland Landfill
**JobNo:** 8877
**OperatingCentre:** 08
**RepoEmail:** 088877@ghd.com
**RepoType:** Project

Hello all,

Here are my notes and photos with descriptions regarding Friday's site inspection.

Work completed

- The sump area was filled with drain rock and the geotextile installed before waste was placed.
- One lift of waste has been place over entire floor of landfill.
- A second lift has been started on the north west area
- Concrete slab poured for pump station enclosure
- A berm has been built along the top west and south edge of landfill to divert surface water from flowing onto the lined area

Next steps

- Construct pump station enclosure
- Install pump, wiring, ect.

Let me know if you have any questions. I am available tomorrow but away from Sept 28 – Oct 10th. You can reach my by call or text during that time.

Cell 1 West viewed from northwest corner

Leachate and leak detection risers / concrete poured for pump station

Leachate and leak detection risers / concrete poured for pump station

Pipe directing leachate to Cell 1 East

Cell 1 West from north east corner

West perimeter road. Berm to prevent surface water run-on visible on right side of photo

**Z**
South end of Cell 2


## David Barbour
**P. Eng.**
**Construction Engineering Inspector & Waste Management Engineer**

## GHD
**Proudly employee-owned | ghd.com**
138 East 7th Avenue Suite 100 Vancouver British Columbia V5T 1M6 Canada
**T** 778 347-1339 **E** david.barbour@ghd.com


➔ **The Power of Commitment**

**Connect**

Please consider the environment before printing this email

# Field Notes

| | | | |
|---|---|---|---|
| **NAME:** | David Barbour | **PROJECT NUMBER:** | 88877 |
| **DATE/TIME:** | 11/8/2022 8:00 | **SITE:** | Upland landfill |
| **PERSONNEL ON SITE:** | Joe Cassidy, Brian Fagan, Liner crew | | |
| **WEATHER CONDITIONS:** | Mixed sun and cloud, -2 C | | |

**HASP for this project can be found on project portal**

**SITE VISIT OBJECTIVE:**
- Observe construction activities

**SITE NOTES / PROGRESS:**
-Crew cleared snow from geotextiled area west of sump yesterday. No geosythetics installed yesterday due to snow
-Crew placing GCL and HDPE panels # 34 and 35 on small area where primary liner was placed west of sump. Slope above this area has both layers of HDPE installed. Area being lined to prevent run-off from lined slope flowing into leak detection layer in sump. Area approximately 7m x 10m.
-Slow progress due to snow and frozen conditions

**Next Steps**

- resume geosynthetic installation when weather permits

**OUTSTANDING INFORMATION / NEW ISSUES:**
-Snow and frozen conditions making geosythetic installation inpracticle

**ATTACHMENTS / SKETCHES (Site Photos To Be Filed Separately):**

NOTE: All site photos to be filed in the Project Folder on the Project Portal.

# Field Notes

| | | | |
|---|---|---|---|
| **NAME:** | David Barbour | **PROJECT NUMBER:** | 88877 |
| **DATE/TIME:** | 11/8/2022 8:00 | **SITE:** | Upland landfill |
| **PERSONNEL ON SITE:** | Joe Cassidy, Brian Fagan, Liner crew | | |
| **WEATHER CONDITIONS:** | Mixed sun and cloud, -2 C | | |

**HASP for this project can be found on project portal**

**SITE VISIT OBJECTIVE:**
- Observe construction activities

**SITE NOTES / PROGRESS:**
-Crew cleared snow from geotextiled area west of sump yesterday. No geosythetics installed yesterday due to snow
-Crew placing GCL and HDPE panels # 34 and 35 on small area where primary liner was placed west of sump. Slope above this area has both layers of HDPE installed. Area being lined to prevent run-off from lined slope flowing into leak detection layer in sump. Area approximately 7m x 10m.
-Slow progress due to snow and frozen conditions

**Next Steps**

- resume geosynthetic installation when weather permits

**OUTSTANDING INFORMATION / NEW ISSUES:**
-Snow and frozen conditions making geosythetic installation inpracticle

**ATTACHMENTS / SKETCHES (Site Photos To Be Filed Separately):**

NOTE: All site photos to be filed in the Project Folder on the Project Portal.

# Field Notes

| | | | |
|---|---|---|---|
| **NAME:** | David Barbour | **PROJECT NUMBER:** | 88877 |
| **DATE/TIME:** | 11/10/2022 12:30 | **SITE:** | Upland landfill |
| **PERSONNEL ON SITE:** | Joe Cassidy, Liner crew | | |
| **WEATHER CONDITIONS:** | Cloudy 1C | | |

**HASP for this project can be found on project portal**

**SITE VISIT OBJECTIVE:**
- Observe construction activities

**SITE NOTES / PROGRESS:**
-Geotextile, GCL and HDPE liner on north-west area of landfill yesterday
- Geocomposite being placed on north end of west slope

**Next Steps**

- continue placing geosythetics on north west area of landfill

**OUTSTANDING INFORMATION / NEW ISSUES:**

**ATTACHMENTS / SKETCHES (Site Photos To Be Filed Separately):**

NOTE: All site photos to be filed in the Project Folder on the Project Portal.

# Field Notes

| | | | |
|---|---|---|---|
| **NAME:** | David Barbour | **PROJECT NUMBER:** | 88877 |
| **DATE/TIME:** | 11/10/2022 12:30 | **SITE:** | Upland landfill |
| **PERSONNEL ON SITE:** | Joe Cassidy, Liner crew | | |
| **WEATHER CONDITIONS:** | Cloudy 1C | | |

**HASP for this project can be found on project portal**

**SITE VISIT OBJECTIVE:**
- Observe construction activities

**SITE NOTES / PROGRESS:**
-Geotextile, GCL and HDPE liner on north-west area of landfill yesterday
- Geocomposite being placed on north end of west slope

**Next Steps**

- continue placing geosythetics on north west area of landfill

**OUTSTANDING INFORMATION / NEW ISSUES:**

**ATTACHMENTS / SKETCHES (Site Photos To Be Filed Separately):**

NOTE: All site photos to be filed in the Project Folder on the Project Portal.

# Field Notes

| | | | |
|---|---|---|---|
| **NAME:** | David Barbour | **PROJECT NUMBER:** | 88877 |
| **DATE/TIME:** | 11/11/2022 12:30 | **SITE:** | Upland landfill |
| **PERSONNEL ON SITE:** | Joe Cassidy, Brian Fagan, Liner crew | | |
| **WEATHER CONDITIONS:** | Snowing 1C | | |

**HASP for this project can be found on project portal**

**SITE VISIT OBJECTIVE:**
- Observe construction activities

**SITE NOTES / PROGRESS:**
-Liner Crew cleaning up noth west area of landfill floor
-Installing second 50 mm leachate detection port on north slope
-Shut down operation due to snow

**Next Steps**

- resume geosythetic installation when weather permits

**OUTSTANDING INFORMATION / NEW ISSUES:**

**ATTACHMENTS / SKETCHES (Site Photos To Be Filed Separately):**

NOTE: All site photos to be filed in the Project Folder on the Project Portal.

# Field Notes

| | | | |
|---|---|---|---|
| **NAME:** | David Barbour | **PROJECT NUMBER:** | 88877 |
| **DATE/TIME:** | 11/11/2022 12:30 | **SITE:** | Upland landfill |
| **PERSONNEL ON SITE:** | Joe Cassidy, Brian Fagan, Liner crew | | |
| **WEATHER CONDITIONS:** | Snowing 1C | | |

**HASP for this project can be found on project portal**

**SITE VISIT OBJECTIVE:**
- Observe construction activities

**SITE NOTES / PROGRESS:**
-Liner Crew cleaning up noth west area of landfill floor
-Installing second 50 mm leachate detection port on north slope
-Shut down operation due to snow

**Next Steps**

- resume geosythetic installation when weather permits

**OUTSTANDING INFORMATION / NEW ISSUES:**

**ATTACHMENTS / SKETCHES (Site Photos To Be Filed Separately):**

NOTE: All site photos to be filed in the Project Folder on the Project Portal.

# Field Notes

| | | | |
|---|---|---|---|
| **NAME:** | David Barbour | **PROJECT NUMBER:** | 88877 |
| **DATE/TIME:** | 11/12/2022 8:00 | **SITE:** | Upland landfill |
| **PERSONNEL ON SITE:** | Joe Cassidy, Brian Fagan, Liner crew | | |
| **WEATHER CONDITIONS:** | Overcast 1C | | |

**HASP for this project can be found on project portal**

**SITE VISIT OBJECTIVE:**
- Observe construction activities

**SITE NOTES / PROGRESS:**
-Liner crew installing geotextile, GCL and HDPE on south west area of landfill
-tieing liner into anchor trench on slope between top of west berm and south transition berm

**Next Steps**

- complete installation of geosythetics on south west area of landfill

**OUTSTANDING INFORMATION / NEW ISSUES:**

**ATTACHMENTS / SKETCHES (Site Photos To Be Filed Separately):**

NOTE: All site photos to be filed in the Project Folder on the Project Portal.

# Field Notes

| | | | |
|---|---|---|---|
| **NAME:** | David Barbour | **PROJECT NUMBER:** | 88877 |
| **DATE/TIME:** | 11/12/2022 8:00 | **SITE:** | Upland landfill |
| **PERSONNEL ON SITE:** | Joe Cassidy, Brian Fagan, Liner crew | | |
| **WEATHER CONDITIONS:** | Overcast 1C | | |

**HASP for this project can be found on project portal**

**SITE VISIT OBJECTIVE:**
- Observe construction activities

**SITE NOTES / PROGRESS:**
-Liner crew installing geotextile, GCL and HDPE on south west area of landfill
-tieing liner into anchor trench on slope between top of west berm and south transition berm

**Next Steps**

- complete installation of geosythetics on south west area of landfill

**OUTSTANDING INFORMATION / NEW ISSUES:**

**ATTACHMENTS / SKETCHES (Site Photos To Be Filed Separately):**

NOTE: All site photos to be filed in the Project Folder on the Project Portal.

# Field Notes

| | | | |
|---|---|---|---|
| **NAME:** | David Barbour | **PROJECT NUMBER:** | 88877 |
| **DATE/TIME:** | 11/14/2022 9:30 | **SITE:** | Upland landfill |
| **PERSONNEL ON SITE:** | Joe Cassidy, Brian Fagan, Liner crew | | |
| **WEATHER CONDITIONS:** | Foggy 0C | | |

**HASP for this project can be found on project portal**

**SITE VISIT OBJECTIVE:**
- Observe construction activities

**SITE NOTES / PROGRESS:**
-Crew installed 3 HDPE pannels 43-45 in south west area of landfill on Saturday Nov 12.
-Crew installed HDPE panels 29-32 on norrth west corner of landfill on Saturday Nov 12
-Geotextile and GCL installed in south west area up edge of fill around ramp
- Installing first HDPE layer on south west area
-Cut DT-7 on panels 45/46 (Smooth / Texture) and sent to lab

**Next Steps**

- complete installation of geosythetics on south west area of landfill

**OUTSTANDING INFORMATION / NEW ISSUES:**

**ATTACHMENTS / SKETCHES (Site Photos To Be Filed Separately):**

NOTE: All site photos to be filed in the Project Folder on the Project Portal.

# Field Notes

| | | | |
|---|---|---|---|
| **NAME:** | David Barbour | **PROJECT NUMBER:** | 88877 |
| **DATE/TIME:** | 11/14/2022 9:30 | **SITE:** | Upland landfill |
| **PERSONNEL ON SITE:** | Joe Cassidy, Brian Fagan, Liner crew | | |
| **WEATHER CONDITIONS:** | Foggy 0C | | |

**HASP for this project can be found on project portal**

**SITE VISIT OBJECTIVE:**
- Observe construction activities

**SITE NOTES / PROGRESS:**
-Crew installed 3 HDPE pannels 43-45 in south west area of landfill on Saturday Nov 12.
-Crew installed HDPE panels 29-32 on norrth west corner of landfill on Saturday Nov 12
-Geotextile and GCL installed in south west area up edge of fill around ramp
- Installing first HDPE layer on south west area
-Cut DT-7 on panels 45/46 (Smooth / Texture) and sent to lab

**Next Steps**

- complete installation of geosythetics on south west area of landfill

**OUTSTANDING INFORMATION / NEW ISSUES:**

**ATTACHMENTS / SKETCHES (Site Photos To Be Filed Separately):**

NOTE: All site photos to be filed in the Project Folder on the Project Portal.

# Field Notes

| | | | |
|---|---|---|---|
| **NAME:** | David Barbour | **PROJECT NUMBER:** | 88877 |
| **DATE/TIME:** | 11/15/2022 7:30 | **SITE:** | Upland landfill |
| **PERSONNEL ON SITE:** | Joe Cassidy, Brian Fagan, Liner crew | | |
| **WEATHER CONDITIONS:** | Sunny 0C | | |

**HASP for this project can be found on project portal**

**SITE VISIT OBJECTIVE:**
- Observe construction activities

**SITE NOTES / PROGRESS:**
-Grew installing GCL and HDPE on South west area up to edge of ramp

**Next Steps**

- place fill in ramp area to blend grades and allow for anchor trench tie in
- complete installation of geosythetics on south west area of landfill

**OUTSTANDING INFORMATION / NEW ISSUES:**

**ATTACHMENTS / SKETCHES (Site Photos To Be Filed Separately):**

NOTE: All site photos to be filed in the Project Folder on the Project Portal.

# Field Notes

| | | | |
|---|---|---|---|
| **NAME:** | David Barbour | **PROJECT NUMBER:** | 88877 |
| **DATE/TIME:** | 11/15/2022 7:30 | **SITE:** | Upland landfill |
| **PERSONNEL ON SITE:** | Joe Cassidy, Brian Fagan, Liner crew | | |
| **WEATHER CONDITIONS:** | Sunny 0C | | |

**HASP for this project can be found on project portal**

**SITE VISIT OBJECTIVE:**
- Observe construction activities

**SITE NOTES / PROGRESS:**
-Grew installing GCL and HDPE on South west area up to edge of ramp

**Next Steps**

- place fill in ramp area to blend grades and allow for anchor trench tie in
- complete installation of geosythetics on south west area of landfill

**OUTSTANDING INFORMATION / NEW ISSUES:**

**ATTACHMENTS / SKETCHES (Site Photos To Be Filed Separately):**

NOTE: All site photos to be filed in the Project Folder on the Project Portal.

# Field Notes

| | | | |
|---|---|---|---|
| **NAME:** | David Barbour | **PROJECT NUMBER:** | 88877 |
| **DATE/TIME:** | 11/16/2022 9:00 | **SITE:** | Upland landfill |
| **PERSONNEL ON SITE:** | Joe Cassidy, Brian Fagan, Liner crew | | |
| **WEATHER CONDITIONS:** | Sunny 0C | | |

**HASP for this project can be found on project portal**

**SITE VISIT OBJECTIVE:**
- Observe construction activities

**SITE NOTES / PROGRESS:**
-Ramp area filled and remainder of anchor trench dug on top of west slope
-Grew installing GCL and HDPE on South west area were ramp was filled over
-Inspected proposed drainrock material in Upland pit wil Terry

**Next Steps**

- complete installation of geosythetics on south west area of landfill

**OUTSTANDING INFORMATION / NEW ISSUES:**

**ATTACHMENTS / SKETCHES (Site Photos To Be Filed Separately):**

NOTE: All site photos to be filed in the Project Folder on the Project Portal.

# Field Notes

| | | | |
|---|---|---|---|
| **NAME:** | David Barbour | **PROJECT NUMBER:** | 88877 |
| **DATE/TIME:** | 11/16/2022 9:00 | **SITE:** | Upland landfill |
| **PERSONNEL ON SITE:** | Joe Cassidy, Brian Fagan, Liner crew | | |
| **WEATHER CONDITIONS:** | Sunny 0C | | |

**HASP for this project can be found on project portal**

**SITE VISIT OBJECTIVE:**
- Observe construction activities

**SITE NOTES / PROGRESS:**
-Ramp area filled and remainder of anchor trench dug on top of west slope
-Grew installing GCL and HDPE on South west area were ramp was filled over
-Inspected proposed drainrock material in Upland pit wil Terry

**Next Steps**

- complete installation of geosythetics on south west area of landfill

**OUTSTANDING INFORMATION / NEW ISSUES:**

**ATTACHMENTS / SKETCHES (Site Photos To Be Filed Separately):**

NOTE: All site photos to be filed in the Project Folder on the Project Portal.

# Field Notes

| | | | |
|---|---|---|---|
| **NAME:** | David Barbour | **PROJECT NUMBER:** | 88877 |
| **DATE/TIME:** | 11/17/2022 13:30 | **SITE:** | Upland landfill |
| **PERSONNEL ON SITE:** | Joe Cassidy, Liner crew, Brian Fagan | | |
| **WEATHER CONDITIONS:** | Sunny 3C | | |

**HASP for this project can be found on project portal**

**SITE VISIT OBJECTIVE:**
- Observe cnstruction activities

**SITE NOTES / PROGRESS:**
-Installing first layer of Geotextile, GCL and HDPE on former ramp area on west slope

**Next Steps**

-Install remaining geosythetic layers in middle on former ramp area

**OUTSTANDING INFORMATION / NEW ISSUES:**

**ATTACHMENTS / SKETCHES (Site Photos To Be Filed Separately):**

NOTE: All site photos to be filed in the Project Folder on the Project Portal.

# Field Notes

| | | | |
|---|---|---|---|
| **NAME:** | David Barbour | **PROJECT NUMBER:** | 88877 |
| **DATE/TIME:** | 11/17/2022 13:30 | **SITE:** | Upland landfill |
| **PERSONNEL ON SITE:** | Joe Cassidy, Liner crew, Brian Fagan | | |
| **WEATHER CONDITIONS:** | Sunny 3C | | |

**HASP for this project can be found on project portal**

**SITE VISIT OBJECTIVE:**
- Observe cnstruction activities

**SITE NOTES / PROGRESS:**
-Installing first layer of Geotextile, GCL and HDPE on former ramp area on west slope

**Next Steps**

-Install remaining geosythetic layers in middle on former ramp area

**OUTSTANDING INFORMATION / NEW ISSUES:**

**ATTACHMENTS / SKETCHES (Site Photos To Be Filed Separately):**

NOTE: All site photos to be filed in the Project Folder on the Project Portal.

# Field Notes

| | | | |
|---|---|---|---|
| **NAME:** | David Barbour | **PROJECT NUMBER:** | 88877 |
| **DATE/TIME:** | 11/18/2022 7:00 | **SITE:** | Upland landfill |
| **PERSONNEL ON SITE:** | Joe Cassidy, Brian Fagan, Liner crew | | |
| **WEATHER CONDITIONS:** | Clear Sky -2C | | |

**HASP for this project can be found on project portal**

**SITE VISIT OBJECTIVE:**
- Observe construction activities

**SITE NOTES / PROGRESS:**
-Crew installing first layer of GCL and HDPE in middle of west slope and panels number 53, 54 and 55 completing first layer of HDPE
--Grabbed destructive tests 8 - panels 49/50 of upper HDPE layer and 9 Panel 53/54 of lowerr HDPE layer

**Next Steps**

- Install GCL, Geocomposite, and HDPE in middle area of west slope

**OUTSTANDING INFORMATION / NEW ISSUES:**

**ATTACHMENTS / SKETCHES (Site Photos To Be Filed Separately):**

NOTE: All site photos to be filed in the Project Folder on the Project Portal.

# Field Notes

| | | | |
|---|---|---|---|
| **NAME:** | David Barbour | **PROJECT NUMBER:** | 88877 |
| **DATE/TIME:** | 11/18/2022 7:00 | **SITE:** | Upland landfill |
| **PERSONNEL ON SITE:** | Joe Cassidy, Brian Fagan, Liner crew | | |
| **WEATHER CONDITIONS:** | Clear Sky -2C | | |

**HASP for this project can be found on project portal**

**SITE VISIT OBJECTIVE:**
- Observe construction activities

**SITE NOTES / PROGRESS:**
-Crew installing first layer of GCL and HDPE in middle of west slope and panels number 53, 54 and 55 completing first layer of HDPE
--Grabbed destructive tests 8 - panels 49/50 of upper HDPE layer and 9 Panel 53/54 of lowerr HDPE layer

**Next Steps**

- Install GCL, Geocomposite, and HDPE in middle area of west slope

**OUTSTANDING INFORMATION / NEW ISSUES:**

**ATTACHMENTS / SKETCHES (Site Photos To Be Filed Separately):**

NOTE: All site photos to be filed in the Project  Folder on the Project Portal.

# Field Notes

| | | | |
|---|---|---|---|
| **NAME:** | David Barbour | **PROJECT NUMBER:** | 88877 |
| **DATE/TIME:** | 11/19/2022 8:00 | **SITE:** | Upland landfill |
| **PERSONNEL ON SITE:** | Joe Cassidy, Liner crew | | |
| **WEATHER CONDITIONS:** | Sunny -3C | | |

**HASP for this project can be found on project portal**

**SITE VISIT OBJECTIVE:**
- Observe construction activities

**SITE NOTES / PROGRESS:**
-Crew placing final GCL on middle of west slope
-Installed second 50 mm HDPE port on west slope
-Installed final 3.5 HDPE panels numbers 53-56 on middle of west slope
-Cut destructive test 10 from panels 55/56

**Next Steps**

- Prep west side of base of landfill for geotextile installation
- Install geocomposite on west slope
- Install remainder of 200 mm perforated leachate collection pipe

**OUTSTANDING INFORMATION / NEW ISSUES:**

**ATTACHMENTS / SKETCHES (Site Photos To Be Filed Separately):**

NOTE: All site photos to be filed in the Project Folder on the Project Portal.

# Field Notes

| | | | |
|---|---|---|---|
| **NAME:** | David Barbour | **PROJECT NUMBER:** | 88877 |
| **DATE/TIME:** | 11/19/2022 8:00 | **SITE:** | Upland landfill |
| **PERSONNEL ON SITE:** | Joe Cassidy, Liner crew | | |
| **WEATHER CONDITIONS:** | Sunny -3C | | |

**HASP for this project can be found on project portal**

**SITE VISIT OBJECTIVE:**
- Observe construction activities

**SITE NOTES / PROGRESS:**
-Crew placing final GCL on middle of west slope
-Installed second 50 mm HDPE port on west slope
-Installed final 3.5 HDPE panels numbers 53-56 on middle of west slope
-Cut destructive test 10 from panels 55/56

**Next Steps**

- Prep west side of base of landfill for geotextile installation
- Install geocomposite on west slope
- Install remainder of 200 mm perforated leachate collection pipe

**OUTSTANDING INFORMATION / NEW ISSUES:**

**ATTACHMENTS / SKETCHES (Site Photos To Be Filed Separately):**

NOTE: All site photos to be filed in the Project Folder on the Project Portal.

ghd.com

→ The Power of Commitment

# Appendix C

## Cell 1 East, Cell 1 West and Ponds Commissioning Report

# Cell 1 East, Cell 1 West & Ponds Commissioning Report

## Northwin Landfill

Northwin Environmental

22 March 2024

DRAFT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Project name** | | 088877 Upland Landfill | | | | | |
| **Document title** | | Cell 1 East, Cell 1 West & Ponds Commissioning Report \| Northwin Landfill | | | | | |
| **Project number** | | 11222680 | | | | | |
| **File name** | | 11222680-RPT-3-Cell 1 East, Cell 1 West & Ponds Commissioning Report.docx | | | | | |
| **Status Code** | **Revision** | **Author** | **Reviewer** | | **Approved for issue** | | |
| | | | **Name** | **Signature** | **Name** | **Signature** | **Date** |
| S3 | 00 | Toby Wong | Deacon Liddy | | Deacon Liddy | | January 20, 2023 |
| S3 | 01 | Deacon Liddy | Deacon Liddy | | Rose Marie Rocca | | February 22, 2024 |
| S3 | 02 | Deacon Liddy | Deacon Liddy | | Rose Marie Rocca | | March 22, 2024 |
| | | | | | | | |

**GHD**

138 East 7th Avenue

Vancouver, British Columbia V5T 1M6, Canada

**T** +1 604 214 0510 | **F** +1 604 214 0525 | **E** info-northamerica@ghd.com | **ghd.com**

*© GHD 2024*

This document is and shall remain the property of GHD. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

# Contents


**1. Introduction** **1**
1.1 Purpose of this Report 1
**2. Leachate Treatment Concept** **1**
**3. Summary of Construction** **2**
3.1 Observed Deficiencies and Corrective Actions 2
**4. Commissioning Activities** **2**
**5. Analytical Results** **3**
**6. Maintenance and Performance Monitoring Plan** **4**
**7. Certification** **5**


## Table index


Table 5.1 Summary of Influent Leachate Samples During Commissioning Period 3
Table 5.2 Summary of Treated Leachate Samples During Commissioning Period 4


## Figure index


Figure 3.1 Leachate Treatment Process 2


## Appendices


Appendix A Leachate Treatment Works Layout
Appendix B Photograph Log
Appendix C Laboratory Analytical Reports


DRAFT



This document is in draft form. The contents, including any opinions, conclusions or recommendations contained in, or which may be implied from, this draft document must not be relied upon. GHD reserves the right, at any time, without notice, to modify or retract any part or all of the draft document. To the maximum extent permitted by law, GHD disclaims any responsibility or liability arising from or in connection with this draft document.

# 1. Introduction

## 1.1 Purpose of this Report

The Northwin Landfill (landfill) is owned by Upland Excavating Ltd. (Upland) and operated by Northwin Environmental (Northwin). The landfill is located on the Upland property at civic address 7295 and 7311 Gold River Highway, Campbell River, British Columbia (Site), approximately 7 kilometers (km) southwest of Campbell River city centre. The Site operates as a sand, gravel and rock quarry, and a waste management facility.

This Commissioning Report (Report) documents the initial leachate characterization and confirmation of treatment process capabilities during the commissioning period of Cell 1 East and Cell 1 West, carried out by Upland Contracting Ltd. (Contractor), Northwin, and other contractors hired by Upland. The Leachate Treatment Facility (LTF) Commissioning Plan is provided in Appendix F of the 2021 Design, Operation, and Closure Plan (DOCP).

The Report has been prepared by GHD for Upland for submission to the Ministry of Environment and Climate Change Strategy (ENV) fulfilling the requirements of Section 2.6(b) of the Landfill's Operational Certificate 107689 (OC).

Upland, as the OC holder retained GHD to act as the Qualified Professional (QP) for this project scope. In this capacity, GHD reviewed and summarized the sampling results taken during the commissioning period to determine the performance of LTF.

# 2. Leachate Treatment Concept

The leachate treatment system is designed to treat the landfill leachate to meet the BC Contaminated Sites Regulation (CSR) Schedule 3.2 Drinking Water Criteria (discharge criteria) prior to discharge to the infiltration pond.

A series of perforated pipes installed at the base of the landfill cell convey leachate to the existing Cell 1 East sump and the Cell 1 West sump. Pumps in perforated pipes within the Cell 1 East sump and Cell 1 West sump, pump leachate to the LTF. The pumps are controlled by level transducers.

The LTS is a batch treatment system, generating a batch of effluent for infiltration. To target operation of a weekly batch at the peak daily leachate generation rate, an average batch size is considered to be 625 $m^3$, with the maximum batch size to be 1,400 $m^3$. A batch size may vary, requiring operational adjustments to the treatment system.

The process begins with aerated equalization, where the aerated equalization pond is filled, and undergoes aeration during filling. The leachate is pumped through a shipping container where chemicals for oxidization, pH adjustment and/or coagulation/flocculation can be added inline through injection ports. After chemical addition, leachate can be recirculated to the equalization pond or a clarifier for settling/precipitation of solids. The water is then pumped through a series of sand filters before entering the effluent holding pond and/or pumped through Granular Activated Carbon (GAC) filters. The effluent batch will be held in the effluent holding pond and sampled and sent for laboratory analysis. Following receipt of sample results, the batch will then be pumped to the infiltration pond or recirculated through the treatment steps as required to meet discharge criteria. During operations the batches will be tested periodically to confirm discharge criteria are being met.

The leachate treatment system will reduce the concentration of leachate constituents by the processes described below:

– Aeration oxidizes dissolved metals such as iron and manganese to less soluble forms and produces flocs that will be filtered. Concentrations of other metals present in the leachate that are not readily oxidized in an aeration lagoon will also be reduced when the suspended (not dissolved) components of these metals are filtered in the sand filters. Oxidization can also be enhanced by adding oxidization chemicals.



This document is in draft form. The contents, including any opinions, conclusions or recommendations contained in, or which may be implied from, this draft document must not be relied upon. GHD reserves the right, at any time, without notice, to modify or retract any part or all of the draft document. To the maximum extent permitted by law, GHD disclaims any responsibility or liability arising from or in connection with this draft document.

– Hydrocarbons and volatile organic compounds will be readily volatized in an aeration lagoon thereby reducing the concentration. If concentrations of organic compounds are required to be further reduced, the effluent will be filtered through a GAC filter.
– The dissolved metals will be removed, if required by chemical precipitation, by adding a volume of chemicals (i.e., mild acids or bases) that will cause an increase or decrease of pH of the leachate to facilitate the formation of an insoluble salt.

Should leachate quality change over time and additional leachate constituents require treatment, the process can include a polishing step to continue to meet the CSR Schedule 3.2 Drinking Water Criteria.

# 3. Summary of Construction

Construction of the LTF was completed with the liner installation on the effluent holding pond on October 19, 2021. The effluent pond was expanded in November with construction completed on November 12, 2021. All components of the LTF were tested by Northwin. GHD observed the functioning of pumps through each stage of the treatment process on December 2, 2021. A drawing of the leachate treatment works layout is provided in Appendix A.

The leachate treatment process is depicted in Figure 3.1 below.

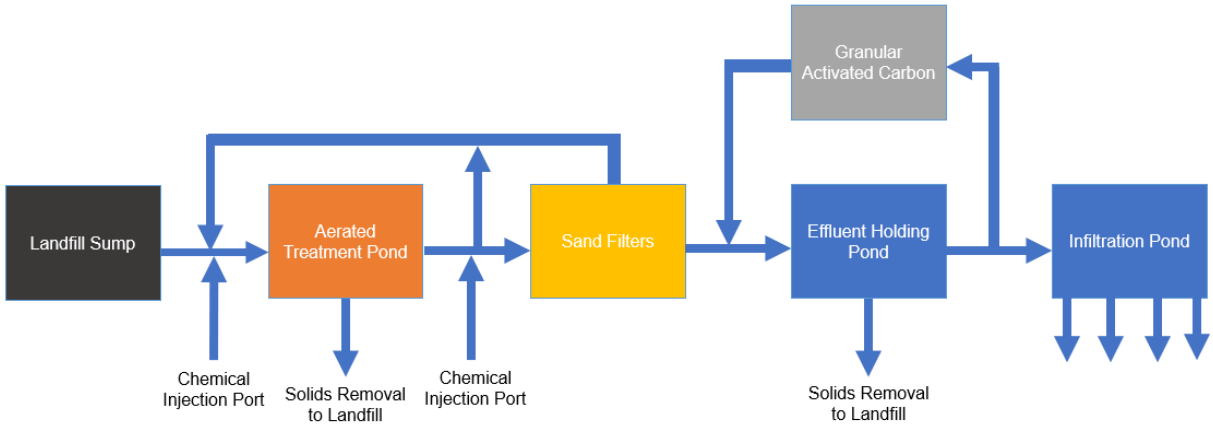



*Figure 3.1 Leachate Treatment Process*

## 3.1 Observed Deficiencies and Corrective Actions

The effluent holding pond constructed in October 2021 was undersized. A larger effluent holding pond of appropriate size was constructed in November 2021.

# 4. Commissioning Activities

The commissioning activities support initial leachate quality characterization and confirm treatment process capabilities. the commissioning activities summarized below.



This document is in draft form. The contents, including any opinions, conclusions or recommendations contained in, or which may be implied from, this draft document must not be relied upon. GHD reserves the right, at any time, without notice, to modify or retract any part or all of the draft document. To the maximum extent permitted by law, GHD disclaims any responsibility or liability arising from or in connection with this draft document.

### *Clean Water Testing and Equipment Commissioning*

Clean water testing was the initial step in the LTF commissioning in the fall of 2021. The hydraulic integrity of all major process ponds, tanks, pumps, piping, and appurtenance was verified via clean water testing prior to the commencement of start-up and commissioning activities. Process equipment (blowers, pumps, and aeration system) was also commissioned by manufacturer representatives prior to start-up activities. All necessary process chemicals were delivered to Site prior to commissioning and all control systems were tested to verify automatic control functions prior to initiation of start-up activities.

### *Sampling Activities*

During the commissioning period, untreated leachate samples were collected from the effluent holding pond prior to discharge to the infiltration pond. This will aid in leachate characterization and establish a baseline for determining the effectiveness of the leachate treatment process.

Samples were analyzed for the comprehensive set of parameters presented in the attached Tables 1 through 4 to confirm the parameters of concern within the leachate.

# 5. Analytical Results

Influent and treated leachate samples were collected and submitted to ALS Environmental (ALS) in Burnaby, BC. Samples were analysed for one or more of the treatment parameters listed in the LTF Commissioning Plan (refer to Appendix F of the DOCP) which include dissolved metals, hardness, chemical oxygen demand (COD), alkalinity, sulphate, sulphide, sodium, pH, total dissolved solids (TDS), total suspended solids (TSS), and polycyclic aromatic hydrocarbons (PAH). Parameter concentrations were compared to the CSR Schedule 3.2 Drinking Water Criteria. If treated leachate concentrations met the discharge criteria, then the treated leachate was discharged to the infiltration pond. If the discharge criteria were not met, leachate continued treatment.

During the commissioning period between December 2021 to December 2023, 24 sampling events were completed. Influent samples were collected by GHD and are summarized in Table 5.1. Treated leachate samples were collected by Northwin and are summarized in Table 5.2. Laboratory reports are provided in Appendix C.

*Table 5.1 Summary of Influent Leachate Samples During Commissioning Period*

| Sample Date | Lab Report No. |
|---|---|
| June 03, 2021 | C138327 |
| November 16, 2021 | C188804 |
| April 01, 2022 | C221453 |
| June 22, 2022 | C244592 |
| September 8, 2022 | C268908 |
| November 17, 2022 | C268889 |



This document is in draft form. The contents, including any opinions, conclusions or recommendations contained in, or which may be implied from, this draft document must not be relied upon. GHD reserves the right, at any time, without notice, to modify or retract any part or all of the draft document. To the maximum extent permitted by law, GHD disclaims any responsibility or liability arising from or in connection with this draft document.

*Table 5.2 Summary of Treated Leachate Samples During Commissioning Period*

| Sample Date | Lab Report No. | Discharge Criteria Results | Treatment Continued or Discharged |
|---|---|---|---|
| December 8, 2021 | VA21C7462 | – 001: Quinoline | Treatment continued |
| December 15, 2021 | VA21C7962 | – 001: Quinoline | Treatment continued |
| January 7, 2022 | VA22A0431 | – 001: No exceedances | Treatment continued |
| January 12, 2022 | VA22A0612 | – 001: No exceedances | Discharged |
| February 23, 2022 | VA22A3490 | – 001: Sulphate, lithium, manganese, benzo(b)pyridine (Quinoline)<br>– 002: Sulphate | Treatment continued |
| March 29, 2022 | VA22A6872 | – 001: Sulfate, manganese, quinoline | Treatment continued |
| April 11, 2022 | VA22A7623 | – 001: Sulfate, manganese, quinoline | Treatment continued |
| June 07, 2022 | VA22B2754 | – 001: Sulfate | Treatment continued |
| July 01, 2022 | VA22B5020 | – 001: Quinoline, cobalt | Treatment continued |
| July 29, 2022 | VA22B7883 | – 001: No exceedances | Discharged |
| July 29, 2022 | VA22B7886 | – 001: Boron, cobalt, sodium | Treatment continued |
| November 2, 2022 | VA22C6839 | – 001: Sulfate, boron, sodium | Treatment continued |
| February 2, 2023 | VA23A2628 | – 001: No exceedances | Discharged |
| February 13, 2023 | VA23A3351 | – 001: Boron, quinoline | Treatment continued |
| March 6, 2023 | VA23A4848 | – 001: Arsenic, boron, quinoline | Treatment continued |
| March 30, 2023 | VA23A6860 | – 001: No exceedances<br>– 002: No exceedances | Discharged |
| April 14, 2023 | VA23A8082 | – 001: Boron, sodium | Treatment continued |
| October 23, 2023 | VA23C5387 | – 001: Sulfate, boron, benzo(a)pyrene, quinoline | Treatment continued |
| November 21, 2023 | VA23C7975 | – 001: No exceedances<br>– 002: No exceedances | Discharged |
| December 11, 2023 | VA23C0976 | – 001: No exceedances | Discharged |
| December 18, 2023 | VA23D0378 | – 001: Benzo(a)pyrene, quinoline<br>– 002: No exceedances | Treatment continued<br>Discharged |

# 6. Maintenance and Performance Monitoring Plan

To assist in the operation and maintenance of the LTF, a Maintenance and Performance Monitoring Plan has been developed to monitor the performance of the LTF and to identify modifications where necessary.

***Influent and Chemical Jar Testing***

To optimize chemical dosing to suit the influent leachate characteristics, on-site jar testing will be conducted at the same time as clean water testing. Influent samples will be collected to create an initial leachate profile. LTF operators will conduct jar tests with various chemicals and dosages to evaluate the effectiveness and appropriate dose conditions for removal of target parameters. The jar tests will be used to set initial batch volume chemical dosage rates.



This document is in draft form. The contents, including any opinions, conclusions or recommendations contained in, or which may be implied from, this draft document must not be relied upon. GHD reserves the right, at any time, without notice, to modify or retract any part or all of the draft document. To the maximum extent permitted by law, GHD disclaims any responsibility or liability arising from or in connection with this draft document.

***Future Sampling Activities***

To meet discharge quality objectives, treated leachate will be sampled regularly to develop a relationship between the parameters of concern within the leachate and the batch treatment sampling program, as well as to monitor the performance of the LTF and chemical dosage.

Each batch of effluent will be sampled from the effluent holding pond and analyzed for a comprehensive set of parameters to determine if a batch can be discharged to the infiltration pond. The effluent will only be discharged to the infiltration pond if the effluent meets the CSR Schedule 3.2 DW criteria. Dependent on the analytical sampling results, leachate will either be recirculated back through the treatment process for additional treatment or, if the effluent meets CSR Schedule 3.2 Drinking Water Criteria, discharged into the infiltration pond.

The effluent sampling results will be used to establish the parameter list for compliance sampling throughout the operation of LTF. Based on leachate quality forecasting discussed in the DOCP, the key leachate parameters will be chemical constituents commonly found in construction and demolition waste, and contaminated soil leachate which may include:

- Chloride
- Sulphate
- Boron
- Iron
- Manganese
- Sulphide
- Arsenic
- Sodium
- PAHs

In addition to sampling to meet discharge quality objectives, leachate will also be sampled to monitor the performance of the treatment process and to observe changes to leachate quality over time as additional waste is added to the landfill. The following parameters may be used to develop an understanding of the system performance and to assist in the operation and maintenance of the LTF:

- Chemical Oxygen Demand (COD)
- Alkalinity
- CSR Metals including hardness
- pH
- TDS
- TSS

Northwin and GHD will continue to monitor parameters and observe changes to the leachate quality, if any.

# 7. Certification

This commissioning report demonstrates that Cell 1 East, Cell 1 West and Ponds have been commissioned in accordance with the OC and the 2021 DOCP. QPs completed inspections before and during commissioning of Cell 1 East, Cell 1 West and the Ponds.

This commissioning report includes the information described in Section 2.6(b) of the OC, and LTF Commissioning Plan presented in the 2021 DOCP, specifically:

- Summary of commission activities including sampling activities
- Summary of analytical results of influent leachate and effluent sampling
- Copy of all calibration reports and laboratory analytical reports
- Comments on any observed deficiencies in the LTF design or performance, and a plan for addressing any such deficiencies
- Maintenance and performance monitoring plan



This document is in draft form. The contents, including any opinions, conclusions or recommendations contained in, or which may be implied from, this draft document must not be relied upon. GHD reserves the right, at any time, without notice, to modify or retract any part or all of the draft document. To the maximum extent permitted by law, GHD disclaims any responsibility or liability arising from or in connection with this draft document.

All of Which is Respectfully Certified and Submitted by:

GHD

Deacon Liddy

Rose Marie Rocca

DRAFT

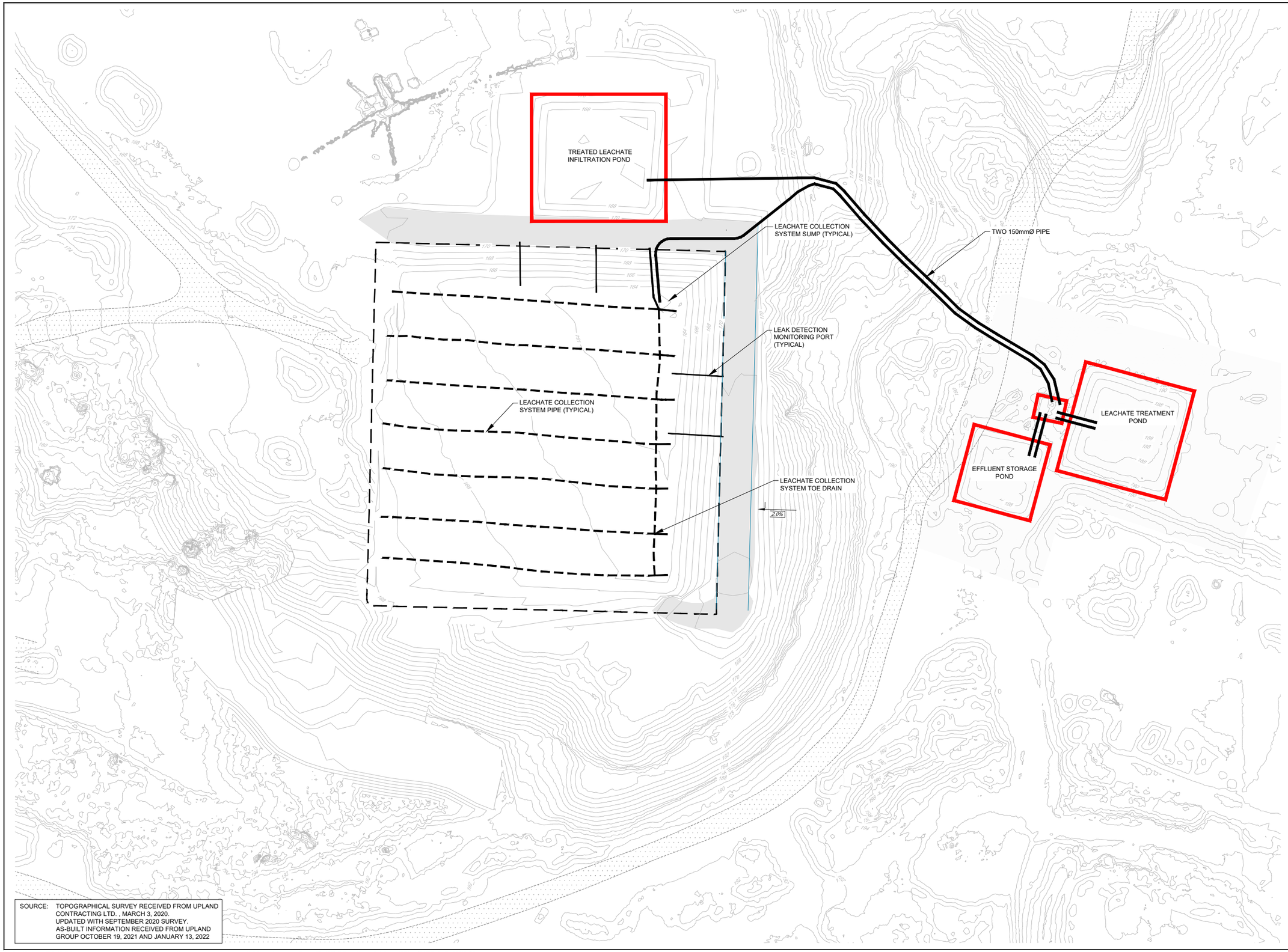


This document is in draft form. The contents, including any opinions, conclusions or recommendations contained in, or which may be implied from, this draft document must not be relied upon. GHD reserves the right, at any time, without notice, to modify or retract any part or all of the draft document. To the maximum extent permitted by law, GHD disclaims any responsibility or liability arising from or in connection with this draft document.

# Appendices

# Appendix A

## Leachate Treatment Works Layout




SOURCE: TOPOGRAPHICAL SURVEY RECEIVED FROM UPLAND CONTRACTING LTD. , MARCH 3, 2020.
UPDATED WITH SEPTEMBER 2020 SURVEY.
AS-BUILT INFORMATION RECEIVED FROM UPLAND GROUP OCTOBER 19, 2021 AND JANUARY 13, 2022

GHD Ltd.
138 EAST 7TH AVENUE, SUITE 100
VANCOUVER, BRITISH COLUMBIA V5T 1M6 CANADA
**T** 1 604 214 0510 **F** 1 604 214 0525 **W** www.ghd.com

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2017 GHD

N

0 6 12 18m

Client
**UPLAND EXCAVATING LTD.**
**CAMPBELL RIVER, B.C.**

Project
**LEACHATE TREATMENT WORKS**

| No. | Issue | Drawn | Approved | Date |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| | |
|---|---|
| Drawn **T.WAGSTAFF** | Designer |
| Drafting Check | Design Check |
| Project Manager | Date **January 19, 2022** |
| This document shall not be used for construction unless signed and sealed for construction. | Scale **1:600** |
| Original Size **ANSI D** | Bar is 20mm on original size drawing 0 20mm |

Project No. **11222680**

Title
**LEACHATE TREATMENT WORKS LAYOUT**

Sheet No.
**CI-0001**

Sheet **1** of **1**

Plot Date: 19 January 2022 - 12:56 PM Plotted By: Tyler Wagstaff CAD File: N:\CA\Vancouver\Projects\663\11222680\Digital_Design\ACAD\Figures\PRES\11222680-GHD-0000-PRE-CI-0001.dwg

# Appendix B

## Photo Log

# Site Photographs

***Photo 1*** ***Aerated Treatment Pond***

***Photo 2*** ***Infiltration Pond***

***Photo 3*** ***Submersible landfill leachate pump***

***Photo 4*** ***Effluent pond after reconstruction***

*Photo 5* *Leachate inlet / effluent out lines*

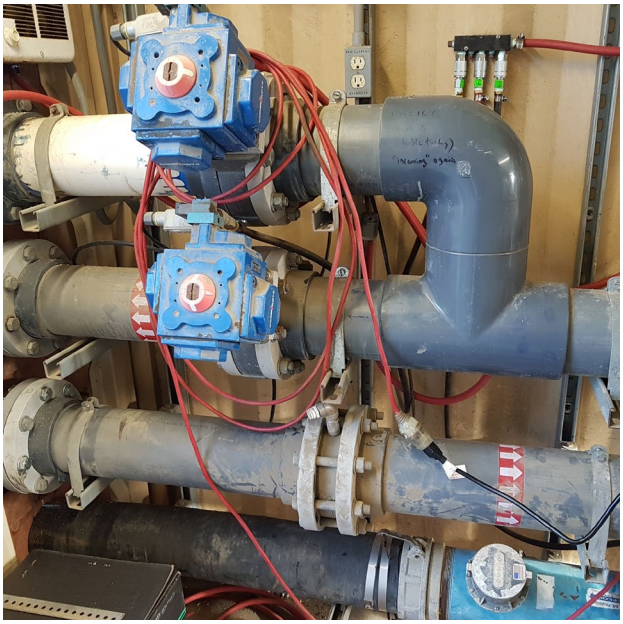


*Photo 6* *Recirculation control valves*

*Photo 7* *Leachate and effluent lines inside treatment container*

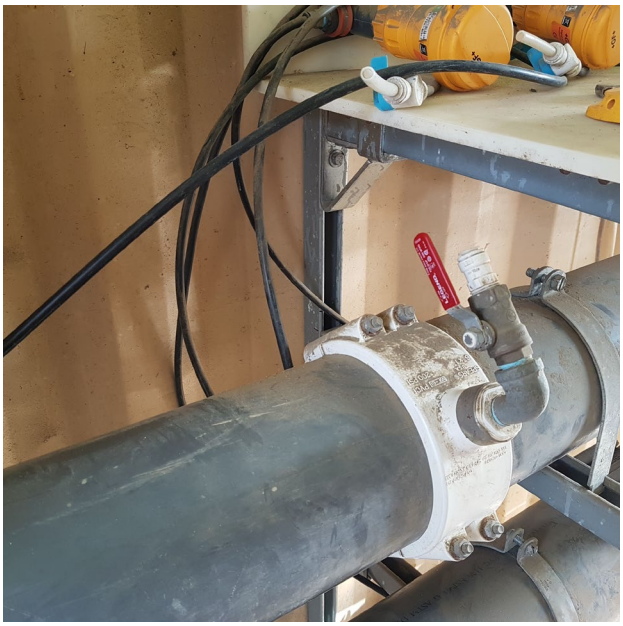


*Photo 8* *Typical chemical injection port*

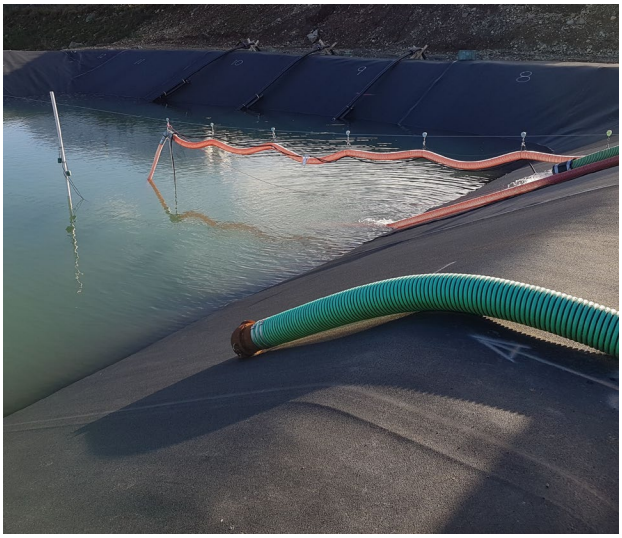


***Photo 9*** ***Aeration Pond inlet / suction lines***

***Photo 10*** ***Effluent Pond inlet lines***

# Appendix C

## Laboratory Analytical Reports

ALS Environmental

# CERTIFICATE OF ANALYSIS

| | | | |
|---|---|---|---|
| **Work Order** | : **VA21C7462** | Page | : 1 of 7 |
| Client | : **Northwin Environmental Ltd.** | Laboratory | : Vancouver - Environmental |
| Contact | : Mr Brian Fagan | Account Manager | : Sneha Sansare |
| Address | : 315 - 1434 Ironwood Street<br>Campbell River BC Canada V9W 5T5 | Address | : 8081 Lougheed Highway<br>Burnaby BC Canada V5A 1W9 |
| Telephone | : ---- | Telephone | : +1 604 253 4188 |
| Project | : ---- | Date Samples Received | : 09-Dec-2021 13:15 |
| PO | : ---- | Date Analysis Commenced | : 09-Dec-2021 |
| C-O-C number | : ---- | Issue Date | : 11-Dec-2021 17:01 |
| Sampler | : ---- | | |
| Site | : ---- | | |
| Quote number | : ---- | | |
| No. of samples received | : 1 | | |
| No. of samples analysed | : 1 | | |

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* |
|---|---|---|
| Angelo Salandanan | Lab Assistant | Metals, Burnaby, British Columbia |
| Dee Lee | Analyst | Metals, Burnaby, British Columbia |
| Harsha Attanayake | Laboratory Analyst | Organics, Burnaby, British Columbia |
| Kevin Duarte | Supervisor - Metals ICP Instrumentation | Metals, Burnaby, British Columbia |
| Ophelia Chiu | Department Manager - Organics | Organics, Burnaby, British Columbia |
| Owen Cheng | | Metals, Burnaby, British Columbia |
| Tracy Harley | Supervisor - Water Quality Instrumentation | Inorganics, Burnaby, British Columbia |

## 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 |
| µg/L | micrograms per litre |
| mg/L | milligrams per litre |

<: 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* |
|---|---|
| *DLCI* | *Detection Limit Raised: Chromatographic interference due to co-elution.* |
| *DLQ* | *Detection Limit raised due to co-eluting interference. GCMS qualifier ion ratio did not meet acceptance criteria.* |

## Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

| Analyte | CAS Number | Method | LOR | Unit | Client sample ID: New Landfill Holding Pond 08/12/21 | ---- | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Client sampling date / time: 08-Dec-2021 04:30 | ---- | ---- | ---- | ---- |
| | | | | | VA21C7462-001 | -------- | -------- | -------- | -------- |
| | | | | | Result | ---- | ---- | ---- | ---- |
| **Physical Tests** | | | | | | | | | |
| **hardness (as CaCO3), dissolved** | ---- | EC100 | 0.60 | mg/L | 22.8 | ---- | ---- | ---- | ---- |
| **Anions and Nutrients** | | | | | | | | | |
| **sulfate (as SO4)** | 14808-79-8 | E235.SO4 | 0.30 | mg/L | 2.84 | ---- | ---- | ---- | ---- |
| **Dissolved Metals** | | | | | | | | | |
| **aluminum, dissolved** | 7429-90-5 | E421 | 0.0010 | mg/L | 0.0244 | ---- | ---- | ---- | ---- |
| **antimony, dissolved** | 7440-36-0 | E421 | 0.00010 | mg/L | <0.00010 | ---- | ---- | ---- | ---- |
| **arsenic, dissolved** | 7440-38-2 | E421 | 0.00010 | mg/L | 0.00025 | ---- | ---- | ---- | ---- |
| **barium, dissolved** | 7440-39-3 | E421 | 0.00010 | mg/L | 0.00537 | ---- | ---- | ---- | ---- |
| **beryllium, dissolved** | 7440-41-7 | E421 | 0.000100 | mg/L | <0.000100 | ---- | ---- | ---- | ---- |
| **bismuth, dissolved** | 7440-69-9 | E421 | 0.000050 | mg/L | <0.000050 | ---- | ---- | ---- | ---- |
| **boron, dissolved** | 7440-42-8 | E421 | 0.010 | mg/L | <0.010 | ---- | ---- | ---- | ---- |
| **cadmium, dissolved** | 7440-43-9 | E421 | 0.0000050 | mg/L | <0.0000050 | ---- | ---- | ---- | ---- |
| **calcium, dissolved** | 7440-70-2 | E421 | 0.050 | mg/L | 6.93 | ---- | ---- | ---- | ---- |
| **cesium, dissolved** | 7440-46-2 | E421 | 0.000010 | mg/L | <0.000010 | ---- | ---- | ---- | ---- |
| **chromium, dissolved** | 7440-47-3 | E421 | 0.00050 | mg/L | <0.00050 | ---- | ---- | ---- | ---- |
| **cobalt, dissolved** | 7440-48-4 | E421 | 0.00010 | mg/L | 0.00010 | ---- | ---- | ---- | ---- |
| **copper, dissolved** | 7440-50-8 | E421 | 0.00020 | mg/L | 0.00409 | ---- | ---- | ---- | ---- |
| **iron, dissolved** | 7439-89-6 | E421 | 0.010 | mg/L | 0.017 | ---- | ---- | ---- | ---- |
| **lead, dissolved** | 7439-92-1 | E421 | 0.000050 | mg/L | 0.000061 | ---- | ---- | ---- | ---- |
| **lithium, dissolved** | 7439-93-2 | E421 | 0.0010 | mg/L | <0.0010 | ---- | ---- | ---- | ---- |
| **magnesium, dissolved** | 7439-95-4 | E421 | 0.0050 | mg/L | 1.34 | ---- | ---- | ---- | ---- |
| **manganese, dissolved** | 7439-96-5 | E421 | 0.00010 | mg/L | 0.0414 | ---- | ---- | ---- | ---- |
| **mercury, dissolved** | 7439-97-6 | E509 | 0.0000050 | mg/L | <0.0000050 | ---- | ---- | ---- | ---- |
| **molybdenum, dissolved** | 7439-98-7 | E421 | 0.000050 | mg/L | 0.000220 | ---- | ---- | ---- | ---- |
| **nickel, dissolved** | 7440-02-0 | E421 | 0.00050 | mg/L | <0.00050 | ---- | ---- | ---- | ---- |
| **phosphorus, dissolved** | 7723-14-0 | E421 | 0.050 | mg/L | 0.060 | ---- | ---- | ---- | ---- |
| **potassium, dissolved** | 7440-09-7 | E421 | 0.050 | mg/L | 0.287 | ---- | ---- | ---- | ---- |
| **rubidium, dissolved** | 7440-17-7 | E421 | 0.00020 | mg/L | <0.00020 | ---- | ---- | ---- | ---- |
| **selenium, dissolved** | 7782-49-2 | E421 | 0.000050 | mg/L | 0.000095 | ---- | ---- | ---- | ---- |

## Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

| Analyte | CAS Number | Method | LOR | Unit | Client sample ID: New Landfill Holding Pond 08/12/21 | ---- | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Client sampling date / time: 08-Dec-2021 04:30 | ---- | ---- | ---- | ---- |
| | | | | | VA21C7462-001 | -------- | -------- | -------- | -------- |
| | | | | | Result | ---- | ---- | ---- | ---- |
| **Dissolved Metals** | | | | | | | | | |
| **silicon, dissolved** | 7440-21-3 | E421 | 0.050 | mg/L | 1.11 | ---- | ---- | ---- | ---- |
| **silver, dissolved** | 7440-22-4 | E421 | 0.000010 | mg/L | <0.000010 | ---- | ---- | ---- | ---- |
| **sodium, dissolved** | 17341-25-2 | E421 | 0.050 | mg/L | 5.47 | ---- | ---- | ---- | ---- |
| **strontium, dissolved** | 7440-24-6 | E421 | 0.00020 | mg/L | 0.0186 | ---- | ---- | ---- | ---- |
| **sulfur, dissolved** | 7704-34-9 | E421 | 0.50 | mg/L | 0.89 | ---- | ---- | ---- | ---- |
| **tellurium, dissolved** | 13494-80-9 | E421 | 0.00020 | mg/L | <0.00020 | ---- | ---- | ---- | ---- |
| **thallium, dissolved** | 7440-28-0 | E421 | 0.000010 | mg/L | <0.000010 | ---- | ---- | ---- | ---- |
| **thorium, dissolved** | 7440-29-1 | E421 | 0.00010 | mg/L | <0.00010 | ---- | ---- | ---- | ---- |
| **tin, dissolved** | 7440-31-5 | E421 | 0.00010 | mg/L | 0.00018 | ---- | ---- | ---- | ---- |
| **titanium, dissolved** | 7440-32-6 | E421 | 0.00030 | mg/L | 0.00096 | ---- | ---- | ---- | ---- |
| **tungsten, dissolved** | 7440-33-7 | E421 | 0.00010 | mg/L | <0.00010 | ---- | ---- | ---- | ---- |
| **uranium, dissolved** | 7440-61-1 | E421 | 0.000010 | mg/L | 0.000013 | ---- | ---- | ---- | ---- |
| **vanadium, dissolved** | 7440-62-2 | E421 | 0.00050 | mg/L | 0.00055 | ---- | ---- | ---- | ---- |
| **zinc, dissolved** | 7440-66-6 | E421 | 0.0010 | mg/L | 0.0018 | ---- | ---- | ---- | ---- |
| **zirconium, dissolved** | 7440-67-7 | E421 | 0.00020 | mg/L | <0.00020 | ---- | ---- | ---- | ---- |
| **dissolved mercury filtration location** | ---- | EP509 | - | - | Field | ---- | ---- | ---- | ---- |
| **dissolved metals filtration location** | ---- | EP421 | - | - | Field | ---- | ---- | ---- | ---- |
| **Volatile Organic Compounds** | | | | | | | | | |
| **chlorobenzene** | 108-90-7 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **chloromethane** | 74-87-3 | E611C | 5.0 | µg/L | <5.0 | ---- | ---- | ---- | ---- |
| **dichlorobenzene, 1,2-** | 95-50-1 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichlorobenzene, 1,3-** | 541-73-1 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichlorobenzene, 1,4-** | 106-46-7 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichloropropane, 1,2-** | 78-87-5 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichloropropylene, cis+trans-1,3-** | 542-75-6 | E611C | 0.75 | µg/L | <0.75 | ---- | ---- | ---- | ---- |
| **dichloropropylene, cis-1,3-** | 10061-01-5 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **tetrachloroethane, 1,1,1,2-** | 630-20-6 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **tetrachloroethane, 1,1,2,2-** | 79-34-5 | E611C | 0.20 | µg/L | <0.20 | ---- | ---- | ---- | ---- |
| **trichloroethane, 1,1,2-** | 79-00-5 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **trichlorofluoromethane** | 75-69-4 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |

## Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

| Analyte | CAS Number | Method | LOR | Unit | Client sample ID: New Landfill Holding Pond 08/12/21 | ---- | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| Client sampling date / time | | | | | 08-Dec-2021 04:30 | ---- | ---- | ---- | ---- |
| | | | | | VA21C7462-001 | -------- | -------- | -------- | -------- |
| | | | | | Result | ---- | ---- | ---- | ---- |
| **Volatile Organic Compounds [Drycleaning]** | | | | | | | | | |
| **carbon tetrachloride** | 56-23-5 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **chloroethane** | 75-00-3 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichloroethane, 1,1-** | 75-34-3 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichloroethane, 1,2-** | 107-06-2 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichloroethylene, 1,1-** | 75-35-4 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichloroethylene, cis-1,2-** | 156-59-2 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichloroethylene, trans-1,2-** | 156-60-5 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichloromethane** | 75-09-2 | E611C | 1.0 | µg/L | <1.0 | ---- | ---- | ---- | ---- |
| **dichloropropylene, trans-1,3-** | 10061-02-6 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **tetrachloroethylene** | 127-18-4 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **trichloroethane, 1,1,1-** | 71-55-6 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **trichloroethylene** | 79-01-6 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **vinyl chloride** | 75-01-4 | E611C | 0.40 | µg/L | <0.40 | ---- | ---- | ---- | ---- |
| **Volatile Organic Compounds [Fuels]** | | | | | | | | | |
| **benzene** | 71-43-2 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **ethylbenzene** | 100-41-4 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **methyl-tert-butyl ether [MTBE]** | 1634-04-4 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **styrene** | 100-42-5 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **toluene** | 108-88-3 | E611C | 0.40 | µg/L | <0.40 | ---- | ---- | ---- | ---- |
| **xylene, m+p-** | 179601-23-1 | E611C | 0.40 | µg/L | <0.40 | ---- | ---- | ---- | ---- |
| **xylene, o-** | 95-47-6 | E611C | 0.30 | µg/L | <0.30 | ---- | ---- | ---- | ---- |
| **xylenes, total** | 1330-20-7 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **Volatile Organic Compounds [THMs]** | | | | | | | | | |
| **bromodichloromethane** | 75-27-4 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **bromoform** | 75-25-2 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **chloroform** | 67-66-3 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dibromochloromethane** | 124-48-1 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **Volatile Organic Compounds Surrogates** | | | | | | | | | |
| **bromofluorobenzene, 4-** | 460-00-4 | E611C | 1.0 | % | 84.2 | ---- | ---- | ---- | ---- |
| **difluorobenzene, 1,4-** | 540-36-3 | E611C | 1.0 | % | 101 | ---- | ---- | ---- | ---- |

## Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

| Analyte | CAS Number | Method | LOR | Unit | Client sample ID: New Landfill Holding Pond 08/12/21 | ---- | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Client sampling date / time: 08-Dec-2021 04:30 | ---- | ---- | ---- | ---- |
| | | | | | VA21C7462-001 | -------- | -------- | -------- | -------- |
| | | | | | Result | ---- | ---- | ---- | ---- |
| **Hydrocarbons** | | | | | | | | | |
| **EPH (C10-C19)** | ---- | E601A | 250 | µg/L | <250 | ---- | ---- | ---- | ---- |
| **EPH (C19-C32)** | ---- | E601A | 250 | µg/L | <250 | ---- | ---- | ---- | ---- |
| **HEPHw** | ---- | EC600A | 250 | µg/L | <250 | ---- | ---- | ---- | ---- |
| **LEPHw** | ---- | EC600A | 250 | µg/L | <250 | ---- | ---- | ---- | ---- |
| **Hydrocarbons Surrogates** | | | | | | | | | |
| **bromobenzotrifluoride, 2- (EPH surr)** | 392-83-6 | E601A | 1.0 | % | 90.7 | ---- | ---- | ---- | ---- |
| **Polycyclic Aromatic Hydrocarbons** | | | | | | | | | |
| **acenaphthene** | 83-32-9 | E641A | 0.010 | µg/L | 0.399 | ---- | ---- | ---- | ---- |
| **acenaphthylene** | 208-96-8 | E641A | 0.010 | µg/L | 0.012 | ---- | ---- | ---- | ---- |
| **acridine** | 260-94-6 | E641A | 0.010 | µg/L | <0.021 DLQ | ---- | ---- | ---- | ---- |
| **anthracene** | 120-12-7 | E641A | 0.010 | µg/L | <0.022 DLCI | ---- | ---- | ---- | ---- |
| **benz(a)anthracene** | 56-55-3 | E641A | 0.010 | µg/L | <0.011 DLQ | ---- | ---- | ---- | ---- |
| **benzo(a)pyrene** | 50-32-8 | E641A | 0.0050 | µg/L | <0.0050 | ---- | ---- | ---- | ---- |
| **benzo(b+j)fluoranthene** | ---- | E641A | 0.010 | µg/L | 0.010 | ---- | ---- | ---- | ---- |
| **benzo(b+j+k)fluoranthene** | ---- | E641A | 0.015 | µg/L | <0.015 | ---- | ---- | ---- | ---- |
| **benzo(g,h,i)perylene** | 191-24-2 | E641A | 0.010 | µg/L | <0.010 | ---- | ---- | ---- | ---- |
| **benzo(k)fluoranthene** | 207-08-9 | E641A | 0.010 | µg/L | <0.010 | ---- | ---- | ---- | ---- |
| **chrysene** | 218-01-9 | E641A | 0.010 | µg/L | <0.010 | ---- | ---- | ---- | ---- |
| **dibenz(a,h)anthracene** | 53-70-3 | E641A | 0.0050 | µg/L | <0.0050 | ---- | ---- | ---- | ---- |
| **fluoranthene** | 206-44-0 | E641A | 0.010 | µg/L | 0.112 | ---- | ---- | ---- | ---- |
| **fluorene** | 86-73-7 | E641A | 0.010 | µg/L | 0.176 | ---- | ---- | ---- | ---- |
| **indeno(1,2,3-c,d)pyrene** | 193-39-5 | E641A | 0.010 | µg/L | <0.010 | ---- | ---- | ---- | ---- |
| **methylnaphthalene, 1-** | 90-12-0 | E641A | 0.010 | µg/L | <0.064 DLQ | ---- | ---- | ---- | ---- |
| **methylnaphthalene, 2-** | 91-57-6 | E641A | 0.010 | µg/L | 0.032 | ---- | ---- | ---- | ---- |
| **naphthalene** | 91-20-3 | E641A | 0.050 | µg/L | 0.098 | ---- | ---- | ---- | ---- |
| **phenanthrene** | 85-01-8 | E641A | 0.020 | µg/L | 0.104 | ---- | ---- | ---- | ---- |
| **pyrene** | 129-00-0 | E641A | 0.010 | µg/L | 0.055 | ---- | ---- | ---- | ---- |
| **quinoline** | 91-22-5 | E641A | 0.050 | µg/L | 0.554 | ---- | ---- | ---- | ---- |
| **Polycyclic Aromatic Hydrocarbons Surrogates** | | | | | | | | | |
| **chrysene-d12** | 1719-03-5 | E641A | 0.1 | % | 101 | ---- | ---- | ---- | ---- |

## Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

| Analyte | CAS Number | Method | LOR | Unit | Client sample ID | New Landfill Holding Pond 08/12/21 | ---- | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Client sampling date / time | 08-Dec-2021 04:30 | ---- | ---- | ---- | ---- |
| | | | | | | VA21C7462-001 | -------- | -------- | -------- | -------- |
| | | | | | | Result | ---- | ---- | ---- | ---- |
| **Polycyclic Aromatic Hydrocarbons Surrogates** | | | | | | | | | | |
| **naphthalene-d8** | 1146-65-2 | E641A | 0.1 | % | | 97.1 | ---- | ---- | ---- | ---- |
| **phenanthrene-d10** | 1517-22-2 | E641A | 0.1 | % | | 111 | ---- | ---- | ---- | ---- |

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

# CERTIFICATE OF ANALYSIS

| | | | |
|---|---|---|---|
| **Work Order** | : **VA21C7962** | Page | : 1 of 7 |
| Client | : **Northwin Environmental Ltd.** | Laboratory | : Vancouver - Environmental |
| Contact | : Mr Brian Fagan | Account Manager | : Sneha Sansare |
| Address | : 315 - 1434 Ironwood Street<br>Campbell River BC Canada V9W 5T5 | Address | : 8081 Lougheed Highway<br>Burnaby BC Canada V5A 1W9 |
| Telephone | : ---- | Telephone | : +1 604 253 4188 |
| Project | : ---- | Date Samples Received | : 15-Dec-2021 20:35 |
| PO | : ---- | Date Analysis Commenced | : 16-Dec-2021 |
| C-O-C number | : ---- | Issue Date | : 19-Dec-2021 23:07 |
| Sampler | : ---- | | |
| Site | : ---- | | |
| Quote number | : ---- | | |
| No. of samples received | : 1 | | |
| No. of samples analysed | : 1 | | |

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* |
|---|---|---|
| Cindy Tang | Team Leader - Inorganics | Inorganics, Burnaby, British Columbia |
| Dee Lee | Analyst | Metals, Burnaby, British Columbia |
| Ilnaz Badbezanchi | Team Leader - Metals preparation | Metals, Burnaby, British Columbia |
| Ophelia Chiu | Department Manager - Organics | Organics, Burnaby, British Columbia |
| Robin Weeks | Team Leader - Metals | Metals, Burnaby, British Columbia |

## 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 |
| µg/L | micrograms per litre |
| mg/L | milligrams per litre |

<: 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* |
|---|---|
| *DLCI* | *Detection Limit Raised: Chromatographic interference due to co-elution.* |
| *DLQ* | *Detection Limit raised due to co-eluting interference. GCMS qualifier ion ratio did not meet acceptance criteria.* |

## Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

| Analyte | CAS Number | Method | LOR | Unit | Client sample ID: New Landfill Holding Pond 08/12/21 | ---- | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Client sampling date / time: 15-Dec-2021 04:30 | ---- | ---- | ---- | ---- |
| | | | | | VA21C7962-001 | -------- | -------- | -------- | -------- |
| | | | | | Result | ---- | ---- | ---- | ---- |
| **Physical Tests** | | | | | | | | | |
| **hardness (as CaCO3), dissolved** | ---- | EC100 | 0.60 | mg/L | 29.6 | ---- | ---- | ---- | ---- |
| **Anions and Nutrients** | | | | | | | | | |
| **sulfate (as SO4)** | 14808-79-8 | E235.SO4 | 0.30 | mg/L | 11.7 | ---- | ---- | ---- | ---- |
| **Dissolved Metals** | | | | | | | | | |
| **aluminum, dissolved** | 7429-90-5 | E421 | 0.0010 | mg/L | 0.0291 | ---- | ---- | ---- | ---- |
| **antimony, dissolved** | 7440-36-0 | E421 | 0.00010 | mg/L | <0.00010 | ---- | ---- | ---- | ---- |
| **arsenic, dissolved** | 7440-38-2 | E421 | 0.00010 | mg/L | 0.00035 | ---- | ---- | ---- | ---- |
| **barium, dissolved** | 7440-39-3 | E421 | 0.00010 | mg/L | 0.00458 | ---- | ---- | ---- | ---- |
| **beryllium, dissolved** | 7440-41-7 | E421 | 0.000100 | mg/L | <0.000100 | ---- | ---- | ---- | ---- |
| **bismuth, dissolved** | 7440-69-9 | E421 | 0.000050 | mg/L | <0.000050 | ---- | ---- | ---- | ---- |
| **boron, dissolved** | 7440-42-8 | E421 | 0.010 | mg/L | 0.021 | ---- | ---- | ---- | ---- |
| **cadmium, dissolved** | 7440-43-9 | E421 | 0.0000050 | mg/L | 0.0000134 | ---- | ---- | ---- | ---- |
| **calcium, dissolved** | 7440-70-2 | E421 | 0.050 | mg/L | 9.04 | ---- | ---- | ---- | ---- |
| **cesium, dissolved** | 7440-46-2 | E421 | 0.000010 | mg/L | <0.000010 | ---- | ---- | ---- | ---- |
| **chromium, dissolved** | 7440-47-3 | E421 | 0.00050 | mg/L | <0.00050 | ---- | ---- | ---- | ---- |
| **cobalt, dissolved** | 7440-48-4 | E421 | 0.00010 | mg/L | 0.00016 | ---- | ---- | ---- | ---- |
| **copper, dissolved** | 7440-50-8 | E421 | 0.00020 | mg/L | 0.00779 | ---- | ---- | ---- | ---- |
| **iron, dissolved** | 7439-89-6 | E421 | 0.010 | mg/L | 0.018 | ---- | ---- | ---- | ---- |
| **lead, dissolved** | 7439-92-1 | E421 | 0.000050 | mg/L | 0.000112 | ---- | ---- | ---- | ---- |
| **lithium, dissolved** | 7439-93-2 | E421 | 0.0010 | mg/L | <0.0010 | ---- | ---- | ---- | ---- |
| **magnesium, dissolved** | 7439-95-4 | E421 | 0.0050 | mg/L | 1.71 | ---- | ---- | ---- | ---- |
| **manganese, dissolved** | 7439-96-5 | E421 | 0.00010 | mg/L | 0.0664 | ---- | ---- | ---- | ---- |
| **mercury, dissolved** | 7439-97-6 | E509 | 0.0000050 | mg/L | <0.0000050 | ---- | ---- | ---- | ---- |
| **molybdenum, dissolved** | 7439-98-7 | E421 | 0.000050 | mg/L | 0.000549 | ---- | ---- | ---- | ---- |
| **nickel, dissolved** | 7440-02-0 | E421 | 0.00050 | mg/L | <0.00050 | ---- | ---- | ---- | ---- |
| **phosphorus, dissolved** | 7723-14-0 | E421 | 0.050 | mg/L | 0.106 | ---- | ---- | ---- | ---- |
| **potassium, dissolved** | 7440-09-7 | E421 | 0.050 | mg/L | 0.383 | ---- | ---- | ---- | ---- |
| **rubidium, dissolved** | 7440-17-7 | E421 | 0.00020 | mg/L | 0.00025 | ---- | ---- | ---- | ---- |
| **selenium, dissolved** | 7782-49-2 | E421 | 0.000050 | mg/L | 0.000097 | ---- | ---- | ---- | ---- |

## Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

| Analyte | CAS Number | Method | LOR | Unit | Client sample ID: New Landfill Holding Pond 08/12/21 | ---- | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| Client sampling date / time | | | | | 15-Dec-2021 04:30 | ---- | ---- | ---- | ---- |
| | | | | | VA21C7962-001 | -------- | -------- | -------- | -------- |
| | | | | | Result | ---- | ---- | ---- | ---- |
| **Dissolved Metals** | | | | | | | | | |
| **silicon, dissolved** | 7440-21-3 | E421 | 0.050 | mg/L | 1.06 | ---- | ---- | ---- | ---- |
| **silver, dissolved** | 7440-22-4 | E421 | 0.000010 | mg/L | <0.000010 | ---- | ---- | ---- | ---- |
| **sodium, dissolved** | 7440-23-5 | E421 | 0.050 | mg/L | 8.69 | ---- | ---- | ---- | ---- |
| **strontium, dissolved** | 7440-24-6 | E421 | 0.00020 | mg/L | 0.0311 | ---- | ---- | ---- | ---- |
| **sulfur, dissolved** | 7704-34-9 | E421 | 0.50 | mg/L | 3.78 | ---- | ---- | ---- | ---- |
| **tellurium, dissolved** | 13494-80-9 | E421 | 0.00020 | mg/L | <0.00020 | ---- | ---- | ---- | ---- |
| **thallium, dissolved** | 7440-28-0 | E421 | 0.000010 | mg/L | <0.000010 | ---- | ---- | ---- | ---- |
| **thorium, dissolved** | 7440-29-1 | E421 | 0.00010 | mg/L | <0.00010 | ---- | ---- | ---- | ---- |
| **tin, dissolved** | 7440-31-5 | E421 | 0.00010 | mg/L | <0.00010 | ---- | ---- | ---- | ---- |
| **titanium, dissolved** | 7440-32-6 | E421 | 0.00030 | mg/L | 0.00106 | ---- | ---- | ---- | ---- |
| **tungsten, dissolved** | 7440-33-7 | E421 | 0.00010 | mg/L | <0.00010 | ---- | ---- | ---- | ---- |
| **uranium, dissolved** | 7440-61-1 | E421 | 0.000010 | mg/L | 0.000016 | ---- | ---- | ---- | ---- |
| **vanadium, dissolved** | 7440-62-2 | E421 | 0.00050 | mg/L | 0.00056 | ---- | ---- | ---- | ---- |
| **zinc, dissolved** | 7440-66-6 | E421 | 0.0010 | mg/L | 0.0043 | ---- | ---- | ---- | ---- |
| **zirconium, dissolved** | 7440-67-7 | E421 | 0.00020 | mg/L | <0.00020 | ---- | ---- | ---- | ---- |
| **dissolved mercury filtration location** | ---- | EP509 | - | - | Field | ---- | ---- | ---- | ---- |
| **dissolved metals filtration location** | ---- | EP421 | - | - | Field | ---- | ---- | ---- | ---- |
| **Volatile Organic Compounds** | | | | | | | | | |
| **chlorobenzene** | 108-90-7 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **chloromethane** | 74-87-3 | E611C | 5.0 | µg/L | <5.0 | ---- | ---- | ---- | ---- |
| **dichlorobenzene, 1,2-** | 95-50-1 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichlorobenzene, 1,3-** | 541-73-1 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichlorobenzene, 1,4-** | 106-46-7 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichloropropane, 1,2-** | 78-87-5 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichloropropylene, cis+trans-1,3-** | 542-75-6 | E611C | 0.75 | µg/L | <0.75 | ---- | ---- | ---- | ---- |
| **dichloropropylene, cis-1,3-** | 10061-01-5 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **tetrachloroethane, 1,1,1,2-** | 630-20-6 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **tetrachloroethane, 1,1,2,2-** | 79-34-5 | E611C | 0.20 | µg/L | <0.20 | ---- | ---- | ---- | ---- |
| **trichloroethane, 1,1,2-** | 79-00-5 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **trichlorofluoromethane** | 75-69-4 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |

## Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

| Analyte | CAS Number | Method | LOR | Unit | Client sample ID: New Landfill Holding Pond 08/12/21 | ---- | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| Client sampling date / time | | | | | 15-Dec-2021 04:30 | ---- | ---- | ---- | ---- |
| | | | | | VA21C7962-001 | -------- | -------- | -------- | -------- |
| | | | | | Result | ---- | ---- | ---- | ---- |
| **Volatile Organic Compounds [Drycleaning]** | | | | | | | | | |
| **carbon tetrachloride** | 56-23-5 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **chloroethane** | 75-00-3 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichloroethane, 1,1-** | 75-34-3 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichloroethane, 1,2-** | 107-06-2 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichloroethylene, 1,1-** | 75-35-4 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichloroethylene, cis-1,2-** | 156-59-2 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichloroethylene, trans-1,2-** | 156-60-5 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichloromethane** | 75-09-2 | E611C | 1.0 | µg/L | <1.0 | ---- | ---- | ---- | ---- |
| **dichloropropylene, trans-1,3-** | 10061-02-6 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **tetrachloroethylene** | 127-18-4 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **trichloroethane, 1,1,1-** | 71-55-6 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **trichloroethylene** | 79-01-6 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **vinyl chloride** | 75-01-4 | E611C | 0.40 | µg/L | <0.40 | ---- | ---- | ---- | ---- |
| **Volatile Organic Compounds [Fuels]** | | | | | | | | | |
| **benzene** | 71-43-2 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **ethylbenzene** | 100-41-4 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **methyl-tert-butyl ether [MTBE]** | 1634-04-4 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **styrene** | 100-42-5 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **toluene** | 108-88-3 | E611C | 0.40 | µg/L | <0.40 | ---- | ---- | ---- | ---- |
| **xylene, m+p-** | 179601-23-1 | E611C | 0.40 | µg/L | <0.40 | ---- | ---- | ---- | ---- |
| **xylene, o-** | 95-47-6 | E611C | 0.30 | µg/L | <0.30 | ---- | ---- | ---- | ---- |
| **xylenes, total** | 1330-20-7 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **Volatile Organic Compounds [THMs]** | | | | | | | | | |
| **bromodichloromethane** | 75-27-4 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **bromoform** | 75-25-2 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **chloroform** | 67-66-3 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dibromochloromethane** | 124-48-1 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **Volatile Organic Compounds Surrogates** | | | | | | | | | |
| **bromofluorobenzene, 4-** | 460-00-4 | E611C | 1.0 | % | 102 | ---- | ---- | ---- | ---- |
| **difluorobenzene, 1,4-** | 540-36-3 | E611C | 1.0 | % | 99.8 | ---- | ---- | ---- | ---- |

## Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

| Analyte | CAS Number | Method | LOR | Unit | Client sample ID: New Landfill Holding Pond 08/12/21 | ---- | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Client sampling date / time: 15-Dec-2021 04:30 | ---- | ---- | ---- | ---- |
| | | | | | VA21C7962-001 | -------- | -------- | -------- | -------- |
| | | | | | Result | ---- | ---- | ---- | ---- |
| **Hydrocarbons** | | | | | | | | | |
| **EPH (C10-C19)** | ---- | E601A | 250 | µg/L | <250 | ---- | ---- | ---- | ---- |
| **EPH (C19-C32)** | ---- | E601A | 250 | µg/L | <250 | ---- | ---- | ---- | ---- |
| **HEPHw** | ---- | EC600A | 250 | µg/L | <250 | ---- | ---- | ---- | ---- |
| **LEPHw** | ---- | EC600A | 250 | µg/L | <250 | ---- | ---- | ---- | ---- |
| **Hydrocarbons Surrogates** | | | | | | | | | |
| **bromobenzotrifluoride, 2- (EPH surr)** | 392-83-6 | E601A | 1.0 | % | 89.2 | ---- | ---- | ---- | ---- |
| **Polycyclic Aromatic Hydrocarbons** | | | | | | | | | |
| **acenaphthene** | 83-32-9 | E641A | 0.010 | µg/L | 0.210 | ---- | ---- | ---- | ---- |
| **acenaphthylene** | 208-96-8 | E641A | 0.010 | µg/L | <0.010 | ---- | ---- | ---- | ---- |
| **acridine** | 260-94-6 | E641A | 0.010 | µg/L | 0.021 | ---- | ---- | ---- | ---- |
| **anthracene** | 120-12-7 | E641A | 0.010 | µg/L | <0.020 DLCI | ---- | ---- | ---- | ---- |
| **benz(a)anthracene** | 56-55-3 | E641A | 0.010 | µg/L | <0.010 | ---- | ---- | ---- | ---- |
| **benzo(a)pyrene** | 50-32-8 | E641A | 0.0050 | µg/L | <0.0050 | ---- | ---- | ---- | ---- |
| **benzo(b+j)fluoranthene** | n/a | E641A | 0.010 | µg/L | <0.010 | ---- | ---- | ---- | ---- |
| **benzo(b+j+k)fluoranthene** | n/a | E641A | 0.015 | µg/L | <0.015 | ---- | ---- | ---- | ---- |
| **benzo(g,h,i)perylene** | 191-24-2 | E641A | 0.010 | µg/L | <0.010 | ---- | ---- | ---- | ---- |
| **benzo(k)fluoranthene** | 207-08-9 | E641A | 0.010 | µg/L | <0.010 | ---- | ---- | ---- | ---- |
| **chrysene** | 218-01-9 | E641A | 0.010 | µg/L | <0.010 | ---- | ---- | ---- | ---- |
| **dibenz(a,h)anthracene** | 53-70-3 | E641A | 0.0050 | µg/L | <0.0050 | ---- | ---- | ---- | ---- |
| **fluoranthene** | 206-44-0 | E641A | 0.010 | µg/L | 0.074 | ---- | ---- | ---- | ---- |
| **fluorene** | 86-73-7 | E641A | 0.010 | µg/L | 0.086 | ---- | ---- | ---- | ---- |
| **indeno(1,2,3-c,d)pyrene** | 193-39-5 | E641A | 0.010 | µg/L | <0.010 | ---- | ---- | ---- | ---- |
| **methylnaphthalene, 1-** | 90-12-0 | E641A | 0.010 | µg/L | <0.050 DLQ | ---- | ---- | ---- | ---- |
| **methylnaphthalene, 2-** | 91-57-6 | E641A | 0.010 | µg/L | 0.014 | ---- | ---- | ---- | ---- |
| **naphthalene** | 91-20-3 | E641A | 0.050 | µg/L | <0.050 | ---- | ---- | ---- | ---- |
| **phenanthrene** | 85-01-8 | E641A | 0.020 | µg/L | 0.033 | ---- | ---- | ---- | ---- |
| **pyrene** | 129-00-0 | E641A | 0.010 | µg/L | 0.039 | ---- | ---- | ---- | ---- |
| **quinoline** | 91-22-5 | E641A | 0.050 | µg/L | 0.512 | ---- | ---- | ---- | ---- |
| **Polycyclic Aromatic Hydrocarbons Surrogates** | | | | | | | | | |
| **chrysene-d12** | 1719-03-5 | E641A | 0.1 | % | 98.2 | ---- | ---- | ---- | ---- |

## Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

| Analyte | CAS Number | Method | LOR | Unit | Client sample ID | New Landfill Holding Pond 08/12/21 | ---- | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Client sampling date / time | 15-Dec-2021 04:30 | ---- | ---- | ---- | ---- |
| | | | | | | VA21C7962-001 | -------- | -------- | -------- | -------- |
| | | | | | | Result | ---- | ---- | ---- | ---- |
| **Polycyclic Aromatic Hydrocarbons Surrogates** | | | | | | | | | | |
| **naphthalene-d8** | 1146-65-2 | E641A | 0.1 | % | | 85.6 | ---- | ---- | ---- | ---- |
| **phenanthrene-d10** | 1517-22-2 | E641A | 0.1 | % | | 105 | ---- | ---- | ---- | ---- |

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

# CERTIFICATE OF ANALYSIS

| | | | |
|---|---|---|---|
| **Work Order** | : **VA22A0431** | Page | : 1 of 5 |
| **Amendment** | : **(Partial Results)** | | |
| Client | : **Northwin Environmental Ltd.** | Laboratory | : Vancouver - Environmental |
| Contact | : Mr Brian Fagan | Account Manager | : Sneha Sansare |
| Address | : 315 - 1434 Ironwood Street<br>Campbell River BC Canada V9W 5T5 | Address | : 8081 Lougheed Highway<br>Burnaby BC Canada V5A 1W9 |
| Telephone | : ---- | Telephone | : +1 604 253 4188 |
| Project | : ---- | Date Samples Received | : 12-Jan-2022 07:30 |
| PO | : ---- | Date Analysis Commenced | : 12-Jan-2022 |
| C-O-C number | : ---- | Issue Date | : 12-Jan-2022 16:32 |
| Sampler | : B F | | |
| Site | : ---- | | |
| Quote number | : ---- | | |
| No. of samples received | : 1 | | |
| No. of samples analysed | : 1 | | |

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* |
|---|---|---|
| Christopher Li | Lab Assistant | Metals, Burnaby, British Columbia |
| Kevin Duarte | Supervisor - Metals ICP Instrumentation | Metals, Burnaby, British Columbia |
| Tracy Harley | Supervisor - Water Quality Instrumentation | Inorganics, Burnaby, British Columbia |

## 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 |
| µg/L | micrograms per litre |
| mg/L | milligrams per litre |

<: 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.

## Sample Comments

| *Sample* | Client Id | *Comment* |
|---|---|---|
| VA22A0431-001 | Holding Pond | Sample(s) XXX: Water sample(s) for dissolved mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low. |

## Qualifiers

| *Qualifier* | *Description* |
|---|---|
| *DLM* | *Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).* |

## Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

| Analyte | CAS Number | Method | LOR | Unit | Client sample ID: Holding Pond | ---- | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Client sampling date / time: 07-Jan-2022 | ---- | ---- | ---- | ---- |
| | | | | | VA22A0431-001 | -------- | -------- | -------- | -------- |
| | | | | | Result | ---- | ---- | ---- | ---- |
| **Physical Tests** | | | | | | | | | |
| **hardness (as CaCO3), dissolved** | ---- | EC100 | 0.60 | mg/L | 165 | ---- | ---- | ---- | ---- |
| **Anions and Nutrients** | | | | | | | | | |
| **sulfate (as SO4)** | 14808-79-8 | E235.SO4 | 0.30 | mg/L | 166 | ---- | ---- | ---- | ---- |
| **Dissolved Metals** | | | | | | | | | |
| **aluminum, dissolved** | 7429-90-5 | E421 | 0.0010 | mg/L | 0.0112 | ---- | ---- | ---- | ---- |
| **antimony, dissolved** | 7440-36-0 | E421 | 0.00010 | mg/L | 0.00202 | ---- | ---- | ---- | ---- |
| **arsenic, dissolved** | 7440-38-2 | E421 | 0.00010 | mg/L | 0.00186 | ---- | ---- | ---- | ---- |
| **barium, dissolved** | 7440-39-3 | E421 | 0.00010 | mg/L | 0.0228 | ---- | ---- | ---- | ---- |
| **beryllium, dissolved** | 7440-41-7 | E421 | 0.000100 | mg/L | <0.000100 | ---- | ---- | ---- | ---- |
| **bismuth, dissolved** | 7440-69-9 | E421 | 0.000050 | mg/L | <0.000050 | ---- | ---- | ---- | ---- |
| **boron, dissolved** | 7440-42-8 | E421 | 0.010 | mg/L | 0.857 | ---- | ---- | ---- | ---- |
| **cadmium, dissolved** | 7440-43-9 | E421 | 0.0000050 | mg/L | 0.000151 | ---- | ---- | ---- | ---- |
| **calcium, dissolved** | 7440-70-2 | E421 | 0.050 | mg/L | 55.1 | ---- | ---- | ---- | ---- |
| **cesium, dissolved** | 7440-46-2 | E421 | 0.000010 | mg/L | 0.000010 | ---- | ---- | ---- | ---- |
| **chromium, dissolved** | 7440-47-3 | E421 | 0.00050 | mg/L | 0.00192 | ---- | ---- | ---- | ---- |
| **cobalt, dissolved** | 7440-48-4 | E421 | 0.00010 | mg/L | 0.00188 | ---- | ---- | ---- | ---- |
| **copper, dissolved** | 7440-50-8 | E421 | 0.00020 | mg/L | 0.0553 | ---- | ---- | ---- | ---- |
| **iron, dissolved** | 7439-89-6 | E421 | 0.010 | mg/L | 0.020 | ---- | ---- | ---- | ---- |
| **lead, dissolved** | 7439-92-1 | E421 | 0.000050 | mg/L | 0.000431 | ---- | ---- | ---- | ---- |
| **lithium, dissolved** | 7439-93-2 | E421 | 0.0010 | mg/L | 0.0025 | ---- | ---- | ---- | ---- |
| **magnesium, dissolved** | 7439-95-4 | E421 | 0.0050 | mg/L | 6.68 | ---- | ---- | ---- | ---- |
| **manganese, dissolved** | 7439-96-5 | E421 | 0.00010 | mg/L | 0.344 | ---- | ---- | ---- | ---- |
| **molybdenum, dissolved** | 7439-98-7 | E421 | 0.000050 | mg/L | 0.00186 | ---- | ---- | ---- | ---- |
| **nickel, dissolved** | 7440-02-0 | E421 | 0.00050 | mg/L | 0.00364 | ---- | ---- | ---- | ---- |
| **phosphorus, dissolved** | 7723-14-0 | E421 | 0.050 | mg/L | 0.074 | ---- | ---- | ---- | ---- |
| **potassium, dissolved** | 7440-09-7 | E421 | 0.050 | mg/L | 6.65 | ---- | ---- | ---- | ---- |
| **rubidium, dissolved** | 7440-17-7 | E421 | 0.00020 | mg/L | 0.00348 | ---- | ---- | ---- | ---- |
| **selenium, dissolved** | 7782-49-2 | E421 | 0.000050 | mg/L | 0.000286 | ---- | ---- | ---- | ---- |
| **silicon, dissolved** | 7440-21-3 | E421 | 0.050 | mg/L | 1.72 | ---- | ---- | ---- | ---- |
| **silver, dissolved** | 7440-22-4 | E421 | 0.000010 | mg/L | <0.000010 | ---- | ---- | ---- | ---- |
| **sodium, dissolved** | 7440-23-5 | E421 | 0.050 | mg/L | 35.3 | ---- | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: Water (Matrix: Water) | | | | | Client sample ID | Holding Pond | ---- | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Client sampling date / time | 07-Jan-2022 | ---- | ---- | ---- | ---- |
| Analyte | CAS Number | Method | LOR | Unit | | VA22A0431-001 | -------- | -------- | -------- | -------- |
| | | | | | | Result | ---- | ---- | ---- | ---- |
| **Dissolved Metals** | | | | | | | | | | |
| **strontium, dissolved** | 7440-24-6 | E421 | 0.00020 | mg/L | | 0.240 | ---- | ---- | ---- | ---- |
| **sulfur, dissolved** | 7704-34-9 | E421 | 0.50 | mg/L | | 54.3 | ---- | ---- | ---- | ---- |
| **tellurium, dissolved** | 13494-80-9 | E421 | 0.00020 | mg/L | | <0.00020 | ---- | ---- | ---- | ---- |
| **thallium, dissolved** | 7440-28-0 | E421 | 0.000010 | mg/L | | 0.000014 | ---- | ---- | ---- | ---- |
| **thorium, dissolved** | 7440-29-1 | E421 | 0.00010 | mg/L | | <0.00010 | ---- | ---- | ---- | ---- |
| **tin, dissolved** | 7440-31-5 | E421 | 0.00010 | mg/L | | 0.00020 | ---- | ---- | ---- | ---- |
| **titanium, dissolved** | 7440-32-6 | E421 | 0.00030 | mg/L | | <0.00060 DLM | ---- | ---- | ---- | ---- |
| **tungsten, dissolved** | 7440-33-7 | E421 | 0.00010 | mg/L | | <0.00010 | ---- | ---- | ---- | ---- |
| **uranium, dissolved** | 7440-61-1 | E421 | 0.000010 | mg/L | | 0.000272 | ---- | ---- | ---- | ---- |
| **vanadium, dissolved** | 7440-62-2 | E421 | 0.00050 | mg/L | | 0.00065 | ---- | ---- | ---- | ---- |
| **zinc, dissolved** | 7440-66-6 | E421 | 0.0010 | mg/L | | 0.0207 | ---- | ---- | ---- | ---- |
| **zirconium, dissolved** | 7440-67-7 | E421 | 0.00020 | mg/L | | <0.00020 | ---- | ---- | ---- | ---- |
| **dissolved metals filtration location** | ---- | EP421 | - | - | | Field | ---- | ---- | ---- | ---- |
| **Volatile Organic Compounds [Fuels]** | | | | | | | | | | |
| **benzene** | 71-43-2 | E611A | 0.50 | µg/L | | Not Authorised | ---- | ---- | ---- | ---- |
| **ethylbenzene** | 100-41-4 | E611A | 0.50 | µg/L | | Not Authorised | ---- | ---- | ---- | ---- |
| **methyl-tert-butyl ether [MTBE]** | 1634-04-4 | E611A | 0.50 | µg/L | | Not Authorised | ---- | ---- | ---- | ---- |
| **styrene** | 100-42-5 | E611A | 0.50 | µg/L | | Not Authorised | ---- | ---- | ---- | ---- |
| **toluene** | 108-88-3 | E611A | 0.50 | µg/L | | Not Authorised | ---- | ---- | ---- | ---- |
| **xylene, m+p-** | 179601-23-1 | E611A | 0.40 | µg/L | | Not Authorised | ---- | ---- | ---- | ---- |
| **xylene, o-** | 95-47-6 | E611A | 0.30 | µg/L | | Not Authorised | ---- | ---- | ---- | ---- |
| **xylenes, total** | 1330-20-7 | E611A | 0.50 | µg/L | | Not Authorised | ---- | ---- | ---- | ---- |
| **Volatile Organic Compounds Surrogates** | | | | | | | | | | |
| **bromofluorobenzene, 4-** | 460-00-4 | E611A | 1.0 | % | | Not Authorised | ---- | ---- | ---- | ---- |
| **difluorobenzene, 1,4-** | 540-36-3 | E611A | 1.0 | % | | Not Authorised | ---- | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: **Water** (Matrix: **Water**) | | | | | Client sample ID | **Holding Pond** | ---- | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Client sampling date / time | 07-Jan-2022 | ---- | ---- | ---- | ---- |
| *Analyte* | *CAS Number* | *Method* | *LOR* | *Unit* | | **VA22A0431-001** | -------- | -------- | -------- | -------- |
| | | | | | | Result | ---- | ---- | ---- | ---- |
| **Hydrocarbons** | | | | | | | | | | |
| **EPH (C10-C19)** | ---- | E601A | 250 | µg/L | | Not Authorised | ---- | ---- | ---- | ---- |
| **EPH (C19-C32)** | ---- | E601A | 250 | µg/L | | Not Authorised | ---- | ---- | ---- | ---- |
| **VHw (C6-C10)** | ---- | E581.VH+F1 | 100 | µg/L | | Not Authorised | ---- | ---- | ---- | ---- |
| **VPHw** | ---- | EC580A | 100 | µg/L | | Not Authorised | ---- | ---- | ---- | ---- |
| **Hydrocarbons Surrogates** | | | | | | | | | | |
| **bromobenzotrifluoride, 2- (EPH surr)** | 392-83-6 | E601A | 1.0 | % | | Not Authorised | ---- | ---- | ---- | ---- |
| **dichlorotoluene, 3,4-** | 97-75-0 | E581.VH+F1 | 1.0 | % | | Not Authorised | ---- | ---- | ---- | ---- |

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

# CERTIFICATE OF ANALYSIS

| | | | |
|---|---|---|---|
| **Work Order** | : **VA22A0612** | Page | : 1 of 6 |
| Client | : **Northwin Environmental Ltd.** | Laboratory | : Vancouver - Environmental |
| Contact | : Mr Brian Fagan | Account Manager | : Sneha Sansare |
| Address | : 315 - 1434 Ironwood Street<br>Campbell River BC Canada V9W 5T5 | Address | : 8081 Lougheed Highway<br>Burnaby BC Canada V5A 1W9 |
| Telephone | : ---- | Telephone | : +1 604 253 4188 |
| Project | : ---- | Date Samples Received | : 13-Jan-2022 17:50 |
| PO | : ---- | Date Analysis Commenced | : 13-Jan-2022 |
| C-O-C number | : ---- | Issue Date | : 14-Jan-2022 20:23 |
| Sampler | : ---- | | |
| Site | : ---- | | |
| Quote number | : ---- | | |
| No. of samples received | : 1 | | |
| No. of samples analysed | : 1 | | |

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* |
|---|---|---|
| Kevin Duarte | Supervisor - Metals ICP Instrumentation | Metals, Burnaby, British Columbia |
| Lindsay Gung | Supervisor - Water Chemistry | Inorganics, Burnaby, British Columbia |
| Ophelia Chiu | Department Manager - Organics | Organics, Burnaby, British Columbia |
| Ruby Pham | Lab Assistant | Metals, Burnaby, British Columbia |

## 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 |
| µg/L | micrograms per litre |
| mg/L | milligrams per litre |

<: 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.* |

## Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

| Analyte | CAS Number | Method | LOR | Unit | Client sample ID: New Landfill Recirc 13/01/22 | ---- | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Client sampling date / time: 12-Jan-2022 04:30 | ---- | ---- | ---- | ---- |
| | | | | | VA22A0612-001 | -------- | -------- | -------- | -------- |
| | | | | | Result | ---- | ---- | ---- | ---- |
| **Physical Tests** | | | | | | | | | |
| **hardness (as CaCO3), dissolved** | ---- | EC100 | 0.50 | mg/L | 85.1 | ---- | ---- | ---- | ---- |
| **Anions and Nutrients** | | | | | | | | | |
| **sulfate (as SO4)** | 14808-79-8 | E235.SO4 | 0.30 | mg/L | 87.3 | ---- | ---- | ---- | ---- |
| **Dissolved Metals** | | | | | | | | | |
| **aluminum, dissolved** | 7429-90-5 | E421 | 0.0010 | mg/L | 0.0079 | ---- | ---- | ---- | ---- |
| **antimony, dissolved** | 7440-36-0 | E421 | 0.00010 | mg/L | 0.00096 | ---- | ---- | ---- | ---- |
| **arsenic, dissolved** | 7440-38-2 | E421 | 0.00010 | mg/L | 0.00090 | ---- | ---- | ---- | ---- |
| **barium, dissolved** | 7440-39-3 | E421 | 0.00010 | mg/L | 0.00764 | ---- | ---- | ---- | ---- |
| **beryllium, dissolved** | 7440-41-7 | E421 | 0.000020 | mg/L | <0.000020 | ---- | ---- | ---- | ---- |
| **bismuth, dissolved** | 7440-69-9 | E421 | 0.000050 | mg/L | <0.000050 | ---- | ---- | ---- | ---- |
| **boron, dissolved** | 7440-42-8 | E421 | 0.010 | mg/L | 0.317 | ---- | ---- | ---- | ---- |
| **cadmium, dissolved** | 7440-43-9 | E421 | 0.0000050 | mg/L | 0.0000541 | ---- | ---- | ---- | ---- |
| **calcium, dissolved** | 7440-70-2 | E421 | 0.050 | mg/L | 27.5 | ---- | ---- | ---- | ---- |
| **cesium, dissolved** | 7440-46-2 | E421 | 0.000010 | mg/L | 0.000032 | ---- | ---- | ---- | ---- |
| **chromium, dissolved** | 7440-47-3 | E421 | 0.00050 | mg/L | 0.00079 | ---- | ---- | ---- | ---- |
| **cobalt, dissolved** | 7440-48-4 | E421 | 0.00010 | mg/L | 0.00069 | ---- | ---- | ---- | ---- |
| **copper, dissolved** | 7440-50-8 | E421 | 0.00020 | mg/L | 0.0218 | ---- | ---- | ---- | ---- |
| **iron, dissolved** | 7439-89-6 | E421 | 0.010 | mg/L | 0.024 | ---- | ---- | ---- | ---- |
| **lead, dissolved** | 7439-92-1 | E421 | 0.000050 | mg/L | 0.000785 | ---- | ---- | ---- | ---- |
| **lithium, dissolved** | 7439-93-2 | E421 | 0.0010 | mg/L | 0.0013 | ---- | ---- | ---- | ---- |
| **magnesium, dissolved** | 7439-95-4 | E421 | 0.0050 | mg/L | 4.00 | ---- | ---- | ---- | ---- |
| **manganese, dissolved** | 7439-96-5 | E421 | 0.00010 | mg/L | 0.140 | ---- | ---- | ---- | ---- |
| **molybdenum, dissolved** | 7439-98-7 | E421 | 0.000050 | mg/L | 0.000956 | ---- | ---- | ---- | ---- |
| **nickel, dissolved** | 7440-02-0 | E421 | 0.00050 | mg/L | 0.00167 | ---- | ---- | ---- | ---- |
| **phosphorus, dissolved** | 7723-14-0 | E421 | 0.050 | mg/L | 0.113 | ---- | ---- | ---- | ---- |
| **potassium, dissolved** | 7440-09-7 | E421 | 0.050 | mg/L | 3.76 | ---- | ---- | ---- | ---- |
| **rubidium, dissolved** | 7440-17-7 | E421 | 0.00020 | mg/L | 0.00263 | ---- | ---- | ---- | ---- |
| **selenium, dissolved** | 7782-49-2 | E421 | 0.000050 | mg/L | 0.000140 | ---- | ---- | ---- | ---- |
| **silicon, dissolved** | 7440-21-3 | E421 | 0.050 | mg/L | 1.10 | ---- | ---- | ---- | ---- |
| **silver, dissolved** | 7440-22-4 | E421 | 0.000010 | mg/L | <0.000010 | ---- | ---- | ---- | ---- |

## Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

| Analyte | CAS Number | Method | LOR | Unit | Client sample ID: New Landfill Recirc 13/01/22 | ---- | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Client sampling date / time: 12-Jan-2022 04:30 | ---- | ---- | ---- | ---- |
| | | | | | VA22A0612-001 | -------- | -------- | -------- | -------- |
| | | | | | Result | ---- | ---- | ---- | ---- |
| **Dissolved Metals** | | | | | | | | | |
| **sodium, dissolved** | 7440-23-5 | E421 | 0.050 | mg/L | 20.6 | ---- | ---- | ---- | ---- |
| **strontium, dissolved** | 7440-24-6 | E421 | 0.00020 | mg/L | 0.127 | ---- | ---- | ---- | ---- |
| **sulfur, dissolved** | 7704-34-9 | E421 | 0.50 | mg/L | 30.8 | ---- | ---- | ---- | ---- |
| **tellurium, dissolved** | 13494-80-9 | E421 | 0.00020 | mg/L | <0.00020 | ---- | ---- | ---- | ---- |
| **thallium, dissolved** | 7440-28-0 | E421 | 0.000010 | mg/L | <0.000010 | ---- | ---- | ---- | ---- |
| **thorium, dissolved** | 7440-29-1 | E421 | 0.00010 | mg/L | <0.00010 | ---- | ---- | ---- | ---- |
| **tin, dissolved** | 7440-31-5 | E421 | 0.00010 | mg/L | 0.00014 | ---- | ---- | ---- | ---- |
| **titanium, dissolved** | 7440-32-6 | E421 | 0.00030 | mg/L | <0.00030 | ---- | ---- | ---- | ---- |
| **tungsten, dissolved** | 7440-33-7 | E421 | 0.00010 | mg/L | <0.00010 | ---- | ---- | ---- | ---- |
| **uranium, dissolved** | 7440-61-1 | E421 | 0.000010 | mg/L | 0.000092 | ---- | ---- | ---- | ---- |
| **vanadium, dissolved** | 7440-62-2 | E421 | 0.00050 | mg/L | <0.00050 | ---- | ---- | ---- | ---- |
| **zinc, dissolved** | 7440-66-6 | E421 | 0.0010 | mg/L | 0.0157 | ---- | ---- | ---- | ---- |
| **zirconium, dissolved** | 7440-67-7 | E421 | 0.00030 | mg/L | <0.00030 | ---- | ---- | ---- | ---- |
| **dissolved metals filtration location** | ---- | EP421 | - | - | Field | ---- | ---- | ---- | ---- |
| **Volatile Organic Compounds** | | | | | | | | | |
| **chlorobenzene** | 108-90-7 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **chloromethane** | 74-87-3 | E611C | 5.0 | µg/L | <5.0 | ---- | ---- | ---- | ---- |
| **dichlorobenzene, 1,2-** | 95-50-1 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichlorobenzene, 1,3-** | 541-73-1 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichlorobenzene, 1,4-** | 106-46-7 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichloropropane, 1,2-** | 78-87-5 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichloropropylene, cis+trans-1,3-** | 542-75-6 | E611C | 0.75 | µg/L | <0.75 | ---- | ---- | ---- | ---- |
| **dichloropropylene, cis-1,3-** | 10061-01-5 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **tetrachloroethane, 1,1,1,2-** | 630-20-6 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **tetrachloroethane, 1,1,2,2-** | 79-34-5 | E611C | 0.20 | µg/L | <0.20 | ---- | ---- | ---- | ---- |
| **trichloroethane, 1,1,2-** | 79-00-5 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **trichlorofluoromethane** | 75-69-4 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **Volatile Organic Compounds [Drycleaning]** | | | | | | | | | |
| **carbon tetrachloride** | 56-23-5 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **chloroethane** | 75-00-3 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichloroethane, 1,1-** | 75-34-3 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |

## Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

| Analyte | CAS Number | Method | LOR | Unit | Client sample ID: New Landfill Recirc 13/01/22 | ---- | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Client sampling date / time: 12-Jan-2022 04:30 | ---- | ---- | ---- | ---- |
| | | | | | VA22A0612-001 | -------- | -------- | -------- | -------- |
| | | | | | Result | ---- | ---- | ---- | ---- |
| **Volatile Organic Compounds [Drycleaning]** | | | | | | | | | |
| **dichloroethane, 1,2-** | 107-06-2 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichloroethylene, 1,1-** | 75-35-4 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichloroethylene, cis-1,2-** | 156-59-2 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichloroethylene, trans-1,2-** | 156-60-5 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **dichloromethane** | 75-09-2 | E611C | 1.0 | µg/L | <1.0 | ---- | ---- | ---- | ---- |
| **dichloropropylene, trans-1,3-** | 10061-02-6 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **tetrachloroethylene** | 127-18-4 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **trichloroethane, 1,1,1-** | 71-55-6 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **trichloroethylene** | 79-01-6 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **vinyl chloride** | 75-01-4 | E611C | 0.40 | µg/L | <0.40 | ---- | ---- | ---- | ---- |
| **Volatile Organic Compounds [Fuels]** | | | | | | | | | |
| **benzene** | 71-43-2 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **ethylbenzene** | 100-41-4 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **methyl-tert-butyl ether [MTBE]** | 1634-04-4 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **styrene** | 100-42-5 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **toluene** | 108-88-3 | E611C | 0.40 | µg/L | 0.69 | ---- | ---- | ---- | ---- |
| **xylene, m+p-** | 179601-23-1 | E611C | 0.40 | µg/L | <0.40 | ---- | ---- | ---- | ---- |
| **xylene, o-** | 95-47-6 | E611C | 0.30 | µg/L | <0.30 | ---- | ---- | ---- | ---- |
| **xylenes, total** | 1330-20-7 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **Volatile Organic Compounds [THMs]** | | | | | | | | | |
| **bromodichloromethane** | 75-27-4 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **bromoform** | 75-25-2 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **chloroform** | 67-66-3 | E611C | 0.50 | µg/L | 3.28 | ---- | ---- | ---- | ---- |
| **dibromochloromethane** | 124-48-1 | E611C | 0.50 | µg/L | <0.50 | ---- | ---- | ---- | ---- |
| **Hydrocarbons** | | | | | | | | | |
| **EPH (C10-C19)** | ---- | E601A | 250 | µg/L | <250 | ---- | ---- | ---- | ---- |
| **EPH (C19-C32)** | ---- | E601A | 250 | µg/L | <250 | ---- | ---- | ---- | ---- |
| **HEPHw** | ---- | EC600A | 250 | µg/L | <250 | ---- | ---- | ---- | ---- |
| **LEPHw** | ---- | EC600A | 250 | µg/L | <250 | ---- | ---- | ---- | ---- |
| **Hydrocarbons Surrogates** | | | | | | | | | |
| **bromobenzotrifluoride, 2- (EPH surr)** | 392-83-6 | E601A | 1.0 | % | 64.2 | ---- | ---- | ---- | ---- |

## Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

| Analyte | CAS Number | Method | LOR | Unit | Client sample ID: New Landfill Recirc 13/01/22 | ---- | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Client sampling date / time: 12-Jan-2022 04:30 | ---- | ---- | ---- | ---- |
| | | | | | VA22A0612-001 | -------- | -------- | -------- | -------- |
| | | | | | Result | ---- | ---- | ---- | ---- |
| **Polycyclic Aromatic Hydrocarbons** | | | | | | | | | |
| **acenaphthene** | 83-32-9 | E641A | 0.010 | µg/L | <0.035 DLQ | ---- | ---- | ---- | ---- |
| **acenaphthylene** | 208-96-8 | E641A | 0.010 | µg/L | <0.010 | ---- | ---- | ---- | ---- |
| **acridine** | 260-94-6 | E641A | 0.010 | µg/L | <0.010 | ---- | ---- | ---- | ---- |
| **anthracene** | 120-12-7 | E641A | 0.010 | µg/L | <0.010 | ---- | ---- | ---- | ---- |
| **benz(a)anthracene** | 56-55-3 | E641A | 0.010 | µg/L | <0.010 | ---- | ---- | ---- | ---- |
| **benzo(a)pyrene** | 50-32-8 | E641A | 0.0050 | µg/L | <0.0050 | ---- | ---- | ---- | ---- |
| **benzo(b+j)fluoranthene** | n/a | E641A | 0.010 | µg/L | <0.010 | ---- | ---- | ---- | ---- |
| **benzo(b+j+k)fluoranthene** | n/a | E641A | 0.015 | µg/L | <0.015 | ---- | ---- | ---- | ---- |
| **benzo(g,h,i)perylene** | 191-24-2 | E641A | 0.010 | µg/L | <0.010 | ---- | ---- | ---- | ---- |
| **benzo(k)fluoranthene** | 207-08-9 | E641A | 0.010 | µg/L | <0.010 | ---- | ---- | ---- | ---- |
| **chrysene** | 218-01-9 | E641A | 0.010 | µg/L | <0.010 | ---- | ---- | ---- | ---- |
| **dibenz(a,h)anthracene** | 53-70-3 | E641A | 0.0050 | µg/L | <0.0050 | ---- | ---- | ---- | ---- |
| **fluoranthene** | 206-44-0 | E641A | 0.010 | µg/L | <0.010 | ---- | ---- | ---- | ---- |
| **fluorene** | 86-73-7 | E641A | 0.010 | µg/L | <0.010 | ---- | ---- | ---- | ---- |
| **indeno(1,2,3-c,d)pyrene** | 193-39-5 | E641A | 0.010 | µg/L | <0.010 | ---- | ---- | ---- | ---- |
| **methylnaphthalene, 1-** | 90-12-0 | E641A | 0.010 | µg/L | 0.108 | ---- | ---- | ---- | ---- |
| **methylnaphthalene, 2-** | 91-57-6 | E641A | 0.010 | µg/L | 0.277 | ---- | ---- | ---- | ---- |
| **naphthalene** | 91-20-3 | E641A | 0.050 | µg/L | 0.233 | ---- | ---- | ---- | ---- |
| **phenanthrene** | 85-01-8 | E641A | 0.020 | µg/L | <0.020 | ---- | ---- | ---- | ---- |
| **pyrene** | 129-00-0 | E641A | 0.010 | µg/L | <0.010 | ---- | ---- | ---- | ---- |
| **quinoline** | 91-22-5 | E641A | 0.050 | µg/L | <0.050 | ---- | ---- | ---- | ---- |
| **Polycyclic Aromatic Hydrocarbons Surrogates** | | | | | | | | | |
| **chrysene-d12** | 1719-03-5 | E641A | 0.1 | % | 108 | ---- | ---- | ---- | ---- |
| **naphthalene-d8** | 1146-65-2 | E641A | 0.1 | % | 98.9 | ---- | ---- | ---- | ---- |
| **phenanthrene-d10** | 1517-22-2 | E641A | 0.1 | % | 106 | ---- | ---- | ---- | ---- |

Please refer to the General Comments section for an explanation of any qualifiers detected.

GHD

# Appendix D

## 2023 Annual Status Form

# Annual Compliance Status Form

AUTHORIZATION NUMBER: 107689
AUTHORIZATION TYPE: Operational Certificate
LEGAL AUTHORIZATION HOLDER NAME: Upland Excavating Ltd.
PERIOD OF COMPLIANCE STATUS ASSESSMENT: 2023-01-01 to 2023-12-31

AUTHORIZED PERSON NAME: Terry Stuart
AUTHORIZED PERSON SIGNATURE: Terry Stuart
SIGNATURE DATE: 2024-03-28

*I understand that it is an offense to mislead a government official, and I declare that all of the information presented is accurate and true.*
*I have been given the authority by the authorization holder to sign this form.*

| AUTHORIZATION CLAUSE NUMBER | AUTHORIZATION CLAUSE DESCRIPTION | COMPLIANT? (Yes/No/ND) | RATIONALE FOR YOUR COMPLIANCE DETERMINATION | LOCATION OF SUPPORTING INFORMATION IN ANNUAL REPORT |
|---|---|---|---|---|
| 1.1.1 | The maximum rate of waste discharge to the Original Lined Cell is 45,000 tonnes per calendar year. | Yes | N/A - waste was not discharged to the Original Landfill in 2023. Operations ceased at the Original Landfill in September 2022 and waste was removed and placed into the New Landfill from April to June 2023. Decomissioning activities were completed in June 2023. | Refer to Section 1.2 of the annual report. |
| 1.1.2 | The characteristics of the waste discharge to the Original Lined Cell must be:<br>(a) demolition waste,<br>(b) construction waste,<br>(c) land clearing waste,<br>(d) soil in which the concentrations of all substances are less than the lowest applicable industrial land use standard specified for those substances in<br>(i) the generic numerical soil standards,<br>(ii) the matrix numerical soil standards, or<br>(iii) a director's interim standard for soil,<br>referred to in section 41(1)(a) of the Contaminated Sites Regulation, B.C. Reg. 375/96,<br>(e) sludge from the Original Leachate Management Works, or,<br>(f) other waste as authorized in writing by the director, but does not include:<br>(g) hazardous waste except as authorized pursuant to the Hazardous Waste Regulation, controlled waste, Attractants, and, | Yes | N/A - waste was not discharged to the Original Landfill in 2023. Operations ceased at the Original Landfill in September 2022 and waste was removed and placed into the New Landfill from April to June 2023. Decomissioning activities were completed in June 2023. | Refer to Section 1.2 of the annual report. |
| 1.1.3 | The waste discharge is authorized to the Original Lined Cell approximately located as shown on Site Plan A. Waste discharge to the Original Unlined Cell is not authorized. | Yes | N/A - waste was not discharged to the Original Landfill in 2023. Operations ceased at the Original Landfill in September 2022 and waste was removed and placed into the New Landfill from April to June 2023. Decomissioning activities were completed in June 2023. | Refer to Section 1.2 of the annual report. |
| 1.1.4 | Authorization to discharge waste to the Original Lined Cell ceases on the earlier of:<br>(i) the date the Original Lined Cell is filled to capacity with grades not steeper than 3H:1V (33%),<br>(ii) the date of commencement of waste discharge to the New Landfill. | Yes | N/A - waste was not discharged to the Original Landfill in 2023. Operations ceased at the Original Landfill in September 2022 and waste was removed and placed into the New Landfill from April to June 2023. Decomissioning activities were completed in June 2023. | Refer to Section 1.2 of the annual report. |
| 1.1.5 | The authorized works are:<br>(i) a lined landfill footprint with a maximum area of 0.72 ha (85 m x 85 m) including from bottom to top a base with perimeter berm, 0.3 m sand cushion layer, 0.5 mm thick coated woven polyethylene liner, 0.3 m granular leak detection layer, leak detection riser pipe, 0.5 mm thick coated woven polyethylene liner, 0.3 m sand protection layer, leachate extraction chamber, final cover, and,<br>(ii) an un-lined landfill footprint with an approximate area of 0.7 ha, final cover,<br>and related appurtenances, approximately located as shown on Site Plan A. | Yes | N/A - Presently, the New Landfill includes two cells: Cell 1 East and Cell 1 West. Cell 1 West was constructed in 2022. Both cells include a double liner system, leak detection layer, and leachate management works. | Refer to Section 2.1 of the annual report. |
| 1.1.6 | The operational certificate holder must ensure the Original Landfill, excluding final cover, is complete and fully operational on or before the date of issuance of this operational certificate, and at all times thereafter, until the Original Landfill is decommissioned in compliance with the plan referred to in section 2.9(a) (plan to remove all waste from the Original Landfill) of this operational certificate. | Yes | N/A - Waste was not discharged to the Original Landfill in 2023. Operations ceased at the Original Landfill in September 2022 and waste was removed and placed into the New Landfill from April to June 2023. Decomissioning activities were completed in June 2023. | Refer to Section 1.2 of the annual report. |
| 1.2.1 | The operational certificate holder must convey the leachate from the Original Lined Cell, that is to be discharged on the Facility site, to the Original Leachate Management Works. | Yes | N/A - Northwin collected, treated, and discharged leachate including batches of leachate from the Original Landfill to the New Landflil. Treated leachate effluent was sampled by Northwin throughout the year. | Refer to Section 2.8 of the annual report. |
| 1.2.2 | The maximum rate of treated leachate effluent discharge to the treated leachate infiltration pond is 7,139 m3 per calendar year. | Yes | N/A - Refer to Section 2.8 of the annual report. | Refer to Section 2.8 of the annual report |
| 1.2.3 | The concentration of any substance in the treated leachate effluent discharge to the treated leachate infiltration pond must not be greater than the Contaminated Sites Regulation Generic Numerical Water Standards for Drinking Water (DW), for that substance. | Yes | N/A - Details regarding treated leachate effluent quality is provided in the Cell 1 East & Ponds Commissioning Report and associated lab reports are provided in Section 2.8 of the annual report. | Refer to Section 2.8 of the annual report. |
| 1.2.4 | The treated leachate effluent is authorized to be discharged to the treated leachate infiltration pond and infiltrated into the ground. This authorization ceases on the date the Original Leachate Management Works are decommissioned in compliance with the plan referred to in section 2.9(a) (plan to remove all waste from the Original Landfill) of this operational certificate. | Yes | N/A | Refer to Section 2.2 of the annual report . |
| 1.2.6 | Minimum Freeboard must be maintained at all times as follows:<br>treated leachate infiltration pond: 0.6 m. | Yes | N/A | Refer to Section 2.2 of the annual report . |
| 1.2.7 | The operational certificate holder must ensure the Original Leachate Management Works are complete and fully operational on or before the date of commencement of discharge to the treated leachate infiltration pond, and at all times thereafter, until the Original Leachate Management Works are decommissioned in compliance with the plan referred to in section 2.9(a) (plan to remove all waste from the Original Landfill) of this operational certificate. | Yes | N/A - waste was not discharged to the Original Landfill in 2023. Operations ceased at the Original Landfill in September 2022 and waste was removed and placed into the New Landfill from April to June 2023. Decomissioning activities were completed in June 2023. | Refer to Section 1.2 of the annual report. |
| 1.3.1 | The maximum rate of waste discharge to the New Landfill is 45,000 tonnes per calendar year. | Yes | N/A - New Landfill accepted approximately 38,327 tonnes in 2023. Note Operational Certificate 107689 Section 1.3.1 states "The maximum rate of waste discharge to the New Landfill is: (45,000 minus the waste discharge to the Original Lined Cell) tonnes per calendar year". Since waste was not discharged to the Original Landfill in 2023 and operations ceased at the Original Landfill in September 2022. The maximum waste dicharge rate of 45,000 tonnes per calendar year only applies to the New Landfill. | Refer to Section 2.6 of the annual report. |
| 1.3.2 | The characteristics of the waste discharge to the New Landfill must be:<br>(a) demolition waste,<br>(b) construction waste,<br>(c) land clearing waste,<br>(d) soil in which the concentrations of all substances are less than the lowest applicable industrial land use standard specified for those substances in<br>(i) the generic numerical soil standards,<br>(ii) the matrix numerical soil standards, or<br>(iii) a director's interim standard for soil,<br>referred to in section 41(1)(a) of the Contaminated Sites Regulation, B.C. Reg. 375/96,<br>(e) sludge from the New Leachate Management Works or the New Stormwater Management Works, or,<br>(f) other waste as authorized in writing by the director,<br>but does not include:<br>(g) hazardous waste except as authorized pursuant to the Hazardous Waste Regulation, controlled waste, Attractants, and, | Yes | N/A | Refer to Section 2.6 of the annual report. |
| 1.3.3 | The waste discharge is authorized to the New Landfill approximately located as shown on Site Plan A. | Yes | N/A | Refer to Section 2.6 of the annual report |
| 1.3.6 | The operational certificate holder must ensure the New Landfill, excluding final cover, is complete and fully operational on or before the date of commencement of waste discharge to the New Landfill, and at all times thereafter. | Yes | N/A | Refer to Section 2.1 of the annual report. |
| 1.4.1 | The operational certificate holder must convey the leachate from the New Landfill, that is to be discharged on the Facility site, to the New Leachate Management Works. | Yes | N/A - Leachate is collected within Cell 1 East (and stormwater from Cell 1 West) in a series of perforated pipes installed at the base of the cell and discharges to a sump. Leachate is stored temporarily in the landfill and pumped from the sump to the leachate treatment pond for batch treatment. | Refer to Section 2.2 of the annual report. |
| 1.4.2 | The maximum rate of treated leachate effluent discharge to the treated leachate infiltration pond is 24,633 m3 per calendar year. | Yes | N/A - Details regarding treated leachate effluent quality is provided in the Cell 1 East & Ponds Commissioning Report. | Refer to Section 2.8 of the annual report. |
| 1.4.3 | The concentration of any substance in the treated leachate effluent discharge to the treated leachate infiltration pond must not be greater than the Contaminated Sites Regulation Generic Numerical Water Standards for Drinking Water (DW), for that substance. | Yes | N/A - Details regarding treated leachate effluent quality is provided in the Cell 1 East & Ponds Commissioning Report. | Refer to Section 2.8 of the annual report. |
| 1.4.4 | The treated leachate effluent is authorized to be discharged to the treated leachate infiltration pond and infiltrated into the ground. | Yes | N/A - Details regarding treated leachate effluent quality is provided in the Cell 1 East & Ponds Commissioning Report. | Refer to Section 2.8 of the annual report. |
| 1.4.5 | The authorized works are leachate conveyance, treatment and discharge works including pumps, pipes, leachate treatment pond(s), treated leachate infiltration pond, flow monitoring works, and related appurtenances approximately located as shown on Site Plan A. | Yes | N/A - The new leachate management works include leachate collection, extraction, storage, treatment, and infiltration. A process schematic of the new leachate management works is provided in Section 2.2 of the annual report. | Refer to Section 2.2 of the annual report. |
| 1.4.7 | Minimum Freeboard must be maintained at all times as follows:<br>leachate treatment pond(s): 0.6 m<br>treated leachate infiltration pond: 0.6 m | Yes | N/A | |
| 1.4.8 | The operational certificate holder must ensure the New Leachate Management Works are complete and fully operational on or before the date of commencement of waste discharge to the New Landfill, and at all times thereafter | Yes | N/A | Refer to Section 2.2 of the annual report. |
| 1.5.1 | The operational certificate holder must manage stormwater from the New Landfill such that stormwater is infiltrated into the ground with the authorized works. | Yes | N/A | Refer to Section 2.3 of the annual report. |
| 1.5.2 | The stormwater must not include leachate and the concentration of any substance in the stormwater must not be greater than the Contaminated Sites Regulation Generic Numerical Water Standards for Drinking Water (DW), for that substance | Yes | N/A - The perimeter stormwater ditches will be established and included in the EMP once final cover is placed. | Refer to Section 6.4 of the annual report. |
| 1.5.4 | Minimum Freeboard must be maintained at all times as follows:<br>stormwater infiltration area: 0.6 m<br>all other authorized works: 0.3 m | Yes | N/A | |
| 1.5.5 | The operational certificate holder must ensure that adequate authorized works to manage stormwater, such that stormwater is infiltrated into the ground with the authorized works, are complete and fully operational on or before the date of commencement of waste discharge to the New Landfill, and at all times thereafter. | Yes | N/A | Refer to Section 3.2 of the annual report. |
| 2.70 | Before a specific quantity of soil is accepted at the Facility, the operational certificate holder must cause a Qualified Professional to certify and submit to the operational certificate holder, a document pertaining to the specific quantity of soil that includes:<br>(i) the soil tonnage(s) and soil quality class(es) as described in the most recent version of Technical Guidance 1 on Contaminated Sites Site Characterization and Confirmation Testing,<br>(ii) the soil origin including applicable civic address, site identification number, parcel identifier, parcel identification number, legal description, and,<br>(iii) characterization of the soil in accordance with ministry procedures and applicable Contaminated Sites Regulation Guidance, Protocols and | Yes | N/A | Refer to Section 3.2 of the annual report. |
| 2.11 | The operational certificate holder must cause a Qualified Professional to carry out inspections before and during the construction or modification of Significant Works, and, after the completion of construction or modification of Significant Works, to certify and submit construction report(s) to the director for all Significant Works, on or before 60 days after the completion of construction or modification of the Significant Works. | Yes | N/A | Refer to Sections 2.1 of the annual report (i.e., construction reports). |
| 2.12 | The operational certificate holder must notify the director of the date of commencement of waste discharge to the New Landfill, on that date. | Yes | N/A | |
| 3.1 | The operational certificate holder must provide and install multiple and/or spare works and auxiliary power facilities to ensure the Original Lined Cell, Original Leachate Management Works, New Landfill, New Leachate Management Works, and New Storm water Management Works, are complete and fully operational as specified in this operational certificate, including during maintenance, breakdowns and electrical power outages. | Yes | N/A | |
| 3.2 | The operational certificate holder must cause persons that are qualified and trained to operate, regularly inspect, and maintain the Facility, in good working order. If components of the Facility have a manufacturer's recommended maintenance schedule, then those components must, at a minimum, be maintained in accordance with that schedule. | Yes | N/A | |
| 3.2 | The operational certificate holder must prepare documents of the qualification and training of the persons operating, inspecting and maintaining the Facility, and of Facility inspections, operation and maintenance. | Yes | N/A | |
| 3.3 | The operational certificate holder must ensure that at least one person responsible for the management of the Facility is certified, and maintains certification, by The Solid Waste Association of North America (SWANA) as a Manager of Landfill Operations, and at least one person responsible for the operation of the Facility has, within the preceding five years, successfully completed the SWANA Landfill Operations Basics course, on or before the earlier of:<br>(i) the date of commencement of waste discharge to the Original Lined Cell,<br>(ii) the date of commencement of waste discharge to the New Landfill, | Yes | N/A | |
| 3.3 | The operational certificate holder must prepare documents of the SWANA certification and training of the person(s) responsible for the management and operation of the Facility. | Yes | N/A | |
| 3.5 | The operational certificate holder must ensure that the Facility does not cause the concentration of any substance in groundwater flowing from the Facility site boundary to be greater than:<br>(i) the Contaminated Sites Regulation Generic Numerical Water Standards for Drinking Water (DW), for that substance, or<br>(ii) if the local background concentration of any substance is greater than (i), the local background concentration of that substance. | Yes | N/A | Refer to Section 6.3 of the annual report. |
| 3.7 | The operational certificate holder must ensure that the Facility does not cause a nuisance including with regard to birds, rodents, insects, odour, noise, dust, litter, vector and wildlife attraction. | Yes | N/A | |
| 3.8 | The operational certificate holder must prepare documents of complaints with regard to matters relevant to this operational certificate, including environmental and nuisance complaints. These documents must include the source and nature of the complaint, actions, responses, and corresponding dates and times. | Yes | N/A | |
| 4.1 | The operational certificate holder must carry out required sampling in accordance with the procedures described in the "British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples, 2013 Edition (Permittee)" or most recent edition, or by alternative procedures as authorized by the director. | Yes | N/A - Refer to Section 5.5 of the annual report. | |
| 4.2 | The operational certificate holder must carry out required analyses in accordance with procedures described in the "British Columbia Laboratory Manual (2015 Permittee Edition)", or the most recent edition or by alternative procedures as authorized by the director. | Yes | N/A | Refer to Sections 5.4 of the annual report. |
| 4.3 | The operational certificate holder must obtain from the analytical laboratory(ies) their precision, accuracy and blank data for each sample set submitted by the operational certificate holder and an evaluation of the data acceptability, based on criteria set by such laboratory. | Yes | N/A - Laboratory reports and respective field sample keys (FSK) for each monitoring event are provided in Appendix F of the annual report. | Refer to Section 5.6 and 6 of the annual report. |

Authorized Person Initial:_____ Date:_____

| AUTHORIZATION CLAUSE NUMBER | AUTHORIZATION CLAUSE DESCRIPTION | COMPLIANT? (Yes/No/ND) | RATIONALE FOR YOUR COMPLIANCE DETERMINATION | LOCATION OF SUPPORTING INFORMATION IN ANNUAL REPORT |
|---|---|---|---|---|
| 4.3 | The operational certificate holder must submit samples to analytical laboratory(ies) that meet the definition of a qualified laboratory under the Environmental Data Quality Assurance Regulation. | Yes | N/A - Analytical services were provided by Bureau Veritas Laboratories (BV) of Burnaby, BC. | Refer to Section 4.6 and 6 of the annual report. |
| 4.3 | The operational certificate holder must collect, prepare and submit for analysis by the analytical laboratory(ies) quality control (QC) samples for each parameter. As a minimum, the number of QC samples should be 20% of all samples collected (environmental + QC samples) within 48 hours of each other, and include duplicate, field and trip blank samples for each parameter. | Yes | N/A -A qualified GHD chemist completed data verification to assess laboratory and field QA/QC measures. | Refer to Section 4.7 and Appendix G of the annual report. |
| 5.2 | The operational certificate holder must immediately notify the director or designate by email at EnvironmentalCompliance@gov.bc.ca, or as otherwise instructed by the director of any non-compliance with the requirements of this authorization by the operational certificate holder and must take remedial action to remedy any effects of such non-compliance. | Yes | N/A - No non-compliances or public complaints. | Refer to Section 2.9 of the annual report. |
| 5.2 | The operational certificate holder must provide the director with written confirmation of all non-compliance events, including available test results within 24 hours of the original notification by email at EnvironmentalCompliance@gov.bc.ca, or as otherwise instructed by the director. | Yes | N/A - No non-compliances or public complaints. | Refer to Section 2.9 of the annual report. |
| 5.3 | If the operational certificate holder fails to comply with any of the requirements of this authorization, the operational certificate holder must, within 30 days of such non-compliance, submit to the director a written report that is satisfactory to the director and includes, but is not necessarily limited to, the following:<br>(i) all relevant test results obtained by the operational certificate holder related to the non-compliance, ii) an explanation of the most probable cause(s) of the non-compliance, and<br>(iii) a description of remedial action planned and/or taken by the operational certificate holder to prevent similar non-compliance(s) in the future. | Yes | N/A - No non-compliances or public complaints. | Refer to Section 2.9 of the annual report. |
| 5.3 | The operational certificate holder must submit all non-compliance reporting required to be submitted under this section by email to the Ministry's Compliance Reporting Submission Mailbox at EnvironmentalCompliance@gov.bc.ca or as otherwise instructed by the director. | Yes | N/A - No non-compliances or public complaints. | Refer to Section 2.9 of the annual report. |
| 5.4 | The operational certificate holder must cause a Qualified Professional to certify and submit an Annual Operations and Monitoring Report in a format suitable for public release, for the preceding calendar year, to the director on or before March 31 of each year. On or before March 31 of each year, the operational certificate holder must post a copy of the Annual Operations and Monitoring Report online, on a website accessible to the public, and in accordance with any requirements of the director. | Yes | N/A | |
| 5.4 | The Annual Operations and Monitoring Report must include a summary of OCP implementation that addresses the information in section 2.3(b), and summary of DOCP implementation that addresses the information in 2.5(b), of this operational certificate. | Yes | N/A | Refer to Section 2.3 of the annual report. |
| 5.4 | The Annual Operations and Monitoring Report must include a summary of construction reports. | Yes | N/A | Refer to Section 2.5 of the annual report. |
| 5.4 | The Annual Operations and Monitoring Report must include annual and cumulative tonnages and categories of waste including soil tonnage(s) and soil quality class(es) discharged to the Original Lined Cell and to the New Landfill. | Yes | N/A | Refer to Section 2.6 of the annual report. |
| 5.4 | The Annual Operations and Monitoring Report must include remaining volume and life of the Original Lined Cell and of the New Landfill. | Yes | N/A - the decommissioning of the Original Landfill began in 2022. | Refer to Section 2.7 of the annual report. |
| 5.4 | The Annual Operations and Monitoring Report must include a summary of treated leachate effluent quantity and quality discharged to the treated leachate infiltration pond. | Yes | N/A | Refer to Section 2.7 and 3.8 of the annual report. |
| 5.4 | The Annual Operations and Monitoring Report must include a summary of complaints and nuisances and description of remedial action planned and/or taken by the operational certificate holder to prevent similar complaints and nuisances in the future. | Yes | N/A | Refer to section 2.9 the annual report. |
| 5.4 | The Annual Operations and Monitoring Report must include a summary of non-compliance notifications and non-compliance reporting and description of remedial action planned and/or taken by the operational certificate holder to prevent similar non-compliance(s) in the future. | Yes | N/A - Refer to sections 2.8 and 3.8 of the annual report. | |
| 5.4 | The Annual Operations and Monitoring Report must include an annual status form in accordance with the instructions and template at the ministry website https://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/data-and-report-submissions/annual-status-form | Yes | N/A - Refer to this form. | (Appendix of the annual report). |
| 5.4 | The Annual Operations and Monitoring Report must include a summary of OCP and DOCP implementation, and construction of Significant Works, planned for the next calendar year. | Yes | N/A | Refer to Sections 2.3 and 2.4 of the annual report. |
| 5.4 | The Environmental Monitoring Plan Report must include site plan(s), sampling locations, storm water flow paths, groundwater elevations, gradients and flow directions. | Yes | N/A | Refer to Figures of the annual report. |
| 5.4 | The Environmental Monitoring Plan Report must include data including laboratory analysis and quality assurance and quality control results. | Yes | N/A | Refer to appendix F of the annual report. |
| 5.4 | The Environmental Monitoring Plan Report must include data tabulation, trend analysis, graphs, diagrams, and interpretation. | Yes | N/A | Refer to Tables 2 - 6 and appendix F of the annual report. |
| 5.4 | The Environmental Monitoring Plan Report must include trigger level assessment plan monitoring, data, results and interpretation. | Yes | N/A - A trigger level assessment plan is not needed for the Original Lined Cell, the New Landfill EMP includes a trigger level response plan. | Refer to Section 2.3 of the annual report. |
| 5.4 | The Environmental Monitoring Plan Report must include any determination(s) of the local background concentration of substance(s) in accordance with section 3.5 of this operational certificate. | Yes | N/A - Local determination(s) on local background concentration of substances was not needed. | |
| 5.4 | The Environmental Monitoring Plan Report must include comparison of the data with the standards for treated leachate effluent discharge, storm water quality, groundwater quality, and landfill gas management, specified in sections 1.2, 1.4, 1.5, 3.5 and 3.6 of this operational certificate, and identification of any non-compliance and predicted future non-compliance. | Yes | N/A | Refer to Section 2.8, Appendix E, and the Tables 2 - 6 of the annual report. |
| 5.4 | The Environmental Monitoring Plan Report must include results, conclusions, recommendations and changes to the environmental monitoring plan. | Yes | N/A - Refer to sections 9 and 10 of the annual report. | Refer to sections 7 and 9 of the annual report. |
| 5.4 | The operational certificate holder must upload monitoring data associated with this operational certificate to the Ministry's Environmental Monitoring System (EMS) database, within 45 days of the end of the 3 month period in which the data is collected. | Yes | N/A - Data has been uploaded to the EMS by the laboratory. | |

# Appendix E

## Borehole Logs

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia
DRILLING CONTRACTOR: Drillwell

HOLE DESIGNATION: BH1-16
DATE COMPLETED: January 27, 2016
DRILLING METHOD: Rotosonic
FIELD PERSONNEL: S. Foster

NORTHING: 5541551.19
EASTING: 330846.01
GROUND SURFACE ELEV. 168.41 m AMSL

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL |
|---|---|---|
| 0 | SW-GRAVELY SAND, well graded, fine to medium sand, fine to coarse gravel, brown, dry, dense | |
| 2 | | 165.67 |
| | SW/GW-SAND AND GRAVEL, well graded, fine to medium sand, fine gravel, brown, dry, very dense | |
| 4 | - with coarse sand at 3.05m BGS | |
| | - moist at 5.15m BGS | 163.23 |
| 6 | SP-SAND with gravel, fine sand with trace coarse sand and fine gravel, moist, sub-rounded, very dense | 162.31 |
| | SW/GW-SAND AND GRAVEL, well graded, fine to coarse sand and gravel, subangular, grey, moist, very dense | |
| 8 | | |
| 10 | | 158.05 |
| | SP-FINE SAND, trace coarse gravel, grey, moist, dense | 157.13 |
| 12 | SW-SAND with gravel, fine to medium grained sand and gravel, grey, moist, very dense | |
| | - cobbles at 12.80m BGS | |
| 14 | | 154.39 |
| | SW-SAND, with gravel to trace gravel, fine to medium grained sand and gravel, grey, wet, loose | |
| 16 | - heaving sands at 14.94m BGS | |
| 18 | | 150.43 |
| | SP-SAND, fine to medium grained sand, grey, moist | |
| 20 | | |
| 22 | | |
| | | 145.25 |
| 24 | BEDROCK, (highly weathered), silty, slight plasticity, soft, grey, wet | 144.94 |
| | | 144.33 |
| 26 | BEDROCK, Karmutsen, porphyritic basalt, igneous extrusive, black (blueish) with white crystals, phaneritic, moderate iron staining on fractures | |
| | vertical fracturing, with iron staining on fracture surface, largely non-intact, RQD=0.25 | |
| 28 | END OF BOREHOLE @ 24.08m BGS | |
| | Borehole completed to target depth in bedrock | |
| | No topsoil evident/surface compact sand and | |

BOREHOLE: SOIL CUTTINGS; BENONITE GRAVEL; 152 mm Ø BOREHOLE; SOIL CUTTINGS; BENTONITE GRAVEL

WELL DETAILS
Seal:
146.46 to 144.33m AMSL
21.95 to 24.08m BGS
Material: Bentonite Gravel

| SAMPLE NUMBER | INTERVAL | REC (m) | 'N' VALUE |
|---|---|---|---|
| RS-1 | | 30.48 | |
| SPT-2 | | 24.38 | 43 |
| RC-2 | | 30.48 | |
| SPT-3 | | 24.38 | 45 |
| RS-3 | | 30.48 | |
| SPT-4 | | 15.24 | 85 |
| RS-4 | | 30.48 | |
| SPT-5 GB-2 | | 30.48 | 87 |
| RS-4 | | 30.48 | |
| SPT-6 | | 15.24 | 41 |
| RS-5 | | 30.48 | |
| SPT-7 GB-1 | | 15.24 | 4 |
| RS-7 | | 30.48 | |
| RS-8 | | 30.48 | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
STATIC WATER LEVEL

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia
DRILLING CONTRACTOR: Drillwell

HOLE DESIGNATION: BH1-16
DATE COMPLETED: January 27, 2016
DRILLING METHOD: Rotosonic
FIELD PERSONNEL: S. Foster

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL | BOREHOLE | SAMPLE | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | NUMBER | INTERVAL | REC (m) | 'N' VALUE | |
| 32 | gravel<br>Borehole backfilled with soil cuttings and sealed with bentonite<br>Static water level in boring - 11.21 m BGS measured after 14 hours<br>RS - Rotosonic Core Sample<br>SPT - Standard Penetration Test (splitspoon sample)<br>GB - Grab Sample | | | | | | | |
| 34 | | | | | | | | |
| 36 | | | | | | | | |
| 38 | | | | | | | | |
| 40 | | | | | | | | |
| 42 | | | | | | | | |
| 44 | | | | | | | | |
| 46 | | | | | | | | |
| 48 | | | | | | | | |
| 50 | | | | | | | | |
| 52 | | | | | | | | |
| 54 | | | | | | | | |
| 56 | | | | | | | | |
| 58 | | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STATIC WATER LEVEL ▼

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia
DRILLING CONTRACTOR: Drillwell

HOLE DESIGNATION: BH2-16
DATE COMPLETED: January 28, 2016
DRILLING METHOD: Rotosonic
FIELD PERSONNEL: J. Stewart

NORTHING: 5541470.19
EASTING: 330839.07
GROUND SURFACE ELEV. m AMSL: 167.86

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL |
|---|---|---|
| 0 | SW-GRAVELY SAND, with cobbles, well graded, fine to coarse sand and gravel, brown, moist, dense | |
| 4 | SW/GW-SAND AND GRAVEL, fine to medium grain sand, dry, compact | 164.51 |
| 6 | SP-SAND, poorly graded, fine sand, brown, dry, very dense | 162.68 |
| 8 | SW/GW-GRAVELY SAND, well graded, grey, moist, dense | 159.63 |
| 12 | ML-SANDY SILT with gravel, slightly cohesive, low plasticity, fine sand and gravel silt till, grey with brown ribbons, moist, compact | 156.28 |
| 14 | BEDROCK, highly weathered (saprolite) surface, silt, crumbly, interbedded grey and brown, moist | 153.84<br>153.53 |
| 16 | BEDROCK, Karmutsen, porphyritic basalt, igneous extrusive, black (blueish) with white crystals, phaneritic, moderate iron staining on fractures<br>vertical fracturing, with iron staining on fracture surface, largely non-intact, RQD=0 | 151.40 |
| 18 | END OF BOREHOLE @ 16.46m BGS | |
| 20 | Borehole completed to target depth in bedrock<br>No topsoil evident/surface compact sand and gravel<br>Borehole dry upon completion<br>Borehole backfilled with soil cuttings and sealed with bentonite<br>RS - Rotosonic Core Sample<br>SPT - Standard Penetration Test (splitspoon sample)<br>GB - Grab Sample | |
| 22 | | |
| 24 | | |
| 26 | | |
| 28 | | |

BOREHOLE

WELL DETAILS
Seal:
156.28 to 151.40m AMSL
11.58 to 16.46m BGS
Material: Bentonite Gravel

| SAMPLE NUMBER | INTERVAL | REC (m) | 'N' VALUE |
|---|---|---|---|
| SPT-1 | | 6.10 | 48 |
| RS-1 | | 30.48 | |
| SPT-2 | | 6.10 | 42 |
| RS-2 | | 30.48 | |
| SPT-3 | | 15.24 | 44 |
| RS-3 | | 30.48 | |
| GB-1 | | | |
| SPT-4 | | 18.29 | 21 |
| RS-4 | | 30.48 | |
| SPT-5 | | 15.24 | >66 |
| RS-5 | | 30.48 | |
| GB-2 | | | |
| SPT-6 | | 15.24 | 37 |
| RS-6 | | 30.48 | |
| GB-3 | | | |
| STP-7 | | 15.24 | 13 |
| GB-4 | | | |
| RS-7 | | 30.48 | |
| GB-5 | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia
DRILLING CONTRACTOR: BMD

HOLE DESIGNATION: BH5-15
DATE COMPLETED: August 6, 2015
DRILLING METHOD: Sonic
FIELD PERSONNEL: T. Fitzgerald
DRILLER: A. McRea

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS |
|---|---|---|
| | GW GRAVEL, with sand, well graded gravel, medium to coarse grained sand, 1.52 m of recovery from 0-3.05 m | |
| | GW GRAVEL, well graded, up to 7.5 cm | 3.05 |
| | GW GRAVEL, with sand, well graded gravel up to 7.5 cm, medium to coarse grained sand | 3.66 |
| | SW SAND, with gravel, medium to coarse grained well graded sand, gravel up to 7.5 cm<br><br>- 0.3 m thick bed of silty sand from 7.01 to 7.32m BGS | 4.27 |
| | GW GRAVEL, with sand, well graded gravel, coarse grained sand | 9.14 |
| | SW SAND, medium grained | 10.36 |
| | SW SAND, with gravel, gravel up to 2 cm | 11.28 |
| | GW GRAVEL, with sand, well graded gravel, coarse grained sand | 12.19 |
| | SW SAND, medium grained | 13.11 |
| | SW SAND, with gravel, gravel up to 2 cm, some cementation but pulverized by coring | 13.41 |
| | GW GRAVEL, with sand, gravel up to 10 cm, coarse grained sand | 15.24 |
| | SW SAND, with gravel, gravel up to 2 cm, some cementation but pulverized by coring | 17.37 |
| | GW GRAVEL, with sand, gravel up to 3 cm, medium to coarse grained sand | 18.29 |
| | SW SAND, with gravel, medium to coarse grained sand, gravel up to 6 cm | 20.42 |
| | END OF BOREHOLE @ 24.38m BGS<br><br>Lost 15.24 m of 0.15 m diameter casing down the borehole. Borehole abandoned. | 24.38 |

BOREHOLE: Bentonite Chips; Soil Cuttings

SAMPLE: NUMBER | INTERVAL | REC (m) | 'N' VALUE

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

OVERBURDEN LOG 088877-WI.GPJ CRA_CORP.GDT 4/17/17

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia
INSTALLED BY: Red Williams Drilling Ltd

HOLE DESIGNATION: MW1-14
DATE COMPLETED: December 4, 2014
DRILLING METHOD: Air Rotary
FIELD PERSONNEL: Red Williams Drilling Ltd
DRILLER: T Johnson

NORTHING: 5541791.65
EASTING: 100824.35

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | GROUND SURFACE | 171.80 | 1.2m Stickup | | | | |
| 0 | SP/PG-SAND AND GRAVEL | | 5.08cm Ø PVC Well Casing; Bentonite; 15.24cm Ø Borehole | | | | |
| 2 | | | | | | | |
| 4 | | | | | | | |
| 6 | - wet at 5.49m BGS | | 5.08cm Ø PVC Well Screen; Sand Pack | | | | |
| 8 | | | | | | | |
| 10 | | | | | | | |
| | END OF BOREHOLE @ 10.97m BGS | 160.83 | | | | | |
| 12 | Log recreated from notes taken by Red Williams Drilling | | | | | | |
| 14 | | | | | | | |
| 16 | | | | | | | |
| 18 | | | | | | | |
| 20 | | | | | | | |
| 22 | | | | | | | |
| 24 | | | | | | | |
| 26 | | | | | | | |
| 28 | | | | | | | |

WELL DETAILS
Screened interval:
166.92 to 160.83m AMSL
4.88 to 10.97m BGS
Length: 6.1m
Diameter: 51mm
Material: PVC
Seal:
171.80 to 167.23m AMSL
0.00 to 4.57m BGS
Material: Bentonite
Sand Pack:
167.23 to 160.83m AMSL
4.57 to 10.97m BGS
Material: Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ 12/4/14

OVERBURDEN LOG 088877-WI.GPJ CRA_CORP.GDT 4/17/17

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia
INSTALLED BY: Red Williams Drilling Ltd

HOLE DESIGNATION: MW2-14
DATE COMPLETED: December 4, 2014
DRILLING METHOD: Air Rotary
FIELD PERSONNEL: Red Williams Drilling Ltd
DRILLER: T Johnson

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | NORTHING: 5541591.19 EASTING: 100877.04 TOP OF RISER GROUND SURFACE | 173.85 173.09 | 0.8m Stickup | | | | |
| 0 | SP/GP-SAND AND GRAVEL | | 5.08cm Ø PVC Well Casing; Bentonite; 15.24cm Ø Borehole | | | | |
| 6 | BOULDERS | 166.38 | | | | | |
| 7 | SP/GP-SAND AND GRAVEL | 165.77 | | | | | |
| 16 | GP-SANDY GRAVEL, wet | 156.02 | 5.08cm Ø PVC Well Screen; Sand Pack | | | | |
| 22 | END OF BOREHOLE @ 21.64m BGS<br>Log recreated from notes taken by Red Williams Drilling | 151.45 | | | | | |

WELL DETAILS
Screened interval:
157.54 to 151.45m AMSL
15.54 to 21.64m BGS
Length: 6.1m
Diameter: 51mm
Material: PVC
Seal:
173.09 to 168.52m AMSL
0.00 to 4.57m BGS
Material: Bentonite
Sand Pack:
168.52 to 151.45m AMSL
4.57 to 21.64m BGS
Material: Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ 12/4/14

OVERBURDEN LOG 088877-WI.GPJ CRA_CORP.GDT 4/17/17

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia
DRILLING CONTRACTOR: Drillwell

HOLE DESIGNATION: MW2A-16
DATE COMPLETED: January 27, 2016
DRILLING METHOD: Rotosonic
FIELD PERSONNEL: S. Foster

NORTHING: 5541591.43
EASTING: 100878

TOP OF RISER 173.86 m AMSL
GROUND SURFACE 173.10 m AMSL

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL |
|---|---|---|
| 0 | SW/GW-SAND AND GRAVEL, medium to coarse sand ti coarse gravel, well graded, grey, dry, subrounded to rounded, dense | |
| 2 | - Compact, brown, dry at 1.22m BGS | |
| | GW-GRAVEL with sand and cobbles, fine to coarse grain gravel, cobbles, coarse sand, well graded, grey, dry, sub-angular-subrounded, compact | 170.36 |
| 4 | - Cobble rich (7-9 cm diameter) from 5.18 to 6.71m BGS | |
| | - Sandy silt layer, increase in fines, very dense, grey, moist at 5.49m BGS | 167.61 |
| 6 | SW/GW-SAND AND GRAVEL, medium sand to coarse gravel, with cobbles, grey moist, well rounded to subrounded, very dense | 166.70 |
| 8 | SW/GW-SAND AND GRAVEL, fine to medium sand fine to coarse gravel, grey, dry, very dense | |
| 10 | | |
| 12 | SP-SAND with gravel, poorly graded, fine to medium sand, fine gravel, grey, moist, subangular to subrounded, very dense | 160.91 |
| 14 | - Becoming wet at 13.41m BGS | |
| 16 | SP-SAND, trace gravel, poorly graded, fine to medium sand, grey, wet, very dense | 156.64 |
| 18 | | |
| 20 | - Cobbles at 19.81m BGS | |
| | SW/GW-SAND AND GRAVEL, fine to coarse sand and gravel to cobble, sand heaving, grey, wet | 152.68 |
| 22 | SP-SAND, fine grain, grey, sand heaving, wet | 152.07 |
| 24 | - Silt rich layer (20 cm) at 24.08m BGS | |
| 26 | | |
| 28 | | |

MONITORING WELL: STICKUP 0.80 M; BENTONITE GRAVEL; 51 mm Ø PVC RISER PIPE; 152 mm Ø BOREHOLE; SOIL CUTTINGS; BENTONITE GRAVEL; SOIL

| SAMPLE NUMBER | INTERVAL | REC (m) | 'N' VALUE |
|---|---|---|---|
| SPT-1 | | 7.62 | 32 |
| RS-1 | | 30.48 | |
| SPT-2 | | 7.62 | 15 |
| GB-1 | G | | |
| RS-2 | | 30.48 | |
| SPT-3 | | 7.62 | 12 |
| RS-3 | | 30.48 | |
| SPT-4 | | 15.24 | 12 |
| RS-4 | | 0.00 | |
| RS-5 | | 30.48 | |
| GB-2 | G | | |
| SPT-5 | | 7.62 | 69 |
| RS-6 | | 30.48 | |
| RS-7 | | 30.48 | |
| RS-8 | | 30.48 | |
| SPT-6 | | 15.24 | 90 |
| RS-9 | | 30.48 | |
| GB-3 | G | | |
| SPT-7 | | 6.10 | >100 |
| RS-10 | | 30.48 | |
| RS-11 | | 30.48 | |
| RS-12 | | 30.48 | |
| GB-4 | G | | |
| SPT-9 | | 15.24 | 7 |
| RS-13 | | 30.48 | |
| GB-5 | G | | |
| RS-14 | | 30.48 | |
| RS-15 | | 30.48 | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STATIC WATER LEVEL ▼

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia
DRILLING CONTRACTOR: Drillwell

HOLE DESIGNATION: MW2A-16
DATE COMPLETED: January 27, 2016
DRILLING METHOD: Rotosonic
FIELD PERSONNEL: S. Foster

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 32 | - Wood detritus (carbon) 2 cm at 32.92m BGS | | CUTTINGS | RS-16 | | 30.48 | |
| 34 | | | | RS-17 | | 30.48 | |
| 36 | | | BENTONITE PELLETS | | | | |
| 38 | | | SILICA SAND | RS-18 | | 30.48 | |
| 40 | | | 51 mm Ø 10-SLOT PVC SCREEN | BG-6 | G | | |
| 42 | | | | RS-19 | | 30.48 | |
| 44 | | | | RS-20 | | 30.48 | |
| 46 | END OF BOREHOLE @ 45.42m BGS | 127.68 | | | | | |
| 48 | Borehole terminated at maximum drilling method depth<br>No topsoil evident/surface compact sand and gravel<br>Static Groundwater Elevation - 13.74 m BGS after completion of well<br>RS - Rotosonic Core Sample<br>SPT - Standard Penetration Test (splitspoon sample)<br>GB - Grab Sample | | | | | | |
| 50 | | | | | | | |
| 52 | | | | | | | |
| 54 | | | | | | | |
| 56 | | | | | | | |
| 58 | | | | | | | |

WELL DETAILS
Screened interval:
135.61 to 132.56m AMSL
37.49 to 40.54m BGS
Length: 3.05m
Diameter: 51mm
Slot Size: 10
Material: SCH. 40 PVC
Seal:
136.22 to 138.05m AMSL
36.88 to 35.05m BGS
Material: Bentonite Pellets
Sand Pack:
132.26 to 136.22m AMSL
40.84 to 36.88m BGS
Material: #2 SILICA SAND
---
Seal:
169.44 to 151.76m AMSL
3.66 to 21.34m BGS
Material: SOIL CUTTINGS
---
Seal:
151.76 to 148.72m AMSL
21.34 to 24.38m BGS
Material: BENTONITE CHIPS
---
Seal:

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
STATIC WATER LEVEL

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia
DRILLING CONTRACTOR: Drillwell

HOLE DESIGNATION: MW2A-16
DATE COMPLETED: January 27, 2016
DRILLING METHOD: Rotosonic
FIELD PERSONNEL: S. Foster

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL | MONITORING WELL | SAMPLE | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | NUMBER | INTERVAL | REC (m) | 'N' VALUE | |
| 62 | | | 148.72 to 138.05m AMSL<br>24.38 to 35.05m BGS<br>Material: SOIL CUTTINGS | | | | | |
| 64 | | | | | | | | |
| 66 | | | | | | | | |
| 68 | | | | | | | | |
| 70 | | | | | | | | |
| 72 | | | | | | | | |
| 74 | | | | | | | | |
| 76 | | | | | | | | |
| 78 | | | | | | | | |
| 80 | | | | | | | | |
| 82 | | | | | | | | |
| 84 | | | | | | | | |
| 86 | | | | | | | | |
| 88 | | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
STATIC WATER LEVEL ▼

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



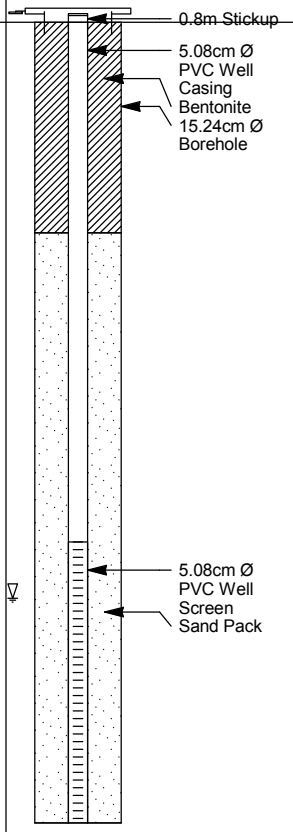
PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia

HOLE DESIGNATION: MW3-14
DATE COMPLETED: December 4, 2014
DRILLING METHOD: Air Rotary
FIELD PERSONNEL: Red Williams Drilling Ltd
DRILLER: T Johnson

NORTHING: 5541429.8
EASTING: 100853.88

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL |
|---|---|---|
| | TOP OF RISER | 168.59 |
| | GROUND SURFACE | 167.59 |
| 0 | SP/GP-SAND AND GRAVEL | |
| 4 | GP-SANDY GRAVEL | 163.32 |
| 8 | SP/GP-SAND AND GRAVEL | 159.97 |
| 12 | GP-SANDY GRAVEL, wet | 155.09 |
| 16 | GRANITE BECROCK | 150.83 |
| 18 | END OF BOREHOLE @ 18.59m BGS<br><br>Log recreated from notes taken by Red Williams Drilling | 149.00 |

MONITORING WELL




WELL DETAILS
Screened interval:
156.31 to 150.22m AMSL
11.28 to 17.37m BGS
Length: 6.1m
Diameter: 51mm
Material: PVC
Seal:
167.59 to 163.02m AMSL
0.00 to 4.57m BGS
Material: Bentonite
Sand Pack:
163.02 to 150.22m AMSL
4.57 to 17.37m BGS
Material: Sand

| SAMPLE | | | | |
|---|---|---|---|---|
| NUMBER | INTERVAL | REC (m) | 'N' VALUE | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ 12/4/14

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia
DRILLING CONTRACTOR: BMD

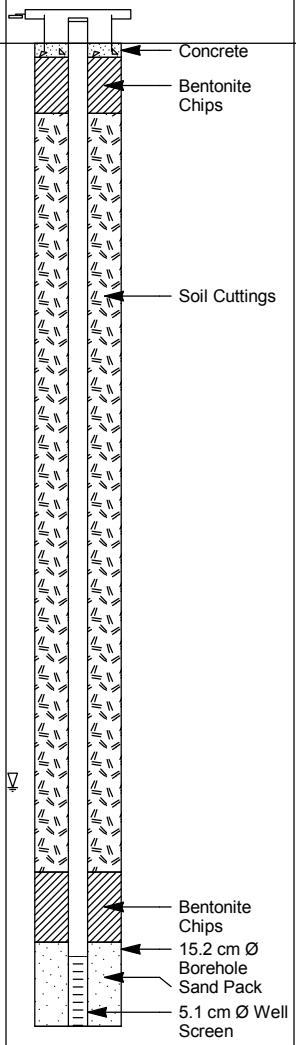
HOLE DESIGNATION: MW4A-15
DATE COMPLETED: August 5, 2015
DRILLING METHOD: Sonic
FIELD PERSONNEL: T. Fitzgerald
DRILLER: A. McRea

NORTHING: 5541583.05
EASTING: 100808.74

TOP OF RISER 169.30 m AMSL
GROUND SURFACE 168.54 m AMSL

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL |
|---|---|---|
| 0 | GW GRAVEL, with sand, subrounded gravel up to 5.1 cm diameter, medium to coarse grained sand | |
| 6 | SW SAND, well graded, medium to coarse grained, moist | 162.14 |
| 10 | SW SAND, well graded, fine to medium grained, moist, 1.52 m of recovery | 159.09 |
| 12 | SW SAND, some gravel, well graded sand, medium to coarse grained gravel | 156.35 |
| | SP SAND, fine grained | 155.74 |
| 14 | SW SAND, some gravel, medium to coarse grained well graded sand | 155.43 |
| | GW GRAVEL, clean, up to 5.1 cm diameter | 153.30 |
| 16 | SW SAND, medium to coarse grained, 1.52 m of recovery<br>- wet at 16.15m BGS | 153.00 |
| 18 | - some gravel from 17.98 to 18.29m BGS | |
| | BEDROCK | 150.25 |
| 20 | IGNEOUS ROCK, porphyritic, aphanitic, brown; phenocrysts approximately 1-3 mm, reddish brown; no evidence of fractures, rock core broken by vibration of the sonic rig | 149.95<br>149.34 |
| 22 | IGNEOUS ROCK, fine grained, coarser than above, green; phenocrysts up to 1 cm<br>- horizontal fracture, fine sediment filling at 19.51m BGS | 147.20 |
| 24 | - vertical and oblique fractures at 19.81m BGS<br>- with secondary mineralization from 20.88 to 21.34m BGS | |
| 26 | END OF BOREHOLE @ 21.34m BGS | |
| 28 | | |

MONITORING WELL




WELL DETAILS
Screened interval:
148.73 to 147.20m AMSL
19.81 to 21.34m BGS
Length: 1.52m
Diameter: 51mm
Slot Size: 10
Material: PVC
Seal:
150.56 to 149.03m AMSL
17.98 to 19.51m BGS
Material: Bentonite Chips
Sand Pack:
149.03 to 147.20m AMSL
19.51 to 21.34m BGS
Material: Sand

SAMPLE

| NUMBER | INTERVAL | REC (m) | 'N' VALUE |
|---|---|---|---|

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ 8/5/15

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia
DRILLING CONTRACTOR: BMD

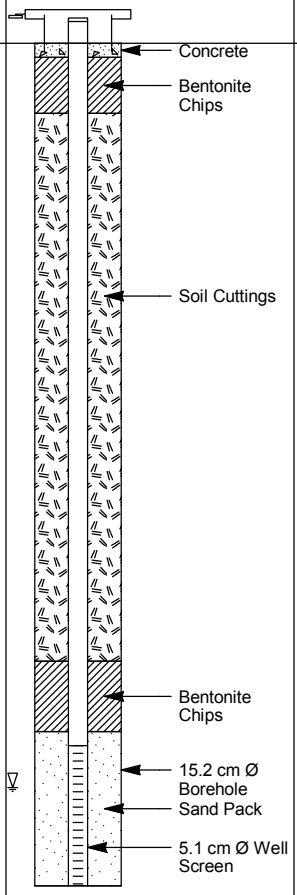
HOLE DESIGNATION: MW4B-15
DATE COMPLETED: August 5, 2015
DRILLING METHOD: Sonic
FIELD PERSONNEL: T. Fitzgerald
DRILLER: A. McRea

NORTHING: 5541575.03
EASTING: 100810.75

TOP OF RISER 169.29 m AMSL
GROUND SURFACE 168.42 m AMSL

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL |
|---|---|---|
| 0 | GW GRAVEL, with sand, subrounded gravel up to 5.1 cm diameter, medium to coarse grained sand | |
| 6 | SW SAND, well graded, medium to coarse grained, moist | 162.02 |
| 10 | SW SAND, well graded, fine to medium grained, moist, 1.52 m of recovery | 158.97 |
| 12 | SW SAND, some gravel, well graded sand, medium to coarse grained gravel | 156.23 |
| | | 155.62 |
| | SP SAND, fine grained | 155.31 |
| 14 | SW SAND, some gravel, medium to coarse grained well graded sand | |
| | | 153.18 |
| | GW GRAVEL, clean, up to 5.1 cm diameter | 152.88 |
| 16 | SW SAND, medium to coarse grained, 1.52 m of recovery<br>- wet at 16.15m BGS | |
| 18 | - some gravel from 17.98 to 18.29m BGS<br>- bedrock at 18.29m BGS | 150.13 |
| | END OF BOREHOLE @ 18.29m BGS | |

MONITORING WELL




WELL DETAILS
Screened interval:
153.18 to 150.13m AMSL
15.24 to 18.29m BGS
Length: 3.05m
Diameter: 51mm
Slot Size: 10
Material: PVC
Seal:
155.01 to 153.48m AMSL
13.41 to 14.94m BGS
Material: Bentonite Chips
Sand Pack:
153.48 to 150.13m AMSL
14.94 to 18.29m BGS
Material: Sand

SAMPLE

| NUMBER | INTERVAL | REC (m) | 'N' VALUE |
|---|---|---|---|
| | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ 8/5/15

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia
DRILLING CONTRACTOR: BMD

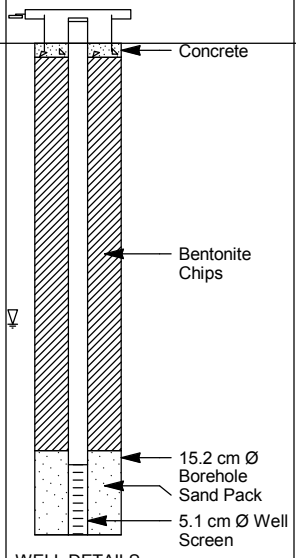
HOLE DESIGNATION: MW5A-15
DATE COMPLETED: August 7, 2015
DRILLING METHOD: Sonic
FIELD PERSONNEL: T. Fitzgerald
DRILLER: A. McRea

NORTHING: 5541325.84
EASTING: 100789.79

TOP OF RISER 191.88 m AMSL
GROUND SURFACE 191.25 m AMSL

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL |
|---|---|---|
| 0 | GW GRAVEL (FILL), with sand, subrounded gravel up to 10 cm, medium to coarse grained sand, 1.52 m of recovery | |
| 2 | | |
| | GW GRAVEL, with sand, gravel up to 10 cm, medium to coarse grained sand<br>- wet due to drilling fluids from 3.05 to 5.49 m BGS | 188.20 |
| 4 | | |
| 6 | SM SAND, silty, fine grained, light brown, wet | 185.15 |
| | ML SILT, light brown, dry | 184.85<br>184.54 |
| | MH SILT, with clay, brownish gray, moist | 183.93 |
| 8 | SM SAND, silty, fine grained, gray, wet | 183.33<br>183.02 |
| | MH SILT, with clay, light brown | |
| 10 | IGNEOUS ROCK, porphyritic, aphanitic; phenocrysts approximately 1-3 mm; some weathered rock possibly from fracture infilling; rock broken by vibration from sonic rig; reddish brown | 180.58 |
| 12 | - 0.15 m long vertical fracture, rock mostly broken by sonic rig, reddish brown, green phenocrysts up to 5 mm from 9.45 to 9.60m BGS | |
| 14 | END OF BOREHOLE @ 10.67m BGS | |
| 16 | | |
| 18 | | |
| 20 | | |
| 22 | | |
| 24 | | |
| 26 | | |
| 28 | | |

MONITORING WELL




WELL DETAILS
Screened interval:
182.11 to 180.58m AMSL
9.14 to 10.67m BGS
Length: 1.52m
Diameter: 51mm
Slot Size: 10
Material: PVC
Seal:
190.34 to 182.41m AMSL
0.91 to 8.84m BGS
Material: Bentonite Chips
Sand Pack:
182.41 to 180.58m AMSL
8.84 to 10.67m BGS
Material: Sand

SAMPLE

| NUMBER | INTERVAL | REC (m) | 'N' VALUE |
|---|---|---|---|
| | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ 8/7/15

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia
DRILLING CONTRACTOR: BMD

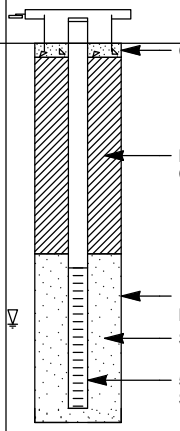
HOLE DESIGNATION: MW5B-15
DATE COMPLETED: August 7, 2015
DRILLING METHOD: Sonic
FIELD PERSONNEL: T. Fitzgerald
DRILLER: A. McRea

NORTHING: 5541325.84
EASTING: 100792.89

TOP OF RISER 192.01 m AMSL
GROUND SURFACE 191.30 m AMSL

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL |
|---|---|---|
| 0 | GW GRAVEL (FILL), with sand, subrounded gravel up to 10 cm, medium to coarse grained sand, 1.52 m of recovery from 0-3.05 m | |
| 2 | | |
| | | 188.25 |
| 4 | GW GRAVEL, with sand, gravel up to 10 cm, medium to coarse grained sand<br>- wet due to drilling fluids from 3.05 to 5.49 m BGS | |
| 6 | | 185.20 |
| | SM SAND, silty, fine grained, light brown, wet | 184.90 |
| | ML SILT, light brown, dry | 184.59 |
| | MH SILT, with clay, brownish gray, moist | 183.98 |
| 8 | | 183.38 |
| | SM SAND, silty, fine grained, gray, wet | 183.07 |
| | MH SILT, with clay, light brown<br>- bedrock at 8.23m BGS | |
| 10 | END OF BOREHOLE @ 8.23m BGS | |
| 12 | | |
| 14 | | |
| 16 | | |
| 18 | | |
| 20 | | |
| 22 | | |
| 24 | | |
| 26 | | |
| 28 | | |

MONITORING WELL




WELL DETAILS
Screened interval:
186.42 to 183.38m AMSL
4.88 to 7.92m BGS
Length: 3.05m
Diameter: 51mm
Slot Size: 10
Material: PVC
Seal:
190.69 to 186.73m AMSL
0.61 to 4.57m BGS
Material: Bentonite Chips
Sand Pack:
186.73 to 183.07m AMSL
4.57 to 8.23m BGS
Material: Sand

SAMPLE

| NUMBER | INTERVAL | REC (m) | 'N' VALUE |
|---|---|---|---|
| | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ 8/7/15

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia

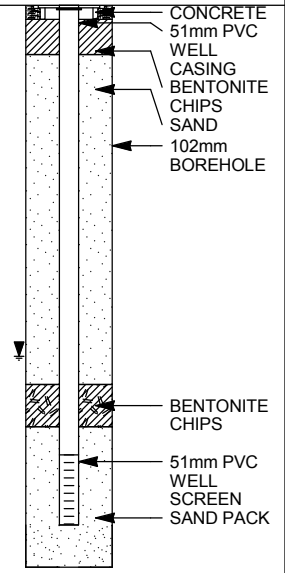
HOLE DESIGNATION: MW6-17
DATE COMPLETED: March 22, 2017
DRILLING METHOD: Sonic
FIELD PERSONNEL: T. Morton

NORTHING: 5541753.1
EASTING: 330407.1

GROUND SURFACE elev. 185.50 m AMSL
TOP OF RISER elev. 185.38 m AMSL

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL |
|---|---|---|
| 0 | GP-GRAVEL (FILL), with sand, occasional cobble, trace silt, poorly graded, brown, moist | |
| | - increase in coarseness at 0.91m BGS | |
| 2 | | |
| | SP-SAND, with gravel, medium to coarse grained, poorly graded, grey, moist | 183.21 |
| 4 | | |
| | SP-SAND, with silt to silty sand, fine to very fine grained, grey to brown, moist | 180.77 |
| 6 | | |
| | SP-SAND, with silt and gravel, occasional till-like cobble, grey, moist | 179.25 |
| 8 | | |
| | SP-SAND (FILL), with silt and gravel, occasional cobble, very dense, grey, moist to wet | 177.57 |
| 10 | | |
| | | 174.22 |
| | TILL/BEDROCK, highly weathered, grey | 173.92 |
| 12 | BEDROCK, granite, pink/red, white inclusions | 173.31 |
| | END OF BOREHOLE @ 12.19m BGS | |
| 14 | | |
| 16 | | |
| 18 | | |
| 20 | | |
| 22 | | |
| 24 | | |
| 26 | | |
| 28 | | |

MONITORING WELL




WELL DETAILS
Screened interval:
175.75 to 174.22m AMSL
9.75 to 11.28m BGS
Length: 1.52m
Diameter: 51mm
Slot Size: 0.020
Material: PVC
Seal:
177.27 to 176.35m AMSL
8.23 to 9.14m BGS
Material: Bentonite Chips
Sand Pack:
176.35 to 173.31m AMSL
9.14 to 12.19m BGS
Material: Sand

| SAMPLE NUMBER | INTERVAL | REC (m) | 'N' VALUE |
|---|---|---|---|
| 1SS | | | |
| 2SS | | | |
| 3SS | | | |
| 4SS | | | |
| 5SS | | | |
| 6SS | | | |
| 7SS | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
STATIC WATER LEVEL ▼ 3/22/17

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia

HOLE DESIGNATION: MW7-17
DATE COMPLETED: March 14, 2017
DRILLING METHOD: Sonic
FIELD PERSONNEL: C. Ragan

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | NORTHING: 5541691.37 EASTING: 100665.22 TOP OF RISER GROUND SURFACE | 187.52 186.86 | | | | | |
| 0 | GP-GRAVEL, with fine to coarse sand, with cobble, trace silt, very dense, well graded, dry to moist | | CONCRETE; 51mm PVC WELL CASING; BENTONITE; 102mm BOREHOLE; BENTONITE CHIPS; 51mm PVC WELL SCREEN; SAND PACK | 1GS | | | |
| 4 | BEDROCK | 182.59 | | 1SS | | 0.00 | 59 |
| | END OF BOREHOLE @ 5.03m BGS | 181.83 | | | | | |

WELL DETAILS
Screened interval:
184.12 to 182.59m AMSL
2.74 to 4.27m BGS
Length: 1.52m
Diameter: 51mm
Slot Size: 0.040
Material: PVC
Seal:
185.18 to 184.57m AMSL
1.68 to 2.29m BGS
Material: Bentonite Chips
Sand Pack:
184.57 to 181.83m AMSL
2.29 to 5.03m BGS
Material: Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
STATIC WATER LEVEL ▼ 3/14/17

OVERBURDEN LOG 088877-WI.GPJ CRA_CORP.GDT 4/17/17

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

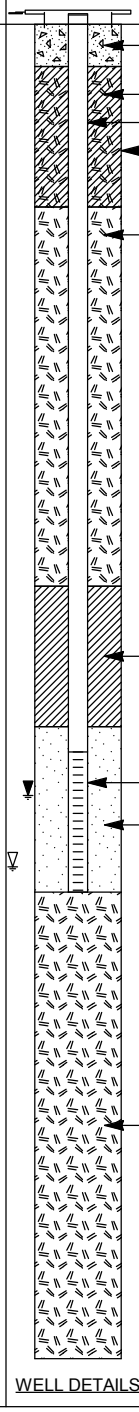


PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia

HOLE DESIGNATION: MW8-17
DATE COMPLETED: February 22, 2017
DRILLING METHOD: Hollow Stem Auger/odex
FIELD PERSONNEL: T. Morton/R. Rocca

NORTHING: 5541828.15
EASTING: 100750.08

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL |
|---|---|---|
| | TOP OF RISER | 192.51 |
| | GROUND SURFACE | 191.29 |
| 0 | SP-SAND (FILL), with gravel, trace silt and organic rootlets, well graded, red/brown | 190.38 |
| 2 | GP-GRAVEL, with sand, trace silt, trace to some cobble, dense to very dense, well graded, grey/brown, dry to moist | 188.24 |
| 4 | SP-SAND, with gravel, trace to some cobble, trace silt, dense, grey/brown, dry to moist | |
| 6 | - infrequent cobble from 6.10m BGS | |
| 8 | | |
| 10 | | |
| 12 | | |
| 14 | BOULDER | 178.18 |
| | GP-GRAVEL, with sand, frequent cobble, trace silt, very dense, poorly graded, brown, wet | 177.73 |
| 16 | - SS9: refusal at 15.62m BGS | |
| | - cobble/boulder from 16.76 to 17.07m BGS | |
| 18 | - red from 17.98 to 18.14m BGS | 173.15 |
| | SP-SAND, with gravel, very dense, medium to fine grained, poorly graded, grey, wet | 172.09 |
| 20 | GP-GRAVEL, with sand, occasional cobble, compact, poorly graded, grey, wet | |
| 22 | SP-SAND, with gravel, very dense, medium to fine grained, poorly graded, grey, wet | 169.34 |
| 24 | - trace gravel, dense below 24.38m BGS | |
| 26 | | |
| 28 | | |
| | END OF BOREHOLE @ 28.96m BGS | 162.33 |




WELL DETAILS

| SAMPLE NUMBER | INTERVAL | REC (m) | 'N' VALUE |
|---|---|---|---|
| 1SS | ☒ | 20.42 | 70 |
| 2SS | ☒ | 16.46 | 44 |
| 3SS | ☒ | 12.80 | 33 |
| 4SS | ☒ | 14.02 | 41 |
| 5SS | ☒ | 15.24 | 40 |
| 6SS | ☒ | 17.68 | 35 |
| 7SS | ☒ | 15.24 | 38 |
| 8SS | ☒ | | 40 |
| 9SS | ☒ | 6.10 | 96+ |
| 10SS | ☒ | 21.64 | 64 |
| 11SS | ☒ | 12.80 | 21 |
| 12SS | ☒ | 30.48 | 38 |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER FOUND ▽ 2/20/17 STATIC WATER LEVEL ▼ 2/20/17

OVERBURDEN LOG 088877-WI.GPJ CRA_CORP.GDT 4/17/17

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia

HOLE DESIGNATION: MW8-17
DATE COMPLETED: February 22, 2017
DRILLING METHOD: Hollow Stem Auger/odex
FIELD PERSONNEL: T. Morton/R. Rocca

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL | MONITORING WELL | SAMPLE | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | NUMBER | INTERVAL | REC (m) | 'N' VALUE | |
| 32<br>34<br>36<br>38<br>40<br>42<br>44<br>46<br>48<br>50<br>52<br>54<br>56<br>58 | | | Screened interval:<br>175.50 to 172.45m AMSL<br>15.79 to 18.84m BGS<br>Length: 3.05m<br>Diameter: 51mm<br>Slot Size: 0.040<br>Material: PVC<br>Seal:<br>179.10 to 176.05m AMSL<br>12.19 to 15.24m BGS<br>Material: Bentonite Pellets<br>Sand Pack:<br>176.05 to 172.45m AMSL<br>15.24 to 18.84m BGS<br>Material: Sand | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ 2/20/17 STATIC WATER LEVEL ▼ 2/20/17

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia

HOLE DESIGNATION: MW9-17
DATE COMPLETED: March 14, 2017
DRILLING METHOD: Sonic
FIELD PERSONNEL: C. Ragan

NORTHING: 5541911.68
EASTING: 100811.04

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL |
|---|---|---|
| | TOP OF RISER | 191.65 |
| | GROUND SURFACE | 190.85 |
| 0 | SP-SAND (FILL), with gravel, trace silt and organic rootlets, well graded, red/brown, dry to moist | 189.94 |
| 2 | GW-GRAVEL, with sand, with cobble, trace silt, dense to very dense, brown, dry<br>- 0.13m diameter boulder at 1.52m BGS | |
| 4 | | 185.97 |
| 6 | SP-SAND, with gravel, trace cobble, trace silt, dense to very dense, fine to coarse grained, brown, dry to moist<br>- increase in gravel and cobble content at 7.32m BGS | 183.23 |
| 8 | GP-GRAVEL, with cobble, with medium to coarse sand, with silt, brown, moist | 182.62 |
| 10 | SW/GW-SAND/GRAVEL, trace cobble, trace silt, dense, fine to coarse sand, fine to coarse subrounded gravel, brown, moist | 181.10 |
| 12 | SP-SAND, with medium gravel, some cobble, trace silt, very dense, coarse grained, moist | |
| 14 | GW-GRAVEL, with cobble, with medium to coarse sand, very dense, fine to medium grained, dark grey, moist | 177.13<br>176.52 |
| 16 | SP-SAND, with fine to medium gravel, some cobble, trace silt, dense, medium to coarse grained, brown, moist | 175.00<br>174.39 |
| 18 | SM-SILTY SAND, with gravel, dense, fine grained, light grey, dry | |
| 20 | SW/GW-SAND/GRAVEL, with cobble, with silt, dense, fine to coarse sand, fine to coarse gravel, brown, moist | 171.34 |
| 22 | SM-SILTY SAND, with gravel, very dense, fine grained, poorly graded, light grey, dry to moist | 170.12 |
| 24 | SW/GW-SAND/GRAVEL, with cobble, with silt, very dense, fine to coarse sad, fine to coarse gravel, brown, moist | |
| 26 | GW-GRAVEL, with fine to medium sand, some cobble, trace silt, very dense, fine to coarse grained, subrounded, brown/dark grey, wet | 166.16 |
| 28 | GP/SP-SAND/GRAVEL, some coble, trace silt, dense, medium to coarse sand, fine to medium subrounded gravel, clean, brown, wet<br>- increase in cobble up to > 7cm, heaving | 163.11 |

MONITORING WELL: CONCRETE; 51mm PVC WELL CASING; BENTONITE CHIPS/CUTTINGS; 102mm BOREHOLE; BENTONITE CHIPS

SAMPLE

| NUMBER | INTERVAL | REC (m) | 'N' VALUE |
|---|---|---|---|
| 1SS | | 30.48 | 58 |
| 2SS | | 9.14 | 51 |
| 3GS | | | |
| 4SS | | 0.00 | 43 |
| 5GS | | | |
| 6SS | | 9.14 | 85 |
| 7SS | | 7.62 | 40 |
| 9GS | | | |
| 8SS | | 9.14 | 95 |
| 10GS | | | |
| 11SS | | 9.14 | 126 |
| 12GS | | | |
| 13SS | | 3.05 | 62 |
| 14GS | | | |
| 15SS | | 3.05 | 21 |
| 16GS | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER FOUND ▽ 3/14/17 STATIC WATER LEVEL ▼ 3/14/17

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia

HOLE DESIGNATION: MW9-17
DATE COMPLETED: March 14, 2017
DRILLING METHOD: Sonic
FIELD PERSONNEL: C. Ragan

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 32 | formation approx. 1.22m into casing at 29.57m BGS | | 51mm PVC WELL SCREEN<br>SAND PACK | 17SS | | 7.62 | 30 |
| 34 | SM-SILTY SAND, trace gravel, dense, fine to medium grained, light brown/grey, wet | 157.93 | | 18GS | | | |
| 36 | END OF BOREHOLE @ 33.53m BGS | 157.32 | | | | | |
| 38 | | | | | | | |
| 40 | | | | | | | |
| 42 | | | | | | | |
| 44 | | | | | | | |
| 46 | | | | | | | |
| 48 | | | | | | | |
| 50 | | | | | | | |
| 52 | | | | | | | |
| 54 | | | | | | | |
| 56 | | | | | | | |
| 58 | | | | | | | |

WELL DETAILS
Screened interval:
160.37 to 157.32m AMSL
30.48 to 33.53m BGS
Length: 3.05m
Diameter: 51mm
Slot Size: 0.040
Material: PVC
Seal:
161.59 to 160.37m AMSL
29.26 to 30.48m BGS
Material: Bentonite Pellets
Sand Pack:
161.59 to 157.32m AMSL
29.26 to 33.53m BGS
Material: Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ 3/14/17 STATIC WATER LEVEL ▼ 3/14/17

OVERBURDEN LOG 088877-WI.GPJ CRA_CORP.GDT 4/17/17

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia

HOLE DESIGNATION: MW10-17
DATE COMPLETED: March 27, 2017
DRILLING METHOD: Sonic/air Rotary
FIELD PERSONNEL: T. Morton/C. Ragan

NORTHING: 5541441.67
EASTING: 331208.63

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | TOP OF RISER | 189.07 | CONCRETE; 51mm PVC WELL CASING; BENTONITE GROUT; PEA GRAVEL/CUTTINGS; 102mm BOREHOLE | | | | |
| | GROUND SURFACE | 188.24 | | | | | |
| 0 | GP-GRAVEL, with sand, intermixed with organics (rootlets), poorly graded, red/brown | 188.09 | | | | | |
| | GP/SP-GRAVEL/SAND, with sand to with gravel, trace silt, occasional cobble, poorly graded, grey, dry | 187.02 | | 1GS | | | |
| 2 | GP-GRAVEL, with sand, trace silt, occasional cobble, poorly graded, grey, dry | 185.19 | | | | | |
| | GP-GRAVEL/COBBLE | 184.73 | | 2GS | | | |
| 4 | SP-SAND, trace gravel, medium to coarse grained, poorly graded, grey, moist to wet | 183.36 | | | | | |
| | GW/SW-SAND/GRAVEL, with cobble, trace silt, fine to medium gravel, medium to coarse sand, very dense, brown, moist | | | 3SS | | 5.18 | 34 |
| 6 | | | | | | | |
| 8 | | | | | | | |
| 10 | | | | | | | |
| | GW-GRAVEL, with fine to medium sand, with silt, with cobble up to 10cm, fine to coarse gravel, very dense, brown, moist | 177.57 | | 4GS | | | |
| 12 | | | | | | | |
| | GW/SW-SAND/GRAVEL, with cobble, some silt, fine to coarse gravel, fine to coarse sand, very dense, brown, moist | 174.52 | | | | | |
| 14 | | | | | | | |
| | SM-SILTY SAND, with gravel, trace cobble, very dense, fine grained, dark grey | 172.39 | | | | | |
| 16 | | 171.48 | | 5GS | | | |
| | SP-SAND, trace silt, trace gravel, dense, medium grained, clean, brown, moist | | | | | | |
| 18 | - with fine gravel at 18.90m BGS | | | | | | |
| 20 | | | | | | | |
| | GP/SP-GRAVEL/SAND, some cobble, trace silt, fine to coarse gravel, medium sand, brown, moist | 167.21 | | 6GS | | | |
| 22 | | | | | | | |
| | SP-SAND, with fine to medium gravel, trace cobble, trace silt, very dense, medium grained, brown, moist | 165.08 | | 7SS | | 15.24 | 101 |
| 24 | | | | | | | |
| 26 | - increase in silt content, trace gravel, fine to medium grained at 27.13m BGS | | | | | | |
| 28 | | | | 8GS | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER FOUND ▽ 3/23/17 STATIC WATER LEVEL ▼ 3/27/17

OVERBURDEN LOG 088877-WI.GPJ CRA_CORP.GDT 4/17/17

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia

HOLE DESIGNATION: MW10-17
DATE COMPLETED: March 27, 2017
DRILLING METHOD: Sonic/air Rotary
FIELD PERSONNEL: T. Morton/C. Ragan

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 32 | | | | 9SS | | 15.24 | 87 |
| 34 | SM-SILTY SAND, very dense, fine grained, some medium grained, dark grey/brown, moist | 154.71 | | 10GS | | | |
| 36 | | | | 11SS | | | 120 |
| 38 | | | | | | | |
| 40 | SP-SAND, with silt, trace gravel, medium fine to fine grained, moist to wet | 148.62 | | | | | |
| 42 | | | BENTONITE PELLETS | | | | |
| 44 | | | 51mm PVC WELL SCREEN | | | | |
| 46 | | | SAND PACK | | | | |
| 48 | END OF BOREHOLE @ 47.85m BGS | 140.39 | SLOUGH | | | | |
| 50 | | | | | | | |
| 52 | | | | | | | |
| 54 | | | | | | | |
| 56 | | | | | | | |
| 58 | | | | | | | |

WELL DETAILS
Screened interval:
145.05 to 142.00m AMSL
43.19 to 46.24m BGS
Length: 3.05m
Diameter: 51mm
Slot Size: 0.020
Material: PVC
Seal:
147.70 to 146.18m AMSL
40.54 to 42.06m BGS
Material: Bentonite Pellets
Sand Pack:
146.18 to 142.00m AMSL
42.06 to 46.24m BGS
Material: Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ 3/23/17 STATIC WATER LEVEL ▼ 3/27/17

# STRATIGRAPHIC LOG
# (OVERBURDEN)



PROJECT NAME: Upland

PROJECT NUMBER: 088877

CLIENT: Upland Contracting

LOCATION: Campbell River, British Columbia

DRILLING CONTRACTOR: Drillwell

HOLE DESIGNATION: BH13-18

DATE COMPLETED: 16 July 2018

DRILLING METHOD: Geoprobe HQ casing advancing the wet coring.

FIELD PERSONNEL: M. Dyck/B. Kempel

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL | SAMPLE | | | | |
|---|---|---|---|---|---|---|---|
| | | | NUMBER | INTERVAL | REC (%) | | |
| | GROUND SURFACE | 191.23 | | | | | |
| 0.5 | SW/GW - SAND and GRAVEL, with cobbles, occassional boulders, medium to coarse grained sand and gravel, grey/brown. | | | | | | |
| 1.0 | Drill unable to advance any further than 14.94 m bgs. | | | | | | |
| 1.5 | | | | | | | |
| 2.0 | | | | | | | |
| 2.5 | | | | | | | |
| 3.0 | | | | | | | |
| 3.5 | | | | | | | |
| 4.0 | | | | | | | |
| 4.5 | | | | | | | |
| 5.0 | | | | | | | |
| 5.5 | | | | | | | |
| 6.0 | | | | | | | |
| 6.5 | | | | | | | |
| 7.0 | | | | | | | |
| 7.5 | | | | | | | |
| 8.0 | | | | | | | |
| 8.5 | | | | | | | |
| 9.0 | | | | | | | |
| 9.5 | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC LOG
# (OVERBURDEN)



PROJECT NAME: Upland

PROJECT NUMBER: 088877

CLIENT: Upland Contracting

LOCATION: Campbell River, British Columbia

DRILLING CONTRACTOR: Drillwell

HOLE DESIGNATION: BH13-18

DATE COMPLETED: 16 July 2018

DRILLING METHOD: Geoprobe HQ casing advancing the wet coring.

FIELD PERSONNEL: M. Dyck/B. Kempel

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | | |
|---|---|---|---|---|---|---|---|
| 10.5 | | | | | | | |
| 11.0 | | | | | | | |
| 11.5 | | | | | | | |
| 12.0 | | | | | | | |
| 12.5 | | | | | | | |
| 13.0 | | | | | | | |
| 13.5 | | | | | | | |
| 14.0 | | | | | | | |
| 14.5 | | | | | | | |
| 15.0 | END OF BOREHOLE @ 14.94m BGS | 176.29 | | | | | |
| 15.5 | | | | | | | |
| 16.0 | | | | | | | |
| 16.5 | | | | | | | |
| 17.0 | | | | | | | |
| 17.5 | | | | | | | |
| 18.0 | | | | | | | |
| 18.5 | | | | | | | |
| 19.0 | | | | | | | |
| 19.5 | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC LOG
# (OVERBURDEN)



PROJECT NAME: Upland
PROJECT NUMBER: 088877
CLIENT: Upland Contracting
LOCATION: Campbell River, British Columbia
DRILLING CONTRACTOR: Drillwell

HOLE DESIGNATION: BH14-18
DATE COMPLETED: 16 July 2018
DRILLING METHOD: Geoprobe Solid Stem
FIELD PERSONNEL: M. Dyck/B. Kempel

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | | |
|---|---|---|---|---|---|---|---|
| | GROUND SURFACE | 191.68 | | | | | |
| 0.5 | FILL - SAND and GRAVEL, some wood pieces, fill | | | | | | |
| | No bedrock down to 10.67 m bgs. | | | | | | |
| 1.0 | | | | | | | |
| 1.5 | | | | | | | |
| 2.0 | | | | | | | |
| 2.5 | | | | | | | |
| 3.0 | | | | | | | |
| 3.5 | | | | | | | |
| 4.0 | | | | | | | |
| 4.5 | | | | | | | |
| 5.0 | | | | | | | |
| 5.5 | | | | | | | |
| 6.0 | | | | | | | |
| 6.5 | | | | | | | |
| 7.0 | | | | | | | |
| 7.5 | | | | | | | |
| 8.0 | | | | | | | |
| 8.5 | | | | | | | |
| 9.0 | | | | | | | |
| 9.5 | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC LOG
# (OVERBURDEN)



PROJECT NAME: Upland
PROJECT NUMBER: 088877
CLIENT: Upland Contracting
LOCATION: Campbell River, British Columbia
DRILLING CONTRACTOR: Drillwell

HOLE DESIGNATION: BH14-18
DATE COMPLETED: 16 July 2018
DRILLING METHOD: Geoprobe Solid Stem
FIELD PERSONNEL: M. Dyck/B. Kempel

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | | |
|---|---|---|---|---|---|---|---|
| 10.5 | | | | | | | |
| | END OF BOREHOLE @ 10.67m BGS | 181.01 | | | | | |
| 11.0 | | | | | | | |
| 11.5 | | | | | | | |
| 12.0 | | | | | | | |
| 12.5 | | | | | | | |
| 13.0 | | | | | | | |
| 13.5 | | | | | | | |
| 14.0 | | | | | | | |
| 14.5 | | | | | | | |
| 15.0 | | | | | | | |
| 15.5 | | | | | | | |
| 16.0 | | | | | | | |
| 16.5 | | | | | | | |
| 17.0 | | | | | | | |
| 17.5 | | | | | | | |
| 18.0 | | | | | | | |
| 18.5 | | | | | | | |
| 19.0 | | | | | | | |
| 19.5 | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland
PROJECT NUMBER: 088877
CLIENT: Upland Contracting
LOCATION: Campbell River, British Columbia
DRILLING CONTRACTOR: Drillwell

HOLE DESIGNATION: MW15A-18
DATE COMPLETED: 18 July 2018
DRILLING METHOD: HW Casing, HQ Coring
FIELD PERSONNEL: M. Dyck/B. Kempel

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) |
|---|---|---|---|---|---|---|
| | TOP OF RISER<br>GROUND SURFACE | 183.07<br>182.41 | | | | |
| 0.5 | SW/SP - Sand with gravel, medium to coarse grain sand, brown/grey | | CONCRETE | | | |
| 1.0 | | | | | | |
| 1.5 | | | | | | |
| 2.0 | | | | | | |
| 2.5 | | | | | | |
| 3.0 | | | | | | |
| 3.5 | | | | | | |
| 4.0 | | | | | | |
| 4.5 | | | | | | |
| 5.0 | | | | | | |
| 5.5 | | | | | | |
| 6.0 | | | | | | |
| 6.5 | | | | | | |
| 7.0 | | | BENTONITE CHIPS | | | |
| 7.5 | | | | | | |
| 8.0 | | | | | | |
| 8.5 | | | | | | |
| 9.0 | END OF OVERBURDEN HOLE @ 9.14m BGS | | | | | |
| 9.5 | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STATIC WATER LEVEL ▼

# STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)



PROJECT NAME: Upland
PROJECT NUMBER: 088877
CLIENT: Upland Contracting
LOCATION: Campbell River, British Columbia
DRILLING CONTRACTOR: Drillwell

HOLE DESIGNATION: MW15A-18
DATE COMPLETED: 18 July 2018
DRILLING METHOD: HW Casing, HQ Coring
FIELD PERSONNEL: M. Dyck/B. Kempel

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL | MONITORING WELL | RUN NUMBER | CORE RECOVERY % | RQD % |
|---|---|---|---|---|---|---|
| 9.0 | | 173.27 | | | | |
| 9.5 | BEDROCK - Basalt (Karmusten Formation), grey, porphyritic, no apparent primary porosity, obvious weathering on fractured surface in upper 1.2 metres | | | 1 | 100% | |
| 10.0 | Weathered sub-vertical fractures. Light brown precipitate on fracture surfaces from 9.15 to 9.30m BGS | | BENTONITE CHIPS | | | |
| 10.5 | - Weathered horizontal fracture. Light brown precipitate on fracture surfaces. at 9.27m BGS | | | | | |
| 11.0 | - Weathered sub-vertical fractures. Light brown precipitate on fracture surfaces from 9.35-9.5m and from 9.55-10.29m BGS from 9.35 to 9.50m BGS | | | 2 | 100% | |
| 11.5 | - Weathered horizontal fracture. Light brown precipitate on fracture surfaces at 9.6, 9.63 and 10.24m BGS at 9.60m BGS | | | | | |
| 12.0 | - Some infilled, consolidated fractures/seams below 10.67 m bgs at 10.67m BGS | | | 3 | >100% (1.60 m) | |
| 12.5 | - Subhorizontal fracture with little weathering at 10.79, 11.15, 11.18 and 11.96m BGS at 10.79m BGS | | | | | |
| 13.0 | - Subvertical fracture. Precipitate and infilling on fractures. from 12.37 to 12.70m BGS | | | | | |
| 13.5 | - Horizontal fractures at 12.83 and 12.9m BGS at 12.83m BGS | | | | | |
| 14.0 | - Horizontal fracture. Precipitate and some infilling/weathering on fractured surface at 13.23, 13.26, 13.28 and 13.31m BGS at 13.23m BGS | | 10-20 FILTER SAND | 4 | >100% (1.57 m) | |
| 14.5 | - Subvertical fracture. Precipitate and infilling on fractures from 13.41-13.72m and from 14.35 to 14.4m BGS from 13.41 to 13.72m BGS | | | | | |
| 15.0 | - Subvertical fracture at 14.63m and from 15.11-15.24m BGS at 14.63m BGS | 167.17 | | | | |
| 15.5 | END OF BOREHOLE @ 15.24m BGS | | | | | |
| 16.0 | | | | | | |
| 16.5 | | | | | | |
| 17.0 | | | | | | |
| 17.5 | | | | | | |
| 18.0 | | | | | | |

WELL DETAILS
Screened interval:
168.69 to 167.17m AMSL
13.72 to 15.24m BGS
Length: 1.52m
Diameter: 51mm
Material: PVC Schedule 40
Seal:
182.11 to 169.00m AMSL
0.30 to 13.41m BGS
Material: Bentonite Chips
Sand Pack:
169.00 to 167.17m AMSL
13.41 to 15.24m BGS
Material: Sand 10-20

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STATIC WATER LEVEL ▼

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland
PROJECT NUMBER: 088877
CLIENT: Upland Contracting
LOCATION: Campbell River, British Columbia
DRILLING CONTRACTOR: Drillwell

HOLE DESIGNATION: MW15B-18
DATE COMPLETED: 23 July 2018
DRILLING METHOD: Air Rotary
FIELD PERSONNEL: M. Dyck
DRILLER: Scott Burrows

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) |
|---|---|---|---|---|---|---|
| | TOP OF RISER<br>GROUND SURFACE | 183.17<br>182.40 | | | | |
| 0.5 – 6.0 | SP/SW - SAND with minor gravel, fine to medium grained sand, medium gravel, brown/grey | | CONCRETE<br>BENTONITE CHIPS | | | |
| 6.0 – 9.0 | SM/SC - SILTY/CLAYEY SAND, fine grained sand, low plasticity, brown | 176.30 | 10-20 FILTER SAND | | | |
| 9.0 | - BASALT (Bedrock) at 8.99m BGS<br>END OF BOREHOLE @ 8.99m BGS | 173.41 | | | | |

WELL DETAILS
Screened interval:
174.93 to 173.41m AMSL
7.47 to 8.99m BGS
Length: 1.52m

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STATIC WATER LEVEL ▼ July 23, 2018

OVERBURDEN LOG 088877 - BH LOGS.GPJ GHD_Corp 26/9/18

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland
PROJECT NUMBER: 088877
CLIENT: Upland Contracting
LOCATION: Campbell River, British Columbia
DRILLING CONTRACTOR: Drillwell

HOLE DESIGNATION: MW15B-18
DATE COMPLETED: 23 July 2018
DRILLING METHOD: Air Rotary
FIELD PERSONNEL: M. Dyck
DRILLER: Scott Burrows

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | | |
|---|---|---|---|---|---|---|---|---|
| 10.5 | | | Diameter: 51mm<br>Material: PVC Schedule 40<br>Seal:<br>182.10 to 175.39m AMSL<br>0.30 to 7.01m BGS<br>Material: Bentonite Chips<br>Sand Pack:<br>175.39 to 173.41m AMSL<br>7.01 to 8.99m BGS<br>Material: Sand 10-20 | | | | | |
| 11.0 | | | | | | | | |
| 11.5 | | | | | | | | |
| 12.0 | | | | | | | | |
| 12.5 | | | | | | | | |
| 13.0 | | | | | | | | |
| 13.5 | | | | | | | | |
| 14.0 | | | | | | | | |
| 14.5 | | | | | | | | |
| 15.0 | | | | | | | | |
| 15.5 | | | | | | | | |
| 16.0 | | | | | | | | |
| 16.5 | | | | | | | | |
| 17.0 | | | | | | | | |
| 17.5 | | | | | | | | |
| 18.0 | | | | | | | | |
| 18.5 | | | | | | | | |
| 19.0 | | | | | | | | |
| 19.5 | | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STATIC WATER LEVEL ▼ July 23, 2018

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia

HOLE DESIGNATION: MW11-19
DATE COMPLETED: 9 April 2019
DRILLING METHOD: Air Rotary
FIELD PERSONNEL: N. Turl/R.M. Rocca

NORTHING: 5541315.22
EASTING: 331194.55

TOP OF RISER 194.78
GROUND SURFACE 193.96

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL |
|---|---|---|
| 0 | TOPSOIL (FILL), trace fine gravel, trace woodchips, dark brown/black, moist | |
| 4 | GW-GRAVEL, trace topsoil, fine to coarse grained, angular, dark brown/black, moist | 190.91 |
| 6 | SW-SAND, with fine angular gravel, well graded | 187.86 |
| 10 | - increase in sand content, angular at 9.14m BGS | |
| 12 | - increase in gravel content, coarse, angular at 12.19m BGS | |
| 18 | GP/SP-GRAVEL/SAND, fine gravel, coarse sand | 175.67 |
| 20 | - increase in gravel content at 21.34m BGS | |
| 24 | GP-GRAVEL, fine grained, angular and round | 169.57 |
| 30 | | |

MONITORING WELL: CONCRETE; BENTONITE CHIPS; 51mm PVC WELL CASING; 152mm BOREHOLE; NATIVE SOIL CUTTINGS

SAMPLE

| NUMBER | INTERVAL | REC (m) |
|---|---|---|
| 1AR | | |
| 2AR | | |
| 3AR | | |
| 4AR | | |
| 5AR | | |
| 15.24m -001 | | |
| 6AR | | |
| 7AR | | |
| 8AR | | |
| 9AR | | |
| 10AR | | |
| 30.48m -002 | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (oval)

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia

HOLE DESIGNATION: MW11-19
DATE COMPLETED: 9 April 2019
DRILLING METHOD: Air Rotary
FIELD PERSONNEL: N. Turl/R.M. Rocca

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) |
|---|---|---|---|---|---|---|
| 34 | SP-SAND, fine to medium grained | 160.43 | | 11AR | | |
| 36 | GW-GRAVEL, fine grained, well sorted | 158.90 | | 12AR | | |
| 38 | SP-SAND, fine grained, poorly graded | 157.38 | | 13AR | | |
| 40 | | | | 14AR | | |
| 42 | | | | | | |
| 44 | | | | 15AR | | |
| 46 | | | | 45.72m -003 | | |
| 48 | | | BENTONITE PELLETS | 16AR | | |
| 50 | | | | 17AR | | |
| 52 | | | 51mm PVC WELL SCREEN | | | |
| 54 | | | SAND PACK | 18AR | | |
| 56 | END OF BOREHOLE @ 54.86m BGS | 139.09 | | | | |
| 58 | | | | | | |
| 60 | | | | | | |
| 62 | | | | | | |

WELL DETAILS
Screened interval:
143.51 to 140.46m AMSL
50.44 to 53.49m BGS
Length: 3.05m
Diameter: 51mm
Slot Size: 0.010
Material: SCH. 40 PVC
Seal:
147.17 to 144.12m AMSL
46.79 to 49.83m BGS
Material: BENTONITE PELLETS
Sand Pack:
147.17 to 140.46m AMSL
46.79 to 53.49m BGS
Material: 10/20 FILTER SAND

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia

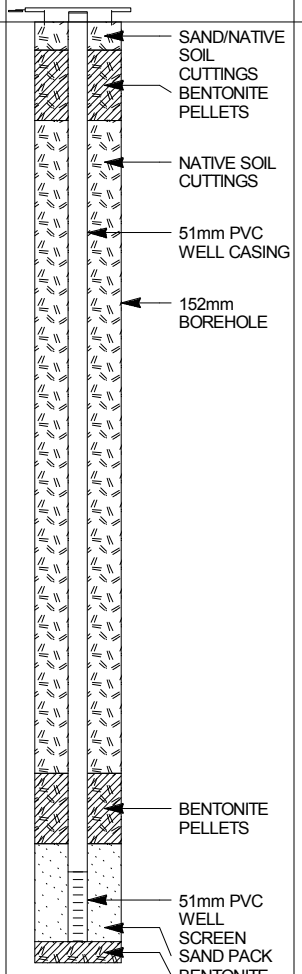
HOLE DESIGNATION: PZ1-19
DATE COMPLETED: 10 April 2019
DRILLING METHOD: Air Rotary
FIELD PERSONNEL: N. Turl/R.M. Rocca

NORTHING: 5541391.35
EASTING: 297

TOP OF RISER 192.12 m AMSL
GROUND SURFACE 191.25 m AMSL

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL |
|---|---|---|
| 0 | GW-GRAVEL, with fine to coarse sand, fine to medium grained, well graded, grey | |
| 2 | | |
| | - increase in sand content at 3.05m BGS | |
| 4 | | |
| 6 | | 185.16 |
| | SW-SAND, with fine gravel, fine to coarse grained, well graded, brown/grey | |
| 8 | | |
| | - increase in gravel content from 9.14 to 12.19m BGS | |
| 10 | | |
| 12 | | |
| 14 | | |
| 16 | | |
| | GW-GRAVEL, with coarse sand, fine grained, well graded, brown/grey | 174.49 |
| 18 | | |
| | SW-SAND, with fine to coarse gravel, fine to coarse grained, well graded, brown/grey | 172.96 |
| 20 | GM-SILTY GRAVEL, with sand, well graded, brown | 171.44 / 171.13 |
| | BEDROCK, brown/grey | 170.83 |
| 22 | END OF BOREHOLE @ 20.42m BGS | |
| 24 | | |
| 26 | | |
| 28 | | |

PIEZOMETER




WELL DETAILS
Screened interval:
172.81 to 171.29m AMSL
18.44 to 19.96m BGS
Length: 1.52m
Diameter: 51mm
Slot Size: 0.010
Material: SCH. 40 PVC
Seal:
174.94 to 173.42m AMSL
16.31 to 17.83m BGS
Material: BENTONITE PELLETS
Sand Pack:
173.42 to 171.29m AMSL
17.83 to 19.96m BGS
Material: 10/20 FILTER SAND

| SAMPLE NUMBER | INTERVAL | REC (m) |
|---|---|---|
| 1AR | | |
| 2AR | | |
| 3AR | | |
| 4AR | | |
| 5AR | | |
| 6AR | | |
| 7AR | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Upland Landfill
PROJECT NUMBER: 088877
CLIENT: Uplands
LOCATION: Campbell River, British Columbia

HOLE DESIGNATION: BH16-19
DATE COMPLETED: 10 April 2019
DRILLING METHOD: Air Rotary
FIELD PERSONNEL: N. Turl/R.M. Rocca

NORTHING: 5541534.43
EASTING: 330733.84

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m AMSL | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) |
|---|---|---|---|---|---|---|
| | GROUND SURFACE | 171.93 | | | | |
| 0 | SW-GRAVELLY SAND, fine to coarse angular to subangular gravel, fine to coarse grained, well graded, brown | | NATIVE SOIL CUTTINGS | | | |
| 2 | GC-CLAYEY GRAVEL, with fine to coarse sand, fine to coarse grained, low to medium plasticity, grey | 169.80 | BENTONITE CHIPS | 1AR | | |
| 4 | SW-GRAVELLY SAND, fine to coarse angular to subangular gravel, fine to coarse grained, well graded, brown | 168.89 | NATIVE SOIL CUTTINGS | 2AR | | |
| 6 | BEDROCK, brown/grey, iron staining | 166.14 | BENTONITE CHIPS | 3AR | | |
| | END OF BOREHOLE @ 6.25m BGS | 165.69 | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

OVERBURDEN LOG 088877-WI.GPJ GHD_Corp 24/5/19

# Appendix F

## 2023 Environmental Monitoring Program Specification

**Environmental Monitoring Program Specification - 2023**

**PROJECT:** New Landfill EMP

**CLIENT:** Northwin Environmental

**PROJECT NO.:** 11222680.15

**PROJECT MANAGER:** Rose Marie Rocca

| **MONITORING STAFF:** | **RESPONSIBILITY** |
|---|---|
| Kathleen Hasler | Field Lead |
| Carny Wong | Field Technician |
| Stephanie Berton | Project Chemist |
| Tristan Habdas | Database Analyst |

**LABORATORIES USED:** ALS Environmental, Burnaby, British Columbia

**AUTHORIZATION:** **MONITORING EVENT(S)** Mar/Apr, Jun, Aug/Sep, Nov **PC/PM SIGNATURE** _____

| Revision # | Date | Revision | GHD |
|---|---|---|---|
| 1 | January 2022 | Specification was developed based on the DOCP, dated July 8, 2021 | RMR |
| 2 | April 2022 | Typo in 2022 EMP Spec was corrected, from MW12-17 to MW11-19. | RMR |
| 3 | August 2022 | MW3-14 was added to the groundwater monitoring program as a downgradient compliance well, to be sampled semi-annually in 2022. This well was sampled in June 2022, as part of the original EMP, the analytical results will be for the New Landfill EMP as well. In 2023, this well will be sampled quarterly. | RMR |
| 4 | August 2022 | MW12-22 was added to the groundwater monitoring specification as a downgradient compliance well following its installation, to be sampled quarterly.<br><br>Renamed LS1 to LDMP-1 and renamed LS2 to LDMP-2. Added LDS, LDMP-3 and LDMP-4. These changes were made to the leak detection monitoring program to account for as built conditions.<br><br>Added phenols to the leachate analytical parameter list, to be analyzed annually due to presence of wood waste. | RMR |
| 5 | September 2022 | Updated QAQC Samples. Added LW-PFAS to field blank's analytical list in Q4. | KH |

| Revision # | Date | Revision | GHD |
|---|---|---|---|
| 6 | March 2023 | Added semi-annual water level monitoring to the full groundwater well network.<br>Removed East and West surface water ditch from the EMP until final cover is placed on the New Landfill.<br>Added Cell 1 West leachate sump to the quarterly leachate monitoring program. Samples will be collected following the discharge of waste to the cell. | RMR |
| 7 | May 2023 | Perfluorinated compounds has been discontinued from the leachate analytical list since standards only apply to sites set out in Schedule 2 as item A4, C3, E10 or G1.<br>For monitoring location TLIP, the sampler has been changed from GHD to Upland to reflect current field practices. | RMR |


Monitoring Schedule: Table 1
Groundwater Analytical Parameters: Table 2
Surface Water Analytical Parameters: Table 3
Leachate Analytical Parameters Table 4
Notes Page 7


**Note for Staff – Labelling error on casing:**

LFG1-22 labelled as “SVP1-22” on casing.
LFG2-22 labelled as “SVP2-22” on casing.

**Environmental Monitoring Program Specification - 2023**
**Monitoring Schedule**
**New Landfill**

| Monitoring Location | Purpose | Sample Matrix | Quarterly Hydraulic Monitoring | March/ April | June | August/ September | November |
|---|---|---|---|---|---|---|---|
| **Groundwater Monitoring (19 WL Locations, 12 Sampling Locations)** | | | | | | | |
| ***Upgradient Monitoring Wells (5 Locations)*** | | | | | | | |
| MW6-17 | To monitor upgradient groundwater quality. | WG | Q | √ | √ | √ | √ |
| MW9-17 | To monitor upgradient groundwater quality. | WG | Q | √ | √ | √ | √ |
| MW1-14 | To monitor upgradient groundwater quality. | WG | Q | √ | √ | √ | √ |
| MW4A-15 | To monitor upgradient groundwater quality. | WG | Q | √ | √ | √ | √ |
| MW4B-15 | To monitor upgradient groundwater quality. | WG | Q | √ | √ | √ | √ |
| ***Cross-Gradient Monitoring Wells (2 Locations)*** | | | | | | | |
| MW2-14 | To monitor cross-gradient groundwater quality. | WG | Q | √ | √ | √ | √ |
| MW2A-16 | To monitor cross-gradient groundwater quality. | WG | Q | √ | √ | √ | √ |
| ***Downgradient Compliance Monitoring Wells (4 Locations, 1 Proposed Location)*** | | | | | | | |
| MW10-17 | To monitor downgradient groundwater quality near the east property boundary. | WG | Q | √ | √ | √ | √ |
| MW12-22 | To monitor downgradient groundwater quality at the south property boundary. | WG | Q | √ | √ | √ | √ |
| MW11-19 | To monitor downgradient groundwater quality at the south east corner of the site. | WG | Q | √ | √ | √ | √ |
| MW3-14 | To monitor groundwater quality immediately downgradient of Phase 1 East Landfill Cell. | WG | Q | √ | √ | √ | √ |
| MW13 (proposed) | To monitor groundwater quality immediately downgradient of the landfill. **Sample once installed.** | WG | Q | √ | √ | √ | √ |
| MW5A-15, MW5B-15, MW7-17, MW8-17, MW15A-18, MW15B-18, PZ1-19 | | WG | Q | - | - | - | - |
| **Surface Water Monitoring (4 Monitoring Locations, 2 Sampling Locations)** | | | | | | | |
| Rico Gauge | To **monitor** the water level in Rico Lake via surface water gauge. | N/A | Q | - | - | - | - |
| SW15-02 | To monitor surface water quality in Rico Lake | WS | N/A | - | - | - | √ |
| McIvor Lake | To monitor the water level in McIvor Lake via BC Hydro Data Records - use link in notes below. **Look up and record on day of monitoring event** - data is only available for a limited period on BC Hydro website[1] | N/A | Q | - | - | - | - |
| SW15-01 | To monitor surface water quality in McIvor Lake | WS | N/A | - | - | - | √ |
| **Leachate Monitoring (3 Locations)** | | | | | | | |
| S06-21 | To characteize leachate quality collected from the Leachate Sump at northeast end of Cell 1 West. Sampling location is from the leachate collection system sump riser pipe. | WL | N/A | √ | √ | √ | √ |
| TLIP | To assess leachate treatment performance and determine if changes to the treatment process are required. Upland to collect samples prior to discharge to the treated leachate infiltration pond (TLIP) to assess if quality meets the CSR DW Standards. | WL | N/A | - | - | - | - |
| S07-YY | To characteize leachate quality collected from the Leachate Sump in Cell 1 West. **Monitoring will begin once waste has been dischaged to this cell**. | WL | N/A | √ | √ | √ | √ |
| **Leak Detection Monitoring Program (5 Locations)** | | | | | | | |
| LDS | To monitor leakage at the primary liner of the landfill as part of the Trigger Level Response Plan. If water is present, collect a sample. Acess to the leak detection sump is on the north side of the landfill. | W | Q | √ | √ | √ | √ |
| LDMP-1 | To monitor leakage at the primary liner of the landfill, as part of the Trigger Level Response Plan. Access to the Leak Detection Monitoring Pipe is on the north side of the landfill. **If water is present call PM** | W | Q | - | - | - | - |
| LDMP-2 | To monitor leakage at the primary liner of the landfill, as part of the Trigger Level Response Plan. Access to the Leak Detection Monitoring Pipe is on the north side of the landfill. **If water is present call PM** | W | Q | - | - | - | - |
| LDMP-3 | To monitor leakage at the primary liner of the landfill, as part of the Trigger Level Response Plan. Access to the Leak Detection Monitoring Pipe is on the east side of the landfill. **If water is present call PM** | W | Q | - | - | - | - |
| LDMP-4 | To monitor leakage at the primary liner of the landfill, as part of the Trigger Level Response Plan. Access to the Leak Detection Monitoring Pipe is on the east side of the landfill. **If water is present call PM** | W | Q | - | - | - | - |
| **Landfill Gas in Soil Monitoring (2 Locations)** | | | | | | | |
| LFG1-22 | To monitor landfill gas migration. | n/a | Q[2] | - | - | - | √ |
| LFG2-22 | To monitor landfill gas migration. | n/a | Q[2] | - | - | - | √ |
| **Field Quality Assurance/Quality Control (QA/QC)[3]** | | | | | | | |
| Field Blank | | WG | - | √ | √ | √ | - |
| Trip Blank - BTEX/VPH Only | | WL/W | - | - | - | - | √ |
| Groundwater Duplicate | | WG | - | √ | √ | √ | √ |
| Leachate Duplicate | | WL | - | √ | √ | √ | - |

**Notes:**

[1] - McIvor Lake water level. Look up current water level at the Ladore Dam: https://www.bchydro.com/energy-in-bc/operations/transmission-reservoir-data/previous-reservoir-elevations/vancouver_island/ladore_ldr.html

[2]- Collect water level only if screen is blocked and a landfill gas in soil cannot be measured.

[3] - The number of QC samples should be 20% of all samples collected within 48 hours of each other;
and include duplicate, field blank, and trip blank samples for each parameter. Add QA/QC samples to the November event if 20% has not been reached.

**Table 2**

**Environmental Monitoring Program Specification - 2023**
**Groundwater Analytical Parameters**
**New Landfill**
**Northwin Environmental, Campbell River, BC**

| Groundwater (WG) | Quarterly | | | |
|---|---|---|---|---|
| | Mar/Apr | Jun | Aug/Sep | Nov |
| **Water Level Monitoring** | | | | |
| Depth to Water | √ | √ | √ | √ |
| Depth to Bottom | √ | √ | √ | √ |
| **Field Parameters** | | | | |
| Conductivity (uS/cm) | √ | √ | √ | √ |
| Oxidation reduction potential (mV) | √ | √ | √ | √ |
| pH (s.u.) | √ | √ | √ | √ |
| Temperature (deg C) | √ | √ | √ | √ |
| Total dissolved solids (mg/L) | √ | √ | √ | √ |
| Turbidity (ntu) | √ | √ | √ | √ |
| **General Chemistry** | | | | |
| Alkalinity (Speciated) | √ | √ | √ | √ |
| Conductivity | √ | √ | √ | √ |
| Chloride | √ | √ | √ | √ |
| Sulphate | √ | √ | √ | √ |
| Total Sulphide (Low Level) + $H_2S$ Calc | √ | √ | √ | √ |
| Total Sulphide, Un-ionized (as $H_2S$) (Calc) | √ | √ | √ | √ |
| Nitrate (as N) | √ | √ | √ | √ |
| Nitrite (as N) | √ | √ | √ | √ |
| Nitrite/Nitrate (N+N) | √ | √ | √ | √ |
| Orthophosphate | √ | √ | √ | √ |
| Total Dissolved Solids (TDS) | √ | √ | √ | √ |
| **Nutrients** | | | | |
| Ammonia Nitrogen | √ | √ | √ | √ |
| **Metals** | | | | |
| Dissolved CSR Metals (Incl. Hg) | √ | √ | √ | √ |
| Dissolved Hardness (as $CaCO_3$) | √ | √ | √ | √ |
| **Other** | | | | |
| LEPH/HEPH (Incl. PAH/EPH) | √ | √ | √ | √ |

**Table 3**

**Environmental Monitoring Program Specification - 2023**
**Surface Water Analytical Parameters**
**New Landfill**
**Northwin Environmental, Campbell River, BC**

| Surface Water (WS) | Quarterly | | | |
|---|---|---|---|---|
| | Mar/Apr | Jun | Aug/Sep | Nov |
| **Water Level Monitoring** | | | | |
| Water level at Rico Gauge | √ | √ | √ | √ |
| Record water level using BC Hydro Data Records - use link in Table 1. | √ | √ | √ | √ |
| **Field Parameters** | | | | |
| Conductivity (uS/cm) | √ | √ | √ | √ |
| Oxidation reduction potential (mV) | √ | √ | √ | √ |
| pH (s.u.) | √ | √ | √ | √ |
| Temperature (deg C) | √ | √ | √ | √ |
| Total dissolved solids (mg/L) | √ | √ | √ | √ |
| Turbidity (ntu) | √ | √ | √ | √ |
| **General Chemistry** | | | | |
| Alkalinity (Speciated) | √ | √ | √ | √ |
| Conductivity | √ | √ | √ | √ |
| Chloride | √ | √ | √ | √ |
| Sulphate | √ | √ | √ | √ |
| Total Sulphide (Low Level) + $H_2S$ Calc | √ | √ | √ | √ |
| Total Sulphide, Un-ionized (as $H_2S$) (Calc) | √ | √ | √ | √ |
| Nitrate (as N) | √ | √ | √ | √ |
| Nitrite (as N) | √ | √ | √ | √ |
| Nitrite/Nitrate (N+N) | √ | √ | √ | √ |
| Orthophosphate | √ | √ | √ | √ |
| Total Suspended Solids (TSS) | √ | √ | √ | √ |
| **Nutrients** | | | | |
| Ammonia Nitrogen | √ | √ | √ | √ |
| **Metals** | | | | |
| Total CSR Metals (Incl. Hg) | √ | √ | √ | √ |
| Dissolved Hardness (as $CaCO_3$) | √ | √ | √ | √ |
| **Other** | | | | |
| LEPH/HEPH (Incl. PAH/EPH)[1] | - | - | - | - |

1 - If leachate concentrations for LEPH/HEPH are 80% within CSR 3.2 Aquatic Life Criteria, include LEPH/HEPH analysis in surface water during the next event

**Table 4**

**Environmental Monitoring Program Specification - 2023**
**Leachate Analytical Parameters**
**New Landfill**
**Northwin Environmental, Campbell River, BC**

| Leachate (WL) | Quarterly | | | |
|---|---|---|---|---|
| | Mar/Apr | Jun | Aug/Sep | Nov |
| **Water Level Monitoring** | | | | |
| Depth to Water | √ | √ | √ | √ |
| Depth to Bottom | √ | √ | √ | √ |
| **Field Parameters** | | | | |
| Conductivity (uS/cm) | √ | √ | √ | √ |
| Oxidation reduction potential (mV) | √ | √ | √ | √ |
| pH (s.u.) | √ | √ | √ | √ |
| Temperature (deg C) | √ | √ | √ | √ |
| Total dissolved solids (mg/L) | √ | √ | √ | √ |
| Turbidity (ntu) | √ | √ | √ | √ |
| **General Chemistry** | | | | |
| Alkalinity (Speciated) | √ | √ | √ | √ |
| Conductivity | √ | √ | √ | √ |
| Chloride | √ | √ | √ | √ |
| Sulphate | √ | √ | √ | √ |
| Total Sulphide (Low Level) + $H_2S$ Calc | √ | √ | √ | √ |
| Total Sulphide, Un-ionized (as $H_2S$) (Calc) | √ | √ | √ | √ |
| Nitrate (as N) | √ | √ | √ | √ |
| Nitrite (as N) | √ | √ | √ | √ |
| Nitrite/Nitrate (N+N) | √ | √ | √ | √ |
| Orthophosphate | √ | √ | √ | √ |
| Biological Oxygen Demand (Total) (BOD5) | √ | √ | √ | √ |
| Chemical Oxygen Demand (COD) | √ | √ | √ | √ |
| Total Dissolved Solids (TDS) | √ | √ | √ | √ |
| Total Suspended Solids (TSS) | √ | √ | √ | √ |
| **Nutrients** | | | | |
| Ammonia Nitrogen | √ | √ | √ | √ |
| **Metals** | | | | |
| Total CSR Metals (Incl. Hg) | √ | √ | √ | √ |
| Dissolved Hardness (as $CaCO_3$) | √ | √ | √ | √ |
| **Other** | | | | |
| LEPH/HEPH (Incl. PAH/EPH) | √ | √ | √ | √ |
| BTEX/VPH | - | - | - | √ |
| Phenols | - | - | - | √ |

**Table 5**

**Environmental Monitoring Program Specification - 2023**
**Leak Detection Water Analytical Parameters**
**New Landfill**
**Northwin Environmental, Campbell River, BC**

| Leak Detection Water (W) | Quarterly | | | |
|---|---|---|---|---|
| | Mar/Apr | Jun | Aug/Sep | Nov |
| **Water Level Monitoring** | | | | |
| Depth to Water | √ | √ | √ | √ |
| Depth to Bottom | √ | √ | √ | √ |
| **Field Parameters** | | | | |
| Conductivity (uS/cm) | √ | √ | √ | √ |
| Oxidation reduction potential (mV) | √ | √ | √ | √ |
| pH (s.u.) | √ | √ | √ | √ |
| Temperature (deg C) | √ | √ | √ | √ |
| Total dissolved solids (mg/L) | √ | √ | √ | √ |
| Turbidity (ntu) | √ | √ | √ | √ |
| **General Chemistry** | | | | |
| Alkalinity (Speciated) | √ | √ | √ | √ |
| Conductivity | √ | √ | √ | √ |
| Chloride | √ | √ | √ | √ |
| Sulphate | √ | √ | √ | √ |
| Total Sulphide (Low Level) + $H_2S$ Calc | √ | √ | √ | √ |
| Total Sulphide, Un-ionized (as $H_2S$) (Calc) | √ | √ | √ | √ |
| Nitrate (as N) | √ | √ | √ | √ |
| Nitrite (as N) | √ | √ | √ | √ |
| Nitrite/Nitrate (N+N) | √ | √ | √ | √ |
| Orthophosphate | √ | √ | √ | √ |
| Biological Oxygen Demand (BOD) | √ | √ | √ | √ |
| Chemical Oxygen Demand (COD) | √ | √ | √ | √ |
| Total Dissolved Solids (TDS) | √ | √ | √ | √ |
| Total Suspended Solids (TSS) | √ | √ | √ | √ |
| **Nutrients** | | | | |
| Ammonia Nitrogen | √ | √ | √ | √ |
| **Metals** | | | | |
| Total CSR Metals (Incl. Hg) | √ | √ | √ | √ |
| Dissolved Hardness (as $CaCO_3$) | √ | √ | √ | √ |
| **Other** | | | | |
| LEPH/HEPH (Incl. PAH/EPH) | √ | √ | √ | √ |
| BTEX/VPH | - | - | - | √ |
| Phenols | - | - | - | √ |

# Appendix G

## EMP Field Sample Keys and Laboratory Reports

**Q1 2023 EMP FSK**
**2023 Environmental Monitoring Program**
**New Landfill, Upland**
**Campbell River, British Columbia**

| Sample Name | Location | Date | Time | Type | Matrix | Parent Sample Name | WaterDepth | DepthUnit | DryYesNo | Temperature | Temperature Unit | Field pH (s.u.) | ORP | ORP units | Conductivity | Conductivity Unit | Turbidity (NTU) | Dissolved Oxygen (DO) | DO Units | TDS | TDS Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rico Gauge~290323 | Rico Gauge | 03/29/2023 | 07:00 | N | WG | - | 1.88 | m | No | - | - | - | - | - | - | - | - | - | - | - | - |
| LDS~290323 | LDS | 03/29/2023 | 07:00 | N | WG | - | DRY | m BTOR | Yes | - | - | - | - | - | - | - | - | - | - | - | - |
| LDMP-1~~290323 | LDMP-1 | 03/29/2023 | 07:00 | N | WG | - | DRY | m BTOR | Yes | - | - | - | - | - | - | - | - | - | - | - | - |
| LDMP-2~~290323 | LDMP-2 | 03/29/2023 | 07:00 | N | WG | - | DRY | m BTOR | Yes | - | - | - | - | - | - | - | - | - | - | - | - |
| LDMP-3~~290323 | LDMP-3 | 03/29/2023 | 07:00 | N | WG | - | DRY | m BTOR | Yes | - | - | - | - | - | - | - | - | - | - | - | - |
| LDMP-4~~290323 | LDMP-4 | 03/29/2023 | 07:00 | N | WG | - | DRY | m BTOR | Yes | - | - | - | - | - | - | - | - | - | - | - | - |
| WG-11222680-280323-KH-01 | MW2A-16 | 03/28/2023 | 13:00 | N | WG | - | 17.406 | m BTOR | No | 12.12 | deg C | 7.63 | 318 | millivolts | 62 | uS/cm | 3.5 | 8.32 | mg/L | 40 | mg/L |
| WG-11222680-280323-KH-02 | MW2-14 | 03/28/2023 | 14:10 | N | WG | - | 17.471 | m BTOR | No | 9.90 | deg C | 6.8 | 382 | millivolts | 110 | uS/cm | 2.8 | 11.07 | mg/L | 70 | mg/L |
| WL-11222680-280323-KH-01 | S06-21 | 03/28/2023 | 15:50 | N | WG | - | 17.440 | m BTOR | No | 16.53 | deg C | 7.67 | -376 | millivolts | 3730 | uS/cm | 30.3 | 8.59 | mg/L | 2100 | mg/L |
| WL-11222680-280323-KH-02 | S06-21 | 03/28/2023 | 16:00 | FD | WG | WL-11222680-280323-KH-01 | 17.440 | m BTOR | No | 16.53 | deg C | 7.67 | -376 | millivolts | 3730 | uS/cm | 30.3 | 8.59 | mg/L | 2100 | mg/L |
| WG-11222680-280323-KH-03 | MW1-14 | 03/28/2023 | 17:45 | N | WG | - | 8.430 | m BTOR | No | 13.87 | deg C | 7.58 | 105 | millivolts | 199 | uS/cm | 24.0 | 8.96 | mg/L | 129 | mg/L |
| WG-11222680-280323-KH-04 | MW9-17 | 03/28/2023 | 18:45 | N | WG | - | 24.566 | m BTOR | No | 7.41 | deg C | 7.51 | 150 | millivolts | 45 | uS/cm | 3.3 | 10.82 | mg/L | 29 | mg/L |
| WG-11222680-290323-KH-05 | MW12-22 | 03/29/2023 | 10:45 | N | WG | - | 40.513 | m BTOR | No | 10.37 | deg C | 7.56 | 173 | millivolts | 124 | uS/cm | 0.5 | 11.53 | mg/L | 80 | mg/L |
| WG-11222680-290323-KH-06 | MW12-22 | 03/29/2023 | 10:55 | FD | WG | WG-11222680-290323-KH-05 | 40.513 | m BTOR | No | 10.37 | deg C | 7.56 | 173 | millivolts | 124 | uS/cm | 0.5 | 11.53 | mg/L | 80 | mg/L |
| WG-11222680-290323-KH-07 | MW11-19 | 03/29/2023 | 13:45 | N | WG | - | 48.094 | m BTOR | No | 16.54 | deg C | 7.67 | 150 | millivolts | 171 | uS/cm | 18.0 | - | mg/L | 111 | mg/L |
| WG-11222680-290323-KH-08 | FIELD BLANK | 03/29/2023 | 13:20 | FB | WGQ | - | - | - | No | - | - | - | - | - | - | - | - | - | - | - | - |
| WG-11222680-290323-KH-09 | MW10-17 | 03/29/2023 | 16:00 | N | WG | - | 42.028 | m BTOR | No | 12.33 | deg C | 7.65 | 140 | millivolts | 159 | uS/cm | 2.5 | - | mg/L | 103 | mg/L |
| WG-11222680-KH-10 | MW6-17 | 03/29/2023 | 17:00 | N | WG | - | 8.023 | m BTOR | No | 10.58 | deg C | 7.09 | 171 | millivolts | 432 | uS/cm | 800 | - | mg/L | 2810 | mg/L |

**Q2 2023 EMP FSK**
**2023 Environmental Monitoring Program**
**New Landfill, Upland**
**Campbell River, British Columbia**

| Location | Date Time | Sample Name | Matrix | Type | Parent Sample Name | Field pH (s.u.) | Conductivity | Conductivity Unit | Temperature | Temperature Unit | Turbidity (NTU) | ORP | ORP Units | Dissolved Oxygen (DO) | DO Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW22-12 | 07/17/2023 15:15:00 | WG-11222680-170723-KH-01 | WG | N | - | 7.24 | 149 | uS/cm | 16.19 | Deg C | 3.8 | 196 | millivolts | 8.93 | mg/L |
| MW10-17 | 07/17/2023 16:15:00 | WG-11222680-170723-KH-02 | WG | N | - | 7.75 | 148 | uS/cm | 13.68 | Deg C | 2.7 | 202 | millivolts | 11.40 | mg/L |
| MW9-17 | 07/17/2023 17:20:00 | WG-11222680-170723-KH-03 | WG | N | - | 7.84 | 57 | uS/cm | 19.42 | Deg C | 3.0 | 189 | millivolts | 12.4 | mg/L |
| MW9-17 | 07/17/2023 17:30:00 | WG-11222680-170723-KH-04 | WG | FD | WG-11222680-170723-KH-03 | 7.84 | 57 | uS/cm | 19.42 | Deg C | 3.0 | 189 | millivolts | 12.4 | mg/L |
| MW11-19 | 07/18/2023 10:40:00 | WG-11222680-180723-KH-05 | WG | N | - | 7.70 | 191 | uS/cm | 16.92 | Deg C | 45.9 | 139 | millivolts | 6.39 | mg/L |
| MW1-14 | 07/18/2023 12:10:00 | WG-11222680-180723-KH-06 | WG | N | - | 7.65 | 132 | uS/cm | 16.90 | Deg C | 9.1 | 148 | millivolts | 10.30 | mg/L |
| MW2A-16 | 07/18/2023 14:00:00 | WG-11222680-180723-KH-08 | WG | N | - | 8.59 | 66 | uS/cm | 15.95 | Deg C | 4.3 | 118 | millivolts | 10.12 | mg/L |
| MW2-14 | 07/18/2023 13:45:00 | WG-11222680-180723-KH-07 | WG | N | - | 6.99 | 191 | uS/cm | 14.96 | Deg C | 8.5 | 195 | millivolts | 11.94 | mg/L |
| MW3-14 | 07/18/2023 15:30:00 | WG-11222680-180723-KH-09 | WG | N | - | 7.37 | 117 | uS/cm | 15.26 | Deg C | 3.1 | 160 | millivolts | 12.09 | mg/L |
| S06-21 | 07/18/2023 16:50:00 | WL-11222680-180723-KH-01 | W | N | - | 6.32 | 4150 | uS/cm | 24.04 | Deg C | 282 | -2 | millivolts | 9.08 | mg/L |
| MW6-17 | 07/19/2023 08:30:00 | WG-11222680-190723-KH-10 | WG | N | - | 6.99 | 484 | uS/cm | 14.59 | Deg C | 300 | 152 | millivolts | 3.33 | mg/L |
| S06-21 | 07/18/2023 17:00:00 | WL-11222680-180723-KH-02 | W | FD | WL-11222680-180723-KH-01 | 6.32 | 4150 | uS/cm | 24.04 | Deg C | 282 | -2 | millivolts | 9.08 | mg/L |
| Field Blank | 07/18/2023 09:30:00 | WG-11222680-180723-KH-11 | WGQ | FB | - | - | - | - | - | - | - | - | - | - | - |

# Q3 2023 EMP FSK
# 2023 Environmental Monitoring Program
# New Landfill, Upland
# Campbell River, British Columbia

| Location | Date Time | Sample Name | Matrix | Type | Parent Sample Name | Field pH (s.u.) | Conductivity | Conductivity Unit | Temperature | Temperature Unit | Turbidity (NTU) | ORP | ORP Units | Dissolved Oxygen (DO) | DO Units | TDS | TDS Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW10-17 | 09/06/2023 16:00:00 | WG-11222680-060923-CXW-01 | WG | N | - | 7.89 | 169 | uS/cm | 12.57 | deg C | 62.0 | 178 | millivolt | 7.66 | mg/L | 109 | mg/L |
| MW3-14 | 09/07/2023 08:45:00 | WG-11222680-070923-CXW-03 | WG | N | - | 6.61 | 131 | uS/cm | 11.02 | deg C | 4.5 | 258 | millivolt | 8.14 | mg/L | 85 | mg/L |
| MW2A-16 | 09/07/2023 09:55:00 | WG-11222680-070923-CXW-04 | WG | N | - | 8.20 | 83 | uS/cm | 10.56 | deg C | 5.0 | 150 | millivolt | 3.50 | mg/L | 54 | mg/L |
| MW2-14 | 09/07/2023 10:05:00 | WG-11222680-070923-CXW-05 | WG | N | - | 6.74 | 165 | uS/cm | 11.84 | deg C | 4.1 | 105 | millivolt | 7.92 | mg/L | 107 | mg/L |
| MW2-14 | 09/07/2023 10:07:00 | WG-11222680-070923-CXW-06 | WG | FD | WG-11222680-070923-CXW-05 | 6.74 | 165 | uS/cm | 11.84 | deg C | 4.1 | 105 | millivolt | 7.92 | mg/L | 107 | mg/L |
| MW1-14 | 09/07/2023 11:20:00 | WG-11222680-070923-CXW-07 | WG | N | - | 7.32 | 86 | uS/cm | 12.36 | deg C | 4.4 | 103 | millivolt | 10.67 | mg/L | 56 | mg/L |
| MW6-17 | 09/07/2023 12:15:00 | WG-11222680-070623-CXW-08 | WG | N | - | 6.74 | 428 | uS/cm | 18.24 | deg C | 122 | 129 | millivolt | 1.56 | mg/L | 279 | mg/L |
| MW11-19 | 09/07/2023 12:40:00 | WG-11222680-070923-CXW-09 | WG | N | - | 6.74 | 250 | uS/cm | 18.72 | deg C | 73.7 | 134 | millivolt | 3.63 | mg/L | 163 | mg/L |
| MW12-22 | 09/06/2023 16:55:00 | WG-11222680-060923-CXW-02 | WG | N | - | 7.37 | 189 | uS/cm | 10.61 | deg C | 22.4 | 194 | millivolt | 11.64 | mg/L | 124 | mg/L |
| LDS | 09/07/2023 14:39:00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| MW9-17 | 09/07/2023 15:15:00 | WG-11222680-070923-CXW-10 | WG | N | - | 7.73 | 74 | uS/cm | 12.35 | deg C | 0.1 | 94 | millivolt | 4.46 | mg/L | 48 | mg/L |
| FIELD BLANK | 09/08/2023 08:25:00 | WG-11222680-080923-CXW-11 | WGQ | FB | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Q4 2023 EMP FSK**
**2023 Environmental Monitoring Program**
**New Landfill, Upland**
**Campbell River, British Columbia**

| Location | Date Time | Sample Name | Matrix | Type | Parent Sample Name | Field pH (s.u.) | Conductivity | Conductivity Unit | Temperature | Temperature Unit | Turbidity (NTU) | ORP | ORP Units | Dissolved Oxygen (DO) | DO Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW9-17 | 11/27/2023 13:10:00 | WG-11222680-271123-KH-01 | WG | N | - | 7.63 | 70 | uS/cm | 17.08 | deg C | 3.9 | 252 | millivolts | 9.13 | mg/L |
| MW10-17 | 11/27/2023 14:15:00 | WG-11222680-271123-KH-02 | WG | N | - | 7.98 | 350 | uS/cm | 10.84 | deg C | 3.4 | 256 | millivolts | 10.20 | mg/L |
| MW1-14 | 11/27/2023 16:50:00 | WG-11222680-271123-KH-05 | WG | N | - | 7.54 | 102 | uS/cm | 13.12 | deg C | 37.1 | 284 | millivolts | 9.77 | mg/L |
| MW12-22 | 11/27/2023 16:00:00 | WG-11222680-271123-KH-03 | WG | N | - | 7.25 | 323 | uS/cm | 9.48 | deg C | 2.6 | 288 | millivolts | 6.63 | mg/L |
| MW12-22 | 11/27/2023 16:10:00 | WG-11222680-271123-KH-04 | WG | FD | WG-11222680-271123-KH-03 | 7.25 | 323 | uS/cm | 9.48 | deg C | 2.6 | 288 | millivolts | 6.63 | mg/L |
| MW11-19 | 11/28/2023 09:30:00 | WG-11222680-281123-KH-06 | WG | N | - | 7.37 | 286 | uS/cm | 10.72 | deg C | 5.6 | 251 | millivolts | 5.81 | mg/L |
| SW15-01 | 11/28/2023 10:00:00 | WS-11222680-281123-KH-01 | WS | N | - | 8.12 | 58 | uS/cm | 8.26 | deg C | 0 | 197 | millivolts | 7.12 | mg/L |
| SW15-02 | 11/28/2023 10:30:00 | WS-11222680-281123-KH-02 | WS | N | - | 7.57 | 62 | uS/cm | 6.33 | deg C | 2.0 | 207 | millivolts | 6.99 | mg/L |
| MW2-14 | 11/28/2023 14:45:00 | WG-11222680-281123-KH-07 | WG | N | - | 7.73 | 164 | uS/cm | 10.55 | deg C | 1.2 | 219 | millivolts | 11.37 | mg/L |
| MW2A-16 | 11/28/2023 15:00:00 | WG-11222680-281123-KH-08 | WG | N | - | 8.38 | 78 | uS/cm | 10.97 | deg C | 2.0 | 201 | millivolts | 10.82 | mg/L |
| MW6-17 | 11/28/2023 16:30:00 | WG-11222680-281123-KH-09 | WG | N | - | 7.19 | 420 | uS/cm | 9.64 | deg C | 37.8 | 210 | millivolts | 11.53 | mg/L |
| S06-21 | 11/28/2023 14:45:00 | WL-11222680-281123-KH-01 | WL | N | - | 6.53 | 3.35 | uS/cm | 9.61 | deg C | 9 | 60 | millivolts | 10.47 | mg/L |
| MW3-14 | 11/29/2023 09:45:00 | WG-11222680-291123-KH-10 | WG | N | - | 6.50 | 135 | uS/cm | 9.54 | deg C | 1.5 | 249 | millivolts | 7.26 | mg/L |

Your P.O. #: 735-002640-3
Your Project #: 11222680-15.1
Site#: GROUNDWATER
Site Location: NEW LANDFILL
Your C.O.C. #: c#689991-01-01, c#689994-01-01

**Attention: Stephanie Berton**

GHD Limited
455 PHILLIP STREET
WATERLOO, ON
CANADA N2L 3X2

**Report Date: 2023/04/05**
Report #: R3319089
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**BUREAU VERITAS JOB #: C322057**
**Received: 2023/03/30, 08:27**

Sample Matrix: Water
# Samples Received: 6

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Analytical Method |
|---|---|---|---|---|---|
| Alkalinity @25C (pp, total), CO3,HCO3,OH | 6 | N/A | 2023/03/31 | BBY6SOP-00026 | SM 23 2320 B m |
| Biochemical Oxygen Demand | 2 | 2023/03/31 | 2023/04/05 | BBY6SOP-00045 | SM 23 5210 B m |
| Chloride/Sulphate by Auto Colourimetry | 6 | N/A | 2023/03/31 | BBY6SOP-00011 / BBY6SOP-00017 | SM23-4500-Cl/SO4-E m |
| COD by Colorimeter | 2 | N/A | 2023/04/01 | BBY6SOP-00024 | SM 23 5220 D m |
| Conductivity @25C | 6 | N/A | 2023/03/31 | BBY6SOP-00026 | SM 23 2510 B m |
| Sulphide (as H2S) (1) | 6 | N/A | 2023/04/04 | | Auto Calc |
| Un-ionized Hydrogen Sulphide as S Calc | 5 | N/A | 2023/04/04 | BBY WI-00033 | Auto Calc |
| Un-ionized Hydrogen Sulphide as S Calc | 1 | N/A | 2023/04/05 | BBY WI-00033 | Auto Calc |
| Hardness (calculated as CaCO3) | 4 | N/A | 2023/03/31 | BBY WI-00033 | Auto Calc |
| Hardness (calculated as CaCO3) | 2 | N/A | 2023/04/05 | BBY WI-00033 | Auto Calc |
| Mercury (Dissolved) by CV (2) | 4 | 2023/04/04 | 2023/04/04 | AB SOP-00084 | BCMOE BCLM Oct2013 m |
| Mercury (Total) by CV | 2 | 2023/04/04 | 2023/04/04 | AB SOP-00084 | BCMOE BCLM Oct2013 m |
| ICP-OES Dissolved Metals in Water (2) | 2 | N/A | 2023/04/04 | BBY7SOP-00018 | EPA 6010d m |
| EPH in Water when PAH required | 6 | 2023/04/04 | 2023/04/04 | BBY8SOP-00029 | BCMOE BCLM Sep2017 m |
| Na, K, Ca, Mg, S by CRC ICPMS (diss.) | 4 | N/A | 2023/03/31 | BBY WI-00033 | Auto Calc |
| Elements by CRC ICPMS (dissolved) (2) | 4 | N/A | 2023/03/31 | BBY7SOP-00002 | EPA 6020b R2 m |
| Na, K, Ca, Mg, S by CRC ICPMS (total) | 2 | 2023/03/30 | 2023/04/04 | BBY WI-00033 | Auto Calc |
| Elements by CRC ICPMS (total) | 2 | 2023/04/03 | 2023/04/04 | BBY7SOP-00003 / BBY7SOP-00002 | EPA 6020b R2 m |
| Ammonia-N (Total) | 6 | N/A | 2023/03/31 | AB SOP-00007 | SM 23 4500 NH3 A G m |
| Nitrate + Nitrite (N) | 6 | N/A | 2023/03/31 | BBY6SOP-00010 | SM 23 4500-NO3- I m |
| Nitrite (N) by CFA | 6 | N/A | 2023/03/31 | BBY6SOP-00010 | SM 23 4500-NO3- I m |
| Nitrogen - Nitrate (as N) | 6 | N/A | 2023/03/31 | BBY WI-00033 | Auto Calc |
| PAH in Water by GC/MS (SIM) | 6 | 2023/04/04 | 2023/04/04 | BBY8SOP-00021 | BCMOE BCLM Jul2017m |
| Total LMW, HMW, Total PAH Calc (3) | 6 | N/A | 2023/04/05 | BBY WI-00033 | Auto Calc |
| Filter and HNO3 Preserve for Metals | 6 | N/A | 2023/03/30 | BBY7 WI-00004 | SM 23 3030B m |
| Orthophosphate by Konelab (4) | 6 | N/A | 2023/03/31 | BBY6SOP-00013 | SM 23 4500-P E m |
| Total Sulphide (1) | 6 | N/A | 2023/04/04 | AB SOP-00080 | SM 23 4500 S2-A D Fm |
| Total Dissolved Solids (Filt. Residue) | 6 | 2023/04/03 | 2023/04/04 | BBY6SOP-00033 | SM 23 2540 C m |
| EPH less PAH in Water by GC/FID (5) | 6 | N/A | 2023/04/05 | BBY WI-00033 | Auto Calc |
| Total Suspended Solids (NFR) | 2 | 2023/04/04 | 2023/04/05 | BBY6SOP-00034 | SM 24 2540 D m |

Your P.O. #: 735-002640-3
Your Project #: 11222680-15.1
Site#: GROUNDWATER
Site Location: NEW LANDFILL
Your C.O.C. #: c#689991-01-01, c#689994-01-01

**Attention: Stephanie Berton**

GHD Limited
455 PHILLIP STREET
WATERLOO, ON
CANADA N2L 3X2

**Report Date: 2023/04/05**
Report #: R3319089
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**BUREAU VERITAS JOB #: C322057**
**Received: 2023/03/30, 08:27**

Sample Matrix: Water
# Samples Received: 6

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Analytical Method |
|---|---|---|---|---|---|
| Field pH | 5 | N/A | 2023/04/03 | | |
| Field Temperature | 5 | N/A | 2023/04/03 | | |

**Remarks:**

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Bureau Veritas Calgary, 4000 - 19 St. , Calgary, AB, T2E 6P8
(2) Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.
(3) Total PAHs in Water include: Quinoline, Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Acridine, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b&j)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, and Benzo(g,h,i)perylene.
(4) Orthophosphate > Total Phosphorus Imbalance: When applicable, Orthophosphate, Total Phosphorus and dissolved Phosphorus results were reviewed and data quality meets acceptable levels unless otherwise noted.
(5) LEPH = EPH (C10 to C19) - (Acenaphthene + Acridine + Anthracene + Fluorene + Naphthalene + Phenanthrene)
HEPH = EPH (C19 to C32) - (Benzo(a)anthracene + Benzo(a)pyrene + Fluoranthene + Pyrene)



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your P.O. #: 735-002640-3
Your Project #: 11222680-15.1
Site#: GROUNDWATER
Site Location: NEW LANDFILL
Your C.O.C. #: c#689991-01-01, c#689994-01-01

**Attention: Stephanie Berton**

GHD Limited
455 PHILLIP STREET
WATERLOO, ON
CANADA N2L 3X2

**Report Date: 2023/04/05**
Report #: R3319089
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**BUREAU VERITAS JOB #: C322057**
**Received: 2023/03/30, 08:27**

Encryption Key

Bureau Veritas
05 Apr 2023 16:17:43

Please direct all questions regarding this Certificate of Analysis to:
Brody Andersen, B.Sc., B.Sc., Program Specialist–Emergency Spill Response
Email: Brody.Andersen@bureauveritas.com
Phone# (780)577-7120

==========

This report has been generated and distributed using a secure automated process.
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Raphael Kwan, Senior Manager, BC and Yukon Regions responsible for British Columbia Environmental laboratory operations.

Bureau Veritas Job #: C322057
Report Date: 2023/04/05

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | BOG477 | BOG478 | BOG479 | BOG480 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/03/28 13:00 | 2023/03/28 14:10 | 2023/03/28 18:45 | 2023/03/28 17:45 | | |
| COC Number | | c#689991-01-01 | c#689991-01-01 | c#689991-01-01 | c#689991-01-01 | | |
| | UNITS | WG-11222680-280323-KH-01 | WG-11222680-280323-KH-02 | WG-11222680-280323-KH-04 | WG-11222680-280323-KH-03 | RDL | QC Batch |
| **ANIONS** | | | | | | | |
| Nitrite (N) | mg/L | <0.0050 | <0.0050 | <0.0050 | 0.0171 | 0.0050 | A925477 |
| **Calculated Parameters** | | | | | | | |
| Filter and HNO3 Preservatio | N/A | FIELD | FIELD | FIELD | FIELD | N/A | ONSITE |
| Nitrate (N) | mg/L | 0.037 | 0.245 | 0.027 | 1.68 | 0.020 | A923718 |
| Sulphide (as H2S) | mg/L | <0.0020 | <0.0020 | <0.0020 | <0.0020 | 0.0020 | A923617 |
| **Field Parameters** | | | | | | | |
| Field pH | pH | 7.63 | 6.80 | 7.51 | 7.58 | N/A | ONSITE |
| Field Temperature | °C | 12.12 | 9.90 | 7.41 | 13.87 | N/A | ONSITE |
| **Misc. Inorganics** | | | | | | | |
| Conductivity | uS/cm | 74 | 130 | 53 | 170 | 2.0 | A925432 |
| Total Dissolved Solids | mg/L | 64 | 92 | 46 | 94 | 10 | A926922 |
| **Anions** | | | | | | | |
| Alkalinity (PP as CaCO3) | mg/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | A925434 |
| Alkalinity (Total as CaCO3) | mg/L | 34 | 50 | 23 | 52 | 1.0 | A925434 |
| Bicarbonate (HCO3) | mg/L | 41 | 62 | 28 | 63 | 1.0 | A925434 |
| Carbonate (CO3) | mg/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | A925434 |
| Hydroxide (OH) | mg/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | A925434 |
| Total Sulphide | mg/L | <0.0018 | <0.0018 | <0.0018 | <0.0018 | 0.0018 | A926674 |
| Chloride (Cl) | mg/L | <1.0 | 3.3 | <1.0 | 14 | 1.0 | A925528 |
| Sulphate (SO4) | mg/L | 2.4 | 7.0 | 2.4 | 2.8 | 1.0 | A925528 |
| **Nutrients** | | | | | | | |
| Total Ammonia (N) | mg/L | <0.015 | <0.015 | <0.015 | <0.015 | 0.015 | A925542 |
| Orthophosphate (P) | mg/L | 0.030 | 0.0051 | 0.0037 | 0.0057 | 0.0030 | A924129 |
| Nitrate plus Nitrite (N) | mg/L | 0.037 | 0.245 | 0.027 | 1.70 | 0.020 | A925471 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C322057
Report Date: 2023/04/05

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | BOG483 | BOG483 | BOG484 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2023/03/28 16:00 | 2023/03/28 16:00 | 2023/03/28 15:50 | | |
| COC Number | | c#689994-01-01 | c#689994-01-01 | c#689994-01-01 | | |
| | UNITS | WL-11222680-280323-KH-02 | WL-11222680-280323-KH-02 Lab-Dup | WL-11222680-280323-KH-01 | RDL | QC Batch |
| **ANIONS** | | | | | | |
| Nitrite (N) | mg/L | 0.0053 | N/A | <0.0050 | 0.0050 | A925477 |
| **Calculated Parameters** | | | | | | |
| Filter and HNO3 Preservatio | N/A | FIELD | N/A | FIELD | N/A | ONSITE |
| Dissolved Hardness (CaCO3) | mg/L | 1040 | N/A | 1010 | 0.50 | A924022 |
| Nitrate (N) | mg/L | <0.020 | N/A | <0.020 | 0.020 | A923718 |
| Sulphide (as H2S) | mg/L | 13 | N/A | 13 | 0.19 | A923617 |
| **Demand Parameters** | | | | | | |
| Biochemical Oxygen Demand | mg/L | 27 | 29 | 26 | 3.0 | A924844 |
| Chemical Oxygen Demand | mg/L | 392 | N/A | 370 | 10 | A925066 |
| **Field Parameters** | | | | | | |
| Field pH | pH | N/A | N/A | 7.67 | N/A | ONSITE |
| Field Temperature | °C | N/A | N/A | 16.53 | N/A | ONSITE |
| **Misc. Inorganics** | | | | | | |
| Conductivity | uS/cm | 3200 | N/A | 3200 | 2.0 | A925432 |
| Total Dissolved Solids | mg/L | 2300 | N/A | 2300 | 10 | A926922 |
| Total Suspended Solids | mg/L | 59 | N/A | 38 | 1.0 | A927556 |
| **Anions** | | | | | | |
| Alkalinity (PP as CaCO3) | mg/L | <1.0 | N/A | <1.0 | 1.0 | A925434 |
| Alkalinity (Total as CaCO3) | mg/L | 830 | N/A | 840 | 1.0 | A925434 |
| Bicarbonate (HCO3) | mg/L | 1000 | N/A | 1000 | 1.0 | A925434 |
| Carbonate (CO3) | mg/L | <1.0 | N/A | <1.0 | 1.0 | A925434 |
| Hydroxide (OH) | mg/L | <1.0 | N/A | <1.0 | 1.0 | A925434 |
| Total Sulphide | mg/L | 12 | N/A | 12 | 0.18 | A926674 |
| Chloride (Cl) | mg/L | 190 | N/A | 190 | 5.0 | A925528 |
| Sulphate (SO4) | mg/L | 720 | N/A | 730 | 25 | A925528 |
| **Nutrients** | | | | | | |
| Total Ammonia (N) | mg/L | 62 | N/A | 61 | 1.5 | A925542 |
| Orthophosphate (P) | mg/L | 0.19 | N/A | 0.18 | 0.0030 | A924129 |
| Nitrate plus Nitrite (N) | mg/L | <0.020 | N/A | <0.020 | 0.020 | A925471 |

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



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C322057
Report Date: 2023/04/05

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

| Bureau Veritas ID | | BOG483 | BOG484 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2023/03/28 16:00 | 2023/03/28 15:50 | | |
| COC Number | | c#689994-01-01 | c#689994-01-01 | | |
| | UNITS | WL-11222680-280323-KH-02 | WL-11222680-280323-KH-01 | RDL | QC Batch |
| **Dissolved Metals by ICP** | | | | | |
| Dissolved Calcium (Ca) | mg/L | 354 | 339 | 0.50 | A927966 |
| Dissolved Magnesium (Mg) | mg/L | 38.5 | 38.5 | 0.050 | A927966 |
| RDL = Reportable Detection Limit | | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## MISCELLANEOUS (WATER)

| Bureau Veritas ID | | BOG477 | BOG478 | BOG479 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2023/03/28 13:00 | 2023/03/28 14:10 | 2023/03/28 18:45 | | |
| COC Number | | c#689991-01-01 | c#689991-01-01 | c#689991-01-01 | | |
| | UNITS | WG-11222680-280323-KH-01 | WG-11222680-280323-KH-02 | WG-11222680-280323-KH-04 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | |
| Total Un-ionized Hydrogen Sulfide as H2 | mg/L | <0.0050 | <0.0050 | <0.0050 | 0.0050 | A924313 |
| RDL = Reportable Detection Limit | | | | | | |

| Bureau Veritas ID | | BOG480 | BOG483 | BOG484 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2023/03/28 17:45 | 2023/03/28 16:00 | 2023/03/28 15:50 | | |
| COC Number | | c#689991-01-01 | c#689994-01-01 | c#689994-01-01 | | |
| | UNITS | WG-11222680-280323-KH-03 | WL-11222680-280323-KH-02 | WL-11222680-280323-KH-01 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | |
| Total Un-ionized Hydrogen Sulfide as H2 | mg/L | <0.0050 | CALCERROR | 2.4 | 0.0050 | A924313 |
| RDL = Reportable Detection Limit | | | | | | |

Bureau Veritas Job #: C322057
Report Date: 2023/04/05

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## LEPH & HEPH WITH CSR/CCME PAH IN WATER (WATER)

| Bureau Veritas ID | | BOG477 | BOG478 | BOG479 | BOG480 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/03/28 13:00 | 2023/03/28 14:10 | 2023/03/28 18:45 | 2023/03/28 17:45 | | |
| COC Number | | c#689991-01-01 | c#689991-01-01 | c#689991-01-01 | c#689991-01-01 | | |
| | UNITS | WG-11222680-280323-KH-01 | WG-11222680-280323-KH-02 | WG-11222680-280323-KH-04 | WG-11222680-280323-KH-03 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | | |
| Low Molecular Weight PAH`s | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | A924067 |
| High Molecular Weight PAH` | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | A924067 |
| Total PAH | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | A924067 |
| **Polycyclic Aromatics** | | | | | | | |
| Quinoline | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | A927637 |
| Naphthalene | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | A927637 |
| 1-Methylnaphthalene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | A927637 |
| 2-Methylnaphthalene | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | A927637 |
| Acenaphthylene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | A927637 |
| Acenaphthene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | A927637 |
| Fluorene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | A927637 |
| Phenanthrene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | A927637 |
| Anthracene | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | A927637 |
| Acridine | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | A927637 |
| Fluoranthene | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | A927637 |
| Pyrene | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | A927637 |
| Benzo(a)anthracene | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | A927637 |
| Chrysene | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | A927637 |
| Benzo(b&j)fluoranthene | ug/L | <0.030 | <0.030 | <0.030 | <0.030 | 0.030 | A927637 |
| Benzo(k)fluoranthene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | A927637 |
| Benzo(a)pyrene | ug/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | 0.0050 | A927637 |
| Indeno(1,2,3-cd)pyrene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | A927637 |
| Dibenz(a,h)anthracene | ug/L | <0.0030 | <0.0030 | <0.0030 | <0.0030 | 0.0030 | A927637 |
| Benzo(g,h,i)perylene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | A927637 |
| **Calculated Parameters** | | | | | | | |
| LEPH (C10-C19 less PAH) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | A924068 |
| HEPH (C19-C32 less PAH) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | A924068 |
| **Ext. Pet. Hydrocarbon** | | | | | | | |
| EPH (C10-C19) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | A927641 |
| EPH (C19-C32) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | A927641 |

RDL = Reportable Detection Limit



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C322057
Report Date: 2023/04/05

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## LEPH & HEPH WITH CSR/CCME PAH IN WATER (WATER)

| Bureau Veritas ID | | BOG477 | BOG478 | BOG479 | BOG480 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/03/28 13:00 | 2023/03/28 14:10 | 2023/03/28 18:45 | 2023/03/28 17:45 | | |
| COC Number | | c#689991-01-01 | c#689991-01-01 | c#689991-01-01 | c#689991-01-01 | | |
| | UNITS | WG-11222680-280323-KH-01 | WG-11222680-280323-KH-02 | WG-11222680-280323-KH-04 | WG-11222680-280323-KH-03 | RDL | QC Batch |
| **Surrogate Recovery (%)** | | | | | | | |
| O-TERPHENYL (sur.) | % | 101 | 100 | 97 | 100 | N/A | A927641 |
| D10-ANTHRACENE (sur.) | % | 97 | 98 | 96 | 99 | N/A | A927637 |
| D8-ACENAPHTHYLENE (sur.) | % | 88 | 88 | 85 | 89 | N/A | A927637 |
| D8-NAPHTHALENE (sur.) | % | 83 | 82 | 80 | 84 | N/A | A927637 |
| TERPHENYL-D14 (sur.) | % | 86 | 85 | 83 | 86 | N/A | A927637 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## LEPH & HEPH WITH CSR/CCME PAH IN WATER (WATER)

| Bureau Veritas ID | | BOG483 | | BOG484 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2023/03/28 16:00 | | 2023/03/28 15:50 | | |
| COC Number | | c#689994-01-01 | | c#689994-01-01 | | |
| | UNITS | WL-11222680-280323-KH-02 | RDL | WL-11222680-280323-KH-01 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | |
| Low Molecular Weight PAH`s | ug/L | 4.2 | 0.10 | 4.0 | 0.10 | A924067 |
| High Molecular Weight PAH` | ug/L | 0.066 | 0.050 | 0.064 | 0.050 | A924067 |
| Total PAH | ug/L | 4.2 | 0.10 | 4.0 | 0.10 | A924067 |
| **Polycyclic Aromatics** | | | | | | |
| Quinoline | ug/L | <0.039 (1) | 0.039 | <0.037 (1) | 0.037 | A927637 |
| Naphthalene | ug/L | 3.1 | 0.10 | 3.0 | 0.10 | A927637 |
| 1-Methylnaphthalene | ug/L | 0.19 | 0.050 | 0.19 | 0.050 | A927637 |
| 2-Methylnaphthalene | ug/L | 0.28 | 0.10 | 0.27 | 0.10 | A927637 |
| Acenaphthylene | ug/L | <0.050 | 0.050 | <0.050 | 0.050 | A927637 |
| Acenaphthene | ug/L | 0.23 | 0.050 | 0.23 | 0.050 | A927637 |
| Fluorene | ug/L | 0.11 | 0.050 | 0.10 | 0.050 | A927637 |
| Phenanthrene | ug/L | 0.10 | 0.050 | 0.10 | 0.050 | A927637 |
| Anthracene | ug/L | 0.026 | 0.010 | 0.025 | 0.010 | A927637 |
| Acridine | ug/L | 0.096 | 0.050 | 0.093 | 0.050 | A927637 |
| Fluoranthene | ug/L | 0.035 | 0.020 | 0.034 | 0.020 | A927637 |
| Pyrene | ug/L | 0.031 | 0.020 | 0.030 | 0.020 | A927637 |
| Benzo(a)anthracene | ug/L | <0.010 | 0.010 | <0.010 | 0.010 | A927637 |
| Chrysene | ug/L | <0.020 | 0.020 | <0.020 | 0.020 | A927637 |
| Benzo(b&j)fluoranthene | ug/L | <0.030 | 0.030 | <0.030 | 0.030 | A927637 |
| Benzo(k)fluoranthene | ug/L | <0.050 | 0.050 | <0.050 | 0.050 | A927637 |
| Benzo(a)pyrene | ug/L | <0.0050 | 0.0050 | <0.0050 | 0.0050 | A927637 |
| Indeno(1,2,3-cd)pyrene | ug/L | <0.050 | 0.050 | <0.050 | 0.050 | A927637 |
| Dibenz(a,h)anthracene | ug/L | <0.0030 | 0.0030 | <0.0030 | 0.0030 | A927637 |
| Benzo(g,h,i)perylene | ug/L | <0.050 | 0.050 | <0.050 | 0.050 | A927637 |
| **Calculated Parameters** | | | | | | |
| LEPH (C10-C19 less PAH) | mg/L | 0.43 | 0.20 | 0.42 | 0.20 | A924068 |
| HEPH (C19-C32 less PAH) | mg/L | 0.22 | 0.20 | 0.23 | 0.20 | A924068 |
| **Ext. Pet. Hydrocarbon** | | | | | | |
| EPH (C10-C19) | mg/L | 0.43 | 0.20 | 0.42 | 0.20 | A927641 |
| EPH (C19-C32) | mg/L | 0.22 | 0.20 | 0.23 | 0.20 | A927641 |

RDL = Reportable Detection Limit
(1) Detection limit raised due to matrix interference.



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## LEPH & HEPH WITH CSR/CCME PAH IN WATER (WATER)

| Bureau Veritas ID | | BOG483 | | BOG484 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2023/03/28 16:00 | | 2023/03/28 15:50 | | |
| COC Number | | c#689994-01-01 | | c#689994-01-01 | | |
| | UNITS | WL-11222680-280323-KH-02 | RDL | WL-11222680-280323-KH-01 | RDL | QC Batch |
| **Surrogate Recovery (%)** | | | | | | |
| O-TERPHENYL (sur.) | % | 95 | N/A | 96 | N/A | A927641 |
| D10-ANTHRACENE (sur.) | % | 88 | N/A | 88 | N/A | A927637 |
| D8-ACENAPHTHYLENE (sur.) | % | 94 | N/A | 94 | N/A | A927637 |
| D8-NAPHTHALENE (sur.) | % | 84 | N/A | 84 | N/A | A927637 |
| TERPHENYL-D14 (sur.) | % | 79 | N/A | 80 | N/A | A927637 |

RDL = Reportable Detection Limit
N/A = Not Applicable

Bureau Veritas Job #: C322057
Report Date: 2023/04/05

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## CSR DISSOLVED METALS IN WATER WITH CV HG (WATER)

| Bureau Veritas ID | | BOG477 | BOG478 | BOG479 | BOG480 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/03/28 13:00 | 2023/03/28 14:10 | 2023/03/28 18:45 | 2023/03/28 17:45 | | |
| COC Number | | c#689991-01-01 | c#689991-01-01 | c#689991-01-01 | c#689991-01-01 | | |
| | UNITS | WG-11222680-280323-KH-01 | WG-11222680-280323-KH-02 | WG-11222680-280323-KH-04 | WG-11222680-280323-KH-03 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | | |
| Dissolved Hardness (CaCO3) | mg/L | 33.8 | 55.2 | 24.6 | 78.4 | 0.50 | A924022 |
| **Elements** | | | | | | | |
| Dissolved Mercury (Hg) | ug/L | <0.0019 | <0.0019 | <0.0019 | <0.0019 | 0.0019 | A927497 |
| **Dissolved Metals by ICPMS** | | | | | | | |
| Dissolved Aluminum (Al) | ug/L | 9.2 | <3.0 | <3.0 | <3.0 | 3.0 | A924870 |
| Dissolved Antimony (Sb) | ug/L | <0.50 | <0.50 | <0.50 | <0.50 | 0.50 | A924870 |
| Dissolved Arsenic (As) | ug/L | 0.96 | <0.10 | <0.10 | <0.10 | 0.10 | A924870 |
| Dissolved Barium (Ba) | ug/L | 2.0 | 1.4 | <1.0 | 1.5 | 1.0 | A924870 |
| Dissolved Beryllium (Be) | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | A924870 |
| Dissolved Bismuth (Bi) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | A924870 |
| Dissolved Boron (B) | ug/L | <50 | <50 | <50 | <50 | 50 | A924870 |
| Dissolved Cadmium (Cd) | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | A924870 |
| Dissolved Chromium (Cr) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | A924870 |
| Dissolved Cobalt (Co) | ug/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | A924870 |
| Dissolved Copper (Cu) | ug/L | <0.20 | 0.26 | <0.20 | <0.20 | 0.20 | A924870 |
| Dissolved Iron (Fe) | ug/L | 10.7 | <5.0 | <5.0 | <5.0 | 5.0 | A924870 |
| Dissolved Lead (Pb) | ug/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | A924870 |
| Dissolved Lithium (Li) | ug/L | <2.0 | <2.0 | <2.0 | <2.0 | 2.0 | A924870 |
| Dissolved Manganese (Mn) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | A924870 |
| Dissolved Molybdenum (Mo | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | A924870 |
| Dissolved Nickel (Ni) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | A924870 |
| Dissolved Phosphorus (P) | ug/L | 34 | <10 | <10 | 11 | 10 | A924870 |
| Dissolved Selenium (Se) | ug/L | <0.10 | 0.18 | <0.10 | 0.14 | 0.10 | A924870 |
| Dissolved Silicon (Si) | ug/L | 4210 | 5590 | 2610 | 5860 | 100 | A924870 |
| Dissolved Silver (Ag) | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | A924870 |
| Dissolved Strontium (Sr) | ug/L | 13.7 | 28.0 | 10.6 | 41.9 | 1.0 | A924870 |
| Dissolved Thallium (Tl) | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | A924870 |
| Dissolved Tin (Sn) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | A924870 |
| Dissolved Titanium (Ti) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | A924870 |
| Dissolved Uranium (U) | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | A924870 |
| Dissolved Vanadium (V) | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | 5.0 | A924870 |

RDL = Reportable Detection Limit



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C322057
Report Date: 2023/04/05

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## CSR DISSOLVED METALS IN WATER WITH CV HG (WATER)

| Bureau Veritas ID | | BOG477 | BOG478 | BOG479 | BOG480 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/03/28 13:00 | 2023/03/28 14:10 | 2023/03/28 18:45 | 2023/03/28 17:45 | | |
| COC Number | | c#689991-01-01 | c#689991-01-01 | c#689991-01-01 | c#689991-01-01 | | |
| | UNITS | WG-11222680-280323-KH-01 | WG-11222680-280323-KH-02 | WG-11222680-280323-KH-04 | WG-11222680-280323-KH-03 | RDL | QC Batch |
| Dissolved Zinc (Zn) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | A924870 |
| Dissolved Zirconium (Zr) | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | A924870 |
| Dissolved Calcium (Ca) | mg/L | 11.0 | 17.3 | 8.30 | 26.1 | 0.050 | A924024 |
| Dissolved Magnesium (Mg) | mg/L | 1.50 | 2.91 | 0.940 | 3.23 | 0.050 | A924024 |
| Dissolved Potassium (K) | mg/L | 0.177 | 0.201 | 0.112 | 0.264 | 0.050 | A924024 |
| Dissolved Sodium (Na) | mg/L | 1.02 | 3.16 | 0.653 | 4.67 | 0.050 | A924024 |
| Dissolved Sulphur (S) | mg/L | <3.0 | <3.0 | <3.0 | <3.0 | 3.0 | A924024 |
| RDL = Reportable Detection Limit | | | | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## CSR TOTAL METALS IN WATER WITH CV HG (WATER)

| Bureau Veritas ID | | BOG483 | BOG484 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2023/03/28 16:00 | 2023/03/28 15:50 | | |
| COC Number | | c#689994-01-01 | c#689994-01-01 | | |
| | UNITS | WL-11222680-280323-KH-02 | WL-11222680-280323-KH-01 | RDL | QC Batch |
| **Elements** | | | | | |
| Total Mercury (Hg) | ug/L | <0.038 (1) | <0.038 (1) | 0.038 | A927551 |
| **Total Metals by ICPMS** | | | | | |
| Total Aluminum (Al) | ug/L | 482 | 488 | 30 | A926714 |
| Total Antimony (Sb) | ug/L | <5.0 | <5.0 | 5.0 | A926714 |
| Total Arsenic (As) | ug/L | 19.1 | 19.3 | 1.0 | A926714 |
| Total Barium (Ba) | ug/L | 120 | 124 | 10 | A926714 |
| Total Beryllium (Be) | ug/L | <1.0 | <1.0 | 1.0 | A926714 |
| Total Bismuth (Bi) | ug/L | <10 | <10 | 10 | A926714 |
| Total Boron (B) | ug/L | 11600 | 12200 | 500 | A926714 |
| Total Cadmium (Cd) | ug/L | <0.10 | <0.10 | 0.10 | A926714 |
| Total Chromium (Cr) | ug/L | 20 | 19 | 10 | A926714 |
| Total Cobalt (Co) | ug/L | 2.6 | 2.9 | 2.0 | A926714 |
| Total Copper (Cu) | ug/L | 7.2 | 7.5 | 5.0 | A926714 |
| Total Iron (Fe) | ug/L | 2160 | 2290 | 100 | A926714 |
| Total Lead (Pb) | ug/L | <2.0 | <2.0 | 2.0 | A926714 |
| Total Lithium (Li) | ug/L | <20 | <20 | 20 | A926714 |
| Total Manganese (Mn) | ug/L | 923 | 957 | 10 | A926714 |
| Total Molybdenum (Mo) | ug/L | <10 | <10 | 10 | A926714 |
| Total Nickel (Ni) | ug/L | 27 | 18 | 10 | A926714 |
| Total Phosphorus (P) | ug/L | 558 | 572 | 100 | A926714 |
| Total Selenium (Se) | ug/L | <1.0 | <1.0 | 1.0 | A926714 |
| Total Silicon (Si) | ug/L | 14600 | 15000 | 1000 | A926714 |
| Total Silver (Ag) | ug/L | <0.20 | <0.20 | 0.20 | A926714 |
| Total Strontium (Sr) | ug/L | 2300 | 2370 | 10 | A926714 |
| Total Thallium (Tl) | ug/L | <0.10 | <0.10 | 0.10 | A926714 |
| Total Tin (Sn) | ug/L | <50 | <50 | 50 | A926714 |
| Total Titanium (Ti) | ug/L | <50 | <50 | 50 | A926714 |
| Total Uranium (U) | ug/L | <1.0 | <1.0 | 1.0 | A926714 |
| Total Vanadium (V) | ug/L | <50 | <50 | 50 | A926714 |
| Total Zinc (Zn) | ug/L | <50 | 51 | 50 | A926714 |

RDL = Reportable Detection Limit
(1) Detection limit raised based on sample volume used and sample matrix



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C322057
Report Date: 2023/04/05

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## CSR TOTAL METALS IN WATER WITH CV HG (WATER)

| Bureau Veritas ID | | BOG483 | BOG484 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2023/03/28 16:00 | 2023/03/28 15:50 | | |
| COC Number | | c#689994-01-01 | c#689994-01-01 | | |
| | UNITS | WL-11222680-280323-KH-02 | WL-11222680-280323-KH-01 | RDL | QC Batch |
| Total Zirconium (Zr) | ug/L | 1.4 | 1.5 | 1.0 | A926714 |
| Total Calcium (Ca) | mg/L | 357 | 366 | 0.50 | A924188 |
| Total Magnesium (Mg) | mg/L | 41.1 | 41.9 | 0.50 | A924188 |
| Total Potassium (K) | mg/L | 48.9 | 50.0 | 0.50 | A924188 |
| Total Sodium (Na) | mg/L | 235 | 240 | 0.50 | A924188 |
| Total Sulphur (S) | mg/L | 241 | 248 | 30 | A924188 |
| RDL = Reportable Detection Limit | | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## GENERAL COMMENTS

**Results relate only to the items tested.**



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## QUALITY ASSURANCE REPORT



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| A927637 | D10-ANTHRACENE (sur.) | 2023/04/04 | | | 94 | 50 - 140 | 104 | % | | |
| A927637 | D8-ACENAPHTHYLENE (sur.) | 2023/04/04 | | | 91 | 50 - 140 | 93 | % | | |
| A927637 | D8-NAPHTHALENE (sur.) | 2023/04/04 | | | 84 | 50 - 140 | 87 | % | | |
| A927637 | TERPHENYL-D14 (sur.) | 2023/04/04 | | | 87 | 50 - 140 | 92 | % | | |
| A927641 | O-TERPHENYL (sur.) | 2023/04/04 | | | 96 | 60 - 140 | 103 | % | | |
| A924129 | Orthophosphate (P) | 2023/03/31 | 97 | 80 - 120 | 101 | 80 - 120 | <0.0030 | mg/L | 2.7 (1) | 20 |
| A924844 | Biochemical Oxygen Demand | 2023/04/05 | | | 93 | 85 - 115 | <2.0 | mg/L | 7.7 (2) | 20 |
| A924870 | Dissolved Aluminum (Al) | 2023/03/31 | 97 | 80 - 120 | 102 | 80 - 120 | <3.0 | ug/L | 5.1 (1) | 20 |
| A924870 | Dissolved Antimony (Sb) | 2023/03/31 | 101 | 80 - 120 | 104 | 80 - 120 | <0.50 | ug/L | NC (1) | 20 |
| A924870 | Dissolved Arsenic (As) | 2023/03/31 | 104 | 80 - 120 | 103 | 80 - 120 | <0.10 | ug/L | 2.0 (1) | 20 |
| A924870 | Dissolved Barium (Ba) | 2023/03/31 | NC | 80 - 120 | 102 | 80 - 120 | <1.0 | ug/L | 0.72 (1) | 20 |
| A924870 | Dissolved Beryllium (Be) | 2023/03/31 | 93 | 80 - 120 | 98 | 80 - 120 | <0.10 | ug/L | NC (1) | 20 |
| A924870 | Dissolved Bismuth (Bi) | 2023/03/31 | 93 | 80 - 120 | 101 | 80 - 120 | <1.0 | ug/L | NC (1) | 20 |
| A924870 | Dissolved Boron (B) | 2023/03/31 | 95 | 80 - 120 | 101 | 80 - 120 | <50 | ug/L | 1.7 (1) | 20 |
| A924870 | Dissolved Cadmium (Cd) | 2023/03/31 | 96 | 80 - 120 | 102 | 80 - 120 | <0.010 | ug/L | NC (1) | 20 |
| A924870 | Dissolved Chromium (Cr) | 2023/03/31 | 95 | 80 - 120 | 102 | 80 - 120 | <1.0 | ug/L | NC (1) | 20 |
| A924870 | Dissolved Cobalt (Co) | 2023/03/31 | 91 | 80 - 120 | 98 | 80 - 120 | <0.20 | ug/L | 1.0 (1) | 20 |
| A924870 | Dissolved Copper (Cu) | 2023/03/31 | 89 | 80 - 120 | 98 | 80 - 120 | <0.20 | ug/L | 3.9 (1) | 20 |
| A924870 | Dissolved Iron (Fe) | 2023/03/31 | NC | 80 - 120 | 105 | 80 - 120 | <5.0 | ug/L | 0.37 (1) | 20 |
| A924870 | Dissolved Lead (Pb) | 2023/03/31 | 93 | 80 - 120 | 100 | 80 - 120 | <0.20 | ug/L | NC (1) | 20 |
| A924870 | Dissolved Lithium (Li) | 2023/03/31 | 89 | 80 - 120 | 95 | 80 - 120 | <2.0 | ug/L | 4.8 (1) | 20 |
| A924870 | Dissolved Manganese (Mn) | 2023/03/31 | NC | 80 - 120 | 102 | 80 - 120 | <1.0 | ug/L | 0.21 (1) | 20 |
| A924870 | Dissolved Molybdenum (Mo) | 2023/03/31 | 101 | 80 - 120 | 107 | 80 - 120 | <1.0 | ug/L | 1.6 (1) | 20 |
| A924870 | Dissolved Nickel (Ni) | 2023/03/31 | 94 | 80 - 120 | 101 | 80 - 120 | <1.0 | ug/L | 1.1 (1) | 20 |
| A924870 | Dissolved Phosphorus (P) | 2023/03/31 | 106 | 80 - 120 | 104 | 80 - 120 | <10 | ug/L | 3.9 (1) | 20 |
| A924870 | Dissolved Selenium (Se) | 2023/03/31 | 104 | 80 - 120 | 103 | 80 - 120 | <0.10 | ug/L | NC (1) | 20 |
| A924870 | Dissolved Silicon (Si) | 2023/03/31 | NC | 80 - 120 | 109 | 80 - 120 | <100 | ug/L | 0.75 (1) | 20 |
| A924870 | Dissolved Silver (Ag) | 2023/03/31 | 96 | 80 - 120 | 103 | 80 - 120 | <0.020 | ug/L | NC (1) | 20 |
| A924870 | Dissolved Strontium (Sr) | 2023/03/31 | NC | 80 - 120 | 102 | 80 - 120 | <1.0 | ug/L | 0.55 (1) | 20 |
| A924870 | Dissolved Thallium (Tl) | 2023/03/31 | 96 | 80 - 120 | 102 | 80 - 120 | <0.010 | ug/L | NC (1) | 20 |
| A924870 | Dissolved Tin (Sn) | 2023/03/31 | 97 | 80 - 120 | 104 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| A924870 | Dissolved Titanium (Ti) | 2023/03/31 | 98 | 80 - 120 | 104 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |
| A924870 | Dissolved Uranium (U) | 2023/03/31 | 99 | 80 - 120 | 103 | 80 - 120 | <0.10 | ug/L | 3.4 (1) | 20 |
| A924870 | Dissolved Vanadium (V) | 2023/03/31 | 97 | 80 - 120 | 102 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |
| A924870 | Dissolved Zinc (Zn) | 2023/03/31 | NC | 80 - 120 | 105 | 80 - 120 | <5.0 | ug/L | 0.94 (1) | 20 |
| A924870 | Dissolved Zirconium (Zr) | 2023/03/31 | 99 | 80 - 120 | 104 | 80 - 120 | <0.10 | ug/L | 8.3 (1) | 20 |
| A925066 | Chemical Oxygen Demand | 2023/04/01 | NC | 80 - 120 | 99 | 80 - 120 | <10 | mg/L | 1.0 (1) | 20 |
| A925432 | Conductivity | 2023/03/31 | | | 102 | 80 - 120 | <2.0 | uS/cm | | |
| A925434 | Alkalinity (PP as CaCO3) | 2023/03/31 | | | | | <1.0 | mg/L | NC (1) | 20 |
| A925434 | Alkalinity (Total as CaCO3) | 2023/03/31 | NC | 80 - 120 | 91 | 80 - 120 | <1.0 | mg/L | 0.96 (1) | 20 |
| A925434 | Bicarbonate (HCO3) | 2023/03/31 | | | | | <1.0 | mg/L | 0.96 (1) | 20 |
| A925434 | Carbonate (CO3) | 2023/03/31 | | | | | <1.0 | mg/L | NC (1) | 20 |
| A925434 | Hydroxide (OH) | 2023/03/31 | | | | | <1.0 | mg/L | NC (1) | 20 |
| A925471 | Nitrate plus Nitrite (N) | 2023/03/31 | NC | 80 - 120 | 104 | 80 - 120 | <0.020 | mg/L | 0.51 (1) | 25 |
| A925477 | Nitrite (N) | 2023/03/31 | 97 | 80 - 120 | 98 | 80 - 120 | <0.0050 | mg/L | NC (1) | 20 |
| A925528 | Chloride (Cl) | 2023/03/31 | 104 | 80 - 120 | 99 | 80 - 120 | <1.0 | mg/L | 1.5 (1) | 20 |
| A925528 | Sulphate (SO4) | 2023/03/31 | NC | 80 - 120 | 100 | 80 - 120 | <1.0 | mg/L | 1.4 (1) | 20 |
| A925542 | Total Ammonia (N) | 2023/03/31 | 107 | 80 - 120 | 104 | 80 - 120 | <0.015 | mg/L | 2.3 (1) | 20 |
| A926674 | Total Sulphide | 2023/04/04 | 85 | 80 - 120 | 81 | 80 - 120 | <0.0018 | mg/L | 8.0 (1) | 20 |
| A926714 | Total Aluminum (Al) | 2023/04/04 | 102 | 80 - 120 | 102 | 80 - 120 | <3.0 | ug/L | 5.4 (1) | 20 |
| A926714 | Total Antimony (Sb) | 2023/04/04 | 103 | 80 - 120 | 101 | 80 - 120 | <0.50 | ug/L | NC (1) | 20 |
| A926714 | Total Arsenic (As) | 2023/04/04 | 106 | 80 - 120 | 101 | 80 - 120 | <0.10 | ug/L | 3.6 (1) | 20 |
| A926714 | Total Barium (Ba) | 2023/04/04 | 98 | 80 - 120 | 99 | 80 - 120 | <1.0 | ug/L | 0.60 (1) | 20 |
| A926714 | Total Beryllium (Be) | 2023/04/04 | 95 | 80 - 120 | 100 | 80 - 120 | <0.10 | ug/L | NC (1) | 20 |
| A926714 | Total Bismuth (Bi) | 2023/04/04 | 95 | 80 - 120 | 101 | 80 - 120 | <1.0 | ug/L | NC (1) | 20 |
| A926714 | Total Boron (B) | 2023/04/04 | NC | 80 - 120 | 110 | 80 - 120 | <50 | ug/L | 1.0 (1) | 20 |
| A926714 | Total Cadmium (Cd) | 2023/04/04 | 95 | 80 - 120 | 100 | 80 - 120 | <0.010 | ug/L | NC (1) | 20 |
| A926714 | Total Chromium (Cr) | 2023/04/04 | 99 | 80 - 120 | 101 | 80 - 120 | <1.0 | ug/L | NC (1) | 20 |
| A926714 | Total Cobalt (Co) | 2023/04/04 | 92 | 80 - 120 | 94 | 80 - 120 | <0.20 | ug/L | 3.7 (1) | 20 |
| A926714 | Total Copper (Cu) | 2023/04/04 | 93 | 80 - 120 | 96 | 80 - 120 | <0.50 | ug/L | 2.3 (1) | 20 |
| A926714 | Total Iron (Fe) | 2023/04/04 | 113 | 80 - 120 | 114 | 80 - 120 | <10 | ug/L | NC (1) | 20 |
| A926714 | Total Lead (Pb) | 2023/04/04 | 93 | 80 - 120 | 99 | 80 - 120 | <0.20 | ug/L | NC (1) | 20 |

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| A926714 | Total Lithium (Li) | 2023/04/04 | 89 | 80 - 120 | 96 | 80 - 120 | <2.0 | ug/L | 4.5 (1) | 20 |
| A926714 | Total Manganese (Mn) | 2023/04/04 | NC | 80 - 120 | 101 | 80 - 120 | <1.0 | ug/L | 4.5 (1) | 20 |
| A926714 | Total Molybdenum (Mo) | 2023/04/04 | 143 (3) | 80 - 120 | 101 | 80 - 120 | <1.0 | ug/L | NC (1) | 20 |
| A926714 | Total Nickel (Ni) | 2023/04/04 | 92 | 80 - 120 | 99 | 80 - 120 | <1.0 | ug/L | NC (1) | 20 |
| A926714 | Total Phosphorus (P) | 2023/04/04 | 107 | 80 - 120 | 102 | 80 - 120 | <10 | ug/L | NC (1) | 20 |
| A926714 | Total Selenium (Se) | 2023/04/04 | 104 | 80 - 120 | 102 | 80 - 120 | <0.10 | ug/L | NC (1) | 20 |
| A926714 | Total Silicon (Si) | 2023/04/04 | 103 | 80 - 120 | 111 | 80 - 120 | <100 | ug/L | 0.15 (1) | 20 |
| A926714 | Total Silver (Ag) | 2023/04/04 | 100 | 80 - 120 | 100 | 80 - 120 | <0.020 | ug/L | NC (1) | 20 |
| A926714 | Total Strontium (Sr) | 2023/04/04 | NC | 80 - 120 | 101 | 80 - 120 | <1.0 | ug/L | 2.4 (1) | 20 |
| A926714 | Total Thallium (Tl) | 2023/04/04 | 100 | 80 - 120 | 101 | 80 - 120 | <0.010 | ug/L | NC (1) | 20 |
| A926714 | Total Tin (Sn) | 2023/04/04 | 107 | 80 - 120 | 100 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |
| A926714 | Total Titanium (Ti) | 2023/04/04 | 108 | 80 - 120 | 100 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |
| A926714 | Total Uranium (U) | 2023/04/04 | 99 | 80 - 120 | 102 | 80 - 120 | <0.10 | ug/L | NC (1) | 20 |
| A926714 | Total Vanadium (V) | 2023/04/04 | 104 | 80 - 120 | 101 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |
| A926714 | Total Zinc (Zn) | 2023/04/04 | 89 | 80 - 120 | 102 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |
| A926714 | Total Zirconium (Zr) | 2023/04/04 | 96 | 80 - 120 | 101 | 80 - 120 | <0.10 | ug/L | NC (1) | 20 |
| A926922 | Total Dissolved Solids | 2023/04/04 | 98 | 80 - 120 | 102 | 80 - 120 | <10 | mg/L | 5.7 (1) | 20 |
| A927497 | Dissolved Mercury (Hg) | 2023/04/04 | 95 | 80 - 120 | 100 | 80 - 120 | <0.0019 | ug/L | NC (1) | 20 |
| A927551 | Total Mercury (Hg) | 2023/04/04 | 95 | 80 - 120 | 96 | 80 - 120 | <0.0019 | ug/L | NC (1) | 20 |
| A927556 | Total Suspended Solids | 2023/04/05 | 103 | 80 - 120 | 103 | 80 - 120 | <1.0 | mg/L | NC (1) | 20 |
| A927637 | 1-Methylnaphthalene | 2023/04/04 | | | 91 | 50 - 140 | <0.050 | ug/L | | |
| A927637 | 2-Methylnaphthalene | 2023/04/04 | | | 87 | 50 - 140 | <0.10 | ug/L | | |
| A927637 | Acenaphthene | 2023/04/04 | | | 91 | 50 - 140 | <0.050 | ug/L | | |
| A927637 | Acenaphthylene | 2023/04/04 | | | 89 | 50 - 140 | <0.050 | ug/L | | |
| A927637 | Acridine | 2023/04/04 | | | 98 | 50 - 140 | <0.050 | ug/L | | |
| A927637 | Anthracene | 2023/04/04 | | | 96 | 50 - 140 | <0.010 | ug/L | | |
| A927637 | Benzo(a)anthracene | 2023/04/04 | | | 94 | 50 - 140 | <0.010 | ug/L | | |
| A927637 | Benzo(a)pyrene | 2023/04/04 | | | 95 | 50 - 140 | <0.0050 | ug/L | | |
| A927637 | Benzo(b&j)fluoranthene | 2023/04/04 | | | 94 | 50 - 140 | <0.030 | ug/L | | |
| A927637 | Benzo(g,h,i)perylene | 2023/04/04 | | | 89 | 50 - 140 | <0.050 | ug/L | | |
| A927637 | Benzo(k)fluoranthene | 2023/04/04 | | | 99 | 50 - 140 | <0.050 | ug/L | | |

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| A927637 | Chrysene | 2023/04/04 | | | 98 | 50 - 140 | <0.020 | ug/L | | |
| A927637 | Dibenz(a,h)anthracene | 2023/04/04 | | | 90 | 50 - 140 | <0.0030 | ug/L | | |
| A927637 | Fluoranthene | 2023/04/04 | | | 85 | 50 - 140 | <0.020 | ug/L | | |
| A927637 | Fluorene | 2023/04/04 | | | 89 | 50 - 140 | <0.050 | ug/L | | |
| A927637 | Indeno(1,2,3-cd)pyrene | 2023/04/04 | | | 92 | 50 - 140 | <0.050 | ug/L | | |
| A927637 | Naphthalene | 2023/04/04 | | | 88 | 50 - 140 | <0.10 | ug/L | | |
| A927637 | Phenanthrene | 2023/04/04 | | | 87 | 50 - 140 | <0.050 | ug/L | | |
| A927637 | Pyrene | 2023/04/04 | | | 84 | 50 - 140 | <0.020 | ug/L | | |
| A927637 | Quinoline | 2023/04/04 | | | 107 | 50 - 140 | <0.020 | ug/L | | |
| A927641 | EPH (C10-C19) | 2023/04/04 | | | 86 | 70 - 130 | <0.20 | mg/L | | |
| A927641 | EPH (C19-C32) | 2023/04/04 | | | 108 | 70 - 130 | <0.20 | mg/L | | |
| A927966 | Dissolved Calcium (Ca) | 2023/04/04 | NC (4) | 80 - 120 | 99 | 80 - 120 | <0.050 | mg/L | | |
| A927966 | Dissolved Magnesium (Mg) | 2023/04/04 | NC (4) | 80 - 120 | 91 | 80 - 120 | <0.050 | mg/L | | |

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

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

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

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

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

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

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Duplicate Parent ID

(2) Duplicate Parent ID [BOG483-09]

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

(4) Matrix Spike Parent ID [BOG483-03]

Bureau Veritas Job #: C322057
Report Date: 2023/04/05

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

David Huang, M.Sc., P.Chem., QP, Scientific Services Manager

Saya Hatton, Sample Logistics – PSS

Bureau Veritas Proprietary Software
Logiciel Propriétaire de Bureau Veritas

Automated Statchk

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by {0}, {1} responsible for {2} {3} laboratory operations.



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas
4606 Canada Way, Burnaby, British Columbia Canada V5G 1K5 Tel:(604) 734 7276 Toll-free:800-563-6266 Fax:(604) 731 2386 www.bvna.com

# Chain Of Custody Record



1/2

| INVOICE TO: | | Report Information | | Project Information | | Laboratory Use Only | |
|---|---|---|---|---|---|---|---|
| Company Name | #163 GHD Limited | Company Name | GHD Limited | Quotation # | C30090 | Bureau Veritas Job # | Bottle Order #: |
| Contact Name | AP Invoices - 735 | Contact Name | Stephanie Berton | P.O. # | 735-002640-3 | | 695951 |
| Address | 455 PHILLIP STREET | Address | stephanie.berton@ghd.com | Project # | 11222680-15.1 | | |
| | WATERLOO ON N2L 3X2 | | Kathleen.hosier@ghd.com | Project Name | Vpland-NewLandfill | Chain Of Custody Record | Project Manager |
| Phone | (519) 884-0510 Fax (519) 725-1394 | Phone | rosemarie.rocca@ghd.com | Site # | Groundwater | C#695951-01-01 | Brody Anderson |
| Email | APInvoices-735@ghd.com invoicing-canada@ghd.com | Email | NationalEDDSupport@mbcbath.ca,stephanie.berton@g | Sampled By | Kathleen Hosier | | |

Regulatory Criteria:
- ☐ CSR
- ☐ CCME
- ☐ BC Water Quality
- ☐ Other

Special Instructions: All bottles were filtered as required. (metals)

SAMPLES MUST BE KEPT COOL ( < 10°C ) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required

Please provide advance notice for rush projects

Regular (Standard) TAT: ☒
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
1 DAY ☐ 2 Day ☐ 3 Day ☐ Date Required: _____ ☐
Rush Confirmation Number: _____ (call lab for #)

| | Sample Barcode Label | Sample (Location) Identification | Date Sampled | Time Sampled | Matrix | Metals Field Filtered ? (Y / N) | Conductivity, Cl, SO4, NO2, NO3, N+N, PO4 | Speciated Alkalinity | Sulphide + H2S Calc (total) | Sulphide, Un-ionized (as H2S) (Calc) | Ammonia-N (Total) | Dissolved Metals with CV Hg, Hardness (dissolved Hg, BS, mod) | Total Dissolved Solids (Filt. Residue) | LEPH/HEPH with subtracted PAHs (incl. PAH LEPH) | Field pH | Field Temperature | # of Bottles | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | WG-11222680-280323-KH-01 | 28/03/23 | 1300 | W | Y | X | X | X | X | X | X | X | X | | | | |
| 2 | | WG-11222680-280323-KH-02 | 28/03/23 | 1410 | W | Y | X | X | X | X | X | X | X | X | | | | |
| 3 | | WG-11222680-280323-KH-04 | 28/03/23 | 1845 | W | Y | X | X | X | X | X | X | X | X | | | | |
| 4 | | WG-11222680-280323-KH-03 | 28/03/23 | 1745 | W | Y | X | X | X | X | X | X | X | X | | | | |
| 5 | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | |

C322057_COC

| * RELINQUISHED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | RECEIVED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | # jars used and not submitted | Lab Use Only: Time Sensitive | Temperature (°C) on Receipt | Custody Seal Intact on Cooler? |
|---|---|---|---|---|---|---|---|---|---|
| Kathleen Hosier | 23/03/28 | 0600 | Catherine Crain | 2023/03/30 | 0827 | | ☐ | 4, 4, 4 | ☐ Yes ☒ No |

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Bureau Veritas Yellow: Client

ICE: yes

Bureau Veritas Canada (2019) Inc.

Bureau Veritas
4606 Canada Way, Burnaby, British Columbia Canada V5G 1K5 Tel:(604) 734 7276 Toll-free:800-563-6266 Fax:(604) 731 2386 www.bvna.com

# Chain Of Custody Record

| INVOICE TO: | | Report Information | | Project Information | | Laboratory Use Only | |
|---|---|---|---|---|---|---|---|
| Company Name | #163 GHD Limited | Company Name | GHD Limited | Quotation # | C30090 | Bureau Veritas Job # | Bottle Order #: |
| Contact Name | AP Invoices - 735 | Contact Name | Stephanie Berton | P.O. # | 735-002640-3 | | G89994 |
| Address | 455 PHILLIP STREET<br>WATERLOO ON N2L 3X2 | Address | Stephanie.berton@ghd.com<br>kathleen.hasler@ghd.com<br>rosemarie.rocca@ghd.com | Project # | 11222680-15 / New | Chain Of Custody Record | Project Manager |
| Phone | (519) 884-0510 Fax (519) 725-1394 | Phone | | Project Name | Upland Landfill | C#89994-01-01 | Brody Anderson |
| Email | ~~APinvoices735@ghd.com~~ mwiring-canada@ghd.com | Email | NationalEDDSupport@maxxam.ca;stephanie.berton@g | Site # | Leachate Water | | |
| | | | | Sampled By | Kathleen Hasler | | |

Regulatory Criteria:
- ☐ CSR
- ☐ CCME
- ☐ BC Water Quality
- ☐ Other _____

Special Instructions: dissolved hardness bottles field filtered as required

SAMPLES MUST BE KEPT COOL ( < 10°C ) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT: ☒
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
1 DAY ☐ 2 Day ☐ 3 Day ☐ Date Required: _____ ☐
Rush Confirmation Number: _____ (call lab for #)

| | Sample Barcode Label | Sample (Location) Identification | Date Sampled | Time Sampled | Matrix | Metals Field Filtered ? (Y / N) | Conductivity, Cl, SO4, NO2, NO3, N+N, PO4, TDS, TSS, Sp. Alk | Total Sulphide, Total H2S, Un-ionized (as H2S) - based on total | Ammonia-N (Total) | Total Metals with CV Hg (NO Aqua HARDNESS) | Total Biochemical Oxygen Demand | COD | Dissolved Hardness | LEPH/HEPH with subfracted PAHs (incl. PAH LEPH) | Field pH | Field Temperature | # of Bottles | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | WL-11222680-280323-KH-02 | 28/03/23 | 1600 | W | | X | X | X | X | X | X | X | X | | | | |
| 2 | | | | | | | | | | | | | | | | | | |
| 3 | | WL-11222680-280323-KH-01 | 28/03/23 | 1550 | W | | X | X | X | X | X | X | X | X | | | | |
| 4 | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | |

C322057_COC

| * RELINQUISHED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | RECEIVED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | # jars used and not submitted | Lab Use Only: Time Sensitive | Temperature (°C) on Receipt | Custody Seal Intact on Cooler? |
|---|---|---|---|---|---|---|---|---|---|
| Kathleen Hasler | 23/03/28 | 0600 | Maud Leblanc Cocci | 2023/03/30 | 0824 | | ☐ | 4, 4.1, 4 | ☐ Yes ☒ No |

ICE: JS

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

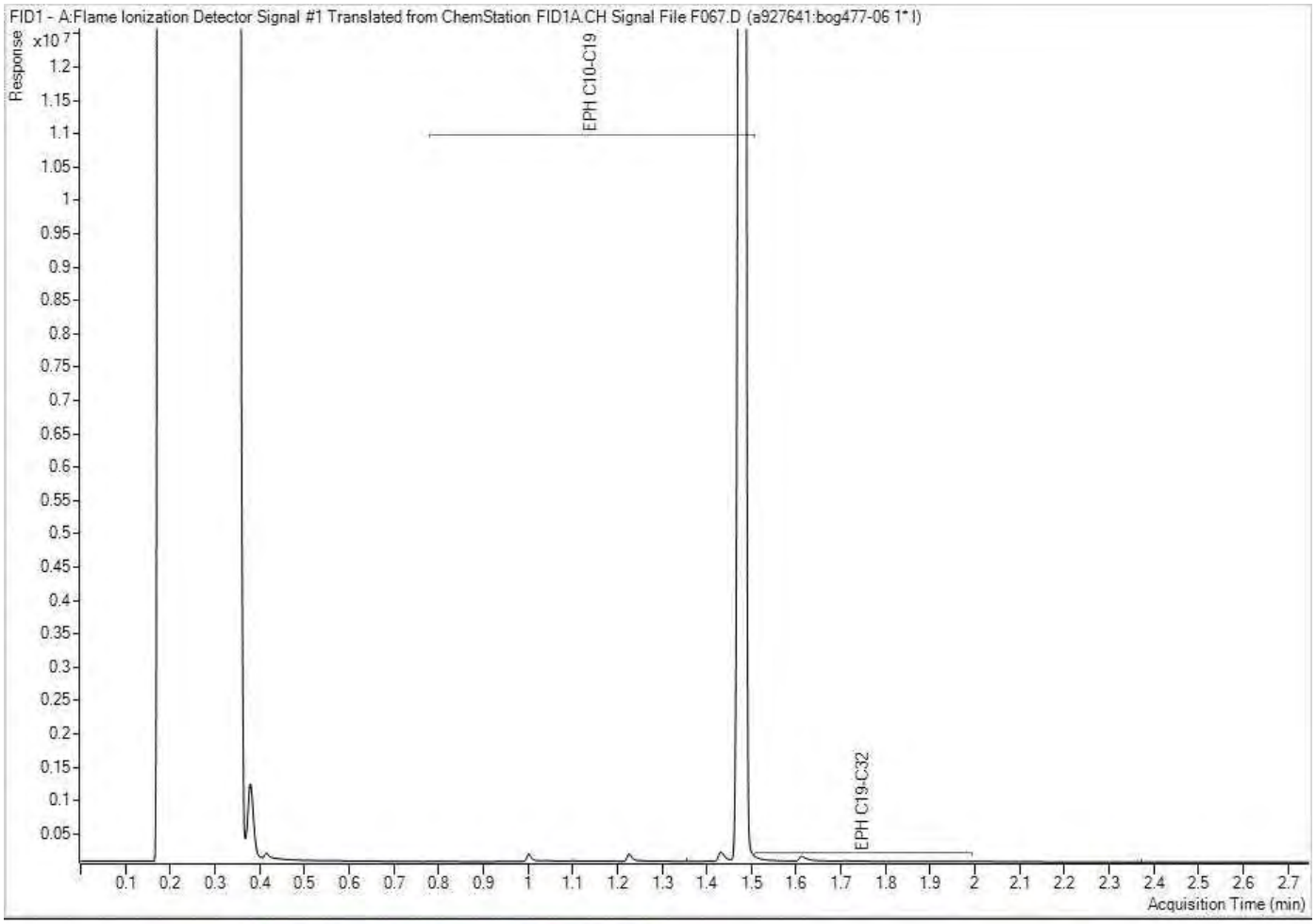
White: Bureau Veritas Yellow: Client

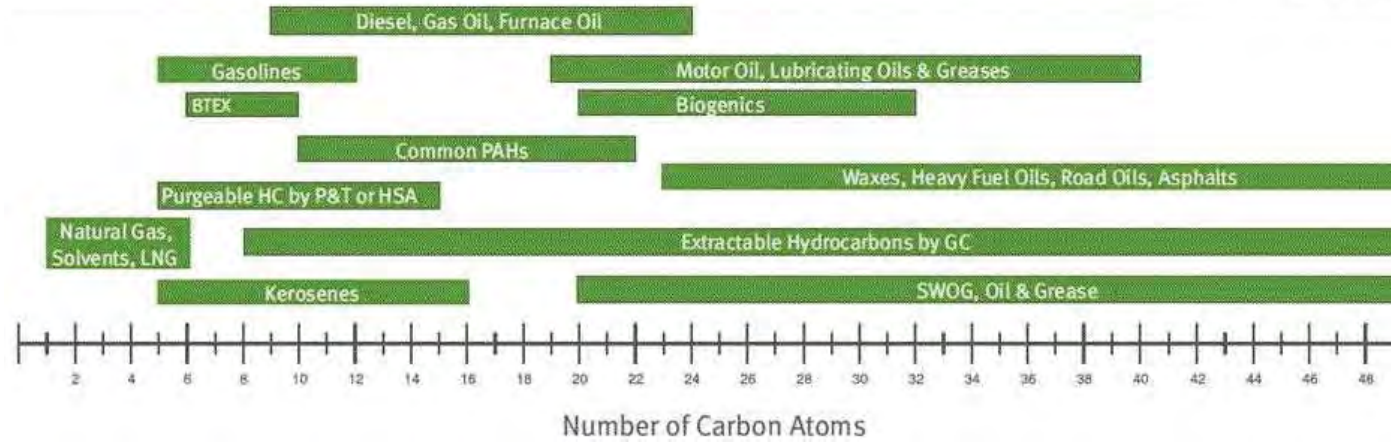
Bureau Veritas Canada (2019) Inc.

Bureau Veritas Job #: C322057
Report Date: 2023/04/05
Bureau Veritas Sample: BOG477

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WG-11222680-280323-KH-01

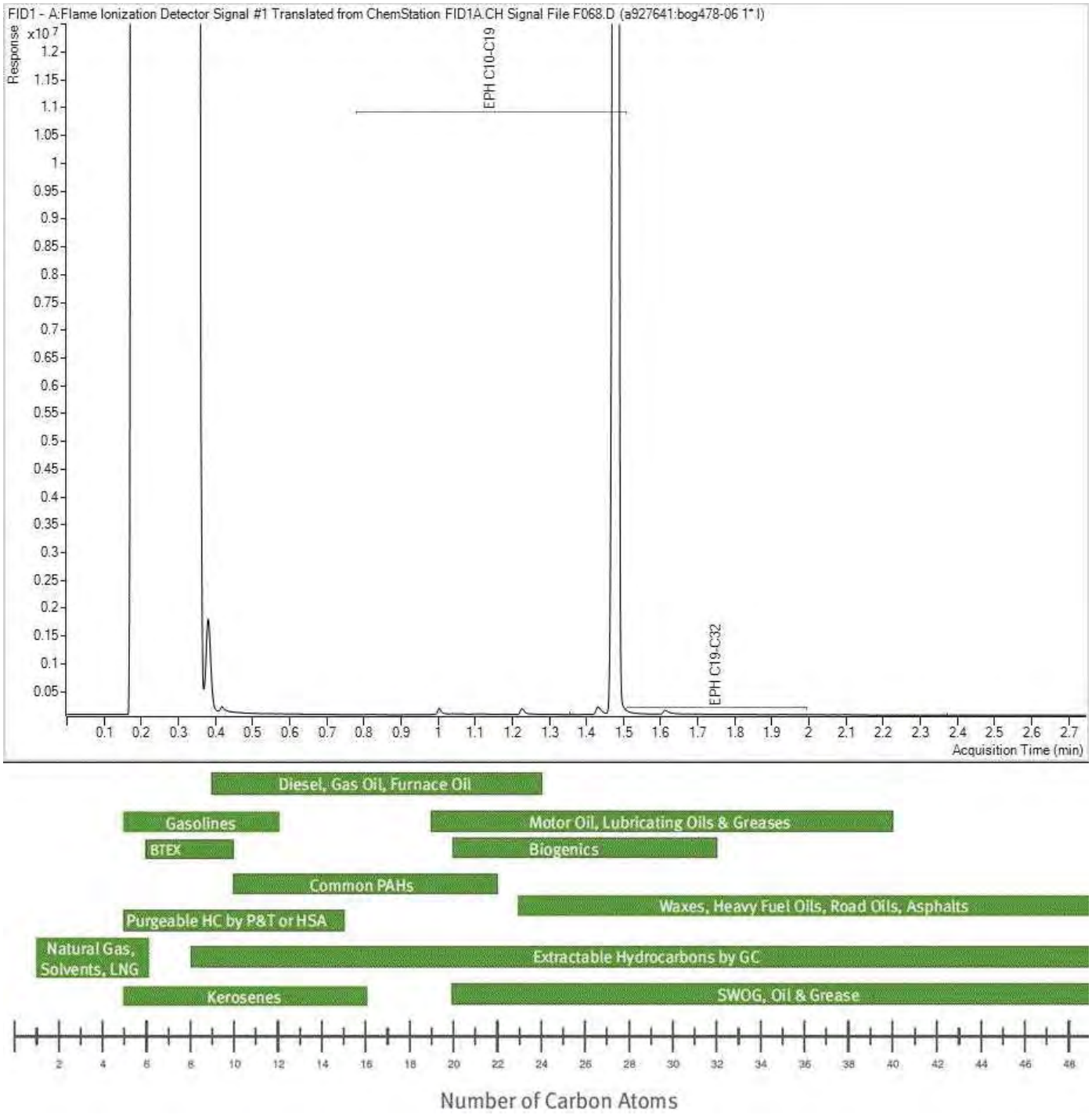
**EPH in Water when PAH required Chromatogram**




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

**EPH in Water when PAH required Chromatogram**

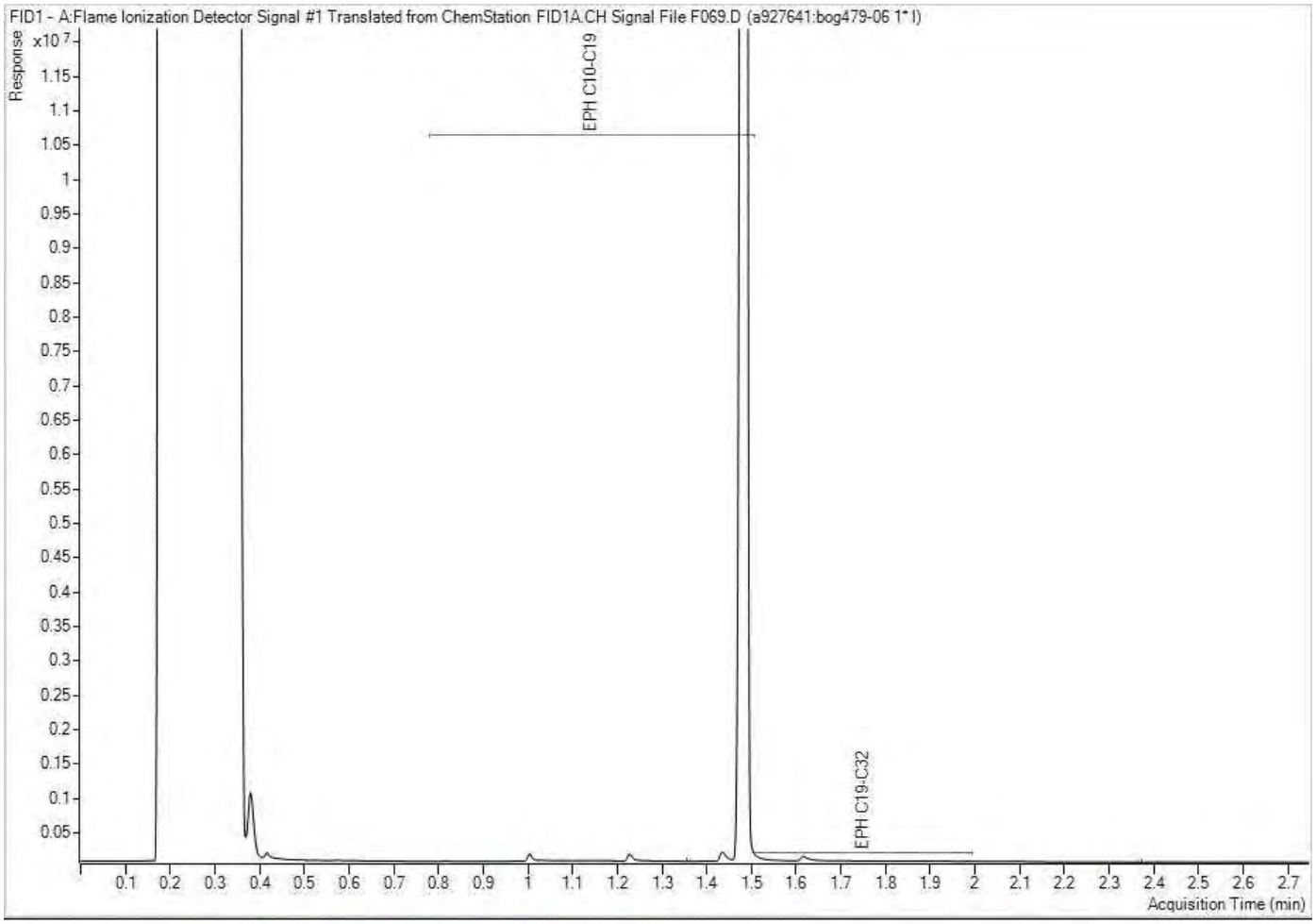


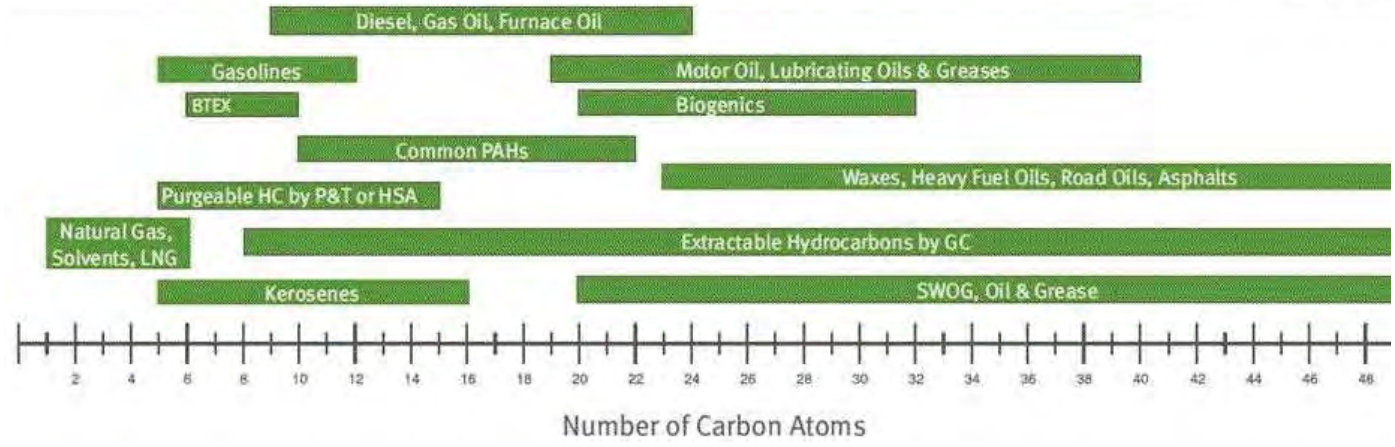

**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

Bureau Veritas Job #: C322057
Report Date: 2023/04/05
Bureau Veritas Sample: BOG479

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WG-11222680-280323-KH-04

**EPH in Water when PAH required Chromatogram**



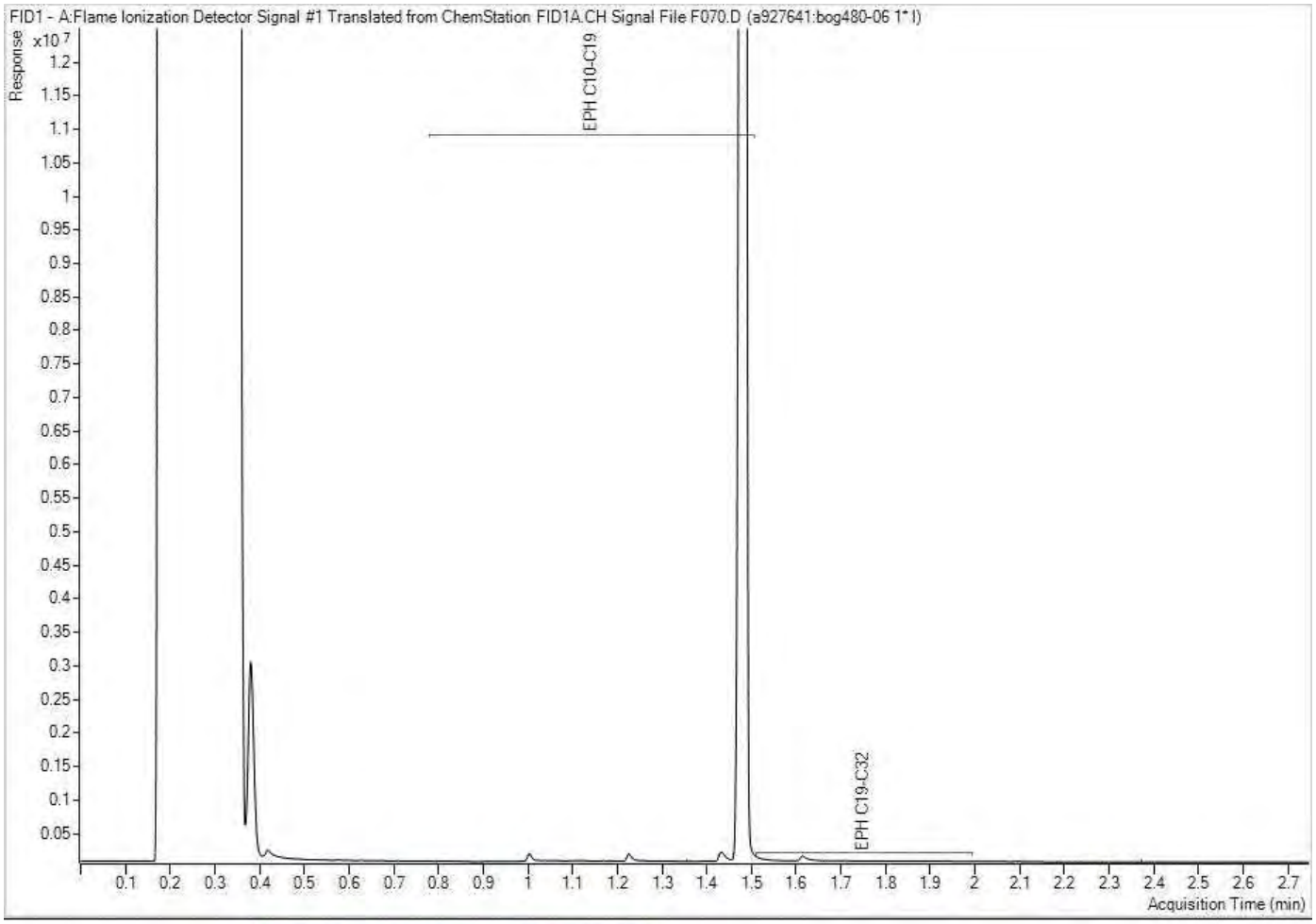



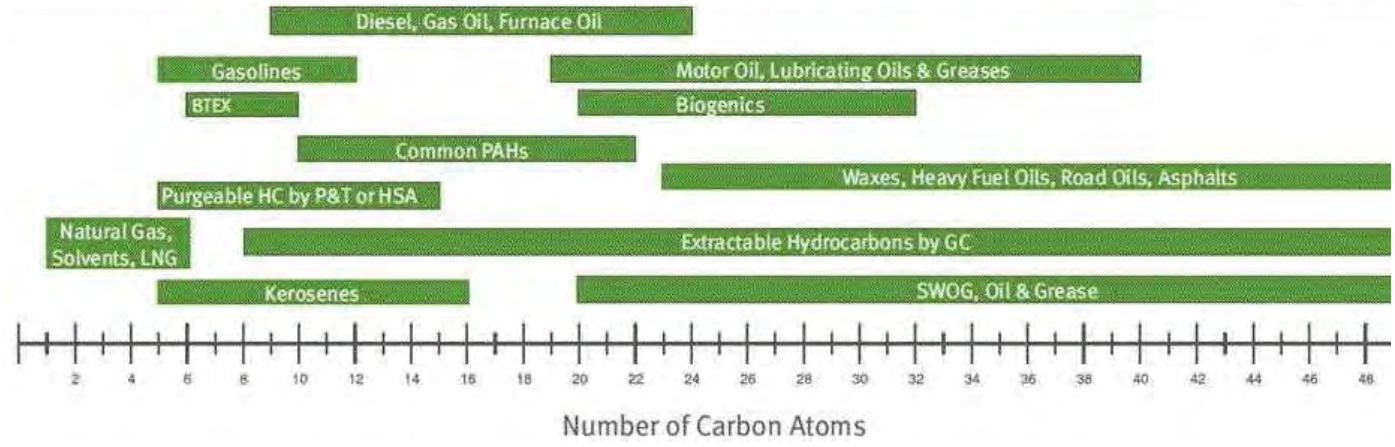

**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

Bureau Veritas Job #: C322057
Report Date: 2023/04/05
Bureau Veritas Sample: BOG480

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WG-11222680-280323-KH-03

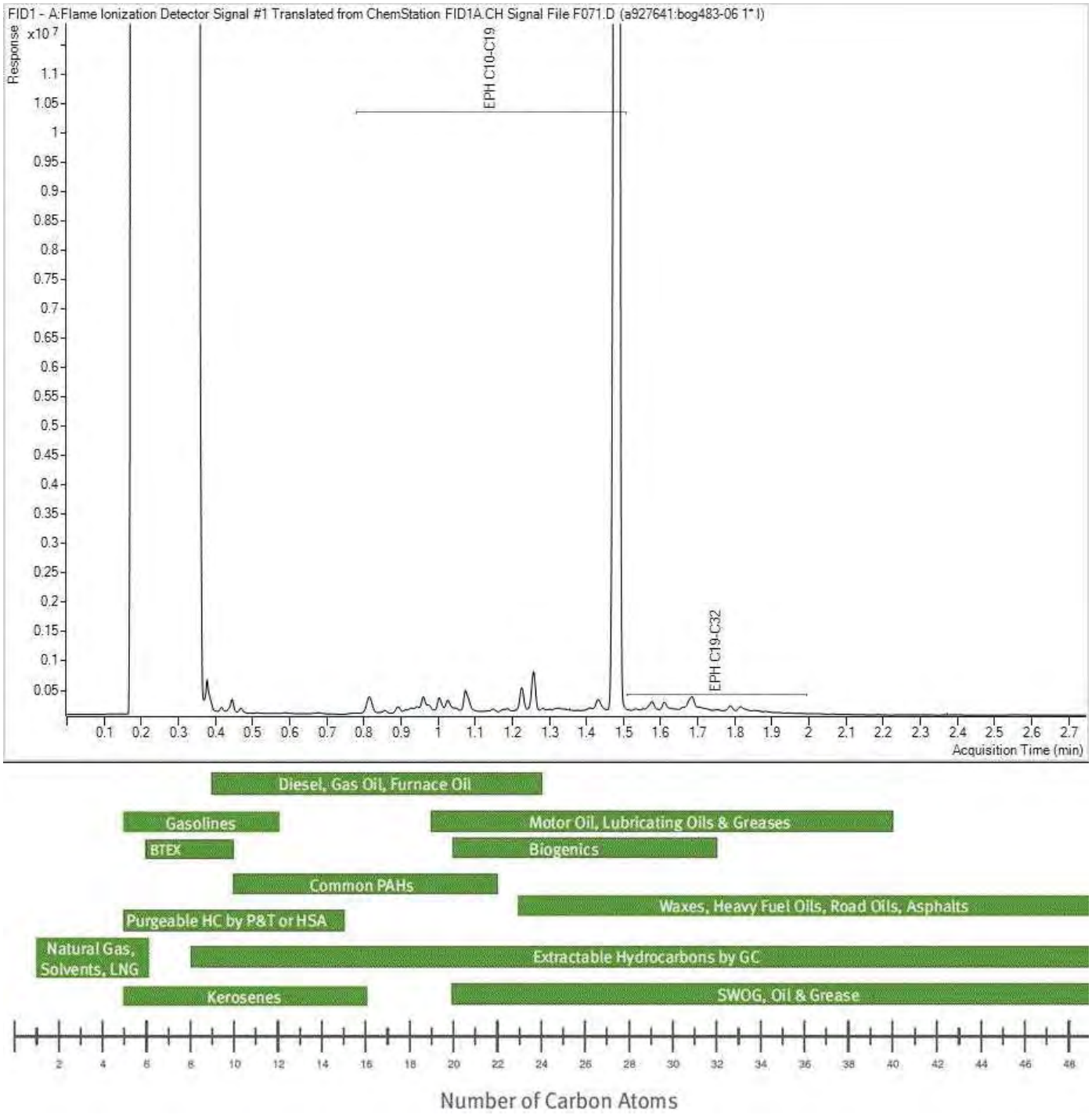
**EPH in Water when PAH required Chromatogram**




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

**EPH in Water when PAH required Chromatogram**

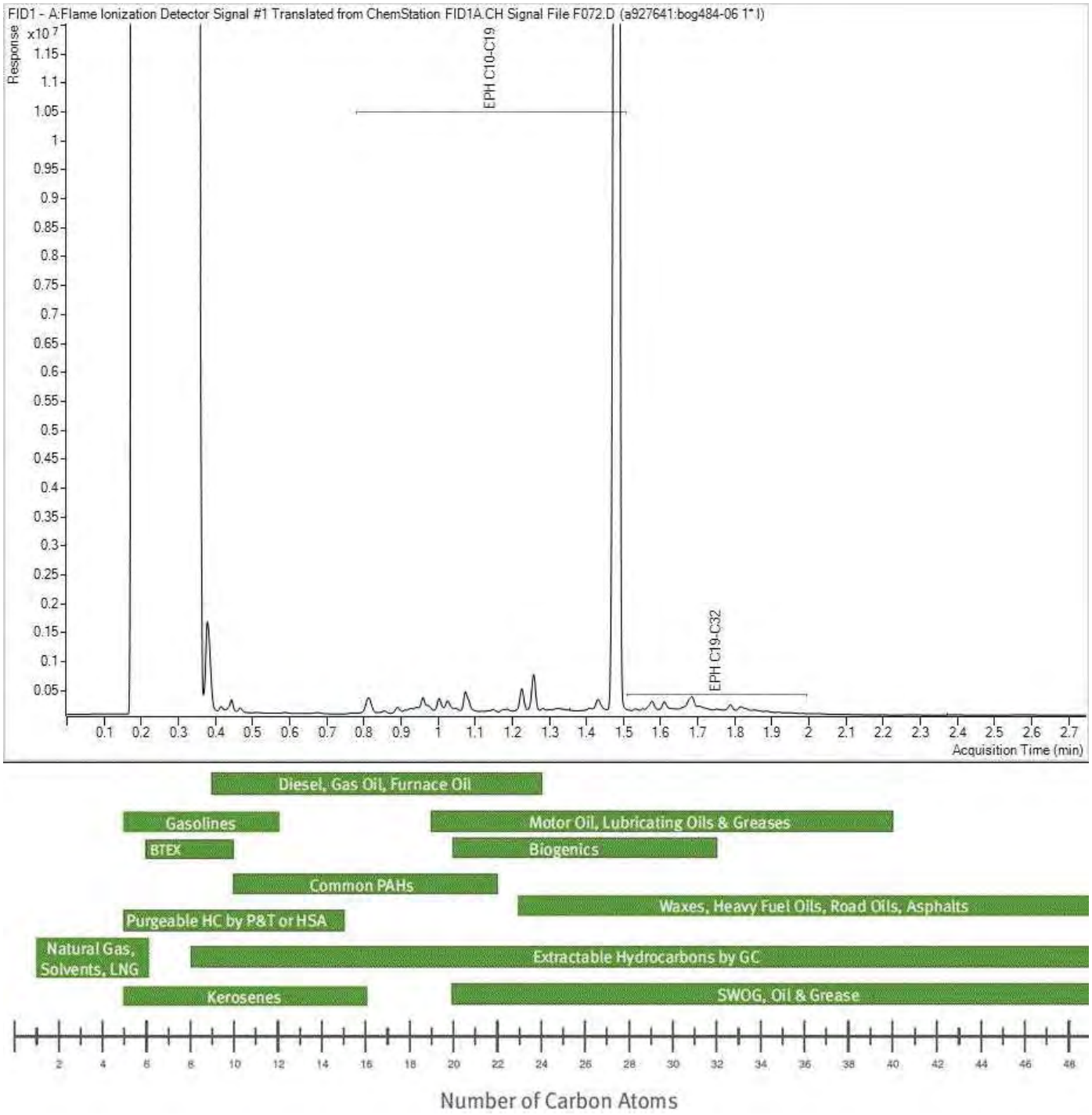



**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

Bureau Veritas Job #: C322057
Report Date: 2023/04/05
Bureau Veritas Sample: BOG484

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WL-11222680-280323-KH-01

**EPH in Water when PAH required Chromatogram**




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

Your P.O. #: 735-002640-3
Your Project #: 11222680-15.1
Site#: GROUNDWATER
Site Location: NEW LANDFILL
Your C.O.C. #: 689991-03-01

**Attention: Stephanie Berton**

GHD Limited
455 PHILLIP STREET
WATERLOO, ON
CANADA N2L 3X2

**Report Date: 2023/04/12**
Report #: R3321133
Version: 2 - Revision

# CERTIFICATE OF ANALYSIS – REVISED REPORT

**BUREAU VERITAS JOB #: C322498**
**Received: 2023/03/31, 14:06**

Sample Matrix: Water
# Samples Received: 6

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Analytical Method |
|---|---|---|---|---|---|
| Alkalinity @25C (pp, total), CO3,HCO3,OH | 6 | N/A | 2023/04/03 | BBY6SOP-00026 | SM 23 2320 B m |
| Chloride/Sulphate by Auto Colourimetry | 6 | N/A | 2023/04/03 | BBY6SOP-00011 / BBY6SOP-00017 | SM23-4500-Cl/SO4-E m |
| Conductivity @25C | 6 | N/A | 2023/04/03 | BBY6SOP-00026 | SM 23 2510 B m |
| Sulphide (as H2S) (1) | 6 | N/A | 2023/04/04 | | Auto Calc |
| Un-ionized Hydrogen Sulphide as S Calc | 6 | N/A | 2023/04/04 | BBY WI-00033 | Auto Calc |
| Hardness (calculated as CaCO3) | 6 | N/A | 2023/04/04 | BBY WI-00033 | Auto Calc |
| Mercury (Dissolved) by CV (2) | 6 | 2023/04/04 | 2023/04/04 | AB SOP-00084 | BCMOE BCLM Oct2013 m |
| EPH in Water when PAH required | 6 | 2023/04/04 | 2023/04/04 | BBY8SOP-00029 | BCMOE BCLM Sep2017 m |
| Na, K, Ca, Mg, S by CRC ICPMS (diss.) | 6 | N/A | 2023/04/04 | BBY WI-00033 | Auto Calc |
| Elements by CRC ICPMS (dissolved) (2) | 6 | N/A | 2023/04/03 | BBY7SOP-00002 | EPA 6020b R2 m |
| Ammonia-N (Total) | 6 | N/A | 2023/04/03 | AB SOP-00007 | SM 23 4500 NH3 A G m |
| Nitrate + Nitrite (N) | 6 | N/A | 2023/04/01 | BBY6SOP-00010 | SM 23 4500-NO3- I m |
| Nitrite (N) by CFA | 6 | N/A | 2023/04/01 | BBY6SOP-00010 | SM 23 4500-NO3- I m |
| Nitrogen - Nitrate (as N) | 6 | N/A | 2023/04/03 | BBY WI-00033 | Auto Calc |
| PAH in Water by GC/MS (SIM) | 2 | 2023/04/04 | 2023/04/04 | BBY8SOP-00021 | BCMOE BCLM Jul2017m |
| PAH in Water by GC/MS (SIM) | 4 | 2023/04/04 | 2023/04/05 | BBY8SOP-00021 | BCMOE BCLM Jul2017m |
| Total LMW, HMW, Total PAH Calc (3) | 6 | N/A | 2023/04/05 | BBY WI-00033 | Auto Calc |
| Filter and HNO3 Preserve for Metals | 6 | N/A | 2023/04/01 | BBY7 WI-00004 | SM 23 3030B m |
| Orthophosphate by Konelab (4) | 6 | N/A | 2023/04/01 | BBY6SOP-00013 | SM 23 4500-P E m |
| Total Sulphide (1) | 6 | N/A | 2023/04/04 | AB SOP-00080 | SM 23 4500 S2-A D Fm |
| Total Dissolved Solids (Filt. Residue) | 6 | 2023/04/03 | 2023/04/04 | BBY6SOP-00033 | SM 23 2540 C m |
| EPH less PAH in Water by GC/FID (5) | 6 | N/A | 2023/04/05 | BBY WI-00033 | Auto Calc |
| Field pH | 5 | N/A | 2023/04/03 | | |
| Field Temperature | 5 | N/A | 2023/04/03 | | |

**Remarks:**

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your P.O. #: 735-002640-3
Your Project #: 11222680-15.1
Site#: GROUNDWATER
Site Location: NEW LANDFILL
Your C.O.C. #: 689991-03-01

**Attention: Stephanie Berton**

GHD Limited
455 PHILLIP STREET
WATERLOO, ON
CANADA N2L 3X2

**Report Date: 2023/04/12**
Report #: R3321133
Version: 2 - Revision

# CERTIFICATE OF ANALYSIS – REVISED REPORT

**BUREAU VERITAS JOB #: C322498**
**Received: 2023/03/31, 14:06**

reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

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

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

(1) This test was performed by Bureau Veritas Calgary, 4000 - 19 St. , Calgary, AB, T2E 6P8

(2) Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.

(3) Total PAHs in Water include: Quinoline, Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Acridine, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b&j)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, and Benzo(g,h,i)perylene.

(4) Orthophosphate > Total Phosphorus Imbalance: When applicable, Orthophosphate, Total Phosphorus and dissolved Phosphorus results were reviewed and data quality meets acceptable levels unless otherwise noted.

(5) LEPH = EPH (C10 to C19) - (Acenaphthene + Acridine + Anthracene + Fluorene + Naphthalene + Phenanthrene)
HEPH = EPH (C19 to C32) - (Benzo(a)anthracene + Benzo(a)pyrene + Fluoranthene + Pyrene)

Encryption Key

Brody Andersen
Program Specialist-Emergency Spill Response
12 Apr 2023 11:41:07

Please direct all questions regarding this Certificate of Analysis to:
Brody Andersen, B.Sc., B.Sc., Program Specialist–Emergency Spill Response
Email: Brody.Andersen@bureauveritas.com
Phone# (780)577-7120

==========

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Raphael Kwan, Senior Manager, BC and Yukon Regions responsible for British Columbia Environmental laboratory operations.

Bureau Veritas Job #: C322498
Report Date: 2023/04/12

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | BOI518 | BOI518 | BOI519 | BOI520 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/03/29 10:45 | 2023/03/29 10:45 | 2023/03/29 10:55 | 2023/03/29 13:45 | | |
| COC Number | | 689991-03-01 | 689991-03-01 | 689991-03-01 | 689991-03-01 | | |
| | UNITS | WG-11222680-290323 -KH-05 | WG-11222680-290323 -KH-05 Lab-Dup | WG-11222680-290323 -KH-06 | WG-11222680-290323 -KH-07 | RDL | QC Batch |
| **ANIONS** | | | | | | | |
| Nitrite (N) | mg/L | <0.0050 | N/A | <0.0050 | <0.0050 | 0.0050 | A925902 |
| **Calculated Parameters** | | | | | | | |
| Filter and HNO3 Preservation | N/A | FIELD | N/A | FIELD | FIELD | N/A | ONSITE |
| Nitrate (N) | mg/L | 0.700 | N/A | 0.699 | 0.408 | 0.020 | A925845 |
| Sulphide (as H2S) | mg/L | <0.0020 | N/A | <0.0020 | 0.0023 | 0.0020 | A925610 |
| **Field Parameters** | | | | | | | |
| Field pH | pH | 7.56 | N/A | 7.56 | 7.67 | N/A | ONSITE |
| Field Temperature | °C | 10.37 | N/A | 10.37 | 16.54 | N/A | ONSITE |
| **Misc. Inorganics** | | | | | | | |
| Conductivity | uS/cm | 150 | N/A | 150 | 210 | 2.0 | A927157 |
| Total Dissolved Solids | mg/L | 130 | N/A | 100 | 140 | 10 | A926922 |
| **Anions** | | | | | | | |
| Alkalinity (PP as CaCO3) | mg/L | <1.0 | N/A | <1.0 | <1.0 | 1.0 | A927158 |
| Alkalinity (Total as CaCO3) | mg/L | 66 | N/A | 65 | 90 | 1.0 | A927158 |
| Bicarbonate (HCO3) | mg/L | 80 | N/A | 80 | 110 | 1.0 | A927158 |
| Carbonate (CO3) | mg/L | <1.0 | N/A | <1.0 | <1.0 | 1.0 | A927158 |
| Hydroxide (OH) | mg/L | <1.0 | N/A | <1.0 | <1.0 | 1.0 | A927158 |
| Total Sulphide | mg/L | <0.0018 | N/A | <0.0018 | 0.0022 | 0.0018 | A927544 |
| Chloride (Cl) | mg/L | 2.3 | N/A | 2.3 | 6.2 | 1.0 | A927135 |
| Sulphate (SO4) | mg/L | 4.4 | N/A | 4.4 | 6.3 | 1.0 | A927135 |
| **Nutrients** | | | | | | | |
| Total Ammonia (N) | mg/L | <0.015 | <0.015 | <0.015 | <0.015 | 0.015 | A927155 |
| Orthophosphate (P) | mg/L | 0.0049 | 0.0050 | 0.0054 | 0.011 | 0.0030 | A925886 |
| Nitrate plus Nitrite (N) | mg/L | 0.700 | N/A | 0.699 | 0.408 | 0.020 | A925901 |

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



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C322498
Report Date: 2023/04/12

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | BOI521 | BOI522 | BOI523 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2023/03/29 13:20 | 2023/03/29 16:00 | 2023/03/29 17:00 | | |
| COC Number | | 689991-03-01 | 689991-03-01 | 689991-03-01 | | |
| | UNITS | WG-11222680-290323-KH-08 | WG-11222680-290323-KH-09 | WG-11222680-290323-KH-10 | RDL | QC Batch |
| **ANIONS** | | | | | | |
| Nitrite (N) | mg/L | <0.0050 | 0.0166 | <0.0050 | 0.0050 | A925902 |
| **Calculated Parameters** | | | | | | |
| Filter and HNO3 Preservation | N/A | FIELD | FIELD | FIELD | N/A | ONSITE |
| Nitrate (N) | mg/L | <0.020 | 1.17 | 0.680 | 0.020 | A925845 |
| Sulphide (as H2S) | mg/L | <0.0020 | <0.0020 | 0.034 | 0.0020 | A925610 |
| **Field Parameters** | | | | | | |
| Field pH | pH | N/A | 7.65 | 7.09 | N/A | ONSITE |
| Field Temperature | °C | N/A | 12.33 | 10.58 | N/A | ONSITE |
| **Misc. Inorganics** | | | | | | |
| Conductivity | uS/cm | <2.0 | 200 | 530 | 2.0 | A927157 |
| Total Dissolved Solids | mg/L | <10 | 100 | 340 | 10 | A926922 |
| **Anions** | | | | | | |
| Alkalinity (PP as CaCO3) | mg/L | <1.0 | <1.0 | <1.0 | 1.0 | A927158 |
| Alkalinity (Total as CaCO3) | mg/L | <1.0 | 77 | 120 | 1.0 | A927158 |
| Bicarbonate (HCO3) | mg/L | <1.0 | 94 | 150 | 1.0 | A927158 |
| Carbonate (CO3) | mg/L | <1.0 | <1.0 | <1.0 | 1.0 | A927158 |
| Hydroxide (OH) | mg/L | <1.0 | <1.0 | <1.0 | 1.0 | A927158 |
| Total Sulphide | mg/L | <0.0018 | <0.0018 | 0.032 | 0.0018 | A927544 |
| Chloride (Cl) | mg/L | <1.0 | 6.0 | 84 | 1.0 | A927135 |
| Sulphate (SO4) | mg/L | <1.0 | 7.2 | 5.1 | 1.0 | A927135 |
| **Nutrients** | | | | | | |
| Total Ammonia (N) | mg/L | <0.015 | <0.015 | <0.015 | 0.015 | A927155 |
| Orthophosphate (P) | mg/L | <0.0030 | 0.010 | 0.0069 | 0.0030 | A925886 |
| Nitrate plus Nitrite (N) | mg/L | <0.020 | 1.19 | 0.680 | 0.020 | A925901 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## MISCELLANEOUS (WATER)

| Bureau Veritas ID | | BOI518 | BOI519 | BOI520 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2023/03/29 10:45 | 2023/03/29 10:55 | 2023/03/29 13:45 | | |
| COC Number | | 689991-03-01 | 689991-03-01 | 689991-03-01 | | |
| | UNITS | WG-11222680-290323-KH-05 | WG-11222680-290323-KH-06 | WG-11222680-290323-KH-07 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | |
| Total Un-ionized Hydrogen Sulfide as S | mg/L | <0.0050 | <0.0050 | <0.0050 | 0.0050 | A925844 |
| Total Un-ionized Hydrogen Sulfide as H2S | mg/L | <0.0050 | <0.0050 | <0.0050 | 0.0050 | A925844 |
| RDL = Reportable Detection Limit | | | | | | |

| Bureau Veritas ID | | BOI521 | BOI522 | BOI523 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2023/03/29 13:20 | 2023/03/29 16:00 | 2023/03/29 17:00 | | |
| COC Number | | 689991-03-01 | 689991-03-01 | 689991-03-01 | | |
| | UNITS | WG-11222680-290323-KH-08 | WG-11222680-290323-KH-09 | WG-11222680-290323-KH-10 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | |
| Total Un-ionized Hydrogen Sulfide as S | mg/L | NA | <0.0050 | 0.017 | 0.0050 | A925844 |
| Total Un-ionized Hydrogen Sulfide as H2S | mg/L | NA | <0.0050 | 0.018 | 0.0050 | A925844 |
| RDL = Reportable Detection Limit | | | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C322498
Report Date: 2023/04/12

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3

## LEPH & HEPH WITH CSR/CCME PAH IN WATER (WATER)

| Bureau Veritas ID | | BOI518 | BOI519 | BOI520 | BOI521 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/03/29 10:45 | 2023/03/29 10:55 | 2023/03/29 13:45 | 2023/03/29 13:20 | | |
| COC Number | | 689991-03-01 | 689991-03-01 | 689991-03-01 | 689991-03-01 | | |
| | UNITS | WG-11222680-290323-KH-05 | WG-11222680-290323-KH-06 | WG-11222680-290323-KH-07 | WG-11222680-290323-KH-08 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | | |
| Low Molecular Weight PAH`s | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | A925710 |
| High Molecular Weight PAH`s | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | A925710 |
| Total PAH | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | A925710 |
| **Polycyclic Aromatics** | | | | | | | |
| Quinoline | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | A927637 |
| Naphthalene | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | A927637 |
| 1-Methylnaphthalene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | A927637 |
| 2-Methylnaphthalene | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | A927637 |
| Acenaphthylene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | A927637 |
| Acenaphthene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | A927637 |
| Fluorene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | A927637 |
| Phenanthrene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | A927637 |
| Anthracene | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | A927637 |
| Acridine | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | A927637 |
| Fluoranthene | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | A927637 |
| Pyrene | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | A927637 |
| Benzo(a)anthracene | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | A927637 |
| Chrysene | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | A927637 |
| Benzo(b&j)fluoranthene | ug/L | <0.030 | <0.030 | <0.030 | <0.030 | 0.030 | A927637 |
| Benzo(k)fluoranthene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | A927637 |
| Benzo(a)pyrene | ug/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | 0.0050 | A927637 |
| Indeno(1,2,3-cd)pyrene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | A927637 |
| Dibenz(a,h)anthracene | ug/L | <0.0030 | <0.0030 | <0.0030 | <0.0030 | 0.0030 | A927637 |
| Benzo(g,h,i)perylene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | A927637 |
| **Calculated Parameters** | | | | | | | |
| LEPH (C10-C19 less PAH) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | A925708 |
| HEPH (C19-C32 less PAH) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | A925708 |
| **Ext. Pet. Hydrocarbon** | | | | | | | |
| EPH (C10-C19) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | A927641 |
| EPH (C19-C32) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | A927641 |

RDL = Reportable Detection Limit



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## LEPH & HEPH WITH CSR/CCME PAH IN WATER (WATER)

| Bureau Veritas ID | | BOI518 | BOI519 | BOI520 | BOI521 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/03/29 10:45 | 2023/03/29 10:55 | 2023/03/29 13:45 | 2023/03/29 13:20 | | |
| COC Number | | 689991-03-01 | 689991-03-01 | 689991-03-01 | 689991-03-01 | | |
| | UNITS | WG-11222680-290323-KH-05 | WG-11222680-290323-KH-06 | WG-11222680-290323-KH-07 | WG-11222680-290323-KH-08 | RDL | QC Batch |
| **Surrogate Recovery (%)** | | | | | | | |
| O-TERPHENYL (sur.) | % | 101 | 100 | 100 | 101 | N/A | A927641 |
| D10-ANTHRACENE (sur.) | % | 103 | 100 | 100 | 102 | N/A | A927637 |
| D8-ACENAPHTHYLENE (sur.) | % | 91 | 89 | 88 | 90 | N/A | A927637 |
| D8-NAPHTHALENE (sur.) | % | 83 | 81 | 80 | 83 | N/A | A927637 |
| TERPHENYL-D14 (sur.) | % | 87 | 86 | 86 | 88 | N/A | A927637 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## LEPH & HEPH WITH CSR/CCME PAH IN WATER (WATER)

| Bureau Veritas ID | | BOI522 | BOI523 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2023/03/29 16:00 | 2023/03/29 17:00 | | |
| COC Number | | 689991-03-01 | 689991-03-01 | | |
| | UNITS | WG-11222680-290323-KH-09 | WG-11222680-290323-KH-10 | RDL | QC Batch |
| **Calculated Parameters** | | | | | |
| Low Molecular Weight PAH`s | ug/L | <0.10 | 0.26 | 0.10 | A925710 |
| High Molecular Weight PAH`s | ug/L | <0.050 | <0.050 | 0.050 | A925710 |
| Total PAH | ug/L | <0.10 | 0.28 | 0.10 | A925710 |
| **Polycyclic Aromatics** | | | | | |
| Quinoline | ug/L | <0.020 | <0.020 | 0.020 | A927637 |
| Naphthalene | ug/L | <0.10 | 0.15 | 0.10 | A927637 |
| 1-Methylnaphthalene | ug/L | <0.050 | <0.050 | 0.050 | A927637 |
| 2-Methylnaphthalene | ug/L | <0.10 | 0.11 | 0.10 | A927637 |
| Acenaphthylene | ug/L | <0.050 | <0.050 | 0.050 | A927637 |
| Acenaphthene | ug/L | <0.050 | <0.050 | 0.050 | A927637 |
| Fluorene | ug/L | <0.050 | <0.050 | 0.050 | A927637 |
| Phenanthrene | ug/L | <0.050 | <0.050 | 0.050 | A927637 |
| Anthracene | ug/L | <0.010 | <0.010 | 0.010 | A927637 |
| Acridine | ug/L | <0.050 | <0.050 | 0.050 | A927637 |
| Fluoranthene | ug/L | <0.020 | <0.020 | 0.020 | A927637 |
| Pyrene | ug/L | <0.020 | 0.021 | 0.020 | A927637 |
| Benzo(a)anthracene | ug/L | <0.010 | <0.010 | 0.010 | A927637 |
| Chrysene | ug/L | <0.020 | <0.020 | 0.020 | A927637 |
| Benzo(b&j)fluoranthene | ug/L | <0.030 | <0.030 | 0.030 | A927637 |
| Benzo(k)fluoranthene | ug/L | <0.050 | <0.050 | 0.050 | A927637 |
| Benzo(a)pyrene | ug/L | <0.0050 | 0.0062 | 0.0050 | A927637 |
| Indeno(1,2,3-cd)pyrene | ug/L | <0.050 | <0.050 | 0.050 | A927637 |
| Dibenz(a,h)anthracene | ug/L | <0.0030 | <0.0030 | 0.0030 | A927637 |
| Benzo(g,h,i)perylene | ug/L | <0.050 | <0.050 | 0.050 | A927637 |
| **Calculated Parameters** | | | | | |
| LEPH (C10-C19 less PAH) | mg/L | <0.20 | <0.20 | 0.20 | A925708 |
| HEPH (C19-C32 less PAH) | mg/L | <0.20 | <0.20 | 0.20 | A925708 |
| **Ext. Pet. Hydrocarbon** | | | | | |
| EPH (C10-C19) | mg/L | <0.20 | <0.20 | 0.20 | A927641 |
| EPH (C19-C32) | mg/L | <0.20 | <0.20 | 0.20 | A927641 |
| RDL = Reportable Detection Limit | | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## LEPH & HEPH WITH CSR/CCME PAH IN WATER (WATER)

| Bureau Veritas ID | | BOI522 | BOI523 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2023/03/29 16:00 | 2023/03/29 17:00 | | |
| COC Number | | 689991-03-01 | 689991-03-01 | | |
| | UNITS | WG-11222680-290323-KH-09 | WG-11222680-290323-KH-10 | RDL | QC Batch |
| **Surrogate Recovery (%)** | | | | | |
| O-TERPHENYL (sur.) | % | 99 | 99 | N/A | A927641 |
| D10-ANTHRACENE (sur.) | % | 105 | 100 | N/A | A927637 |
| D8-ACENAPHTHYLENE (sur.) | % | 91 | 89 | N/A | A927637 |
| D8-NAPHTHALENE (sur.) | % | 84 | 83 | N/A | A927637 |
| TERPHENYL-D14 (sur.) | % | 89 | 88 | N/A | A927637 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C322498
Report Date: 2023/04/12

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3

## CSR DISSOLVED METALS IN WATER WITH CV HG (WATER)

| Bureau Veritas ID | | BOI518 | BOI519 | BOI520 | BOI521 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/03/29 10:45 | 2023/03/29 10:55 | 2023/03/29 13:45 | 2023/03/29 13:20 | | |
| COC Number | | 689991-03-01 | 689991-03-01 | 689991-03-01 | 689991-03-01 | | |
| | UNITS | WG-11222680-290323-KH-05 | WG-11222680-290323-KH-06 | WG-11222680-290323-KH-07 | WG-11222680-290323-KH-08 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | | |
| Dissolved Hardness (CaCO3) | mg/L | 65.3 | 65.3 | 95.1 | 0.77 | 0.50 | A925748 |
| **Elements** | | | | | | | |
| Dissolved Mercury (Hg) | ug/L | <0.0019 | <0.0019 | <0.0019 | <0.0019 | 0.0019 | A927497 |
| **Dissolved Metals by ICPMS** | | | | | | | |
| Dissolved Aluminum (Al) | ug/L | 11.4 | <3.0 | <3.0 | <3.0 | 3.0 | A925968 |
| Dissolved Antimony (Sb) | ug/L | <0.50 | <0.50 | <0.50 | <0.50 | 0.50 | A925968 |
| Dissolved Arsenic (As) | ug/L | 0.24 | <0.10 | 0.25 | <0.10 | 0.10 | A925968 |
| Dissolved Barium (Ba) | ug/L | 3.5 | 3.1 | 5.7 | <1.0 | 1.0 | A925968 |
| Dissolved Beryllium (Be) | ug/L | 0.19 | 0.12 | <0.10 | <0.10 | 0.10 | A925968 |
| Dissolved Bismuth (Bi) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | A925968 |
| Dissolved Boron (B) | ug/L | <50 | <50 | <50 | <50 | 50 | A925968 |
| Dissolved Cadmium (Cd) | ug/L | 0.167 | <0.010 | <0.010 | 0.011 | 0.010 | A925968 |
| Dissolved Chromium (Cr) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | A925968 |
| Dissolved Cobalt (Co) | ug/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | A925968 |
| Dissolved Copper (Cu) | ug/L | 2.17 | <0.20 | 0.53 | <0.20 | 0.20 | A925968 |
| Dissolved Iron (Fe) | ug/L | 24.1 | 11.5 | <5.0 | 17.0 | 5.0 | A925968 |
| Dissolved Lead (Pb) | ug/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | A925968 |
| Dissolved Lithium (Li) | ug/L | <2.0 | <2.0 | <2.0 | <2.0 | 2.0 | A925968 |
| Dissolved Manganese (Mn) | ug/L | 9.6 | 5.8 | <1.0 | <1.0 | 1.0 | A925968 |
| Dissolved Molybdenum (Mo) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | A925968 |
| Dissolved Nickel (Ni) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | A925968 |
| Dissolved Phosphorus (P) | ug/L | 31 | <10 | 15 | <10 | 10 | A925968 |
| Dissolved Selenium (Se) | ug/L | 0.28 | 0.18 | 0.20 | 0.12 | 0.10 | A925968 |
| Dissolved Silicon (Si) | ug/L | 7630 | 7690 | 8900 | <100 | 100 | A925968 |
| Dissolved Silver (Ag) | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | A925968 |
| Dissolved Strontium (Sr) | ug/L | 32.4 | 27.5 | 45.2 | <1.0 | 1.0 | A925968 |
| Dissolved Thallium (Tl) | ug/L | 0.032 | <0.010 | <0.010 | <0.010 | 0.010 | A925968 |
| Dissolved Tin (Sn) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | A925968 |
| Dissolved Titanium (Ti) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | A925968 |
| Dissolved Uranium (U) | ug/L | 0.16 | <0.10 | <0.10 | <0.10 | 0.10 | A925968 |
| Dissolved Vanadium (V) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | A925968 |

RDL = Reportable Detection Limit



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## CSR DISSOLVED METALS IN WATER WITH CV HG (WATER)

| Bureau Veritas ID | | BOI518 | BOI519 | BOI520 | BOI521 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/03/29 10:45 | 2023/03/29 10:55 | 2023/03/29 13:45 | 2023/03/29 13:20 | | |
| COC Number | | 689991-03-01 | 689991-03-01 | 689991-03-01 | 689991-03-01 | | |
| | UNITS | WG-11222680-290323-KH-05 | WG-11222680-290323-KH-06 | WG-11222680-290323-KH-07 | WG-11222680-290323-KH-08 | RDL | QC Batch |
| Dissolved Zinc (Zn) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | A925968 |
| Dissolved Zirconium (Zr) | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | A925968 |
| Dissolved Calcium (Ca) | mg/L | 20.4 | 20.3 | 30.2 | 0.310 | 0.050 | A925749 |
| Dissolved Magnesium (Mg) | mg/L | 3.47 | 3.53 | 4.77 | <0.050 | 0.050 | A925749 |
| Dissolved Potassium (K) | mg/L | 0.326 | 0.275 | 0.392 | <0.050 | 0.050 | A925749 |
| Dissolved Sodium (Na) | mg/L | 5.22 | 5.03 | 5.67 | <0.050 | 0.050 | A925749 |
| Dissolved Sulphur (S) | mg/L | <3.0 | <3.0 | <3.0 | <3.0 | 3.0 | A925749 |
| RDL = Reportable Detection Limit | | | | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## CSR DISSOLVED METALS IN WATER WITH CV HG (WATER)

| Bureau Veritas ID | | BOI522 | | BOI523 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2023/03/29 16:00 | | 2023/03/29 17:00 | | |
| COC Number | | 689991-03-01 | | 689991-03-01 | | |
| | UNITS | WG-11222680-290323-KH-09 | QC Batch | WG-11222680-290323-KH-10 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | |
| Dissolved Hardness (CaCO3) | mg/L | 85.8 | A925748 | 175 | 0.50 | A925748 |
| **Elements** | | | | | | |
| Dissolved Mercury (Hg) | ug/L | <0.0019 | A927497 | <0.0019 | 0.0019 | A927770 |
| **Dissolved Metals by ICPMS** | | | | | | |
| Dissolved Aluminum (Al) | ug/L | 3.7 | A925968 | 13.4 | 3.0 | A925968 |
| Dissolved Antimony (Sb) | ug/L | <0.50 | A925968 | <0.50 | 0.50 | A925968 |
| Dissolved Arsenic (As) | ug/L | 0.40 | A925968 | 0.25 | 0.10 | A925968 |
| Dissolved Barium (Ba) | ug/L | 3.7 | A925968 | 18.1 | 1.0 | A925968 |
| Dissolved Beryllium (Be) | ug/L | 0.15 | A925968 | <0.10 | 0.10 | A925968 |
| Dissolved Bismuth (Bi) | ug/L | <1.0 | A925968 | <1.0 | 1.0 | A925968 |
| Dissolved Boron (B) | ug/L | 490 | A925968 | <50 | 50 | A925968 |
| Dissolved Cadmium (Cd) | ug/L | 0.034 | A925968 | 0.077 | 0.010 | A925968 |
| Dissolved Chromium (Cr) | ug/L | 1.6 | A925968 | <1.0 | 1.0 | A925968 |
| Dissolved Cobalt (Co) | ug/L | <0.20 | A925968 | <0.20 | 0.20 | A925968 |
| Dissolved Copper (Cu) | ug/L | 2.34 | A925968 | 1.66 | 0.20 | A925968 |
| Dissolved Iron (Fe) | ug/L | 11.9 | A925968 | 16.5 | 5.0 | A925968 |
| Dissolved Lead (Pb) | ug/L | <0.20 | A925968 | <0.20 | 0.20 | A925968 |
| Dissolved Lithium (Li) | ug/L | <2.0 | A925968 | <2.0 | 2.0 | A925968 |
| Dissolved Manganese (Mn) | ug/L | 1.0 | A925968 | 28.1 | 1.0 | A925968 |
| Dissolved Molybdenum (Mo) | ug/L | <1.0 | A925968 | <1.0 | 1.0 | A925968 |
| Dissolved Nickel (Ni) | ug/L | <1.0 | A925968 | <1.0 | 1.0 | A925968 |
| Dissolved Phosphorus (P) | ug/L | 20 | A925968 | 23 | 10 | A925968 |
| Dissolved Selenium (Se) | ug/L | 0.23 | A925968 | <0.10 | 0.10 | A925968 |
| Dissolved Silicon (Si) | ug/L | 6950 | A925968 | 13600 | 100 | A925968 |
| Dissolved Silver (Ag) | ug/L | <0.020 | A925968 | <0.020 | 0.020 | A925968 |
| Dissolved Strontium (Sr) | ug/L | 37.6 | A925968 | 107 | 1.0 | A925968 |
| Dissolved Thallium (Tl) | ug/L | <0.010 | A925968 | 0.018 | 0.010 | A925968 |
| Dissolved Tin (Sn) | ug/L | <5.0 | A925968 | <5.0 | 5.0 | A925968 |
| Dissolved Titanium (Ti) | ug/L | <5.0 | A925968 | <5.0 | 5.0 | A925968 |
| Dissolved Uranium (U) | ug/L | <0.10 | A925968 | <0.10 | 0.10 | A925968 |
| Dissolved Vanadium (V) | ug/L | <5.0 | A925968 | <5.0 | 5.0 | A925968 |
| RDL = Reportable Detection Limit | | | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## CSR DISSOLVED METALS IN WATER WITH CV HG (WATER)

| **Bureau Veritas ID** | | BOI522 | | BOI523 | | |
|---|---|---|---|---|---|---|
| **Sampling Date** | | 2023/03/29 16:00 | | 2023/03/29 17:00 | | |
| **COC Number** | | 689991-03-01 | | 689991-03-01 | | |
| | **UNITS** | **WG-11222680-290323 -KH-09** | **QC Batch** | **WG-11222680-290323 -KH-10** | **RDL** | **QC Batch** |
| Dissolved Zinc (Zn) | ug/L | <5.0 | A925968 | <5.0 | 5.0 | A925968 |
| Dissolved Zirconium (Zr) | ug/L | <0.10 | A925968 | <0.10 | 0.10 | A925968 |
| Dissolved Calcium (Ca) | mg/L | 27.5 | A925749 | 46.3 | 0.050 | A925749 |
| Dissolved Magnesium (Mg) | mg/L | 4.16 | A925749 | 14.4 | 0.050 | A925749 |
| Dissolved Potassium (K) | mg/L | 0.365 | A925749 | 1.05 | 0.050 | A925749 |
| Dissolved Sodium (Na) | mg/L | 5.79 | A925749 | 26.3 | 0.050 | A925749 |
| Dissolved Sulphur (S) | mg/L | <3.0 | A925749 | <3.0 | 3.0 | A925749 |
| RDL = Reportable Detection Limit | | | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## GENERAL COMMENTS

Version 2: Report reissued to update the sampling date of all samples from 2023/03/23 to 2023/03/29 as per client request on 2023/04/12.

**Results relate only to the items tested.**



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## QUALITY ASSURANCE REPORT



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| A927637 | D10-ANTHRACENE (sur.) | 2023/04/04 | | | 94 | 50 - 140 | 104 | % | | |
| A927637 | D8-ACENAPHTHYLENE (sur.) | 2023/04/04 | | | 91 | 50 - 140 | 93 | % | | |
| A927637 | D8-NAPHTHALENE (sur.) | 2023/04/04 | | | 84 | 50 - 140 | 87 | % | | |
| A927637 | TERPHENYL-D14 (sur.) | 2023/04/04 | | | 87 | 50 - 140 | 92 | % | | |
| A927641 | O-TERPHENYL (sur.) | 2023/04/04 | | | 96 | 60 - 140 | 103 | % | | |
| A925886 | Orthophosphate (P) | 2023/04/01 | 104 (1) | 80 - 120 | 96 | 80 - 120 | <0.0030 | mg/L | 0.99 (2) | 20 |
| A925901 | Nitrate plus Nitrite (N) | 2023/04/01 | 96 | 80 - 120 | 109 | 80 - 120 | <0.020 | mg/L | 1.6 (3) | 25 |
| A925902 | Nitrite (N) | 2023/04/01 | 98 | 80 - 120 | 106 | 80 - 120 | <0.0050 | mg/L | NC (3) | 20 |
| A925968 | Dissolved Aluminum (Al) | 2023/04/03 | 118 | 80 - 120 | 104 | 80 - 120 | <3.0 | ug/L | 1.3 (3) | 20 |
| A925968 | Dissolved Antimony (Sb) | 2023/04/03 | NC | 80 - 120 | 105 | 80 - 120 | <0.50 | ug/L | 0.14 (3) | 20 |
| A925968 | Dissolved Arsenic (As) | 2023/04/03 | 119 | 80 - 120 | 104 | 80 - 120 | <0.10 | ug/L | 0.12 (3) | 20 |
| A925968 | Dissolved Barium (Ba) | 2023/04/03 | 119 | 80 - 120 | 104 | 80 - 120 | <1.0 | ug/L | 0.74 (3) | 20 |
| A925968 | Dissolved Beryllium (Be) | 2023/04/03 | 99 | 80 - 120 | 100 | 80 - 120 | <0.10 | ug/L | NC (3) | 20 |
| A925968 | Dissolved Bismuth (Bi) | 2023/04/03 | 106 | 80 - 120 | 104 | 80 - 120 | <1.0 | ug/L | NC (3) | 20 |
| A925968 | Dissolved Boron (B) | 2023/04/03 | 110 | 80 - 120 | 112 | 80 - 120 | <50 | ug/L | NC (3) | 20 |
| A925968 | Dissolved Cadmium (Cd) | 2023/04/03 | 109 | 80 - 120 | 102 | 80 - 120 | <0.010 | ug/L | NC (3) | 20 |
| A925968 | Dissolved Chromium (Cr) | 2023/04/03 | 109 | 80 - 120 | 102 | 80 - 120 | <1.0 | ug/L | NC (3) | 20 |
| A925968 | Dissolved Cobalt (Co) | 2023/04/03 | 102 | 80 - 120 | 96 | 80 - 120 | <0.20 | ug/L | NC (3) | 20 |
| A925968 | Dissolved Copper (Cu) | 2023/04/03 | 99 | 80 - 120 | 96 | 80 - 120 | <0.20 | ug/L | NC (3) | 20 |
| A925968 | Dissolved Iron (Fe) | 2023/04/03 | 104 | 80 - 120 | 106 | 80 - 120 | <5.0 | ug/L | 7.7 (3) | 20 |
| A925968 | Dissolved Lead (Pb) | 2023/04/03 | 107 | 80 - 120 | 102 | 80 - 120 | <0.20 | ug/L | NC (3) | 20 |
| A925968 | Dissolved Lithium (Li) | 2023/04/03 | 94 | 80 - 120 | 98 | 80 - 120 | <2.0 | ug/L | 3.8 (3) | 20 |
| A925968 | Dissolved Manganese (Mn) | 2023/04/03 | 110 | 80 - 120 | 101 | 80 - 120 | <1.0 | ug/L | 3.1 (3) | 20 |
| A925968 | Dissolved Molybdenum (Mo) | 2023/04/03 | NC | 80 - 120 | 107 | 80 - 120 | <1.0 | ug/L | 1.0 (3) | 20 |
| A925968 | Dissolved Nickel (Ni) | 2023/04/03 | 104 | 80 - 120 | 100 | 80 - 120 | <1.0 | ug/L | NC (3) | 20 |
| A925968 | Dissolved Phosphorus (P) | 2023/04/03 | 122 (4) | 80 - 120 | 106 | 80 - 120 | <10 | ug/L | 1.6 (3) | 20 |
| A925968 | Dissolved Selenium (Se) | 2023/04/03 | 100 | 80 - 120 | 102 | 80 - 120 | <0.10 | ug/L | 3.0 (3) | 20 |
| A925968 | Dissolved Silicon (Si) | 2023/04/03 | 106 | 80 - 120 | 110 | 80 - 120 | <100 | ug/L | 0.85 (3) | 20 |
| A925968 | Dissolved Silver (Ag) | 2023/04/03 | 109 | 80 - 120 | 103 | 80 - 120 | <0.020 | ug/L | NC (3) | 20 |
| A925968 | Dissolved Strontium (Sr) | 2023/04/03 | NC | 80 - 120 | 104 | 80 - 120 | <1.0 | ug/L | 0.081 (3) | 20 |
| A925968 | Dissolved Thallium (Tl) | 2023/04/03 | 111 | 80 - 120 | 104 | 80 - 120 | <0.010 | ug/L | NC (3) | 20 |
| A925968 | Dissolved Tin (Sn) | 2023/04/03 | 114 | 80 - 120 | 105 | 80 - 120 | <5.0 | ug/L | NC (3) | 20 |

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| A925968 | Dissolved Titanium (Ti) | 2023/04/03 | 114 | 80 - 120 | 102 | 80 - 120 | <5.0 | ug/L | NC (3) | 20 |
| A925968 | Dissolved Uranium (U) | 2023/04/03 | 119 | 80 - 120 | 105 | 80 - 120 | <0.10 | ug/L | 0.53 (3) | 20 |
| A925968 | Dissolved Vanadium (V) | 2023/04/03 | 114 | 80 - 120 | 102 | 80 - 120 | <5.0 | ug/L | NC (3) | 20 |
| A925968 | Dissolved Zinc (Zn) | 2023/04/03 | 104 | 80 - 120 | 103 | 80 - 120 | <5.0 | ug/L | NC (3) | 20 |
| A925968 | Dissolved Zirconium (Zr) | 2023/04/03 | 119 | 80 - 120 | 102 | 80 - 120 | <0.10 | ug/L | NC (3) | 20 |
| A926922 | Total Dissolved Solids | 2023/04/04 | 98 | 80 - 120 | 102 | 80 - 120 | <10 | mg/L | 5.7 (3) | 20 |
| A927135 | Chloride (Cl) | 2023/04/03 | 104 | 80 - 120 | 100 | 80 - 120 | <1.0 | mg/L | NC (3) | 20 |
| A927135 | Sulphate (SO4) | 2023/04/03 | 98 | 80 - 120 | 96 | 80 - 120 | <1.0 | mg/L | 1.0 (3) | 20 |
| A927155 | Total Ammonia (N) | 2023/04/03 | 105 (5) | 80 - 120 | 106 | 80 - 120 | <0.015 | mg/L | NC (6) | 20 |
| A927157 | Conductivity | 2023/04/03 | | | 101 | 80 - 120 | <2.0 | uS/cm | 0.41 (3) | 10 |
| A927158 | Alkalinity (PP as CaCO3) | 2023/04/03 | | | | | <1.0 | mg/L | NC (3) | 20 |
| A927158 | Alkalinity (Total as CaCO3) | 2023/04/03 | NC | 80 - 120 | 95 | 80 - 120 | <1.0 | mg/L | 1.3 (3) | 20 |
| A927158 | Bicarbonate (HCO3) | 2023/04/03 | | | | | <1.0 | mg/L | 1.3 (3) | 20 |
| A927158 | Carbonate (CO3) | 2023/04/03 | | | | | <1.0 | mg/L | NC (3) | 20 |
| A927158 | Hydroxide (OH) | 2023/04/03 | | | | | <1.0 | mg/L | NC (3) | 20 |
| A927497 | Dissolved Mercury (Hg) | 2023/04/04 | 95 | 80 - 120 | 100 | 80 - 120 | <0.0019 | ug/L | NC (3) | 20 |
| A927544 | Total Sulphide | 2023/04/04 | 45 (4) | 80 - 120 | 91 | 80 - 120 | <0.0018 | mg/L | NC (3) | 20 |
| A927637 | 1-Methylnaphthalene | 2023/04/04 | | | 91 | 50 - 140 | <0.050 | ug/L | | |
| A927637 | 2-Methylnaphthalene | 2023/04/04 | | | 87 | 50 - 140 | <0.10 | ug/L | | |
| A927637 | Acenaphthene | 2023/04/04 | | | 91 | 50 - 140 | <0.050 | ug/L | | |
| A927637 | Acenaphthylene | 2023/04/04 | | | 89 | 50 - 140 | <0.050 | ug/L | | |
| A927637 | Acridine | 2023/04/04 | | | 98 | 50 - 140 | <0.050 | ug/L | | |
| A927637 | Anthracene | 2023/04/04 | | | 96 | 50 - 140 | <0.010 | ug/L | | |
| A927637 | Benzo(a)anthracene | 2023/04/04 | | | 94 | 50 - 140 | <0.010 | ug/L | | |
| A927637 | Benzo(a)pyrene | 2023/04/04 | | | 95 | 50 - 140 | <0.0050 | ug/L | | |
| A927637 | Benzo(b&j)fluoranthene | 2023/04/04 | | | 94 | 50 - 140 | <0.030 | ug/L | | |
| A927637 | Benzo(g,h,i)perylene | 2023/04/04 | | | 89 | 50 - 140 | <0.050 | ug/L | | |
| A927637 | Benzo(k)fluoranthene | 2023/04/04 | | | 99 | 50 - 140 | <0.050 | ug/L | | |
| A927637 | Chrysene | 2023/04/04 | | | 98 | 50 - 140 | <0.020 | ug/L | | |
| A927637 | Dibenz(a,h)anthracene | 2023/04/04 | | | 90 | 50 - 140 | <0.0030 | ug/L | | |
| A927637 | Fluoranthene | 2023/04/04 | | | 85 | 50 - 140 | <0.020 | ug/L | | |
| A927637 | Fluorene | 2023/04/04 | | | 89 | 50 - 140 | <0.050 | ug/L | | |

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| A927637 | Indeno(1,2,3-cd)pyrene | 2023/04/04 | | | 92 | 50 - 140 | <0.050 | ug/L | | |
| A927637 | Naphthalene | 2023/04/04 | | | 88 | 50 - 140 | <0.10 | ug/L | | |
| A927637 | Phenanthrene | 2023/04/04 | | | 87 | 50 - 140 | <0.050 | ug/L | | |
| A927637 | Pyrene | 2023/04/04 | | | 84 | 50 - 140 | <0.020 | ug/L | | |
| A927637 | Quinoline | 2023/04/04 | | | 107 | 50 - 140 | <0.020 | ug/L | | |
| A927641 | EPH (C10-C19) | 2023/04/04 | | | 86 | 70 - 130 | <0.20 | mg/L | | |
| A927641 | EPH (C19-C32) | 2023/04/04 | | | 108 | 70 - 130 | <0.20 | mg/L | | |
| A927770 | Dissolved Mercury (Hg) | 2023/04/04 | 99 | 80 - 120 | 94 | 80 - 120 | <0.0019 | ug/L | NC (3) | 20 |

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

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

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

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

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

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

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Matrix Spike Parent ID [BOI518-01]

(2) Duplicate Parent ID [BOI518-01]

(3) Duplicate Parent ID

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

(5) Matrix Spike Parent ID [BOI518-06]

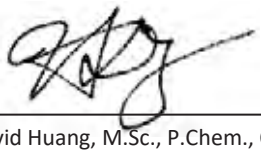
(6) Duplicate Parent ID [BOI518-06]



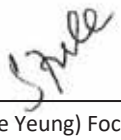
Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:



David Huang, M.Sc., P.Chem., QP, Scientific Services Manager



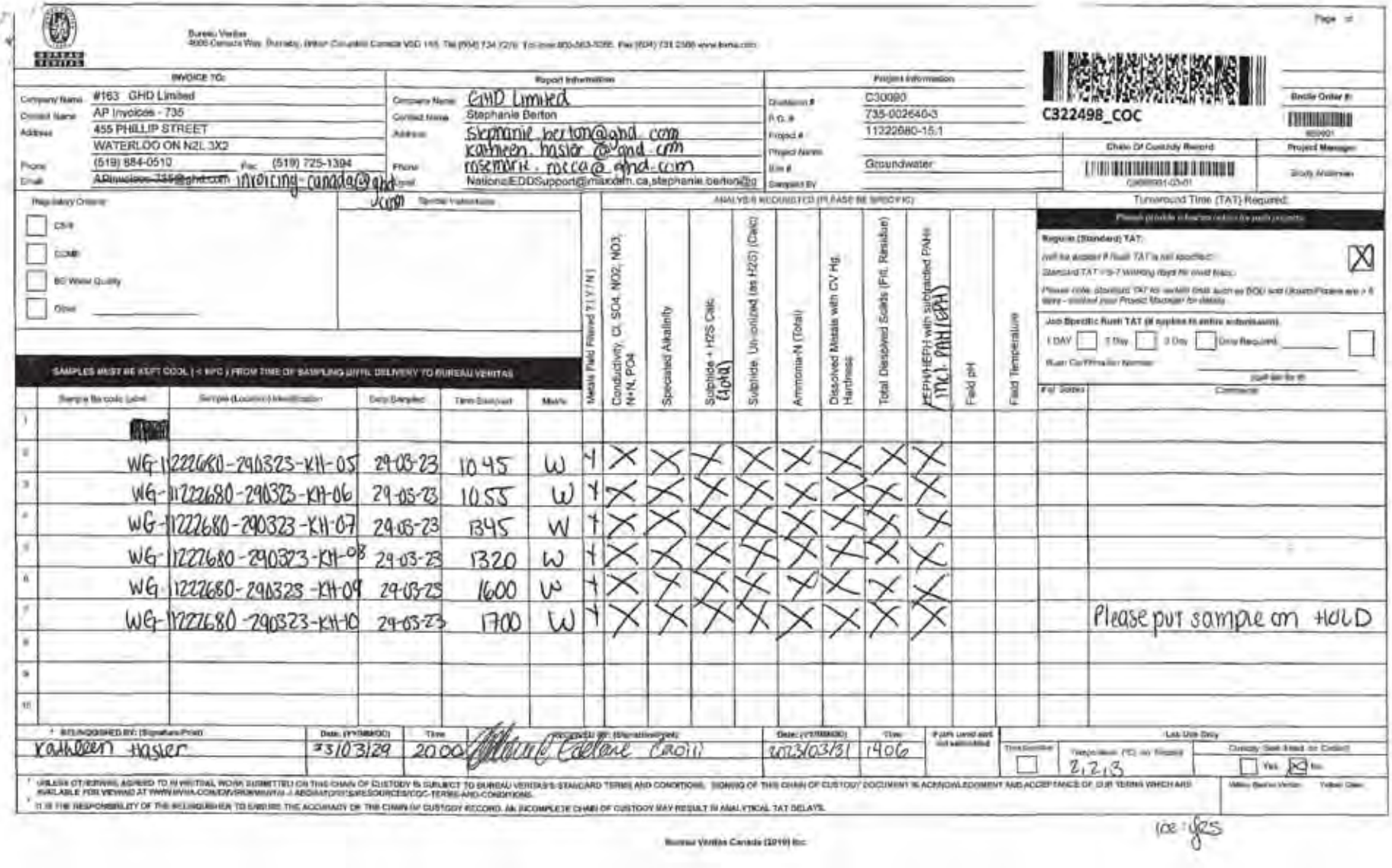
Suwan (Sze Yeung) Fock, B.Sc., Scientific Specialist

Automated Statchk

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by {0}, {1} responsible for {2} {3} laboratory operations.



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386



Bureau Veritas
2000 Carwin Way, Burnaby, British Columbia Canada V5G 1K5 Tel (604) 734-7276 Toll-free 800-563-7266 Fax (604) 731-2386 www.bvlabs.com

Page of

C32249B_COC

| INVOICE TO: | | Report Information | | Project Information | | Bottle Order #: |
|---|---|---|---|---|---|---|
| Company Name: | #163 GHD Limited | Company Name: | GHD Limited | Quotation #: | C30980 | |
| Contact Name: | AP Invoices - 735 | Contact Name: | Stephanie Berton | P.O. #: | 735-002640-3 | |
| Address: | 455 PHILLIP STREET | Address: | Stephanie.berton@ghd.com | Project #: | 11222680-15.1 | |
| | WATERLOO ON N2L 3X2 | | kathleen.hasler@ghd.com | Project Name: | | Chain Of Custody Record / Project Manager |
| Phone: | (519) 884-0510 Fax: (519) 725-1394 | Phone: | rosemarie.rocca@ghd.com | Site #: | Groundwater | |
| Email: | APInvoices-735@ghd.com, invoicing-canada@ghd.com | Email: | NationalEDDSupport@maxxam.ca,stephanie.berton@g | Sampled By: | | Shelly Anderson |

Regulatory Criteria: CSR / CCME / BC Water Quality / Other

Special Instructions

SAMPLES MUST BE KEPT COOL ( < 10°C ) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT:
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
1 DAY ☐ 2 Day ☐ 3 Day ☐ Date Required: ____
Rush Confirmation Number: ____ (call lab for #)

| | Sample Barcode Label | Sample (Location) Identification | Date Sampled | Time Sampled | Matrix | Metals Field Filtered (Y/N) | Conductivity, Cl, SO4, NO2, NO3, N+N, PO4 | Speciated Alkalinity | Sulphide + H2S Calc (total) | Sulphide, Un-ionized (as H2S) (Calc) | Ammonia-N (Total) | Dissolved Metals with CV Hg, Hardness | Total Dissolved Solids (Fil. Residue) | EPH10-19 with subtracted PAH (MCL PAH (EPH)) | Field pH | Field Temperature | # of Bottles | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | [redacted] | | | | | | | | | | | | | | | | | |
| 2 | | WG-11222680-290323-KH-05 | 29-03-23 | 1045 | W | N | X | X | X | X | X | X | X | X | | | | |
| 3 | | WG-11222680-290323-KH-06 | 29-03-23 | 1055 | W | N | X | X | X | X | X | X | X | X | | | | |
| 4 | | WG-11222680-290323-KH-07 | 29-03-23 | 1345 | W | N | X | X | X | X | X | X | X | X | | | | |
| 5 | | WG-11222680-290323-KH-08 | 29-03-23 | 1320 | W | N | X | X | X | X | X | X | X | X | | | | |
| 6 | | WG-11222680-290323-KH-09 | 29-03-23 | 1600 | W | N | X | X | X | X | X | X | X | X | | | | |
| 7 | | WG-11222680-290323-KH-10 | 29-03-23 | 1700 | W | N | X | X | X | X | X | X | X | X | | | | Please put sample on HOLD |
| 8 | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | |

| * RELINQUISHED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | RECEIVED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | If pH, Lead and not submitted | Lab Use Only: Time Sensitive | Temperature (°C) on Receipt | Custody Seal Intact on Cooler |
|---|---|---|---|---|---|---|---|---|---|
| Kathleen Hasler | 23/03/29 | 2000 | [redacted] | 2023/03/31 | 1406 | | ☐ | 2.2.3 | ☐ Yes ☒ No |

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGEMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-ANALYTICS/SITE/SOURCES/COC-TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THIS CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Bureau Veritas Yellow: Client

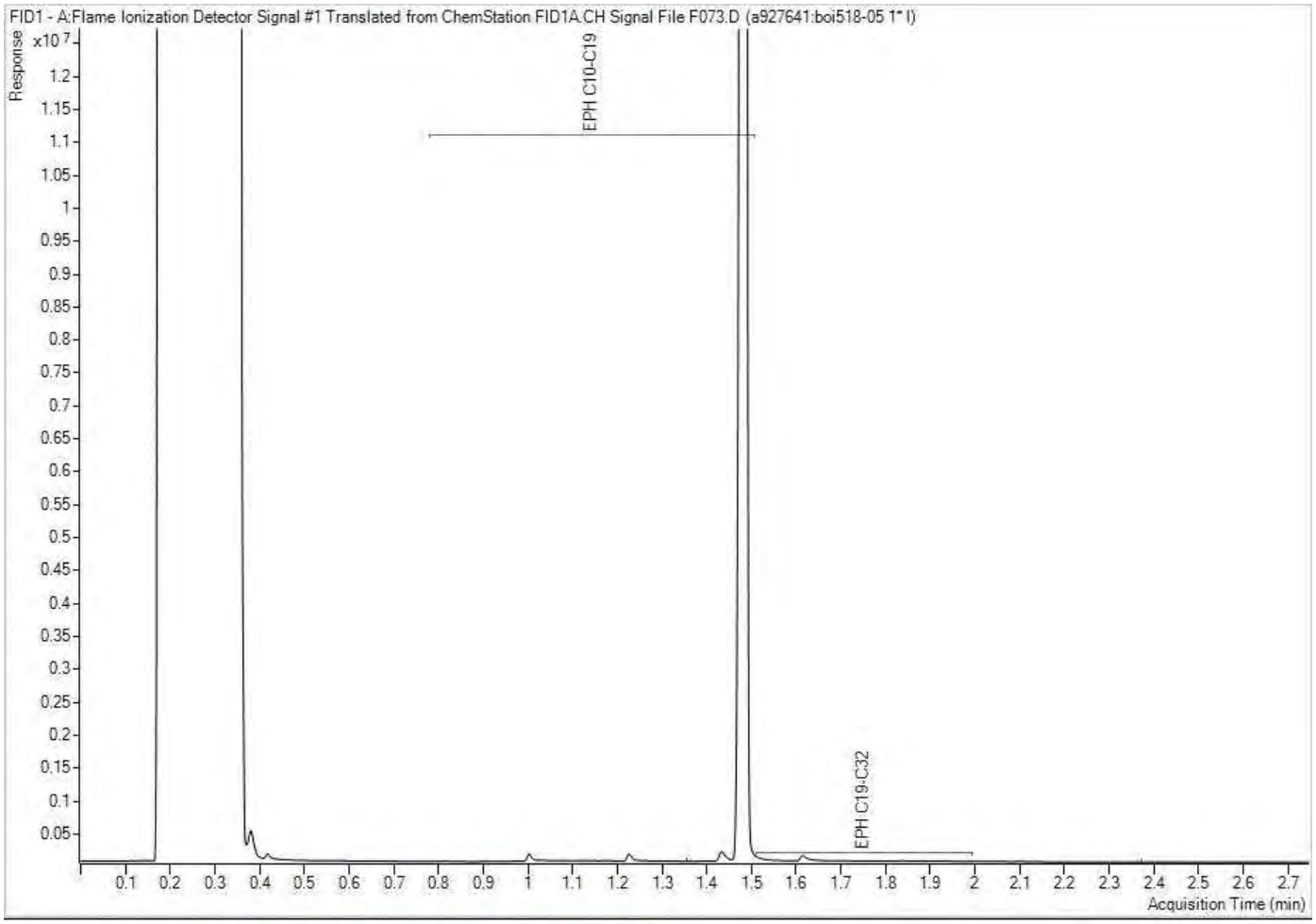
Bureau Veritas Canada (2019) Inc.

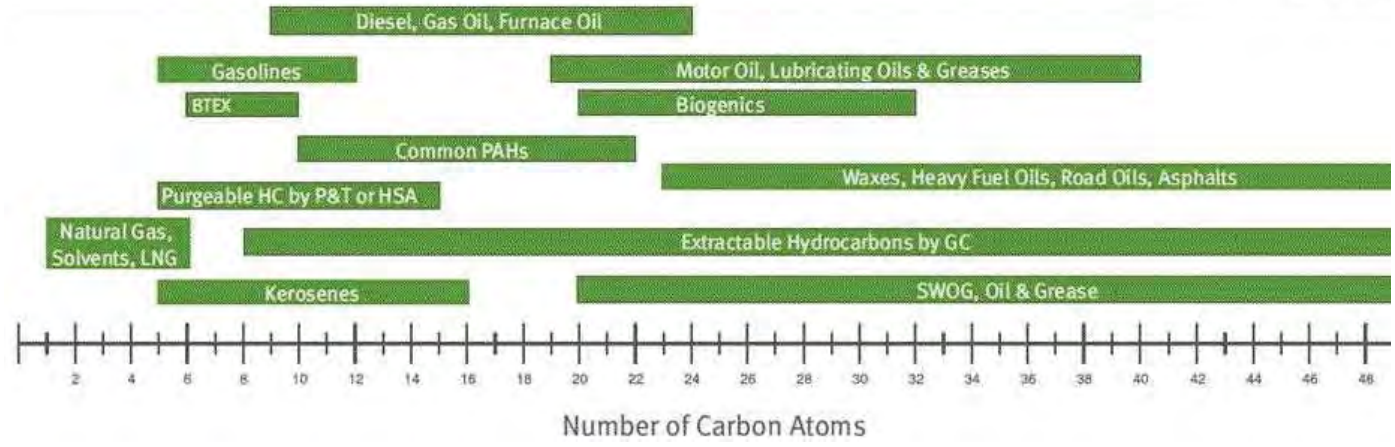
COC #: 825

Bureau Veritas Job #: C322498
Report Date: 2023/04/12
Bureau Veritas Sample: BOI518

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WG-11222680-290323-KH-05

**EPH in Water when PAH required Chromatogram**



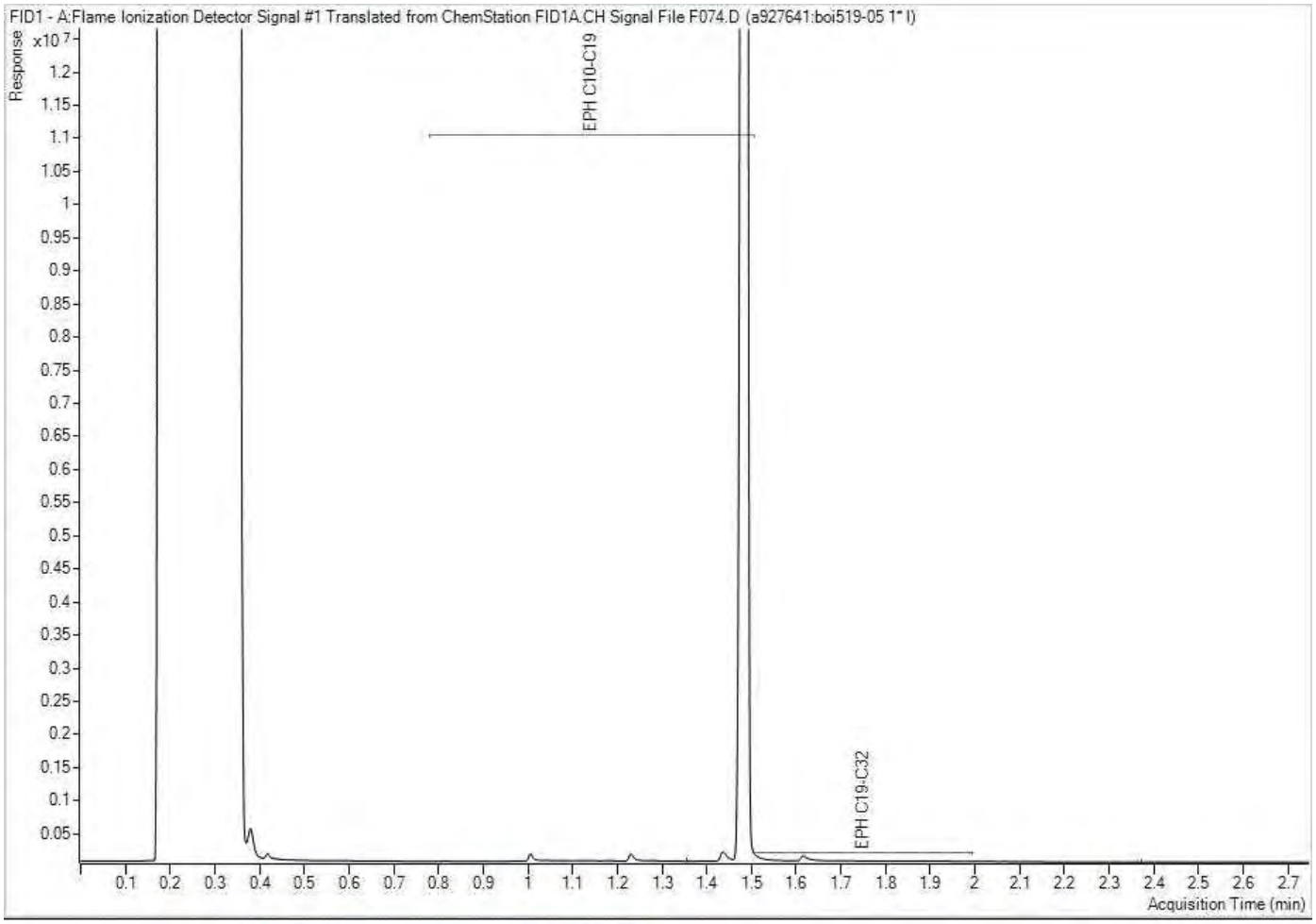



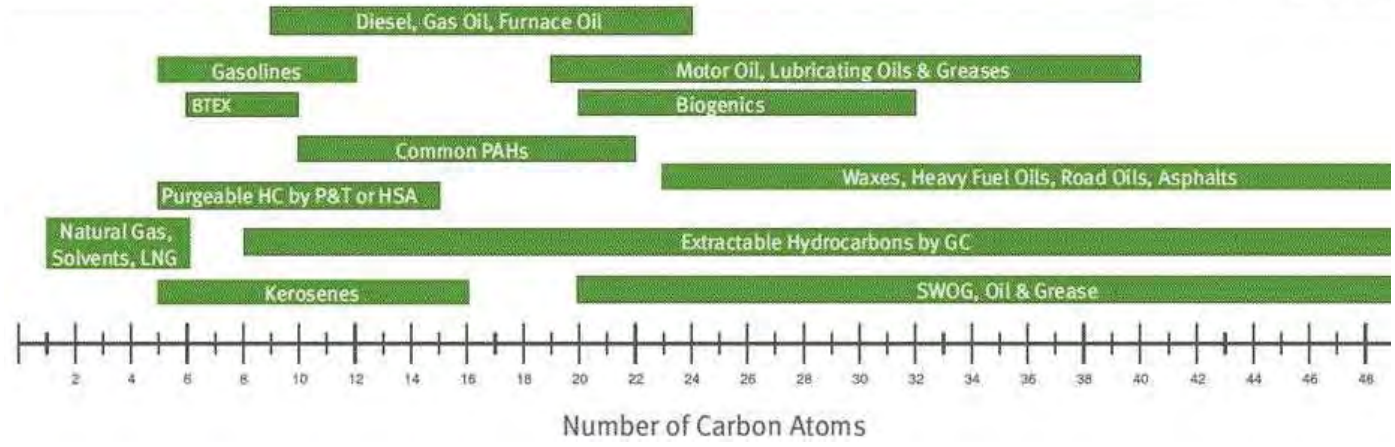

**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

Bureau Veritas Job #: C322498
Report Date: 2023/04/12
Bureau Veritas Sample: BOI519

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WG-11222680-290323-KH-06

**EPH in Water when PAH required Chromatogram**



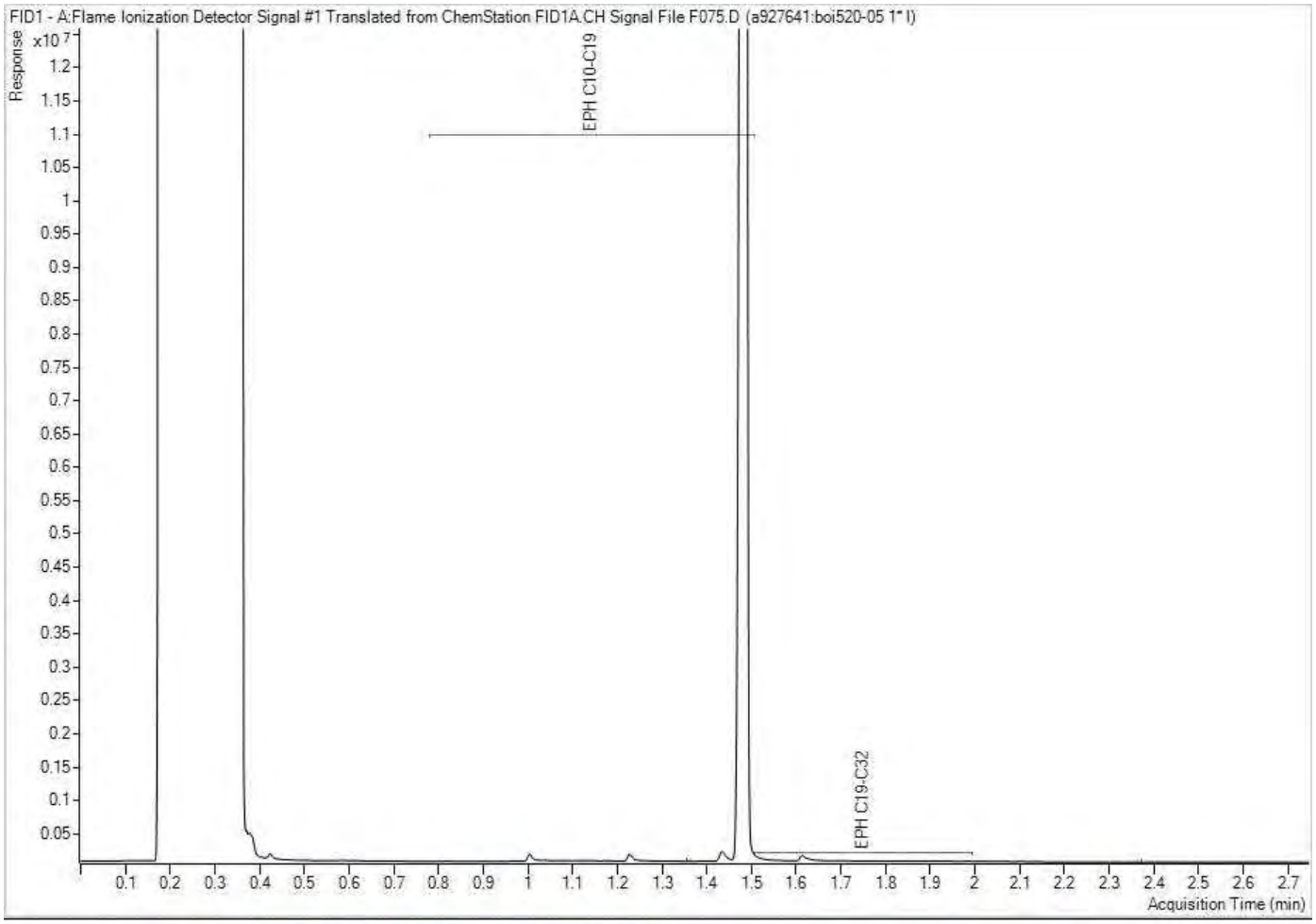



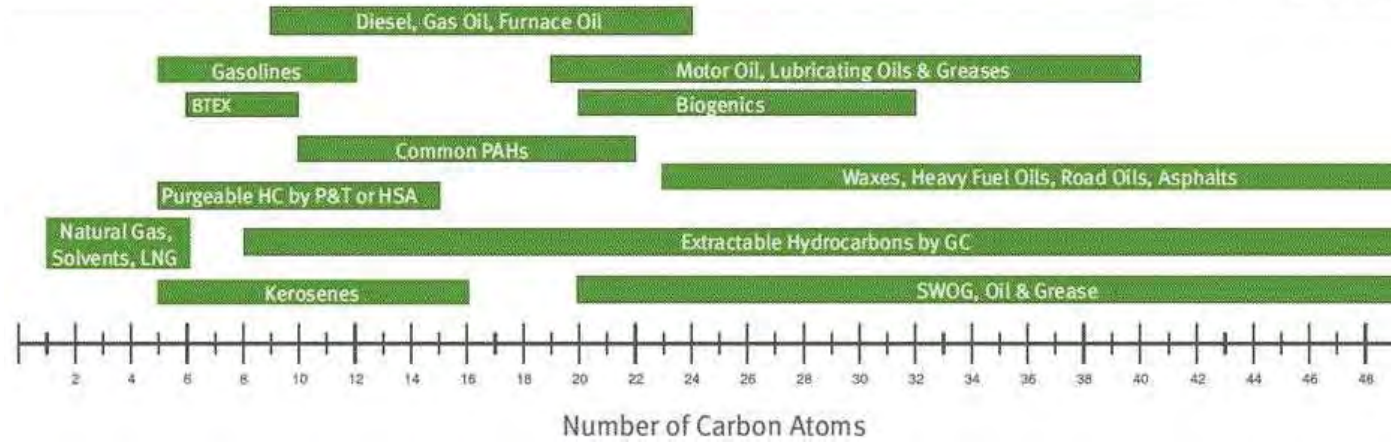

**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

Bureau Veritas Job #: C322498
Report Date: 2023/04/12
Bureau Veritas Sample: BOI520

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WG-11222680-290323-KH-07

**EPH in Water when PAH required Chromatogram**



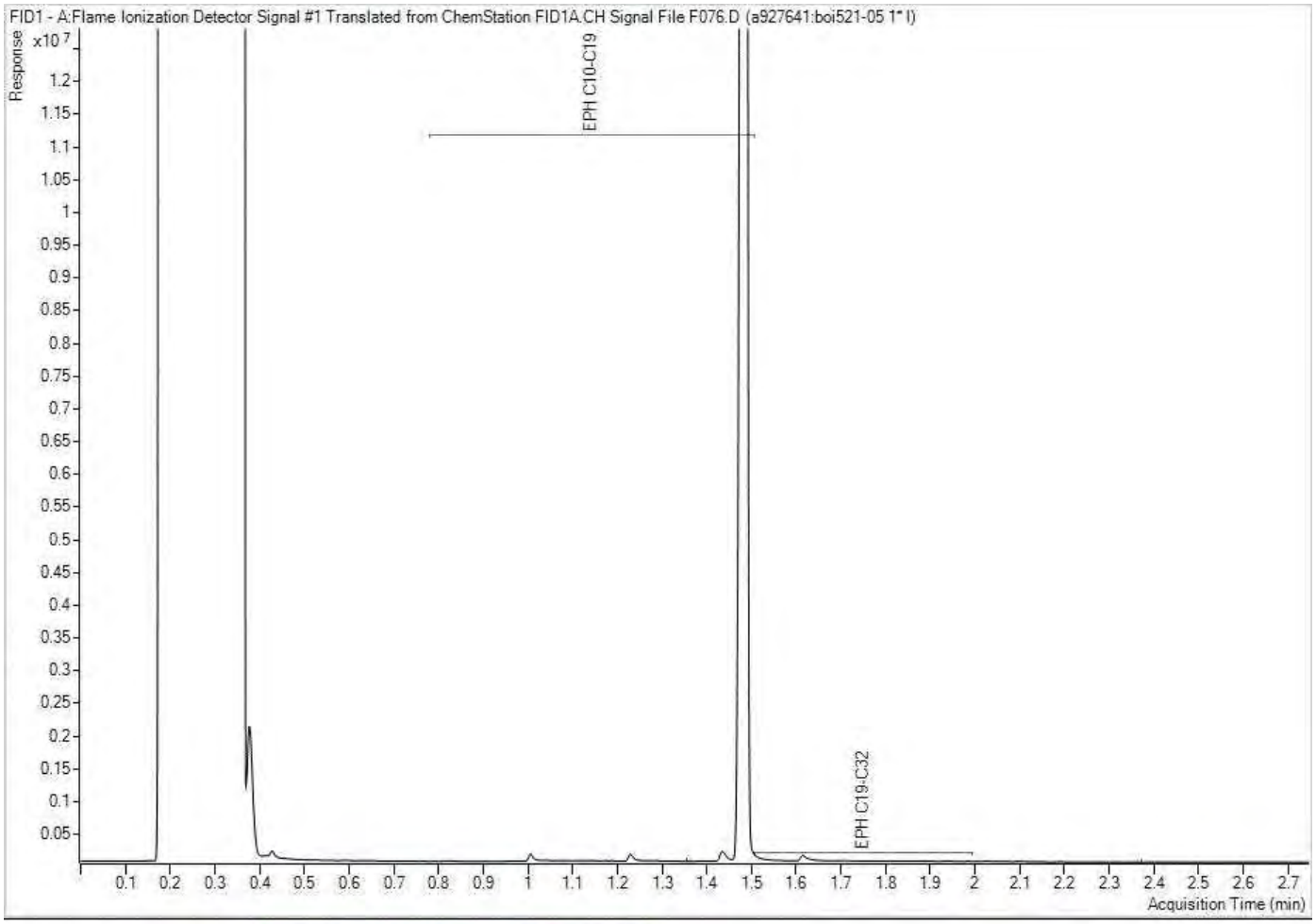



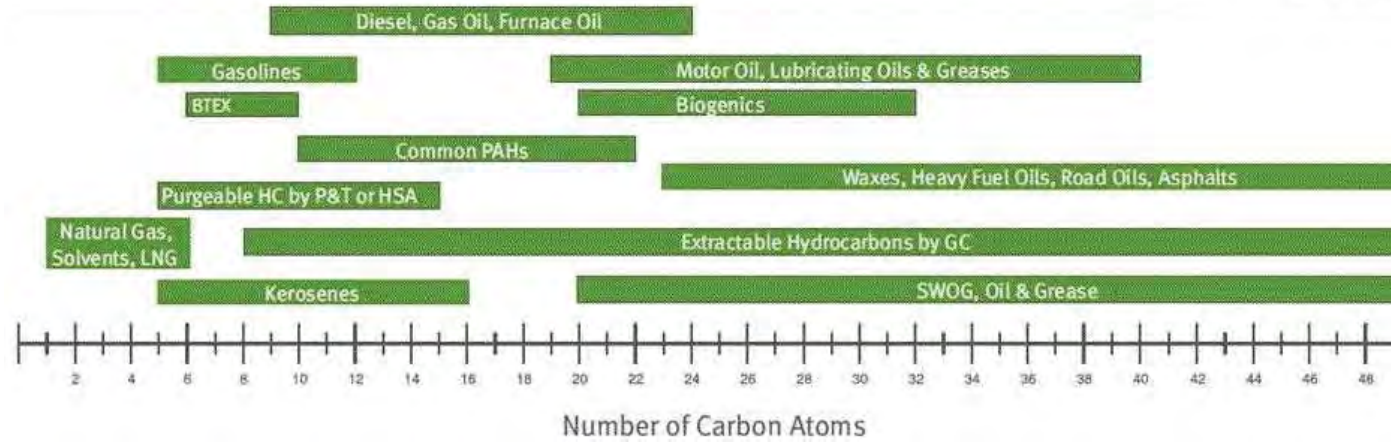

**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

Bureau Veritas Job #: C322498
Report Date: 2023/04/12
Bureau Veritas Sample: BOI521

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WG-11222680-290323-KH-08

**EPH in Water when PAH required Chromatogram**



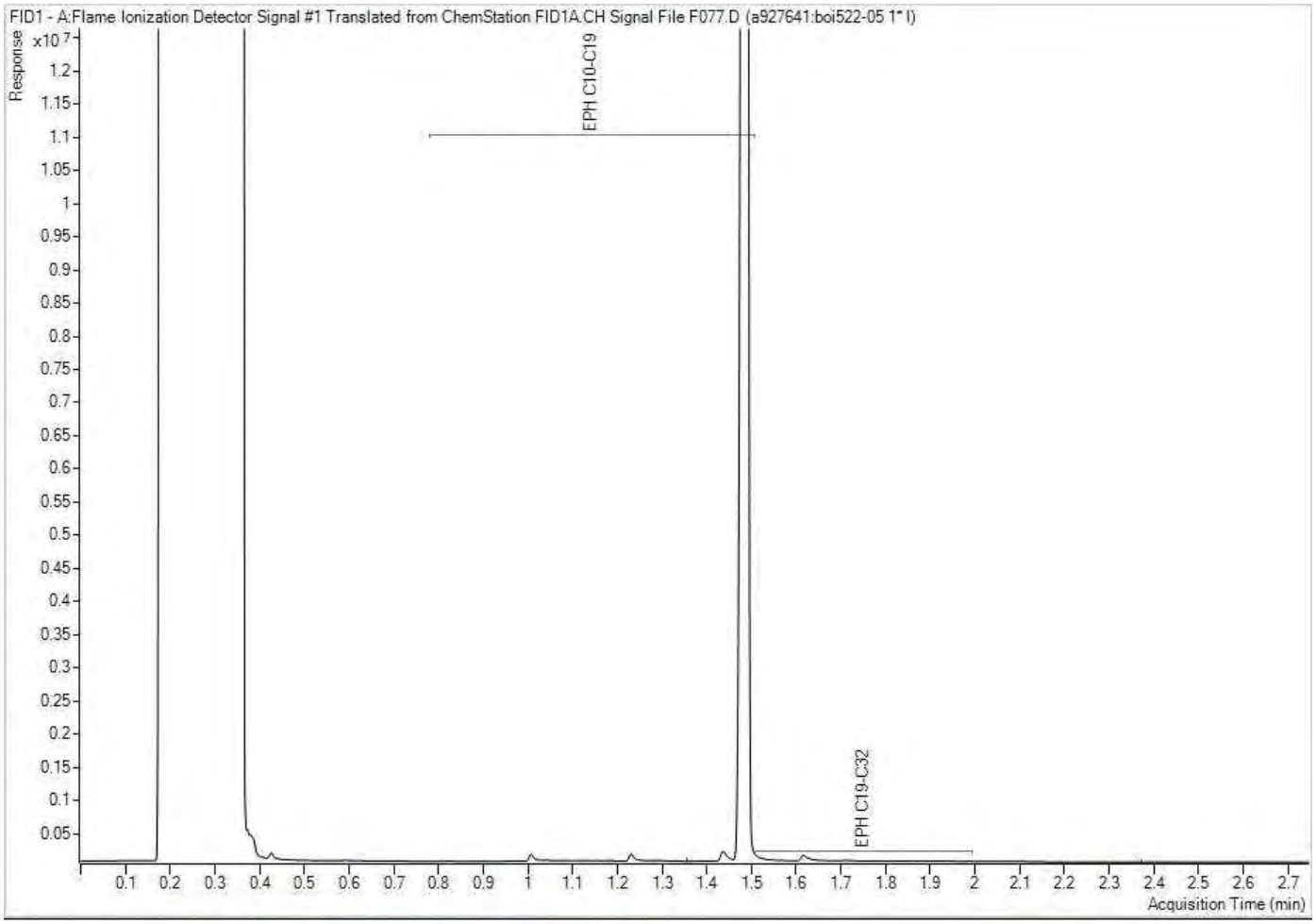



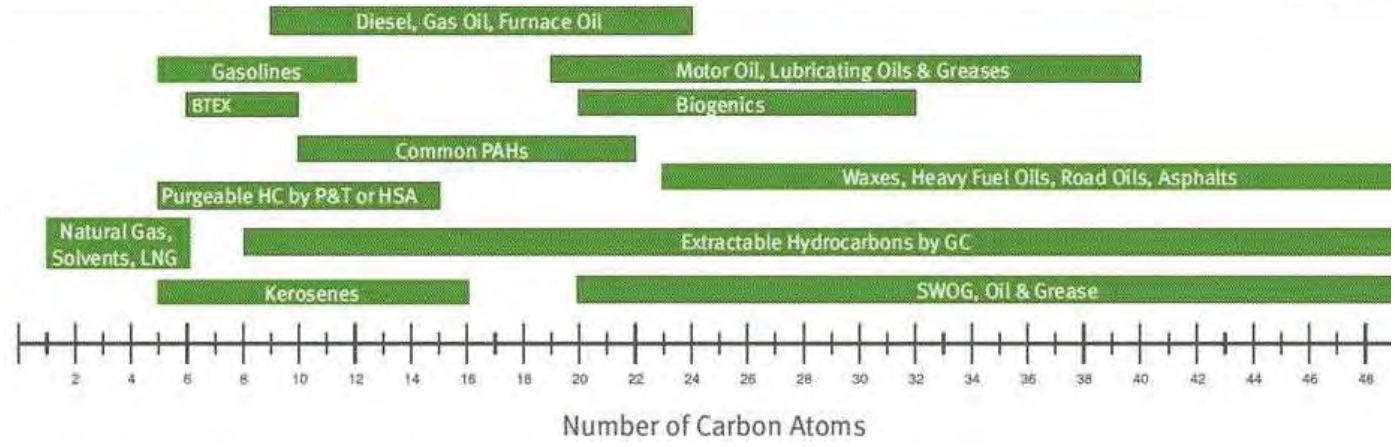

**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

Bureau Veritas Job #: C322498
Report Date: 2023/04/12
Bureau Veritas Sample: BOI522

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WG-11222680-290323-KH-09

**EPH in Water when PAH required Chromatogram**



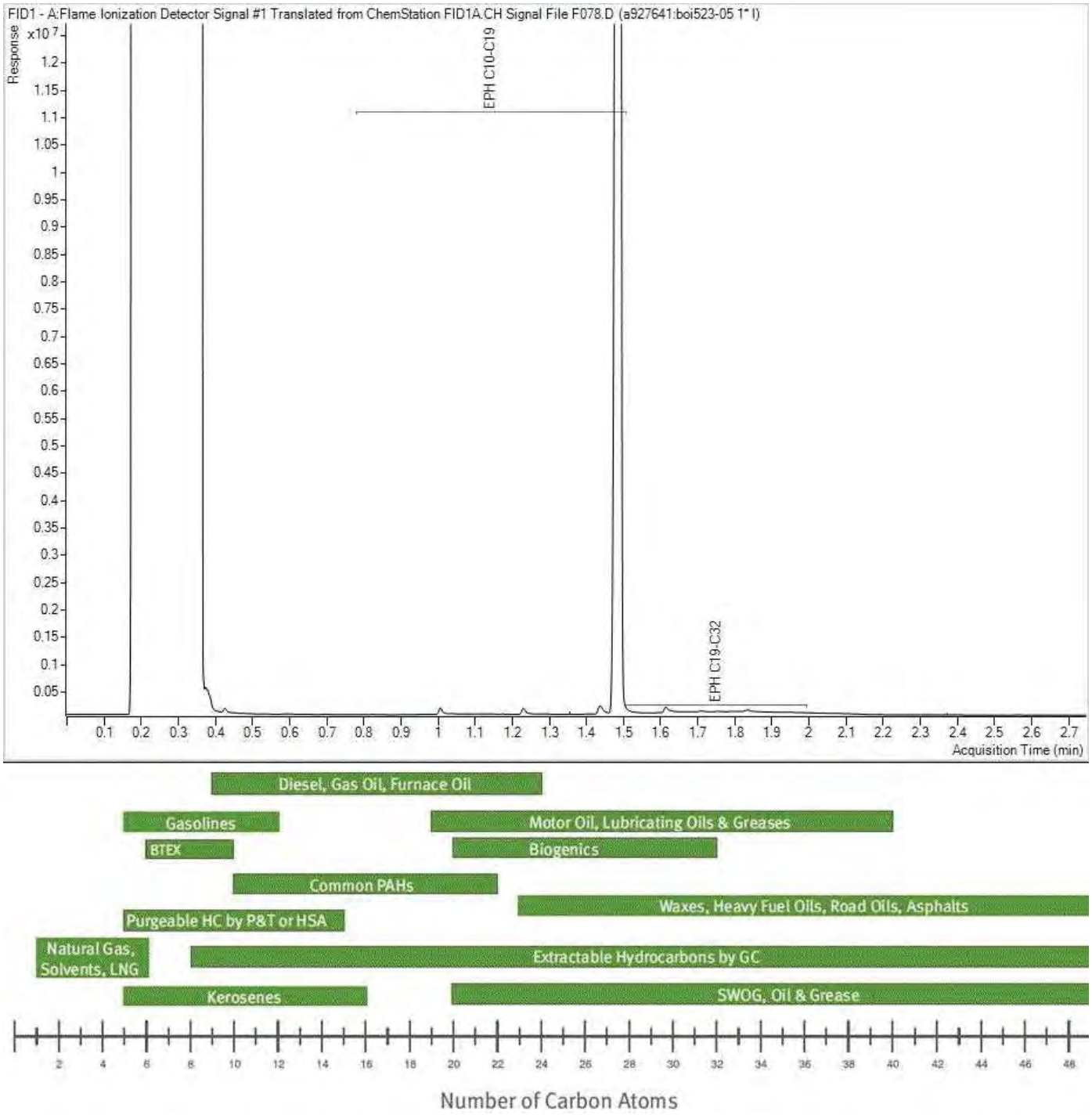




**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

Bureau Veritas Job #: C322498
Report Date: 2023/04/12
Bureau Veritas Sample: BOI523

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WG-11222680-290323-KH-10

**EPH in Water when PAH required Chromatogram**




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

Your P.O. #: 735-002640-3
Your Project #: 11222680-15.1
Site#: Groundwater
Site Location: NEW LANDFILL
Your C.O.C. #: 694569-01-01

**Attention: Stephanie Berton**

GHD Limited
455 PHILLIP STREET
WATERLOO, ON
CANADA N2L 3X2

**Report Date: 2023/07/27**
Report #: R3372034
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**BUREAU VERITAS JOB #: C354929**
**Received: 2023/07/19, 10:15**

Sample Matrix: Water
# Samples Received: 4

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Analytical Method |
|---|---|---|---|---|---|
| Alkalinity @25C (pp, total), CO3,HCO3,OH | 4 | N/A | 2023/07/20 | BBY6SOP-00026 | SM 24 2320 B m |
| Chloride/Sulphate by Auto Colourimetry | 4 | N/A | 2023/07/24 | BBY6SOP-00011 / BBY6SOP-00017 | SM24-4500-Cl/SO4-E m |
| Conductivity @25C | 4 | N/A | 2023/07/20 | BBY6SOP-00026 | SM 24 2510 B m |
| Sulphide (as H2S) (1) | 4 | N/A | 2023/07/24 | | Auto Calc |
| Un-ionized Hydrogen Sulphide as S Calc (1) | 4 | N/A | 2023/07/25 | | |
| Hardness (calculated as CaCO3) | 4 | N/A | 2023/07/24 | BBY WI-00033 | Auto Calc |
| Mercury (Dissolved) by CV (2) | 4 | 2023/07/26 | 2023/07/26 | AB SOP-00084 | BCMOE BCLM Oct2013 m |
| EPH in Water when PAH required | 4 | 2023/07/21 | 2023/07/21 | BBY8SOP-00029 | BCMOE BCLM Sep2017 m |
| Na, K, Ca, Mg, S by CRC ICPMS (diss.) | 4 | N/A | 2023/07/24 | BBY WI-00033 | Auto Calc |
| Elements by CRC ICPMS (dissolved) (2) | 4 | N/A | 2023/07/22 | BBY7SOP-00002 | EPA 6020b R2 m |
| Ammonia-N (Total) | 4 | N/A | 2023/07/25 | AB SOP-00007 | SM 24 4500 NH3 A G m |
| Nitrate + Nitrite (N) | 4 | N/A | 2023/07/20 | BBY6SOP-00010 | SM 23 4500-NO3- I m |
| Nitrite (N) by CFA | 4 | N/A | 2023/07/20 | BBY6SOP-00010 | SM 23 4500-NO3- I m |
| Nitrogen - Nitrate (as N) | 4 | N/A | 2023/07/21 | BBY WI-00033 | Auto Calc |
| PAH in Water by GC/MS (SIM) | 4 | 2023/07/21 | 2023/07/21 | BBY8SOP-00021 | BCMOE BCLM Jul2017m |
| Orthophosphate by Konelab (3) | 4 | N/A | 2023/07/20 | BBY6SOP-00013 | SM 24 4500-P E m |
| Total Sulphide (1) | 4 | N/A | 2023/07/24 | AB SOP-00080 | SM 23 4500 S2-A D Fm |
| Total Dissolved Solids (Filt. Residue) | 4 | 2023/07/21 | 2023/07/24 | BBY6SOP-00033 | SM 24 2540 C m |
| EPH less PAH in Water by GC/FID (4) | 4 | N/A | 2023/07/24 | BBY WI-00033 | Auto Calc |
| Field pH | 4 | N/A | 2023/07/20 | | |
| Field Temperature | 4 | N/A | 2023/07/20 | | |

**Remarks:**

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Your P.O. #: 735-002640-3
Your Project #: 11222680-15.1
Site#: Groundwater
Site Location: NEW LANDFILL
Your C.O.C. #: 694569-01-01

**Attention: Stephanie Berton**

GHD Limited
455 PHILLIP STREET
WATERLOO, ON
CANADA N2L 3X2

**Report Date: 2023/07/27**
Report #: R3372034
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**BUREAU VERITAS JOB #: C354929**
**Received: 2023/07/19, 10:15**

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Bureau Veritas Calgary, 4000 - 19 St. , Calgary, AB, T2E 6P8
(2) Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.
(3) Orthophosphate > Total Phosphorus Imbalance: When applicable, Orthophosphate, Total Phosphorus and dissolved Phosphorus results were reviewed and data quality meets acceptable levels unless otherwise noted.
(4) LEPH = EPH (C10 to C19) - (Acenaphthene + Acridine + Anthracene + Fluorene + Naphthalene + Phenanthrene)
HEPH = EPH (C19 to C32) - (Benzo(a)anthracene + Benzo(a)pyrene + Fluoranthene + Pyrene)

Encryption Key

Bureau Veritas
27 Jul 2023 11:29:09

Please direct all questions regarding this Certificate of Analysis to:
Brody Andersen, B.Sc., B.Sc., Program Specialist–Emergency Spill Response
Email: Brody.Andersen@bureauveritas.com
Phone# (780)577-7120

==========

This report has been generated and distributed using a secure automated process.
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Raphael Kwan, Senior Manager, BC and Yukon Regions responsible for British Columbia Environmental laboratory operations.

Bureau Veritas Job #: C354929
Report Date: 2023/07/27

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | BUZ014 | BUZ014 | BUZ015 | BUZ015 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/07/17 15:15 | 2023/07/17 15:15 | 2023/07/17 16:15 | 2023/07/17 16:15 | | |
| COC Number | | 694569-01-01 | 694569-01-01 | 694569-01-01 | 694569-01-01 | | |
| | UNITS | WG-11222680-170723 -KH-01 | WG-11222680-170723 -KH-01 Lab-Dup | WG-11222680-170723 -KH-02 | WG-11222680-170723 -KH-02 Lab-Dup | RDL | QC Batch |
| **ANIONS** | | | | | | | |
| Nitrite (N) | mg/L | <0.0050 | N/A | <0.0050 | <0.0050 | 0.0050 | B041712 |
| **Calculated Parameters** | | | | | | | |
| Nitrate (N) | mg/L | 0.653 | N/A | 0.298 | N/A | 0.020 | B040742 |
| Sulphide (as H2S) | mg/L | <0.0020 | N/A | <0.0020 | N/A | 0.0020 | B041248 |
| **Field Parameters** | | | | | | | |
| Field pH | pH | 7.24 | N/A | 7.75 | N/A | N/A | ONSITE |
| Field Temperature | °C | 16.19 | N/A | 13.68 | N/A | N/A | ONSITE |
| **Misc. Inorganics** | | | | | | | |
| Conductivity | uS/cm | 160 | 160 | 150 | N/A | 2.0 | B041783 |
| Total Dissolved Solids | mg/L | 92 | N/A | 38 | N/A | 10 | B042634 |
| **Anions** | | | | | | | |
| Alkalinity (PP as CaCO3) | mg/L | <1.0 | <1.0 | <1.0 | N/A | 1.0 | B041787 |
| Alkalinity (Total as CaCO3) | mg/L | 73 | 73 | 63 | N/A | 1.0 | B041787 |
| Bicarbonate (HCO3) | mg/L | 89 | 90 | 77 | N/A | 1.0 | B041787 |
| Carbonate (CO3) | mg/L | <1.0 | <1.0 | <1.0 | N/A | 1.0 | B041787 |
| Hydroxide (OH) | mg/L | <1.0 | <1.0 | <1.0 | N/A | 1.0 | B041787 |
| Total Sulphide | mg/L | <0.0018 | N/A | <0.0018 | N/A | 0.0018 | B045000 |
| Chloride (Cl) | mg/L | <1.0 | N/A | 3.4 | N/A | 1.0 | B045835 |
| Sulphate (SO4) | mg/L | 3.8 | N/A | 7.0 | N/A | 1.0 | B045835 |
| **Nutrients** | | | | | | | |
| Total Ammonia (N) | mg/L | <0.015 | N/A | <0.015 | N/A | 0.015 | B046614 |
| Orthophosphate (P) | mg/L | 0.0048 | N/A | 0.010 | N/A | 0.0030 | B041593 |
| Nitrate plus Nitrite (N) | mg/L | 0.653 | N/A | 0.298 | 0.299 | 0.020 | B041707 |

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



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354929
Report Date: 2023/07/27

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | BUZ016 | BUZ017 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2023/07/17 17:20 | 2023/07/17 17:30 | | |
| COC Number | | 694569-01-01 | 694569-01-01 | | |
| | UNITS | WG-11222680-170723-KH-03 | WG-11222680-170723-KH-04 | RDL | QC Batch |
| **ANIONS** | | | | | |
| Nitrite (N) | mg/L | <0.0050 | <0.0050 | 0.0050 | B041712 |
| **Calculated Parameters** | | | | | |
| Nitrate (N) | mg/L | 0.046 | 0.045 | 0.020 | B040742 |
| Sulphide (as H2S) | mg/L | <0.0020 | <0.0020 | 0.0020 | B041248 |
| **Field Parameters** | | | | | |
| Field pH | pH | 7.84 | 7.84 | N/A | ONSITE |
| Field Temperature | °C | 19.42 | 19.42 | N/A | ONSITE |
| **Misc. Inorganics** | | | | | |
| Conductivity | uS/cm | 60 | 60 | 2.0 | B041783 |
| Total Dissolved Solids | mg/L | 42 | 46 | 10 | B042634 |
| **Anions** | | | | | |
| Alkalinity (PP as CaCO3) | mg/L | <1.0 | <1.0 | 1.0 | B041787 |
| Alkalinity (Total as CaCO3) | mg/L | 25 | 26 | 1.0 | B041787 |
| Bicarbonate (HCO3) | mg/L | 31 | 32 | 1.0 | B041787 |
| Carbonate (CO3) | mg/L | <1.0 | <1.0 | 1.0 | B041787 |
| Hydroxide (OH) | mg/L | <1.0 | <1.0 | 1.0 | B041787 |
| Total Sulphide | mg/L | <0.0018 | <0.0018 | 0.0018 | B045000 |
| Chloride (Cl) | mg/L | <1.0 | <1.0 | 1.0 | B045835 |
| Sulphate (SO4) | mg/L | 2.2 | 2.2 | 1.0 | B045835 |
| **Nutrients** | | | | | |
| Total Ammonia (N) | mg/L | <0.015 | 0.020 | 0.015 | B046614 |
| Orthophosphate (P) | mg/L | <0.0030 | <0.0030 | 0.0030 | B041593 |
| Nitrate plus Nitrite (N) | mg/L | 0.046 | 0.045 | 0.020 | B041707 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354929
Report Date: 2023/07/27

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## SEMIVOLATILE ORGANICS BY GC-MS (WATER)

| Bureau Veritas ID | | BUZ014 | BUZ015 | BUZ016 | BUZ017 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/07/17 15:15 | 2023/07/17 16:15 | 2023/07/17 17:20 | 2023/07/17 17:30 | | |
| COC Number | | 694569-01-01 | 694569-01-01 | 694569-01-01 | 694569-01-01 | | |
| | UNITS | WG-11222680-170723-KH-01 | WG-11222680-170723-KH-02 | WG-11222680-170723-KH-03 | WG-11222680-170723-KH-04 | RDL | QC Batch |
| **Polycyclic Aromatics** | | | | | | | |
| Naphthalene | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B042787 |
| Acenaphthene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B042787 |
| Fluorene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B042787 |
| Phenanthrene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B042787 |
| Anthracene | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | B042787 |
| Acridine | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B042787 |
| Fluoranthene | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | B042787 |
| Pyrene | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | B042787 |
| Benzo(a)anthracene | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | B042787 |
| Benzo(a)pyrene | ug/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | 0.0050 | B042787 |
| **Surrogate Recovery (%)** | | | | | | | |
| D10-ANTHRACENE (sur.) | % | 89 | 90 | 88 | 88 | N/A | B042787 |
| D8-ACENAPHTHYLENE (sur.) | % | 88 | 89 | 88 | 87 | N/A | B042787 |
| D8-NAPHTHALENE (sur.) | % | 85 | 83 | 82 | 82 | N/A | B042787 |
| TERPHENYL-D14 (sur.) | % | 82 | 83 | 82 | 82 | N/A | B042787 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354929
Report Date: 2023/07/27

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## TOTAL PETROLEUM HYDROCARBONS (WATER)

| Bureau Veritas ID | | BUZ014 | BUZ015 | BUZ016 | BUZ017 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/07/17 15:15 | 2023/07/17 16:15 | 2023/07/17 17:20 | 2023/07/17 17:30 | | |
| COC Number | | 694569-01-01 | 694569-01-01 | 694569-01-01 | 694569-01-01 | | |
| | UNITS | WG-11222680-170723-KH-01 | WG-11222680-170723-KH-02 | WG-11222680-170723-KH-03 | WG-11222680-170723-KH-04 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | | |
| LEPH (C10-C19 less PAH) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B041128 |
| HEPH (C19-C32 less PAH) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B041128 |
| **Ext. Pet. Hydrocarbon** | | | | | | | |
| EPH (C10-C19) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B042796 |
| EPH (C19-C32) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B042796 |
| **Surrogate Recovery (%)** | | | | | | | |
| O-TERPHENYL (sur.) | % | 100 | 101 | 101 | 99 | N/A | B042796 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354929
Report Date: 2023/07/27

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## MISCELLANEOUS (WATER)

| Bureau Veritas ID | | BUZ014 | BUZ015 | BUZ016 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2023/07/17 15:15 | 2023/07/17 16:15 | 2023/07/17 17:20 | | |
| COC Number | | 694569-01-01 | 694569-01-01 | 694569-01-01 | | |
| | UNITS | WG-11222680-170723-KH-01 | WG-11222680-170723-KH-02 | WG-11222680-170723-KH-03 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | |
| Total Un-ionized Hydrogen Sulfide as S | mg/L | <0.0050 | <0.0050 | <0.0050 | 0.0050 | B041137 |
| Total Un-ionized Hydrogen Sulfide as H2S | mg/L | <0.0050 | <0.0050 | <0.0050 | 0.0050 | B041137 |
| RDL = Reportable Detection Limit | | | | | | |

| Bureau Veritas ID | | BUZ017 | | |
|---|---|---|---|---|
| Sampling Date | | 2023/07/17 17:30 | | |
| COC Number | | 694569-01-01 | | |
| | UNITS | WG-11222680-170723-KH-04 | RDL | QC Batch |
| **Calculated Parameters** | | | | |
| Total Un-ionized Hydrogen Sulfide as S | mg/L | <0.0050 | 0.0050 | B041137 |
| Total Un-ionized Hydrogen Sulfide as H2S | mg/L | <0.0050 | 0.0050 | B041137 |
| RDL = Reportable Detection Limit | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354929
Report Date: 2023/07/27

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## CSR D. METALS W/CV HG-DISS (WATER)

| Bureau Veritas ID | | BUZ014 | BUZ014 | BUZ015 | BUZ016 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/07/17 15:15 | 2023/07/17 15:15 | 2023/07/17 16:15 | 2023/07/17 17:20 | | |
| COC Number | | 694569-01-01 | 694569-01-01 | 694569-01-01 | 694569-01-01 | | |
| | UNITS | WG-11222680-170723-KH-01 | WG-11222680-170723-KH-01 Lab-Dup | WG-11222680-170723-KH-02 | WG-11222680-170723-KH-03 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | | |
| Dissolved Hardness (CaCO3) | mg/L | 65.3 | N/A | 59.1 | 26.4 | 0.50 | B040635 |
| **Elements** | | | | | | | |
| Dissolved Mercury (Hg) | ug/L | <0.0019 | N/A | <0.0019 | <0.0019 | 0.0019 | B048284 |
| **Dissolved Metals by ICPMS** | | | | | | | |
| Dissolved Aluminum (Al) | ug/L | <3.0 | <3.0 | <3.0 | 8.8 | 3.0 | B042783 |
| Dissolved Antimony (Sb) | ug/L | <0.50 | <0.50 | <0.50 | <0.50 | 0.50 | B042783 |
| Dissolved Arsenic (As) | ug/L | <0.10 | <0.10 | 0.39 | <0.10 | 0.10 | B042783 |
| Dissolved Barium (Ba) | ug/L | 2.4 | 2.4 | 2.7 | <1.0 | 1.0 | B042783 |
| Dissolved Beryllium (Be) | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B042783 |
| Dissolved Bismuth (Bi) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B042783 |
| Dissolved Boron (B) | ug/L | <50 | <50 | 92 | <50 | 50 | B042783 |
| Dissolved Cadmium (Cd) | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | B042783 |
| Dissolved Chromium (Cr) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B042783 |
| Dissolved Cobalt (Co) | ug/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B042783 |
| Dissolved Copper (Cu) | ug/L | <0.20 | <0.20 | 0.70 | <0.20 | 0.20 | B042783 |
| Dissolved Iron (Fe) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B042783 |
| Dissolved Lead (Pb) | ug/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B042783 |
| Dissolved Lithium (Li) | ug/L | <2.0 | <2.0 | <2.0 | <2.0 | 2.0 | B042783 |
| Dissolved Manganese (Mn) | ug/L | 2.5 | 2.5 | <1.0 | <1.0 | 1.0 | B042783 |
| Dissolved Molybdenum (Mo) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B042783 |
| Dissolved Nickel (Ni) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B042783 |
| Dissolved Phosphorus (P) | ug/L | <10 | <10 | 14 | <10 | 10 | B042783 |
| Dissolved Selenium (Se) | ug/L | 0.11 | 0.11 | <0.10 | <0.10 | 0.10 | B042783 |
| Dissolved Silicon (Si) | ug/L | 7520 | 7620 | 6410 | 2570 | 100 | B042783 |
| Dissolved Silver (Ag) | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | B042783 |
| Dissolved Strontium (Sr) | ug/L | 28.2 | 28.2 | 27.7 | 11.5 | 1.0 | B042783 |
| Dissolved Thallium (Tl) | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | B042783 |
| Dissolved Tin (Sn) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B042783 |
| Dissolved Titanium (Ti) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B042783 |

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



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354929
Report Date: 2023/07/27

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## CSR D. METALS W/CV HG-DISS (WATER)

| Bureau Veritas ID | | BUZ014 | BUZ014 | BUZ015 | BUZ016 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/07/17 15:15 | 2023/07/17 15:15 | 2023/07/17 16:15 | 2023/07/17 17:20 | | |
| COC Number | | 694569-01-01 | 694569-01-01 | 694569-01-01 | 694569-01-01 | | |
| | UNITS | WG-11222680-170723-KH-01 | WG-11222680-170723-KH-01 Lab-Dup | WG-11222680-170723-KH-02 | WG-11222680-170723-KH-03 | RDL | QC Batch |
| Dissolved Uranium (U) | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B042783 |
| Dissolved Vanadium (V) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B042783 |
| Dissolved Zinc (Zn) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B042783 |
| Dissolved Zirconium (Zr) | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B042783 |
| Dissolved Calcium (Ca) | mg/L | 20.0 | N/A | 18.7 | 8.75 | 0.050 | B040637 |
| Dissolved Magnesium (Mg) | mg/L | 3.70 | N/A | 3.02 | 1.11 | 0.050 | B040637 |
| Dissolved Potassium (K) | mg/L | 0.278 | N/A | 0.338 | 0.115 | 0.050 | B040637 |
| Dissolved Sodium (Na) | mg/L | 5.18 | N/A | 6.21 | 0.688 | 0.050 | B040637 |
| Dissolved Sulphur (S) | mg/L | <3.0 | N/A | <3.0 | <3.0 | 3.0 | B040637 |

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



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354929
Report Date: 2023/07/27

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## CSR D. METALS W/CV HG-DISS (WATER)

| Bureau Veritas ID | | BUZ017 | | |
|---|---|---|---|---|
| Sampling Date | | 2023/07/17 17:30 | | |
| COC Number | | 694569-01-01 | | |
| | UNITS | WG-11222680-170723 -KH-04 | RDL | QC Batch |
| **Calculated Parameters** | | | | |
| Dissolved Hardness (CaCO3) | mg/L | 26.0 | 0.50 | B040635 |
| **Elements** | | | | |
| Dissolved Mercury (Hg) | ug/L | <0.0019 | 0.0019 | B048535 |
| **Dissolved Metals by ICPMS** | | | | |
| Dissolved Aluminum (Al) | ug/L | <3.0 | 3.0 | B042783 |
| Dissolved Antimony (Sb) | ug/L | <0.50 | 0.50 | B042783 |
| Dissolved Arsenic (As) | ug/L | <0.10 | 0.10 | B042783 |
| Dissolved Barium (Ba) | ug/L | <1.0 | 1.0 | B042783 |
| Dissolved Beryllium (Be) | ug/L | <0.10 | 0.10 | B042783 |
| Dissolved Bismuth (Bi) | ug/L | <1.0 | 1.0 | B042783 |
| Dissolved Boron (B) | ug/L | <50 | 50 | B042783 |
| Dissolved Cadmium (Cd) | ug/L | <0.010 | 0.010 | B042783 |
| Dissolved Chromium (Cr) | ug/L | <1.0 | 1.0 | B042783 |
| Dissolved Cobalt (Co) | ug/L | <0.20 | 0.20 | B042783 |
| Dissolved Copper (Cu) | ug/L | <0.20 | 0.20 | B042783 |
| Dissolved Iron (Fe) | ug/L | <5.0 | 5.0 | B042783 |
| Dissolved Lead (Pb) | ug/L | <0.20 | 0.20 | B042783 |
| Dissolved Lithium (Li) | ug/L | <2.0 | 2.0 | B042783 |
| Dissolved Manganese (Mn) | ug/L | <1.0 | 1.0 | B042783 |
| Dissolved Molybdenum (Mo) | ug/L | <1.0 | 1.0 | B042783 |
| Dissolved Nickel (Ni) | ug/L | <1.0 | 1.0 | B042783 |
| Dissolved Phosphorus (P) | ug/L | <10 | 10 | B042783 |
| Dissolved Selenium (Se) | ug/L | <0.10 | 0.10 | B042783 |
| Dissolved Silicon (Si) | ug/L | 2580 | 100 | B042783 |
| Dissolved Silver (Ag) | ug/L | <0.020 | 0.020 | B042783 |
| Dissolved Strontium (Sr) | ug/L | 11.5 | 1.0 | B042783 |
| Dissolved Thallium (Tl) | ug/L | <0.010 | 0.010 | B042783 |
| Dissolved Tin (Sn) | ug/L | <5.0 | 5.0 | B042783 |
| Dissolved Titanium (Ti) | ug/L | <5.0 | 5.0 | B042783 |
| Dissolved Uranium (U) | ug/L | <0.10 | 0.10 | B042783 |
| Dissolved Vanadium (V) | ug/L | <5.0 | 5.0 | B042783 |
| RDL = Reportable Detection Limit | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## CSR D. METALS W/CV HG-DISS (WATER)

| Bureau Veritas ID | | BUZ017 | | |
|---|---|---|---|---|
| Sampling Date | | 2023/07/17 17:30 | | |
| COC Number | | 694569-01-01 | | |
| | UNITS | WG-11222680-170723-KH-04 | RDL | QC Batch |
| Dissolved Zinc (Zn) | ug/L | <5.0 | 5.0 | B042783 |
| Dissolved Zirconium (Zr) | ug/L | <0.10 | 0.10 | B042783 |
| Dissolved Calcium (Ca) | mg/L | 8.64 | 0.050 | B040637 |
| Dissolved Magnesium (Mg) | mg/L | 1.07 | 0.050 | B040637 |
| Dissolved Potassium (K) | mg/L | 0.111 | 0.050 | B040637 |
| Dissolved Sodium (Na) | mg/L | 0.698 | 0.050 | B040637 |
| Dissolved Sulphur (S) | mg/L | <3.0 | 3.0 | B040637 |
| RDL = Reportable Detection Limit | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## GENERAL COMMENTS

**Results relate only to the items tested.**



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354929
Report Date: 2023/07/27

## QUALITY ASSURANCE REPORT

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B042787 | D10-ANTHRACENE (sur.) | 2023/07/21 | | | 90 | 50 - 140 | 89 | % | | |
| B042787 | D8-ACENAPHTHYLENE (sur.) | 2023/07/21 | | | 93 | 50 - 140 | 89 | % | | |
| B042787 | D8-NAPHTHALENE (sur.) | 2023/07/21 | | | 85 | 50 - 140 | 80 | % | | |
| B042787 | TERPHENYL-D14 (sur.) | 2023/07/21 | | | 86 | 50 - 140 | 82 | % | | |
| B042796 | O-TERPHENYL (sur.) | 2023/07/21 | | | 94 | 60 - 140 | 98 | % | | |
| B041593 | Orthophosphate (P) | 2023/07/20 | 102 | 80 - 120 | 109 | 80 - 120 | <0.0030 | mg/L | 1.4 (1) | 20 |
| B041707 | Nitrate plus Nitrite (N) | 2023/07/20 | 102 (2) | 80 - 120 | 107 | 80 - 120 | <0.020 | mg/L | 0.47 (3) | 25 |
| B041712 | Nitrite (N) | 2023/07/20 | 100 (2) | 80 - 120 | 103 | 80 - 120 | <0.0050 | mg/L | NC (3) | 20 |
| B041783 | Conductivity | 2023/07/20 | | | 101 | 90 - 110 | <2.0 | uS/cm | 0.50 (4) | 10 |
| B041787 | Alkalinity (PP as CaCO3) | 2023/07/20 | | | | | <1.0 | mg/L | NC (4) | 20 |
| B041787 | Alkalinity (Total as CaCO3) | 2023/07/20 | | | 99 | 80 - 120 | <1.0 | mg/L | 0.14 (4) | 20 |
| B041787 | Bicarbonate (HCO3) | 2023/07/20 | | | | | <1.0 | mg/L | 0.14 (4) | 20 |
| B041787 | Carbonate (CO3) | 2023/07/20 | | | | | <1.0 | mg/L | NC (4) | 20 |
| B041787 | Hydroxide (OH) | 2023/07/20 | | | | | <1.0 | mg/L | NC (4) | 20 |
| B042634 | Total Dissolved Solids | 2023/07/24 | 101 | 80 - 120 | 97 | 80 - 120 | <10 | mg/L | 2.5 (1) | 20 |
| B042783 | Dissolved Aluminum (Al) | 2023/07/22 | 99 (5) | 80 - 120 | 103 | 80 - 120 | <3.0 | ug/L | NC (6) | 20 |
| B042783 | Dissolved Antimony (Sb) | 2023/07/22 | 100 (5) | 80 - 120 | 103 | 80 - 120 | <0.50 | ug/L | NC (6) | 20 |
| B042783 | Dissolved Arsenic (As) | 2023/07/22 | 101 (5) | 80 - 120 | 103 | 80 - 120 | <0.10 | ug/L | NC (6) | 20 |
| B042783 | Dissolved Barium (Ba) | 2023/07/22 | 95 (5) | 80 - 120 | 99 | 80 - 120 | <1.0 | ug/L | 2.4 (6) | 20 |
| B042783 | Dissolved Beryllium (Be) | 2023/07/22 | 102 (5) | 80 - 120 | 104 | 80 - 120 | <0.10 | ug/L | NC (6) | 20 |
| B042783 | Dissolved Bismuth (Bi) | 2023/07/22 | 98 (5) | 80 - 120 | 98 | 80 - 120 | <1.0 | ug/L | NC (6) | 20 |
| B042783 | Dissolved Boron (B) | 2023/07/22 | 102 (5) | 80 - 120 | 107 | 80 - 120 | <50 | ug/L | NC (6) | 20 |
| B042783 | Dissolved Cadmium (Cd) | 2023/07/22 | 97 (5) | 80 - 120 | 101 | 80 - 120 | <0.010 | ug/L | NC (6) | 20 |
| B042783 | Dissolved Chromium (Cr) | 2023/07/22 | 96 (5) | 80 - 120 | 99 | 80 - 120 | <1.0 | ug/L | NC (6) | 20 |
| B042783 | Dissolved Cobalt (Co) | 2023/07/22 | 93 (5) | 80 - 120 | 98 | 80 - 120 | <0.20 | ug/L | NC (6) | 20 |
| B042783 | Dissolved Copper (Cu) | 2023/07/22 | 93 (5) | 80 - 120 | 98 | 80 - 120 | <0.20 | ug/L | NC (6) | 20 |
| B042783 | Dissolved Iron (Fe) | 2023/07/22 | 103 (5) | 80 - 120 | 105 | 80 - 120 | <5.0 | ug/L | NC (6) | 20 |
| B042783 | Dissolved Lead (Pb) | 2023/07/22 | 104 (5) | 80 - 120 | 101 | 80 - 120 | <0.20 | ug/L | NC (6) | 20 |
| B042783 | Dissolved Lithium (Li) | 2023/07/22 | 100 (5) | 80 - 120 | 102 | 80 - 120 | <2.0 | ug/L | NC (6) | 20 |
| B042783 | Dissolved Manganese (Mn) | 2023/07/22 | 96 (5) | 80 - 120 | 100 | 80 - 120 | <1.0 | ug/L | 0.52 (6) | 20 |
| B042783 | Dissolved Molybdenum (Mo) | 2023/07/22 | 101 (5) | 80 - 120 | 104 | 80 - 120 | <1.0 | ug/L | NC (6) | 20 |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B042783 | Dissolved Nickel (Ni) | 2023/07/22 | 94 (5) | 80 - 120 | 99 | 80 - 120 | <1.0 | ug/L | NC (6) | 20 |
| B042783 | Dissolved Phosphorus (P) | 2023/07/22 | 100 (5) | 80 - 120 | 103 | 80 - 120 | <10 | ug/L | NC (6) | 20 |
| B042783 | Dissolved Selenium (Se) | 2023/07/22 | 100 (5) | 80 - 120 | 102 | 80 - 120 | <0.10 | ug/L | 0.55 (6) | 20 |
| B042783 | Dissolved Silicon (Si) | 2023/07/22 | NC (5) | 80 - 120 | 111 | 80 - 120 | <100 | ug/L | 1.2 (6) | 20 |
| B042783 | Dissolved Silver (Ag) | 2023/07/22 | 97 (5) | 80 - 120 | 100 | 80 - 120 | <0.020 | ug/L | NC (6) | 20 |
| B042783 | Dissolved Strontium (Sr) | 2023/07/22 | 99 (5) | 80 - 120 | 101 | 80 - 120 | <1.0 | ug/L | 0.26 (6) | 20 |
| B042783 | Dissolved Thallium (Tl) | 2023/07/22 | 99 (5) | 80 - 120 | 99 | 80 - 120 | <0.010 | ug/L | NC (6) | 20 |
| B042783 | Dissolved Tin (Sn) | 2023/07/22 | 97 (5) | 80 - 120 | 105 | 80 - 120 | <5.0 | ug/L | NC (6) | 20 |
| B042783 | Dissolved Titanium (Ti) | 2023/07/22 | 97 (5) | 80 - 120 | 101 | 80 - 120 | <5.0 | ug/L | NC (6) | 20 |
| B042783 | Dissolved Uranium (U) | 2023/07/22 | 103 (5) | 80 - 120 | 100 | 80 - 120 | <0.10 | ug/L | NC (6) | 20 |
| B042783 | Dissolved Vanadium (V) | 2023/07/22 | 97 (5) | 80 - 120 | 101 | 80 - 120 | <5.0 | ug/L | NC (6) | 20 |
| B042783 | Dissolved Zinc (Zn) | 2023/07/22 | 98 (5) | 80 - 120 | 102 | 80 - 120 | <5.0 | ug/L | NC (6) | 20 |
| B042783 | Dissolved Zirconium (Zr) | 2023/07/22 | 100 (5) | 80 - 120 | 101 | 80 - 120 | <0.10 | ug/L | NC (6) | 20 |
| B042787 | Acenaphthene | 2023/07/21 | | | 82 | 50 - 140 | <0.050 | ug/L | | |
| B042787 | Acridine | 2023/07/21 | | | 89 | 50 - 140 | <0.050 | ug/L | | |
| B042787 | Anthracene | 2023/07/21 | | | 84 | 50 - 140 | <0.010 | ug/L | | |
| B042787 | Benzo(a)anthracene | 2023/07/21 | | | 81 | 50 - 140 | <0.010 | ug/L | | |
| B042787 | Benzo(a)pyrene | 2023/07/21 | | | 83 | 50 - 140 | <0.0050 | ug/L | | |
| B042787 | Fluoranthene | 2023/07/21 | | | 77 | 50 - 140 | <0.020 | ug/L | | |
| B042787 | Fluorene | 2023/07/21 | | | 81 | 50 - 140 | <0.050 | ug/L | | |
| B042787 | Naphthalene | 2023/07/21 | | | 81 | 50 - 140 | <0.10 | ug/L | | |
| B042787 | Phenanthrene | 2023/07/21 | | | 80 | 50 - 140 | <0.050 | ug/L | | |
| B042787 | Pyrene | 2023/07/21 | | | 77 | 50 - 140 | <0.020 | ug/L | | |
| B042796 | EPH (C10-C19) | 2023/07/21 | | | 103 | 70 - 130 | <0.20 | mg/L | | |
| B042796 | EPH (C19-C32) | 2023/07/21 | | | 108 | 70 - 130 | <0.20 | mg/L | | |
| B045000 | Total Sulphide | 2023/07/24 | 100 | 80 - 120 | 93 | 80 - 120 | <0.0018 | mg/L | NC (1) | 20 |
| B045835 | Chloride (Cl) | 2023/07/25 | 106 | 80 - 120 | 101 | 80 - 120 | <1.0 | mg/L | NC (1) | 20 |
| B045835 | Sulphate (SO4) | 2023/07/25 | 120 | 80 - 120 | 98 | 80 - 120 | <1.0 | mg/L | 3.7 (1) | 20 |
| B046614 | Total Ammonia (N) | 2023/07/25 | 124 (7) | 80 - 120 | 109 | 80 - 120 | <0.015 | mg/L | NC (1) | 20 |
| B048284 | Dissolved Mercury (Hg) | 2023/07/26 | 90 | 80 - 120 | 98 | 80 - 120 | <0.0019 | ug/L | NC (1) | 20 |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B048535 | Dissolved Mercury (Hg) | 2023/07/26 | 99 | 80 - 120 | 98 | 80 - 120 | <0.0019 | ug/L | NC (1) | 20 |

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

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

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

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

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

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

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Duplicate Parent ID

(2) Matrix Spike Parent ID [BUZ015-01]

(3) Duplicate Parent ID [BUZ015-01]

(4) Duplicate Parent ID [BUZ014-01]

(5) Matrix Spike Parent ID [BUZ014-03]

(6) Duplicate Parent ID [BUZ014-03]

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



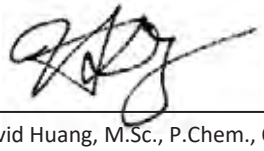
Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354929
Report Date: 2023/07/27

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:



David Huang, M.Sc., P.Chem., QP, Scientific Services Manager

Suwan (Sze Yeung) Fock, B.Sc., Scientific Specialist

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by {0}, {1} responsible for {2} {3} laboratory operations.



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas
4606 Canada Way, Burnaby, British Columbia Canada V5G 1K5 Tel (604) 734 7276 Toll-free 800-563-6266 Fax (604) 731 2386 www.bvna.com

# Chain Of Custody Record

| INVOICE TO: | | Report Information | | Project Information | | Laboratory Use Only | |
|---|---|---|---|---|---|---|---|
| Company Name | #163 GHD Limited | Company Name | GHD Limited | Quotation # | C30090 | Bureau Veritas Job # | Bottle Order #: |
| Contact Name | AP Invoices - 735 | Contact Name | Stephanie Berton | P.O. # | 735-002640-3 | | 694569 |
| Address | 455 PHILLIP STREET | Address | per PO | Project # | 11222680-15.1 | Chain Of Custody Record | Project Manager |
| | WATERLOO ON N2L 3X2 | | | Project Name | Upland | C#694569-01-01 | Brody Andersen |
| Phone | (519) 884-0510 Fax: (519) 725-1394 | Phone | Fax: | Site # | Groundwater | | |
| Email | APinvoices-735@ghd.com | Email | NationalEDDSupport@maxxam.ca,stephanie.berton@g | Sampled By | Kaileen Hasler | | |

Regulatory Criteria: [x] CSR [ ] CCME [ ] BC Water Quality [ ] Other

Special Instructions: bottles were labeled, filtered in the field and preserved as indicated on the labels

SAMPLES MUST BE KEPT COOL ( < 10°C ) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT: (will be applied if Rush TAT is not specified) [x]
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
1 DAY [ ] 2 Day [ ] 3 Day [ ] Date Required: [ ]
Rush Confirmation Number: (call lab for #)

| | Sample Barcode Label | Sample (Location) Identification | Date Sampled | Time Sampled | Matrix | Metals Field Filtered ? (Y / N) | Conductivity, Cl, SO4, NO2, NO3, N+N, PO4 | Speciated Alkalinity | Sulphide + H2S Calc | Sulphide, Un-ionized (as H2S) (Calc) | Ammonia-N (Total) | Dissolved Metals with CV Hg, Hardness | Total Dissolved Solids (Filt. Residue) | LEPH/HEPH with subtracted PAHs | Field pH | Field Temperature | # of Bottles | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | WG-11222680-170723-KH-01 | 17/07/23 | 15:15 | W | ✓ | X | X | X | X | X | X | X | X | 7.24 | 16.19 | | |
| 2 | | WG-11222680-170723-KH-02 | 17/07/23 | 16:15 | W | ✓ | X | X | X | X | X | X | X | X | 7.75 | 13.68 | | |
| 3 | | WG-11222680-170723-KH-03 | 17/07/23 | 17:20 | W | ✓ | X | X | X | X | X | X | X | X | 7.84 | 19.42 | | |
| 4 | | WG-11222680-170723-KH-04 | 17/07/23 | 17:30 | W | ✓ | X | X | X | X | X | X | X | X | 7.84 | 19.42 | | |
| 5 | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | |

C354929_COC

| * RELINQUISHED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | RECEIVED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | # jars used and not submitted | Lab Use Only: Time Sensitive | Temperature (°C) on Receipt | Custody Seal Intact on Cooler? |
|---|---|---|---|---|---|---|---|---|---|
| Kaileen Hasler | 23/07/17 | 17:30 | [signature] | 230719 | 10:15 | | [ ] | 5, 3, 2 | [x] Yes [ ] No |
| | | | ELAINE CHOU | 2023/07/20 | 09:20 | | | 10, 10, 4 | |

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.
* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Bureau Veritas Yellow: Client

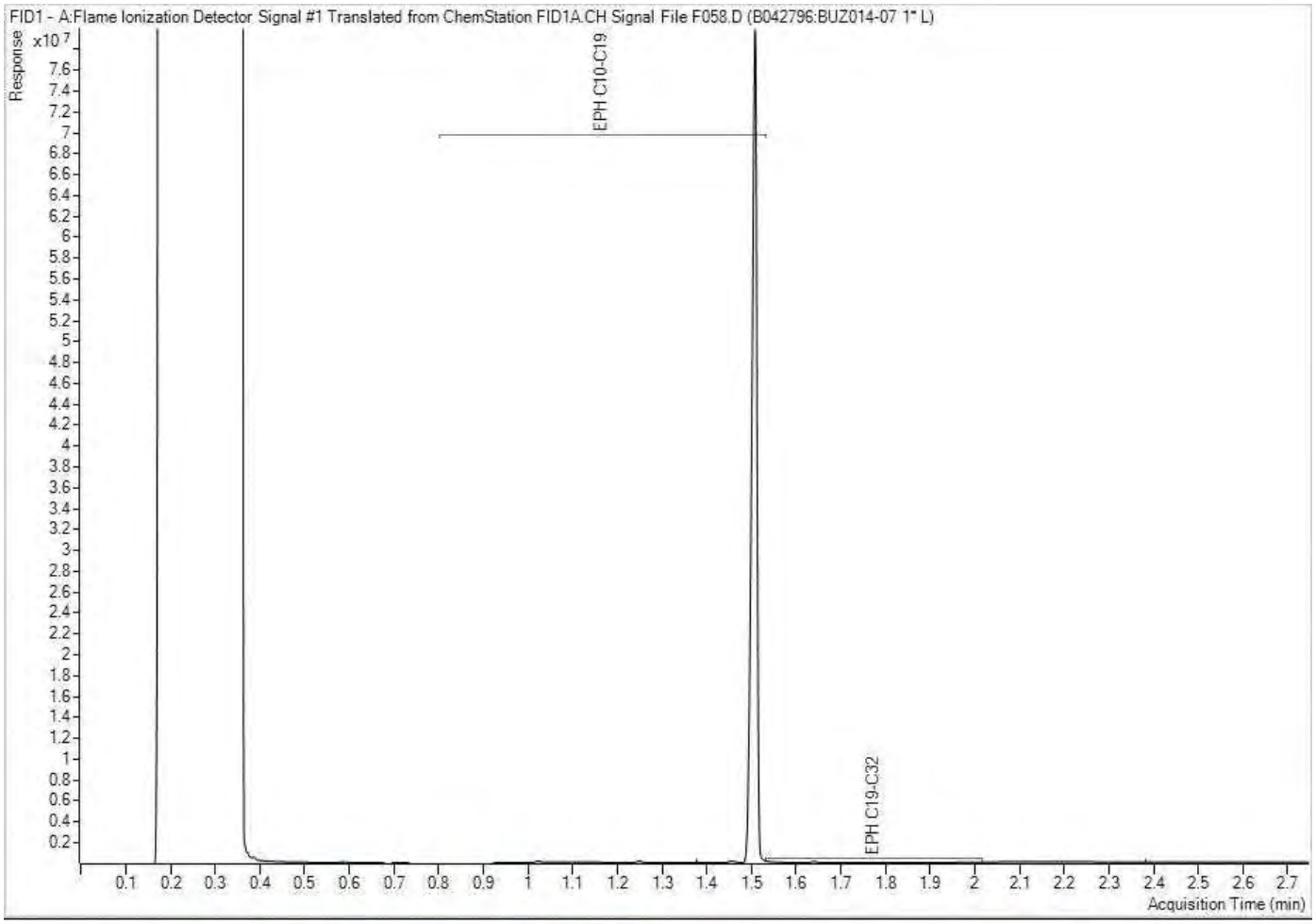
ice packs: yes

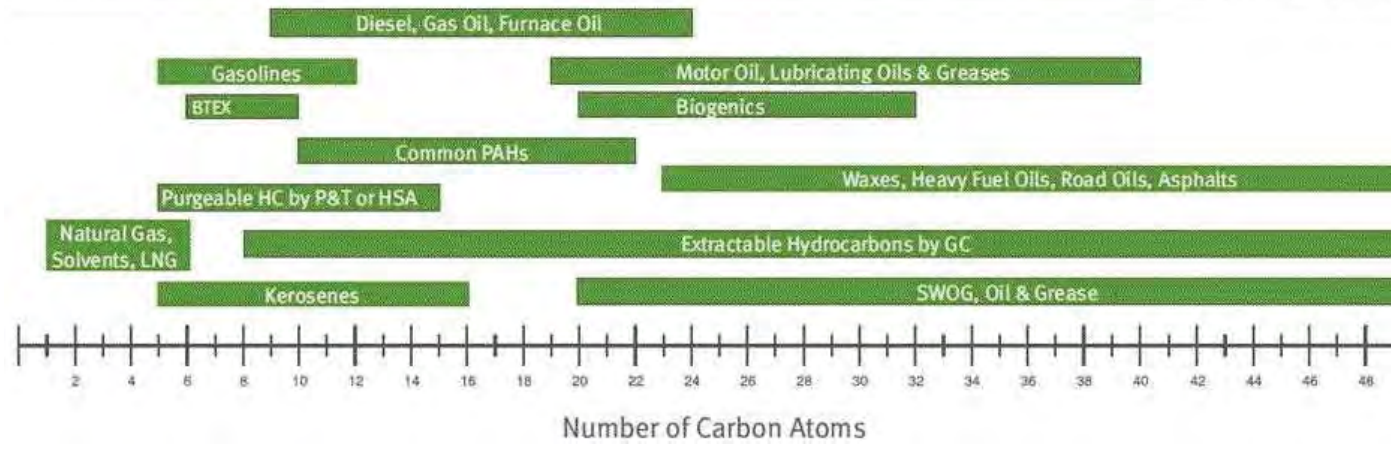
Bureau Veritas Canada (2019) Inc.

Bureau Veritas Job #: C354929
Report Date: 2023/07/27
Bureau Veritas Sample: BUZ014

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WG-11222680-170723-KH-01

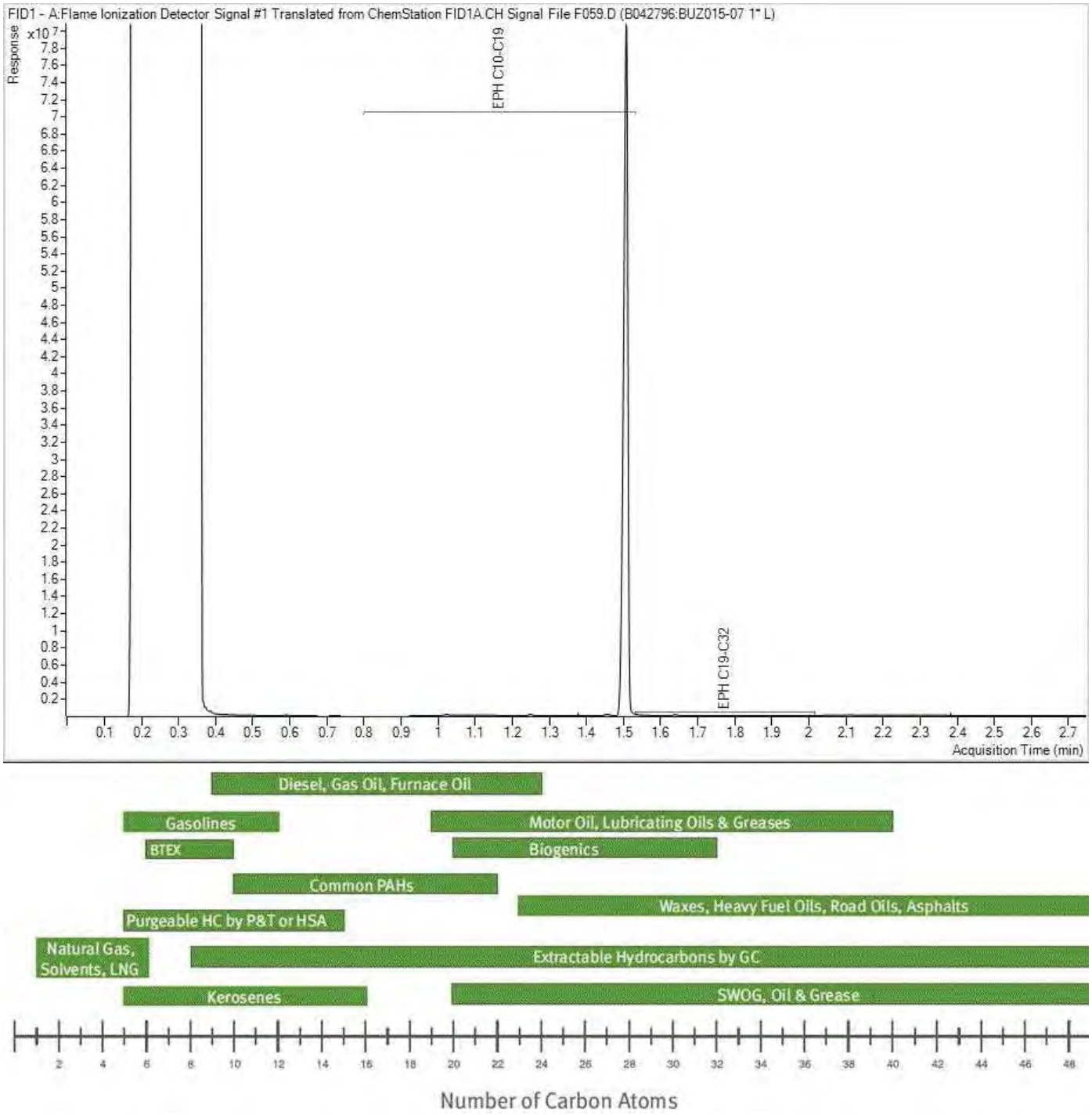
**EPH in Water when PAH required Chromatogram**




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

**EPH in Water when PAH required Chromatogram**

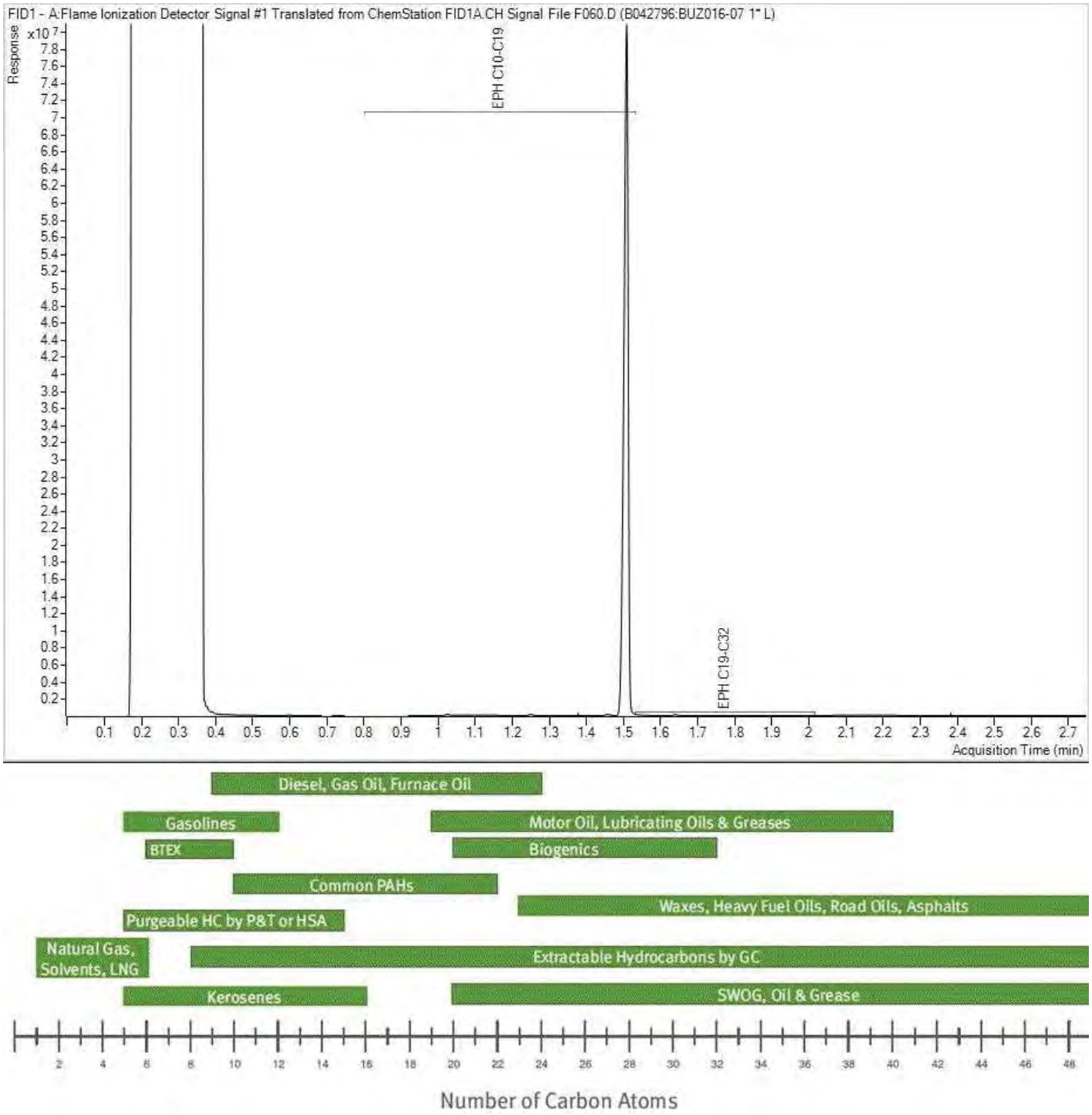



**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

Bureau Veritas Job #: C354929
Report Date: 2023/07/27
Bureau Veritas Sample: BUZ016

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WG-11222680-170723-KH-03

**EPH in Water when PAH required Chromatogram**

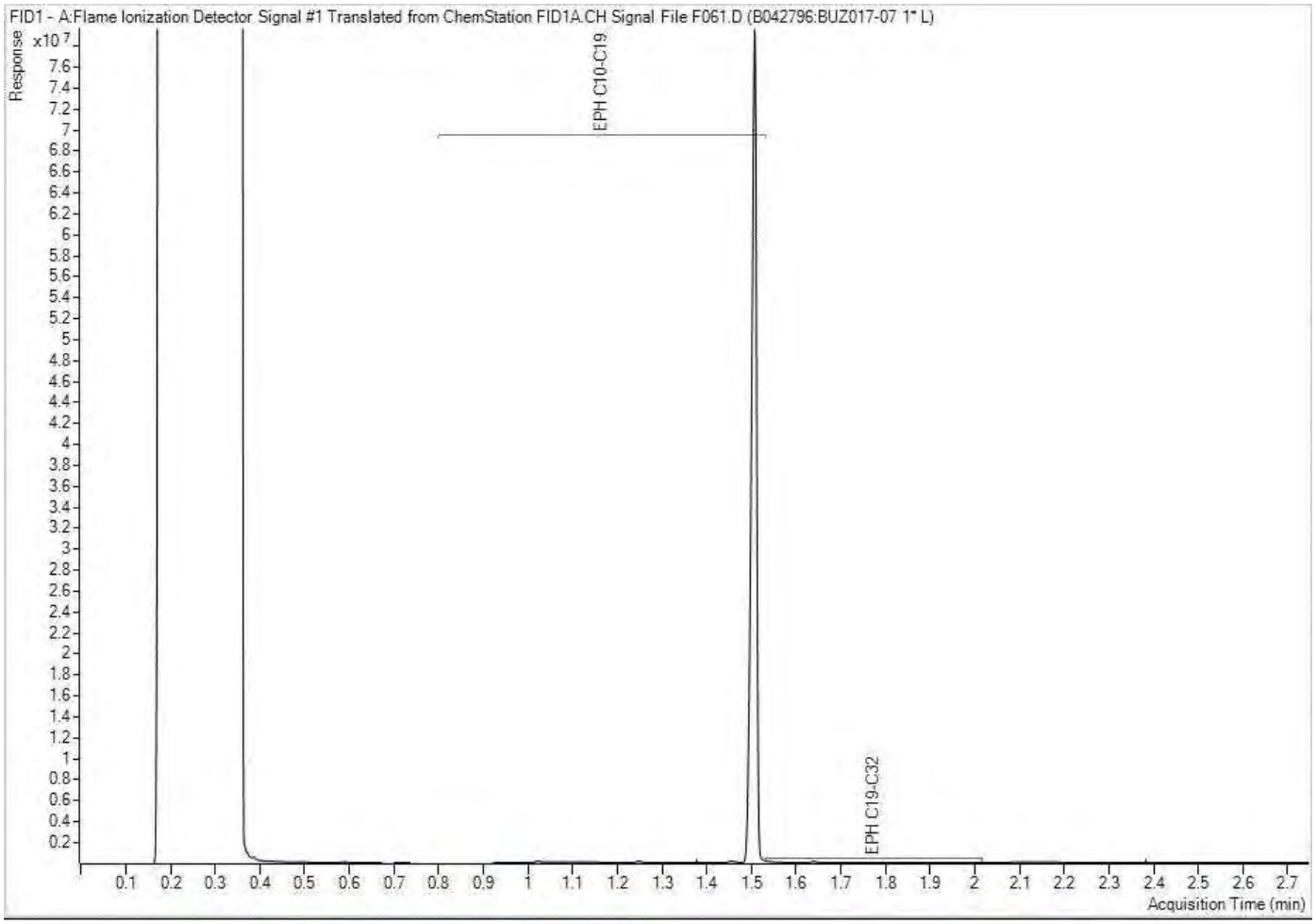


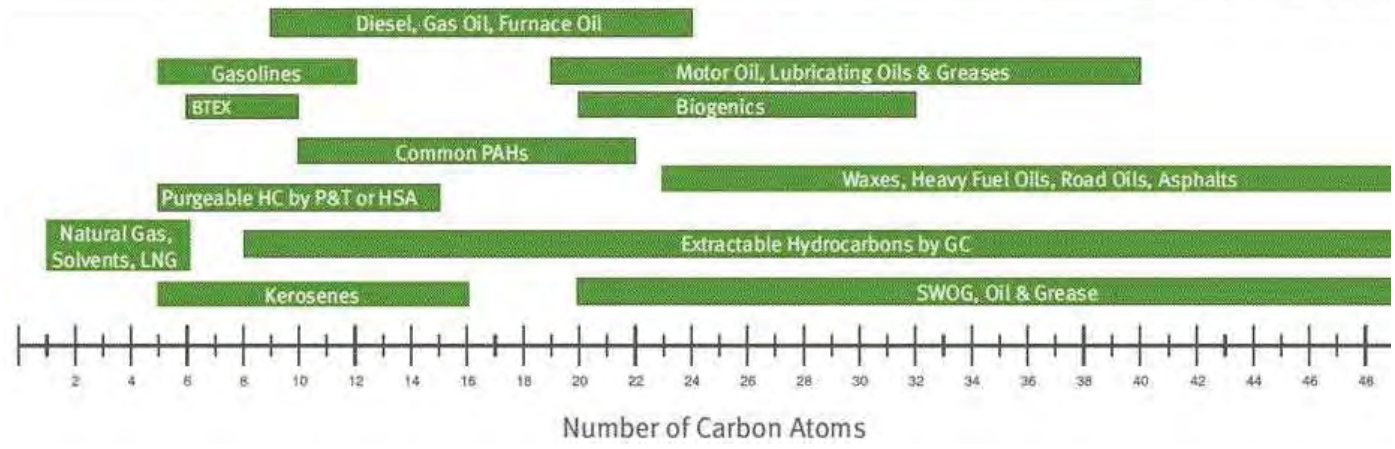

**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

Bureau Veritas Job #: C354929
Report Date: 2023/07/27
Bureau Veritas Sample: BUZ017

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WG-11222680-170723-KH-04

**EPH in Water when PAH required Chromatogram**




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

Your P.O. #: 735-002640-3
Your Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your C.O.C. #: 694571-01-01

**Attention: Stephanie Berton**

GHD Limited
455 PHILLIP STREET
WATERLOO, ON
CANADA N2L 3X2

**Report Date: 2023/08/04**
Report #: R3376673
Version: 2 - Revision

# CERTIFICATE OF ANALYSIS – REVISED REPORT

**BUREAU VERITAS JOB #: C354963**
**Received: 2023/07/19, 11:02**

Sample Matrix: Water
# Samples Received: 2

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Analytical Method |
|---|---|---|---|---|---|
| Alkalinity @25C (pp, total), CO3,HCO3,OH | 2 | N/A | 2023/07/21 | BBY6SOP-00026 | SM 24 2320 B m |
| Biochemical Oxygen Demand | 2 | 2023/07/20 | 2023/07/25 | BBY6SOP-00045 | SM 23 5210 B m |
| Chloride/Sulphate by Auto Colourimetry | 2 | N/A | 2023/07/25 | BBY6SOP-00011 / BBY6SOP-00017 | SM24-4500-Cl/SO4-E m |
| COD by Colorimeter | 2 | N/A | 2023/07/21 | BBY6SOP-00024 | SM 23 5220 D m |
| Conductivity @25C | 2 | N/A | 2023/07/21 | BBY6SOP-00026 | SM 24 2510 B m |
| Sulphide (as H2S) (1) | 2 | N/A | 2023/07/24 | | Auto Calc |
| Un-ionized Hydrogen Sulphide as S Calc (1) | 2 | N/A | 2023/07/25 | | |
| Hardness Total (calculated as CaCO3) (2) | 2 | N/A | 2023/07/24 | BBY WI-00033 | Auto Calc |
| Hardness (calculated as CaCO3) | 2 | N/A | 2023/07/26 | BBY WI-00033 | Auto Calc |
| Mercury (Total) by CV | 2 | 2023/07/24 | 2023/07/25 | AB SOP-00084 | BCMOE BCLM Oct2013 m |
| ICP-OES Dissolved Metals in Water (3) | 2 | N/A | 2023/07/26 | BBY7SOP-00018 | EPA 6010d m |
| EPH in Water when PAH required | 2 | 2023/07/21 | 2023/07/21 | BBY8SOP-00029 | BCMOE BCLM Sep2017 m |
| Na, K, Ca, Mg, S by CRC ICPMS (total) | 2 | 2023/07/20 | 2023/07/24 | BBY WI-00033 | Auto Calc |
| Elements by CRC ICPMS (total) | 2 | 2023/07/21 | 2023/07/24 | BBY7SOP-00003 / BBY7SOP-00002 | EPA 6020b R2 m |
| Ammonia-N (Total) | 2 | N/A | 2023/07/25 | AB SOP-00007 | SM 24 4500 NH3 A G m |
| Nitrate + Nitrite (N) | 2 | N/A | 2023/07/21 | BBY6SOP-00010 | SM 23 4500-NO3- I m |
| Nitrite (N) by CFA | 2 | N/A | 2023/07/21 | BBY6SOP-00010 | SM 23 4500-NO3- I m |
| Nitrogen - Nitrate (as N) | 2 | N/A | 2023/07/22 | BBY WI-00033 | Auto Calc |
| PAH in Water by GC/MS (SIM) | 2 | 2023/07/21 | 2023/07/21 | BBY8SOP-00021 | BCMOE BCLM Jul2017m |
| pH @25°C (4) | 2 | N/A | 2023/07/21 | BBY6SOP-00026 | SM 24 4500-H+ B m |
| Orthophosphate by Konelab (5) | 2 | N/A | 2023/07/21 | BBY6SOP-00013 | SM 24 4500-P E m |
| Total Sulphide (1) | 2 | N/A | 2023/07/24 | AB SOP-00080 | SM 23 4500 S2-A D Fm |
| Total Dissolved Solids (Filt. Residue) | 2 | 2023/07/24 | 2023/07/25 | BBY6SOP-00033 | SM 24 2540 C m |
| EPH less PAH in Water by GC/FID (6) | 2 | N/A | 2023/07/24 | BBY WI-00033 | Auto Calc |
| Total Suspended Solids (NFR) | 2 | 2023/07/21 | 2023/07/24 | BBY6SOP-00034 | SM 24 2540 D m |
| Field pH | 2 | N/A | 2023/07/20 | | |
| Field Temperature | 2 | N/A | 2023/07/20 | | |

**Remarks:**

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your P.O. #: 735-002640-3
Your Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your C.O.C. #: 694571-01-01

**Attention: Stephanie Berton**

GHD Limited
455 PHILLIP STREET
WATERLOO, ON
CANADA N2L 3X2

**Report Date: 2023/08/04**
Report #: R3376673
Version: 2 - Revision

# CERTIFICATE OF ANALYSIS – REVISED REPORT

**BUREAU VERITAS JOB #: C354963**
**Received: 2023/07/19, 11:02**

Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Bureau Veritas Calgary, 4000 - 19 St. , Calgary, AB, T2E 6P8
(2) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).
(3) Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.
(4) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Bureau Veritas endeavours to analyze samples as soon as possible after receipt.
(5) Orthophosphate > Total Phosphorus Imbalance: When applicable, Orthophosphate, Total Phosphorus and dissolved Phosphorus results were reviewed and data quality meets acceptable levels unless otherwise noted.
(6) LEPH = EPH (C10 to C19) - (Acenaphthene + Acridine + Anthracene + Fluorene + Naphthalene + Phenanthrene)
HEPH = EPH (C19 to C32) - (Benzo(a)anthracene + Benzo(a)pyrene + Fluoranthene + Pyrene)

Your P.O. #: 735-002640-3
Your Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your C.O.C. #: 694571-01-01

**Attention: Stephanie Berton**

GHD Limited
455 PHILLIP STREET
WATERLOO, ON
CANADA N2L 3X2

**Report Date: 2023/08/04**
Report #: R3376673
Version: 2 - Revision

# CERTIFICATE OF ANALYSIS – REVISED REPORT

**BUREAU VERITAS JOB #: C354963**
**Received: 2023/07/19, 11:02**

Encryption Key

Brody Andersen
Program Specialist-Emergency Spill Response
04 Aug 2023 16:33:57

Please direct all questions regarding this Certificate of Analysis to:
Brody Andersen, B.Sc., B.Sc., Program Specialist–Emergency Spill Response
Email: Brody.Andersen@bureauveritas.com
Phone# (780)577-7120

==========

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Raphael Kwan, Senior Manager, BC and Yukon Regions responsible for British Columbia Environmental laboratory operations.



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354963
Report Date: 2023/08/04

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | BUZ206 | BUZ206 | | BUZ207 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/07/18 16:50 | 2023/07/18 16:50 | | 2023/07/18 17:00 | | |
| COC Number | | 694571-01-01 | 694571-01-01 | | 694571-01-01 | | |
| | UNITS | WL-11222680-180723-KH-01 | WL-11222680-180723-KH-01 Lab-Dup | QC Batch | WL-11222680-180723-KH-02 | RDL | QC Batch |
| **ANIONS** | | | | | | | |
| Nitrite (N) | mg/L | <0.0050 | <0.0050 | B043059 | <0.0050 | 0.0050 | B043059 |
| **Calculated Parameters** | | | | | | | |
| Dissolved Hardness (CaCO3) | mg/L | 1530 | N/A | B040635 | 1560 | 0.50 | B040635 |
| Nitrate (N) | mg/L | <0.020 | N/A | B040742 | <0.020 | 0.020 | B040742 |
| Sulphide (as H2S) | mg/L | 0.37 | N/A | B040445 | 0.34 | 0.0040 | B041248 |
| **Demand Parameters** | | | | | | | |
| Biochemical Oxygen Demand | mg/L | 8.4 | N/A | B040505 | 8.3 | 2.0 | B040505 |
| Chemical Oxygen Demand | mg/L | 208 | N/A | B040515 | 210 | 10 | B040515 |
| **Field Parameters** | | | | | | | |
| Field pH | pH | 6.32 | N/A | ONSITE | 6.32 | N/A | ONSITE |
| Field Temperature | °C | 24.04 | N/A | ONSITE | 24.04 | N/A | ONSITE |
| **Misc. Inorganics** | | | | | | | |
| Conductivity | uS/cm | 4400 | N/A | B042663 | 4400 | 2.0 | B042663 |
| pH | pH | 5.82 | N/A | B042658 | 5.96 | N/A | B042658 |
| Total Dissolved Solids | mg/L | 3700 (1) | N/A | B045215 | 3600 (1) | 13 | B045215 |
| Total Suspended Solids | mg/L | 140 (1) | N/A | B040632 | 180 (1) | 5.0 | B040632 |
| **Anions** | | | | | | | |
| Alkalinity (PP as CaCO3) | mg/L | <1.0 | N/A | B042664 | <1.0 | 1.0 | B042664 |
| Alkalinity (Total as CaCO3) | mg/L | 26 | N/A | B042664 | 30 | 1.0 | B042664 |
| Bicarbonate (HCO3) | mg/L | 31 | N/A | B042664 | 36 | 1.0 | B042664 |
| Carbonate (CO3) | mg/L | <1.0 | N/A | B042664 | <1.0 | 1.0 | B042664 |
| Hydroxide (OH) | mg/L | <1.0 | N/A | B042664 | <1.0 | 1.0 | B042664 |
| Total Sulphide | mg/L | 0.35 (2) | N/A | B043887 | 0.32 (2) | 0.0036 | B043887 |
| Chloride (Cl) | mg/L | 310 | 320 | B046927 | 310 | 5.0 | B046927 |
| Sulphate (SO4) | mg/L | 2000 | 2000 | B046927 | 2000 | 25 | B046927 |
| **Nutrients** | | | | | | | |
| Total Ammonia (N) | mg/L | 55 | N/A | B046614 | 55 | 0.75 | B046614 |

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) RDL raised due to high concentration of solids in the sample.
(2) Sample pH <9, preservation incomplete. Due to volatility of analyte, a low bias in the results is likely.



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354963
Report Date: 2023/08/04

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## RESULTS OF CHEMICAL ANALYSES OF WATER

| **Bureau Veritas ID** | | BUZ206 | BUZ206 | | BUZ207 | | |
|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2023/07/18 16:50 | 2023/07/18 16:50 | | 2023/07/18 17:00 | | |
| **COC Number** | | 694571-01-01 | 694571-01-01 | | 694571-01-01 | | |
| | **UNITS** | **WL-11222680-180723-KH-01** | **WL-11222680-180723-KH-01 Lab-Dup** | **QC Batch** | **WL-11222680-180723-KH-02** | **RDL** | **QC Batch** |
| Orthophosphate (P) | mg/L | <0.0030 | N/A | B042667 | <0.0030 | 0.0030 | B042667 |
| Nitrate plus Nitrite (N) | mg/L | <0.020 | <0.020 | B043056 | <0.020 | 0.020 | B043056 |

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


Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## SEMIVOLATILE ORGANICS BY GC-MS (WATER)

| Bureau Veritas ID | | BUZ206 | BUZ207 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2023/07/18 16:50 | 2023/07/18 17:00 | | |
| COC Number | | 694571-01-01 | 694571-01-01 | | |
| | UNITS | WL-11222680-180723-KH-01 | WL-11222680-180723-KH-02 | RDL | QC Batch |
| **Polycyclic Aromatics** | | | | | |
| Naphthalene | ug/L | 0.78 | 0.82 | 0.10 | B042271 |
| Acenaphthene | ug/L | 0.094 | 0.094 | 0.050 | B042271 |
| Fluorene | ug/L | <0.050 | <0.050 | 0.050 | B042271 |
| Phenanthrene | ug/L | <0.050 | <0.050 | 0.050 | B042271 |
| Anthracene | ug/L | 0.018 | 0.019 | 0.010 | B042271 |
| Acridine | ug/L | <0.050 | <0.050 | 0.050 | B042271 |
| Fluoranthene | ug/L | 0.021 | <0.020 | 0.020 | B042271 |
| Pyrene | ug/L | <0.020 | <0.020 | 0.020 | B042271 |
| Benzo(a)anthracene | ug/L | <0.010 | <0.010 | 0.010 | B042271 |
| Benzo(a)pyrene | ug/L | <0.0050 | <0.0050 | 0.0050 | B042271 |
| **Surrogate Recovery (%)** | | | | | |
| D10-ANTHRACENE (sur.) | % | 85 | 86 | N/A | B042271 |
| D8-ACENAPHTHYLENE (sur.) | % | 90 | 92 | N/A | B042271 |
| D8-NAPHTHALENE (sur.) | % | 82 | 84 | N/A | B042271 |
| TERPHENYL-D14 (sur.) | % | 83 | 83 | N/A | B042271 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354963
Report Date: 2023/08/04

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

| Bureau Veritas ID | | BUZ206 | BUZ206 | BUZ207 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2023/07/18 16:50 | 2023/07/18 16:50 | 2023/07/18 17:00 | | |
| COC Number | | 694571-01-01 | 694571-01-01 | 694571-01-01 | | |
| | UNITS | WL-11222680-180723-KH-01 | WL-11222680-180723-KH-01 Lab-Dup | WL-11222680-180723-KH-02 | RDL | QC Batch |
| **Dissolved Metals by ICP** | | | | | | |
| Dissolved Calcium (Ca) | mg/L | 486 | 475 | 500 | 0.50 | B048276 |
| Dissolved Magnesium (Mg) | mg/L | 76.7 | 77.3 | 76.9 | 0.050 | B048276 |

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354963
Report Date: 2023/08/04

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## TOTAL PETROLEUM HYDROCARBONS (WATER)

| Bureau Veritas ID | | BUZ206 | BUZ207 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2023/07/18 16:50 | 2023/07/18 17:00 | | |
| COC Number | | 694571-01-01 | 694571-01-01 | | |
| | UNITS | WL-11222680-180723-KH-01 | WL-11222680-180723-KH-02 | RDL | QC Batch |
| **Calculated Parameters** | | | | | |
| LEPH (C10-C19 less PAH) | mg/L | <0.20 | <0.20 | 0.20 | B041128 |
| HEPH (C19-C32 less PAH) | mg/L | <0.20 | <0.20 | 0.20 | B041128 |
| **Ext. Pet. Hydrocarbon** | | | | | |
| EPH (C10-C19) | mg/L | <0.20 | <0.20 | 0.20 | B042275 |
| EPH (C19-C32) | mg/L | <0.20 | <0.20 | 0.20 | B042275 |
| **Surrogate Recovery (%)** | | | | | |
| O-TERPHENYL (sur.) | % | 86 | 84 | N/A | B042275 |

RDL = Reportable Detection Limit
N/A = Not Applicable


Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## MISCELLANEOUS (WATER)

| Bureau Veritas ID | | BUZ206 | BUZ207 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2023/07/18 16:50 | 2023/07/18 17:00 | | |
| COC Number | | 694571-01-01 | 694571-01-01 | | |
| | UNITS | WL-11222680-180723-KH-01 | WL-11222680-180723-KH-02 | RDL | QC Batch |
| **Calculated Parameters** | | | | | |
| Total Un-ionized Hydrogen Sulfide as S | mg/L | 0.28 | 0.25 | 0.0050 | B041137 |
| Total Un-ionized Hydrogen Sulfide as H2S | mg/L | 0.29 | 0.26 | 0.0050 | B041137 |
| RDL = Reportable Detection Limit | | | | | |


Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## CSR TOTAL METALS IN WATER WITH CV HG (WATER)

| Bureau Veritas ID | | BUZ206 | BUZ207 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2023/07/18 16:50 | 2023/07/18 17:00 | | |
| COC Number | | 694571-01-01 | 694571-01-01 | | |
| | UNITS | WL-11222680-180723-KH-01 | WL-11222680-180723-KH-02 | RDL | QC Batch |
| **Calculated Parameters** | | | | | |
| Total Hardness (CaCO3) | mg/L | 1290 | 1350 | 0.50 | B040739 |
| **Elements** | | | | | |
| Total Mercury (Hg) | ug/L | 0.0041 | 0.0041 | 0.0019 | B045377 |
| **Total Metals by ICPMS** | | | | | |
| Total Aluminum (Al) | ug/L | 1250 | 1170 | 15 | B042401 |
| Total Antimony (Sb) | ug/L | <2.5 | <2.5 | 2.5 | B042401 |
| Total Arsenic (As) | ug/L | 3.06 | 3.18 | 0.50 | B042401 |
| Total Barium (Ba) | ug/L | 59.8 | 62.0 | 5.0 | B042401 |
| Total Beryllium (Be) | ug/L | <0.50 | <0.50 | 0.50 | B042401 |
| Total Bismuth (Bi) | ug/L | <5.0 | <5.0 | 5.0 | B042401 |
| Total Boron (B) | ug/L | 1240 | 1280 | 100 | B042401 |
| Total Cadmium (Cd) | ug/L | 0.282 | 0.297 | 0.050 | B042401 |
| Total Chromium (Cr) | ug/L | 10.4 | 10.2 | 5.0 | B042401 |
| Total Cobalt (Co) | ug/L | 13.9 | 14.5 | 1.0 | B042401 |
| Total Copper (Cu) | ug/L | 32.0 | 31.7 | 2.5 | B042401 |
| Total Iron (Fe) | ug/L | 26300 | 26500 | 50 | B042401 |
| Total Lead (Pb) | ug/L | <1.0 | <1.0 | 1.0 | B042401 |
| Total Lithium (Li) | ug/L | 11 | 12 | 10 | B042401 |
| Total Manganese (Mn) | ug/L | 4600 | 4790 | 5.0 | B042401 |
| Total Molybdenum (Mo) | ug/L | <5.0 | <5.0 | 5.0 | B042401 |
| Total Nickel (Ni) | ug/L | 20.3 | 18.8 | 5.0 | B042401 |
| Total Phosphorus (P) | ug/L | 123 | 106 | 50 | B042401 |
| Total Selenium (Se) | ug/L | <0.50 | <0.50 | 0.50 | B042401 |
| Total Silicon (Si) | ug/L | 18400 | 19100 | 500 | B042401 |
| Total Silver (Ag) | ug/L | <0.10 | <0.10 | 0.10 | B042401 |
| Total Strontium (Sr) | ug/L | 2720 | 2890 | 5.0 | B042401 |
| Total Thallium (Tl) | ug/L | <0.050 | <0.050 | 0.050 | B042401 |
| Total Tin (Sn) | ug/L | <25 | <25 | 25 | B042401 |
| Total Titanium (Ti) | ug/L | 34 | 26 | 25 | B042401 |
| Total Uranium (U) | ug/L | <0.50 | <0.50 | 0.50 | B042401 |
| Total Vanadium (V) | ug/L | <25 | <25 | 25 | B042401 |
| RDL = Reportable Detection Limit | | | | | |

Bureau Veritas Job #: C354963
Report Date: 2023/08/04

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## CSR TOTAL METALS IN WATER WITH CV HG (WATER)

| Bureau Veritas ID | | BUZ206 | BUZ207 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2023/07/18 16:50 | 2023/07/18 17:00 | | |
| COC Number | | 694571-01-01 | 694571-01-01 | | |
| | UNITS | WL-11222680-180723-KH-01 | WL-11222680-180723-KH-02 | RDL | QC Batch |
| Total Zinc (Zn) | ug/L | 131 | 132 | 25 | B042401 |
| Total Zirconium (Zr) | ug/L | 0.56 | 0.55 | 0.50 | B042401 |
| Total Calcium (Ca) | mg/L | 409 | 426 | 0.25 | B040818 |
| Total Magnesium (Mg) | mg/L | 66.6 | 69.4 | 0.25 | B040818 |
| Total Potassium (K) | mg/L | 48.2 | 51.0 | 0.25 | B040818 |
| Total Sodium (Na) | mg/L | 304 | 319 | 0.25 | B040818 |
| Total Sulphur (S) | mg/L | 593 | 648 | 15 | B040818 |
| RDL = Reportable Detection Limit | | | | | |


Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## GENERAL COMMENTS

Version 2: Report reissued to remove Fluoride in Water from all samples as per original chain of custody form.

**Results relate only to the items tested.**



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## QUALITY ASSURANCE REPORT



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B042271 | D10-ANTHRACENE (sur.) | 2023/07/21 | 89 | 50 - 140 | 84 | 50 - 140 | 89 | % | | |
| B042271 | D8-ACENAPHTHYLENE (sur.) | 2023/07/21 | 88 | 50 - 140 | 84 | 50 - 140 | 86 | % | | |
| B042271 | D8-NAPHTHALENE (sur.) | 2023/07/21 | 84 | 50 - 140 | 77 | 50 - 140 | 76 | % | | |
| B042271 | TERPHENYL-D14 (sur.) | 2023/07/21 | 95 | 50 - 140 | 89 | 50 - 140 | 95 | % | | |
| B042275 | O-TERPHENYL (sur.) | 2023/07/21 | | | 93 | 60 - 140 | 98 | % | | |
| B040505 | Biochemical Oxygen Demand | 2023/07/25 | | | 92 | 85 - 115 | <2.0 | mg/L | 6.3 (1) | 20 |
| B040515 | Chemical Oxygen Demand | 2023/07/21 | 102 | N/A | 100 | 80 - 120 | <10 | mg/L | 3.3 (1) | 20 |
| B040632 | Total Suspended Solids | 2023/07/24 | 103 | 80 - 120 | 99 | 80 - 120 | <1.0 | mg/L | NC (1) | 20 |
| B042271 | Acenaphthene | 2023/07/21 | 85 | 50 - 140 | 78 | 50 - 140 | <0.050 | ug/L | 12 (1) | 40 |
| B042271 | Acridine | 2023/07/21 | 102 | 50 - 140 | 99 | 50 - 140 | <0.050 | ug/L | 0.13 (1) | 40 |
| B042271 | Anthracene | 2023/07/21 | 94 | 50 - 140 | 87 | 50 - 140 | <0.010 | ug/L | 17 (1) | 40 |
| B042271 | Benzo(a)anthracene | 2023/07/21 | 89 | 50 - 140 | 78 | 50 - 140 | <0.010 | ug/L | 2.7 (1) | 40 |
| B042271 | Benzo(a)pyrene | 2023/07/21 | 81 | 50 - 140 | 75 | 50 - 140 | <0.0050 | ug/L | 8.8 (1) | 40 |
| B042271 | Fluoranthene | 2023/07/21 | 94 | 50 - 140 | 86 | 50 - 140 | <0.020 | ug/L | 11 (1) | 40 |
| B042271 | Fluorene | 2023/07/21 | 87 | 50 - 140 | 80 | 50 - 140 | <0.050 | ug/L | 20 (1) | 40 |
| B042271 | Naphthalene | 2023/07/21 | 79 | 50 - 140 | 73 | 50 - 140 | <0.10 | ug/L | 11 (1) | 40 |
| B042271 | Phenanthrene | 2023/07/21 | 84 | 50 - 140 | 77 | 50 - 140 | <0.050 | ug/L | 12 (1) | 40 |
| B042271 | Pyrene | 2023/07/21 | 96 | 50 - 140 | 88 | 50 - 140 | <0.020 | ug/L | 12 (1) | 40 |
| B042275 | EPH (C10-C19) | 2023/07/21 | | | 102 | 70 - 130 | <0.20 | mg/L | NC (1) | 30 |
| B042275 | EPH (C19-C32) | 2023/07/21 | | | 105 | 70 - 130 | <0.20 | mg/L | NC (1) | 30 |
| B042401 | Total Aluminum (Al) | 2023/07/21 | 102 | 80 - 120 | 105 | 80 - 120 | <3.0 | ug/L | 2.5 (1) | 20 |
| B042401 | Total Antimony (Sb) | 2023/07/21 | 102 | 80 - 120 | 104 | 80 - 120 | <0.50 | ug/L | | |
| B042401 | Total Arsenic (As) | 2023/07/21 | 102 | 80 - 120 | 101 | 80 - 120 | <0.10 | ug/L | 3.2 (1) | 20 |
| B042401 | Total Barium (Ba) | 2023/07/21 | 98 | 80 - 120 | 99 | 80 - 120 | <1.0 | ug/L | | |
| B042401 | Total Beryllium (Be) | 2023/07/21 | 99 | 80 - 120 | 101 | 80 - 120 | <0.10 | ug/L | | |
| B042401 | Total Bismuth (Bi) | 2023/07/21 | 94 | 80 - 120 | 100 | 80 - 120 | <1.0 | ug/L | | |
| B042401 | Total Boron (B) | 2023/07/21 | 99 | 80 - 120 | 102 | 80 - 120 | <50 | ug/L | NC (1) | 20 |
| B042401 | Total Cadmium (Cd) | 2023/07/21 | 99 | 80 - 120 | 100 | 80 - 120 | <0.010 | ug/L | NC (1) | 20 |
| B042401 | Total Chromium (Cr) | 2023/07/21 | 97 | 80 - 120 | 102 | 80 - 120 | <1.0 | ug/L | 2.8 (1) | 20 |
| B042401 | Total Cobalt (Co) | 2023/07/21 | 94 | 80 - 120 | 98 | 80 - 120 | <0.20 | ug/L | NC (1) | 20 |
| B042401 | Total Copper (Cu) | 2023/07/21 | 91 | 80 - 120 | 97 | 80 - 120 | <0.50 | ug/L | 2.8 (1) | 20 |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B042401 | Total Iron (Fe) | 2023/07/21 | 100 | 80 - 120 | 100 | 80 - 120 | <10 | ug/L | 0.0095 (1) | 20 |
| B042401 | Total Lead (Pb) | 2023/07/21 | 95 | 80 - 120 | 98 | 80 - 120 | <0.20 | ug/L | NC (1) | 20 |
| B042401 | Total Lithium (Li) | 2023/07/21 | 93 | 80 - 120 | 95 | 80 - 120 | <2.0 | ug/L | | |
| B042401 | Total Manganese (Mn) | 2023/07/21 | 97 | 80 - 120 | 100 | 80 - 120 | <1.0 | ug/L | 2.4 (1) | 20 |
| B042401 | Total Molybdenum (Mo) | 2023/07/21 | NC | 80 - 120 | 101 | 80 - 120 | <1.0 | ug/L | 0.84 (1) | 20 |
| B042401 | Total Nickel (Ni) | 2023/07/21 | 94 | 80 - 120 | 99 | 80 - 120 | <1.0 | ug/L | 3.7 (1) | 20 |
| B042401 | Total Phosphorus (P) | 2023/07/21 | 104 | 80 - 120 | 103 | 80 - 120 | <10 | ug/L | | |
| B042401 | Total Selenium (Se) | 2023/07/21 | 98 | 80 - 120 | 101 | 80 - 120 | <0.10 | ug/L | 1.9 (1) | 20 |
| B042401 | Total Silicon (Si) | 2023/07/21 | NC | 80 - 120 | 113 | 80 - 120 | <100 | ug/L | | |
| B042401 | Total Silver (Ag) | 2023/07/21 | 99 | 80 - 120 | 100 | 80 - 120 | <0.020 | ug/L | NC (1) | 20 |
| B042401 | Total Strontium (Sr) | 2023/07/21 | NC | 80 - 120 | 99 | 80 - 120 | <1.0 | ug/L | | |
| B042401 | Total Thallium (Tl) | 2023/07/21 | 97 | 80 - 120 | 101 | 80 - 120 | <0.010 | ug/L | | |
| B042401 | Total Tin (Sn) | 2023/07/21 | 99 | 80 - 120 | 101 | 80 - 120 | <5.0 | ug/L | | |
| B042401 | Total Titanium (Ti) | 2023/07/21 | 101 | 80 - 120 | 102 | 80 - 120 | <5.0 | ug/L | | |
| B042401 | Total Uranium (U) | 2023/07/21 | 102 | 80 - 120 | 103 | 80 - 120 | <0.10 | ug/L | | |
| B042401 | Total Vanadium (V) | 2023/07/21 | 98 | 80 - 120 | 100 | 80 - 120 | <5.0 | ug/L | | |
| B042401 | Total Zinc (Zn) | 2023/07/21 | 97 | 80 - 120 | 101 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |
| B042401 | Total Zirconium (Zr) | 2023/07/21 | 101 | 80 - 120 | 98 | 80 - 120 | <0.10 | ug/L | | |
| B042658 | pH | 2023/07/21 | | | 100 | 97 - 103 | | | 0.096 (1) | N/A |
| B042663 | Conductivity | 2023/07/21 | | | 100 | 90 - 110 | <2.0 | uS/cm | 0.27 (1) | 10 |
| B042664 | Alkalinity (PP as CaCO3) | 2023/07/21 | | | | | <1.0 | mg/L | NC (1) | 20 |
| B042664 | Alkalinity (Total as CaCO3) | 2023/07/21 | | | 98 | 80 - 120 | <1.0 | mg/L | 0.36 (1) | 20 |
| B042664 | Bicarbonate (HCO3) | 2023/07/21 | | | | | <1.0 | mg/L | 0.36 (1) | 20 |
| B042664 | Carbonate (CO3) | 2023/07/21 | | | | | <1.0 | mg/L | NC (1) | 20 |
| B042664 | Hydroxide (OH) | 2023/07/21 | | | | | <1.0 | mg/L | NC (1) | 20 |
| B042667 | Orthophosphate (P) | 2023/07/21 | 111 | 80 - 120 | 107 | 80 - 120 | <0.0030 | mg/L | NC (1) | 20 |
| B043056 | Nitrate plus Nitrite (N) | 2023/07/21 | 98 (2) | 80 - 120 | 107 | 80 - 120 | <0.020 | mg/L | NC (3) | 25 |
| B043059 | Nitrite (N) | 2023/07/21 | 96 (2) | 80 - 120 | 103 | 80 - 120 | <0.0050 | mg/L | NC (3) | 20 |
| B043887 | Total Sulphide | 2023/07/24 | NC | 80 - 120 | 100 | 80 - 120 | <0.0018 | mg/L | | |
| B045215 | Total Dissolved Solids | 2023/07/25 | 101 | 80 - 120 | 108 | 80 - 120 | <10 | mg/L | 3.3 (1) | 20 |
| B045377 | Total Mercury (Hg) | 2023/07/25 | 86 | 80 - 120 | 104 | 80 - 120 | <0.0019 | ug/L | NC (1) | 20 |

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B046614 | Total Ammonia (N) | 2023/07/25 | 124 (4) | 80 - 120 | 109 | 80 - 120 | <0.015 | mg/L | NC (1) | 20 |
| B046927 | Chloride (Cl) | 2023/07/25 | NC (2) | 80 - 120 | 101 | 80 - 120 | <1.0 | mg/L | 0.82 (3) | 20 |
| B046927 | Sulphate (SO4) | 2023/07/25 | NC (2) | 80 - 120 | 105 | 80 - 120 | <1.0 | mg/L | 0.13 (3) | 20 |
| B048276 | Dissolved Calcium (Ca) | 2023/07/26 | NC (5) | 80 - 120 | 100 | 80 - 120 | <0.050 | mg/L | 2.3 (6) | 20 |
| B048276 | Dissolved Magnesium (Mg) | 2023/07/26 | NC (5) | 80 - 120 | 108 | 80 - 120 | <0.050 | mg/L | 0.81 (6) | 20 |

N/A = Not Applicable

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

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

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

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

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

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

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Duplicate Parent ID

(2) Matrix Spike Parent ID [BUZ206-03]

(3) Duplicate Parent ID [BUZ206-03]

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

(5) Matrix Spike Parent ID [BUZ206-07]

(6) Duplicate Parent ID [BUZ206-07]



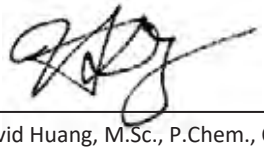
Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354963
Report Date: 2023/08/04

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:



David Huang, M.Sc., P.Chem., QP, Scientific Services Manager

Suwan (Sze Yeung) Fock, B.Sc., Scientific Specialist

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by {0}, {1} responsible for {2} {3} laboratory operations.



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

C354963_ACTR

Maxxam

# ADDITIONAL COOLER TEMPERATURE RECORD

## CHAIN-OF-CUSTODY RECORD

| CHAIN OF CUSTODY # | |
|---|---|
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |

COOLER OBSERVATIONS

| CUSTODY SEAL | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| PRESENT | ✓ | | TEMP | 1 | 2 | 3 |
| INTACT | ✓ | | | 0 | 9 | 4 |
| ICE PRESENT | ✓ | | | | | |

| CUSTODY SEAL | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| PRESENT | ✓ | | TEMP | 1 | 2 | 3 |
| INTACT | ✓ | | | 9 | 4 | 6 |
| ICE PRESENT | ✓ | | | | | |

| CUSTODY SEAL | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| PRESENT | | | TEMP | 1 | 2 | 3 |
| INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| CUSTODY SEAL | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| PRESENT | | | TEMP | 1 | 2 | 3 |
| INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| CUSTODY SEAL | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| PRESENT | | | TEMP | 1 | 2 | 3 |
| INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| CUSTODY SEAL | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| PRESENT | | | TEMP | 1 | 2 | 3 |
| INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| CUSTODY SEAL | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| PRESENT | | | TEMP | 1 | 2 | 3 |
| INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| CUSTODY SEAL | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| PRESENT | | | TEMP | 1 | 2 | 3 |
| INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| CUSTODY SEAL | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| PRESENT | | | TEMP | 1 | 2 | 3 |
| INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| CUSTODY SEAL | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| PRESENT | | | TEMP | 1 | 2 | 3 |
| INTACT | | | | | | |
| ICE PRESENT | | | | | | |

MAXXAM JOB#:

| CUSTODY SEAL | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| PRESENT | | | TEMP | 1 | 2 | 3 |
| INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| CUSTODY SEAL | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| PRESENT | | | TEMP | 1 | 2 | 3 |
| INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| CUSTODY SEAL | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| PRESENT | | | TEMP | 1 | 2 | 3 |
| INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| CUSTODY SEAL | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| PRESENT | | | TEMP | 1 | 2 | 3 |
| INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| CUSTODY SEAL | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| PRESENT | | | TEMP | 1 | 2 | 3 |
| INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| CUSTODY SEAL | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| PRESENT | | | TEMP | 1 | 2 | 3 |
| INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| CUSTODY SEAL | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| PRESENT | | | TEMP | 1 | 2 | 3 |
| INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| CUSTODY SEAL | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| PRESENT | | | TEMP | 1 | 2 | 3 |
| INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| CUSTODY SEAL | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| PRESENT | | | TEMP | 1 | 2 | 3 |
| INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| CUSTODY SEAL | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| PRESENT | | | TEMP | 1 | 2 | 3 |
| INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| RECEIVED BY (SIGN & PRINT) | | DATE (YYYY/MM/DD) | TIME (HH:MM) |
|---|---|---|---|
| | EDELANE CAO/L | 2023/07/20 | 0820 |

Bureau Veritas
4606 Canada Way, Burnaby, British Columbia Canada V5G 1K5. Tel (604) 734-7276. Toll-free 800 563-6266. Fax (604) 731-2386 www.bvna.com

Page 1 of 2

# Chain Of Custody Record

| INVOICE TO: | | Report Information | | Project Information | | Laboratory Use Only | |
|---|---|---|---|---|---|---|---|
| Company Name | #163 GHD Limited | Company Name: | GHD Limited | Quotation #: | C30090 | Bureau Veritas Job # | Bottle Order #: |
| Contact Name | AP Invoices - 735 | Contact Name: | Stephanie Berton | P.O. #: | 735-002640-3 | | 694571 |
| Address | 455 PHILLIP STREET<br>WATERLOO ON N2L 3X2 | Address: | | Project #: | 11222680-15.1 | Chain Of Custody Record | Project Manager |
| Phone | (519) 884-0510 Fax (519) 725-1394 | Phone: | Fax: | Project Name: | upland | C#694571-01-01 | Brody Anderson |
| Email: | APinvoices-735@ghd.com | Email: | NationalEDDSupport@maxxam.ca;stephanie.berton@g | Sites #: | Leachate Water | | |
| | | | | Sampled By: | K Hosler | | |

Regulatory Criteria: [X] CUR [ ] CCME [ ] BC Water Quality [ ] Other: _____

Special Instructions: Bottles filed filtered and preserved as indicated on bottle.

**SAMPLES MUST BE KEPT COOL ( < 10°C ) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS**

Turnaround Time (TAT) Required

Please provide advance notice for rush projects

Regular (Standard) TAT: [ ]
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests
Please Note: Standard TAT for certain tests such as BOD and Dissolved Metals are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission): 1 DAY [X] 2 Day [X] 3 Day [ ] Date Required: _____ [ ]
Rush Confirmation Number: per PO (call lab for #)

| | Sample Barcode Label | Sample (Location) Identification | Date Sampled | Time Sampled | Matrix | # of Bottles | Metals Field Filtered (Y/N) | Conductivity, Cl, SO4, NO2, NO3, N+N, PO4, TDS, TSS, Sp Alk | Total Sulphide, Total H2S, Un-ionized (as H2S) - based on total | Ammonia-N (Total) | Total Metals with CV Hg (NO HARDNESS) | Biochemical Oxygen Demand (TOTAL) BOD5 | COD + CO3 + HCO3 + OH + Alkalinity @ 25C (PP) | Dissolved Hardness | LEPH/HEPH with subtracted PAHs | Field pH | Field Temperature | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | WL-11222680-180723-KH-01 | 18/07/23 | 1650 | W | | X | X | X | X | X | X | X | X | X | 6.32 | 24.04 | |
| 2 | | WL-11222680-180723-KH-02 | 18/07/23 | 1700 | W | | X | X | X | X | X | X | X | X | X | 6.32 | 24.04 | |
| 3 | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | |

C354963_COC

| * RELINQUISHED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | RECEIVED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | # jars used and not submitted | Lab Use Only: Field Sealed | Temperature (°C) on Receipt | Custody Seal Intact on Cooler? |
|---|---|---|---|---|---|---|---|---|---|
| Kathleen Hosler | 18/07/23 | 1800 | [signature] NLE EDBLANE CAOILI | 23 07 19 | 11:02 | | [ ] | 3, 5, 2 | [ ] Yes [ ] No |

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

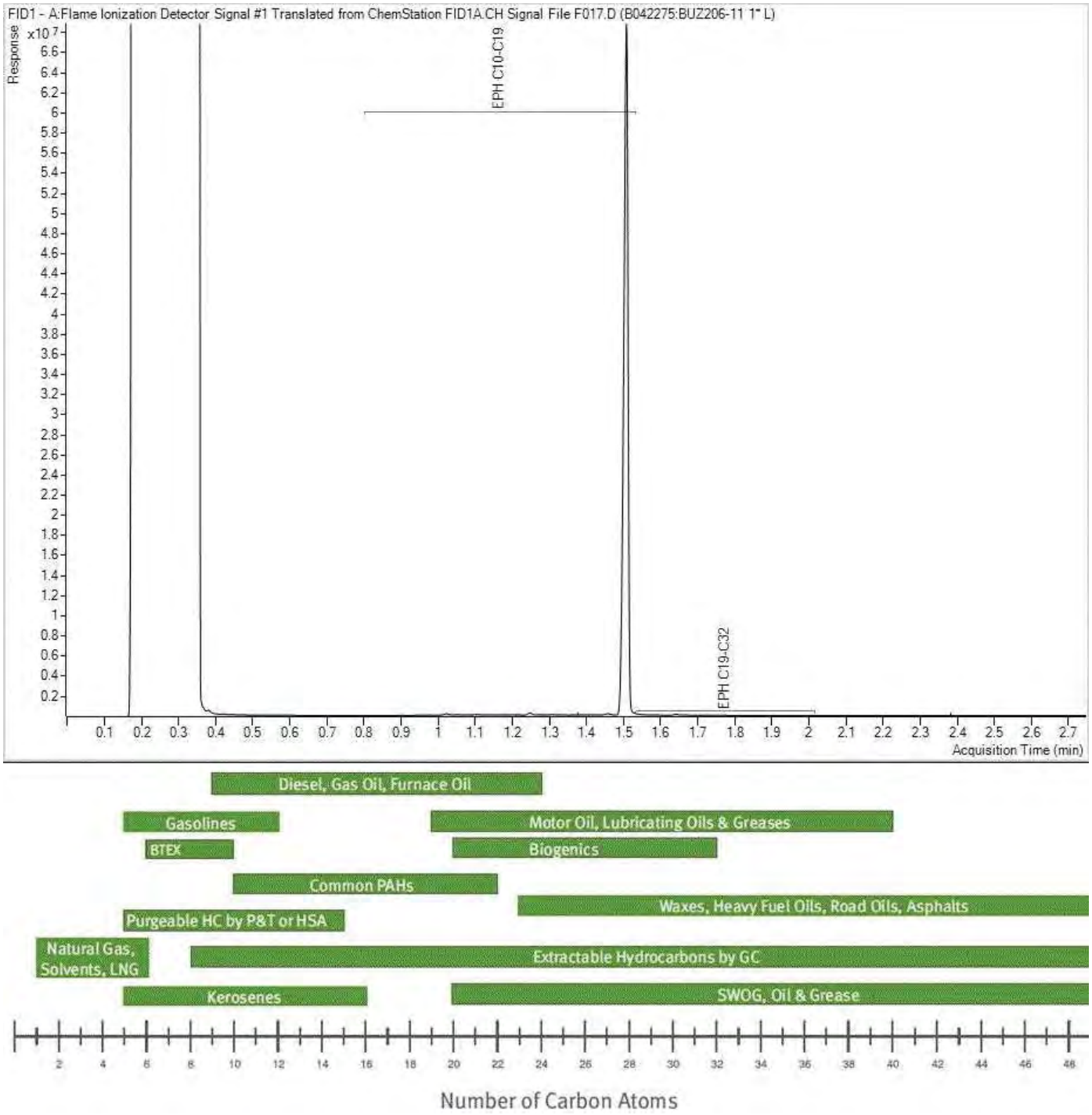
7, 2, 5
Ice-yes

REACTR for BBY temps

Bureau Veritas Job #: C354963
Report Date: 2023/08/04
Bureau Veritas Sample: BUZ206

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WL-11222680-180723-KH-01

**EPH in Water when PAH required Chromatogram**

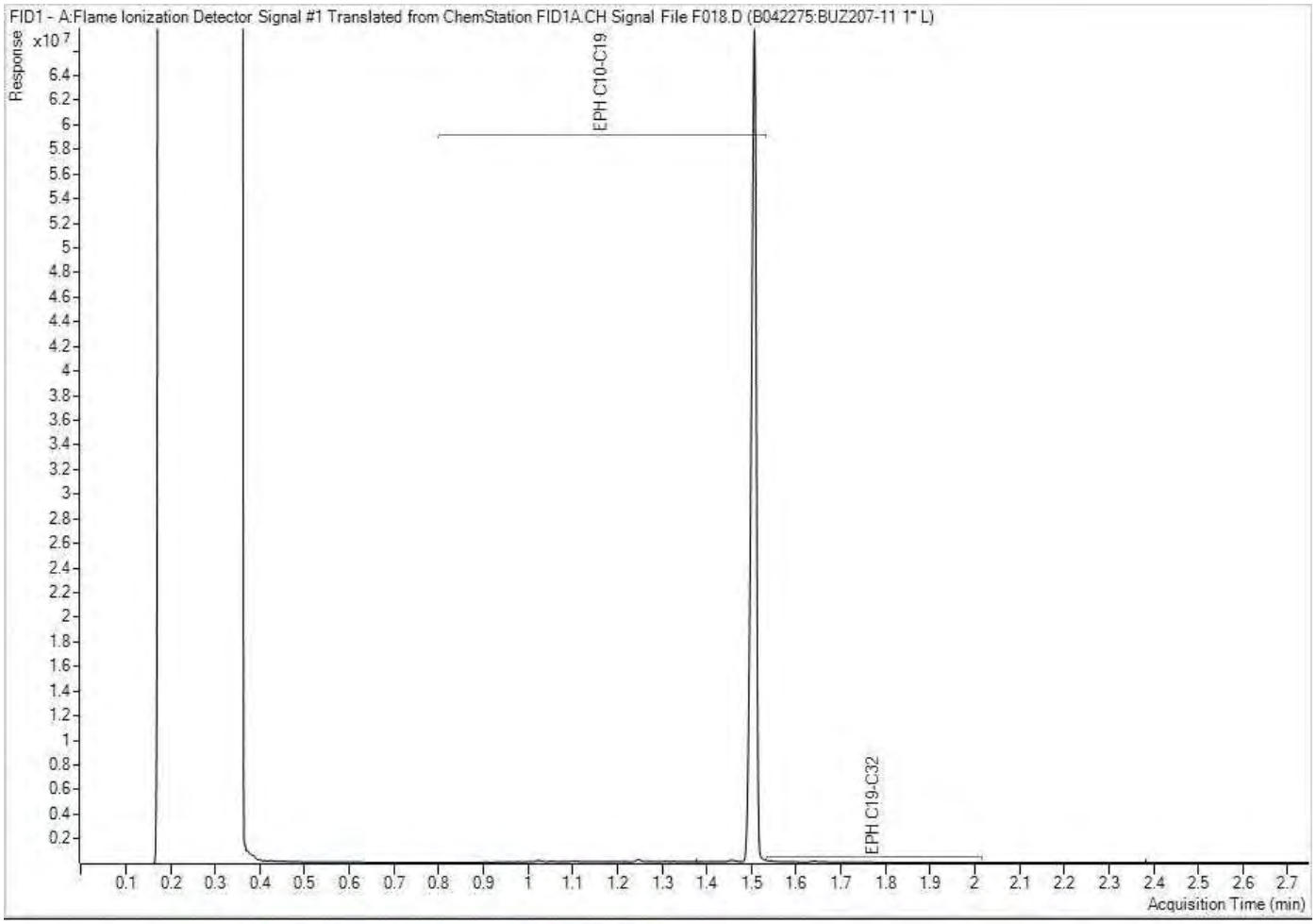


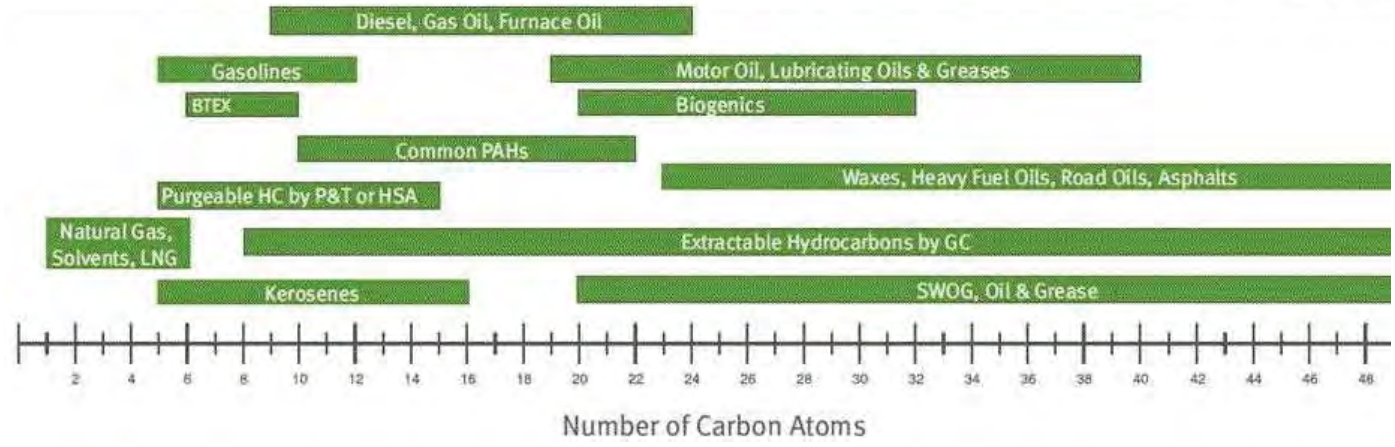

**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

Bureau Veritas Job #: C354963
Report Date: 2023/08/04
Bureau Veritas Sample: BUZ207

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WL-11222680-180723-KH-02

**EPH in Water when PAH required Chromatogram**




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

Your P.O. #: 735-002640-3
Your Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your C.O.C. #: 694569-02-01

**Attention: Stephanie Berton**

GHD Limited
455 PHILLIP STREET
WATERLOO, ON
CANADA N2L 3X2

**Report Date: 2023/07/28**
Report #: R3373120
Version: 2 - Final

# CERTIFICATE OF ANALYSIS

**BUREAU VERITAS JOB #: C354973**
**Received: 2023/07/19, 11:02**

Sample Matrix: Water
# Samples Received: 7

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Analytical Method |
|---|---|---|---|---|---|
| Alkalinity @25C (pp, total), CO3,HCO3,OH | 6 | N/A | 2023/07/20 | BBY6SOP-00026 | SM 24 2320 B m |
| Alkalinity @25C (pp, total), CO3,HCO3,OH | 1 | N/A | 2023/07/28 | BBY6SOP-00026 | SM 24 2320 B m |
| Chloride/Sulphate by Auto Colourimetry | 2 | N/A | 2023/07/24 | BBY6SOP-00011 / BBY6SOP-00017 | SM24-4500-Cl/SO4-E m |
| Chloride/Sulphate by Auto Colourimetry | 4 | N/A | 2023/07/25 | BBY6SOP-00011 / BBY6SOP-00017 | SM24-4500-Cl/SO4-E m |
| Chloride/Sulphate by Auto Colourimetry | 1 | N/A | 2023/07/27 | BBY6SOP-00011 / BBY6SOP-00017 | SM24-4500-Cl/SO4-E m |
| Conductivity @25C | 6 | N/A | 2023/07/20 | BBY6SOP-00026 | SM 24 2510 B m |
| Conductivity @25C | 1 | N/A | 2023/07/28 | BBY6SOP-00026 | SM 24 2510 B m |
| Sulphide (as H2S) (1) | 7 | N/A | 2023/07/25 | | Auto Calc |
| Un-ionized Hydrogen Sulphide as S Calc (1) | 7 | N/A | 2023/07/25 | | |
| Hardness (calculated as CaCO3) | 6 | N/A | 2023/07/24 | BBY WI-00033 | Auto Calc |
| Hardness (calculated as CaCO3) | 1 | N/A | 2023/07/27 | BBY WI-00033 | Auto Calc |
| Mercury (Dissolved) by CV (2) | 7 | 2023/07/27 | 2023/07/28 | AB SOP-00084 | BCMOE BCLM Oct2013 m |
| EPH in Water when PAH required | 2 | 2023/07/21 | 2023/07/21 | BBY8SOP-00029 | BCMOE BCLM Sep2017 m |
| EPH in Water when PAH required | 5 | 2023/07/24 | 2023/07/24 | BBY8SOP-00029 | BCMOE BCLM Sep2017 m |
| Na, K, Ca, Mg, S by CRC ICPMS (diss.) | 6 | N/A | 2023/07/24 | BBY WI-00033 | Auto Calc |
| Na, K, Ca, Mg, S by CRC ICPMS (diss.) | 1 | N/A | 2023/07/27 | BBY WI-00033 | Auto Calc |
| Elements by CRC ICPMS (dissolved) (2) | 6 | N/A | 2023/07/22 | BBY7SOP-00002 | EPA 6020b R2 m |
| Elements by CRC ICPMS (dissolved) (2) | 1 | N/A | 2023/07/26 | BBY7SOP-00002 | EPA 6020b R2 m |
| Ammonia-N (Total) | 7 | N/A | 2023/07/25 | AB SOP-00007 | SM 24 4500 NH3 A G m |
| Nitrate + Nitrite (N) | 6 | N/A | 2023/07/20 | BBY6SOP-00010 | SM 23 4500-NO3- I m |
| Nitrate + Nitrite (N) | 1 | N/A | 2023/07/27 | BBY6SOP-00010 | SM 23 4500-NO3- I m |
| Nitrite (N) by CFA | 6 | N/A | 2023/07/20 | BBY6SOP-00010 | SM 23 4500-NO3- I m |
| Nitrite (N) by CFA | 1 | N/A | 2023/07/27 | BBY6SOP-00010 | SM 23 4500-NO3- I m |
| Nitrogen - Nitrate (as N) | 6 | N/A | 2023/07/21 | BBY WI-00033 | Auto Calc |
| Nitrogen - Nitrate (as N) | 1 | N/A | 2023/07/27 | BBY WI-00033 | Auto Calc |
| PAH in Water by GC/MS (SIM) | 2 | 2023/07/21 | 2023/07/22 | BBY8SOP-00021 | BCMOE BCLM Jul2017m |
| PAH in Water by GC/MS (SIM) | 5 | 2023/07/24 | 2023/07/24 | BBY8SOP-00021 | BCMOE BCLM Jul2017m |
| pH @25°C (3) | 5 | N/A | 2023/07/20 | BBY6SOP-00026 | SM 24 4500-H+ B m |
| pH @25°C (3) | 1 | N/A | 2023/07/21 | BBY6SOP-00026 | SM 24 4500-H+ B m |

Your P.O. #: 735-002640-3
Your Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your C.O.C. #: 694569-02-01

**Attention: Stephanie Berton**

GHD Limited
455 PHILLIP STREET
WATERLOO, ON
CANADA N2L 3X2

**Report Date: 2023/07/28**
Report #: R3373120
Version: 2 - Final

# CERTIFICATE OF ANALYSIS

**BUREAU VERITAS JOB #: C354973**
**Received: 2023/07/19, 11:02**

Sample Matrix: Water
# Samples Received: 7

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Analytical Method |
|---|---|---|---|---|---|
| pH @25°C (3) | 1 | N/A | 2023/07/28 | BBY6SOP-00026 | SM 24 4500-H+ B m |
| Orthophosphate by Konelab (4) | 6 | N/A | 2023/07/20 | BBY6SOP-00013 | SM 24 4500-P E m |
| Orthophosphate by Konelab (4) | 1 | N/A | 2023/07/27 | BBY6SOP-00013 | SM 24 4500-P E m |
| Total Sulphide (1) | 7 | N/A | 2023/07/25 | AB SOP-00080 | SM 23 4500 S2-A D Fm |
| Total Dissolved Solids (Filt. Residue) | 3 | 2023/07/21 | 2023/07/24 | BBY6SOP-00033 | SM 24 2540 C m |
| Total Dissolved Solids (Filt. Residue) | 4 | 2023/07/24 | 2023/07/25 | BBY6SOP-00033 | SM 24 2540 C m |
| EPH less PAH in Water by GC/FID (5) | 2 | N/A | 2023/07/24 | BBY WI-00033 | Auto Calc |
| EPH less PAH in Water by GC/FID (5) | 3 | N/A | 2023/07/25 | BBY WI-00033 | Auto Calc |
| EPH less PAH in Water by GC/FID (5) | 2 | N/A | 2023/07/26 | BBY WI-00033 | Auto Calc |
| Field pH | 7 | N/A | 2023/07/20 | | |
| Field Temperature | 7 | N/A | 2023/07/20 | | |

**Remarks:**

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Bureau Veritas Calgary, 4000 - 19 St. , Calgary, AB, T2E 6P8

Your P.O. #: 735-002640-3
Your Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your C.O.C. #: 694569-02-01

**Attention: Stephanie Berton**

GHD Limited
455 PHILLIP STREET
WATERLOO, ON
CANADA N2L 3X2

**Report Date: 2023/07/28**
Report #: R3373120
Version: 2 - Final

# CERTIFICATE OF ANALYSIS

**BUREAU VERITAS JOB #: C354973**

**Received: 2023/07/19, 11:02**

(2) Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.
(3) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Bureau Veritas endeavours to analyze samples as soon as possible after receipt.
(4) Orthophosphate > Total Phosphorus Imbalance: When applicable, Orthophosphate, Total Phosphorus and dissolved Phosphorus results were reviewed and data quality meets acceptable levels unless otherwise noted.
(5) LEPH = EPH (C10 to C19) - (Acenaphthene + Acridine + Anthracene + Fluorene + Naphthalene + Phenanthrene)
HEPH = EPH (C19 to C32) - (Benzo(a)anthracene + Benzo(a)pyrene + Fluoranthene + Pyrene)

Encryption Key

AUTHORIZED REPORT
RAPPORT AUTORISÉ

Bureau Veritas
28 Jul 2023 19:11:23

Please direct all questions regarding this Certificate of Analysis to:
Brody Andersen, B.Sc., B.Sc., Program Specialist–Emergency Spill Response
Email: Brody.Andersen@bureauveritas.com
Phone# (780)577-7120

==========

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Raphael Kwan, Senior Manager, BC and Yukon Regions responsible for British Columbia Environmental laboratory operations.

Bureau Veritas Job #: C354973
Report Date: 2023/07/28

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | BUZ261 | BUZ261 | | BUZ262 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/07/18 10:40 | 2023/07/18 10:40 | | 2023/07/18 12:10 | | |
| COC Number | | 694569-02-01 | 694569-02-01 | | 694569-02-01 | | |
| | UNITS | WG-11222680-180723 -KH-05 | WG-11222680-180723 -KH-05 Lab-Dup | QC Batch | WG-11222680-180723 -KH-06 | RDL | QC Batch |
| **ANIONS** | | | | | | | |
| Nitrite (N) | mg/L | <0.0050 | N/A | B041712 | 0.0055 | 0.0050 | B050812 |
| **Calculated Parameters** | | | | | | | |
| Nitrate (N) | mg/L | 0.365 | N/A | B040742 | 0.190 | 0.020 | B049848 |
| Sulphide (as H2S) | mg/L | <0.0020 | N/A | B040445 | <0.0020 | 0.0020 | B040445 |
| **Field Parameters** | | | | | | | |
| Field pH | pH | 7.70 | N/A | ONSITE | 7.65 | N/A | ONSITE |
| Field Temperature | °C | 16.92 | N/A | ONSITE | 16.90 | N/A | ONSITE |
| **Misc. Inorganics** | | | | | | | |
| Conductivity | uS/cm | 220 | N/A | B041769 | 130 | 2.0 | B050736 |
| pH | pH | 7.76 | N/A | B041758 | 7.15 | N/A | B050725 |
| Total Dissolved Solids | mg/L | 130 | N/A | B042634 | 54 | 10 | B042634 |
| **Anions** | | | | | | | |
| Alkalinity (PP as CaCO3) | mg/L | <1.0 | N/A | B041770 | <1.0 | 1.0 | B050737 |
| Alkalinity (Total as CaCO3) | mg/L | 74 | N/A | B041770 | 41 | 1.0 | B050737 |
| Bicarbonate (HCO3) | mg/L | 90 | N/A | B041770 | 50 | 1.0 | B050737 |
| Carbonate (CO3) | mg/L | <1.0 | N/A | B041770 | <1.0 | 1.0 | B050737 |
| Hydroxide (OH) | mg/L | <1.0 | N/A | B041770 | <1.0 | 1.0 | B050737 |
| Total Sulphide | mg/L | <0.0018 | <0.0018 | B046711 | <0.0018 (1) | 0.0018 | B046711 |
| Chloride (Cl) | mg/L | 16 | N/A | B045835 | 12 | 1.0 | B050697 |
| Sulphate (SO4) | mg/L | 6.6 | N/A | B045835 | 3.1 | 1.0 | B050697 |
| **Nutrients** | | | | | | | |
| Total Ammonia (N) | mg/L | <0.015 | N/A | B046614 | <0.015 | 0.015 | B046614 |
| Orthophosphate (P) | mg/L | 0.0099 | N/A | B041593 | 0.0040 | 0.0030 | B050548 |
| Nitrate plus Nitrite (N) | mg/L | 0.365 | N/A | B041707 | 0.195 | 0.020 | B050809 |

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Matrix spike exceeds acceptance limits due to matrix interference.



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354973
Report Date: 2023/07/28

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | BUZ262 | | BUZ263 | | BUZ264 | | |
|---|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/07/18 12:10 | | 2023/07/18 13:45 | | 2023/07/18 14:00 | | |
| COC Number | | 694569-02-01 | | 694569-02-01 | | 694569-02-01 | | |
| | UNITS | WG-11222680-180723-KH-06 Lab-Dup | QC Batch | WG-11222680-180723-KH-07 | QC Batch | WG-11222680-180723-KH-08 | RDL | QC Batch |
| **ANIONS** | | | | | | | | |
| Nitrite (N) | mg/L | N/A | B050812 | <0.0050 | B041712 | <0.0050 | 0.0050 | B041712 |
| **Calculated Parameters** | | | | | | | | |
| Nitrate (N) | mg/L | N/A | B049848 | 0.720 | B040742 | 0.082 | 0.020 | B040742 |
| Sulphide (as H2S) | mg/L | N/A | B040445 | <0.0020 | B040445 | <0.0020 | 0.0020 | B040445 |
| **Field Parameters** | | | | | | | | |
| Field pH | pH | N/A | ONSITE | 6.99 | ONSITE | 8.59 | N/A | ONSITE |
| Field Temperature | °C | N/A | ONSITE | 14.96 | ONSITE | 15.95 | N/A | ONSITE |
| **Misc. Inorganics** | | | | | | | | |
| Conductivity | uS/cm | N/A | B050736 | 200 | B041769 | 73 | 2.0 | B041769 |
| pH | pH | N/A | B050725 | 7.54 | B041758 | 7.61 | N/A | B041758 |
| Total Dissolved Solids | mg/L | N/A | B042634 | 120 | B042634 | 56 | 10 | B045215 |
| **Anions** | | | | | | | | |
| Alkalinity (PP as CaCO3) | mg/L | N/A | B050737 | <1.0 | B041770 | <1.0 | 1.0 | B041770 |
| Alkalinity (Total as CaCO3) | mg/L | N/A | B050737 | 77 | B041770 | 32 | 1.0 | B041770 |
| Bicarbonate (HCO3) | mg/L | N/A | B050737 | 94 | B041770 | 40 | 1.0 | B041770 |
| Carbonate (CO3) | mg/L | N/A | B050737 | <1.0 | B041770 | <1.0 | 1.0 | B041770 |
| Hydroxide (OH) | mg/L | N/A | B050737 | <1.0 | B041770 | <1.0 | 1.0 | B041770 |
| Total Sulphide | mg/L | N/A | B046711 | <0.0018 | B046711 | <0.0018 | 0.0018 | B046711 |
| Chloride (Cl) | mg/L | 12 | B050697 | 6.3 | B045835 | <1.0 | 1.0 | B045835 |
| Sulphate (SO4) | mg/L | 3.0 | B050697 | 8.4 | B045835 | 2.7 | 1.0 | B045835 |
| **Nutrients** | | | | | | | | |
| Total Ammonia (N) | mg/L | N/A | B046614 | <0.015 | B046614 | <0.015 | 0.015 | B046614 |
| Orthophosphate (P) | mg/L | N/A | B050548 | 0.0035 | B041593 | 0.026 | 0.0030 | B041593 |
| Nitrate plus Nitrite (N) | mg/L | N/A | B050809 | 0.720 | B041707 | 0.082 | 0.020 | B041707 |

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



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354973
Report Date: 2023/07/28

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | BUZ264 | | | BUZ265 | | BUZ266 | | |
|---|---|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/07/18 14:00 | | | 2023/07/18 15:30 | | 2023/07/19 08:30 | | |
| COC Number | | 694569-02-01 | | | 694569-02-01 | | 694569-02-01 | | |
| | UNITS | WG-11222680-180723-KH-08 Lab-Dup | RDL | QC Batch | WG-11222680-180723-KH-09 | RDL | WG-11222680-180723-KH-10 | RDL | QC Batch |
| **ANIONS** | | | | | | | | | |
| Nitrite (N) | mg/L | N/A | 0.0050 | B041712 | <0.0050 | 0.0050 | <0.0050 | 0.0050 | B041712 |
| **Calculated Parameters** | | | | | | | | | |
| Nitrate (N) | mg/L | N/A | 0.020 | B040742 | 2.66 | 0.10 | 0.901 | 0.020 | B040742 |
| Sulphide (as H2S) | mg/L | N/A | 0.0020 | B040445 | <0.0020 | 0.0020 | <0.0020 | 0.0020 | B040445 |
| **Field Parameters** | | | | | | | | | |
| Field pH | pH | N/A | N/A | ONSITE | 7.37 | N/A | 6.99 | N/A | ONSITE |
| Field Temperature | °C | N/A | N/A | ONSITE | 15.26 | N/A | 14.59 | N/A | ONSITE |
| **Misc. Inorganics** | | | | | | | | | |
| Conductivity | uS/cm | N/A | 2.0 | B041769 | 130 | 2.0 | 500 | 2.0 | B041769 |
| pH | pH | N/A | N/A | B041758 | 7.14 | N/A | 7.49 | N/A | B041758 |
| Total Dissolved Solids | mg/L | N/A | 10 | B045215 | 100 | 10 | 370 | 10 | B045215 |
| **Anions** | | | | | | | | | |
| Alkalinity (PP as CaCO3) | mg/L | N/A | 1.0 | B041770 | <1.0 | 1.0 | <1.0 | 1.0 | B041770 |
| Alkalinity (Total as CaCO3) | mg/L | N/A | 1.0 | B041770 | 44 | 1.0 | 94 | 1.0 | B041770 |
| Bicarbonate (HCO3) | mg/L | N/A | 1.0 | B041770 | 54 | 1.0 | 110 | 1.0 | B041770 |
| Carbonate (CO3) | mg/L | N/A | 1.0 | B041770 | <1.0 | 1.0 | <1.0 | 1.0 | B041770 |
| Hydroxide (OH) | mg/L | N/A | 1.0 | B041770 | <1.0 | 1.0 | <1.0 | 1.0 | B041770 |
| Total Sulphide | mg/L | N/A | 0.0018 | B046711 | <0.0018 | 0.0018 | <0.0018 | 0.0018 | B046711 |
| Chloride (Cl) | mg/L | <1.0 | 1.0 | B045835 | 1.9 | 1.0 | 86 | 1.0 | B045835 |
| Sulphate (SO4) | mg/L | 2.6 | 1.0 | B045835 | 8.6 | 1.0 | 6.4 | 1.0 | B045835 |
| **Nutrients** | | | | | | | | | |
| Total Ammonia (N) | mg/L | N/A | 0.015 | B046614 | <0.015 | 0.015 | <0.015 | 0.015 | B046617 |
| Orthophosphate (P) | mg/L | 0.027 | 0.0030 | B041593 | 0.0047 | 0.0030 | 0.0075 | 0.0030 | B041593 |
| Nitrate plus Nitrite (N) | mg/L | N/A | 0.020 | B041707 | 2.66 | 0.10 | 0.901 | 0.020 | B041707 |

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



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354973
Report Date: 2023/07/28

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | BUZ267 | BUZ267 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2023/07/19 09:30 | 2023/07/19 09:30 | | |
| COC Number | | 694569-02-01 | 694569-02-01 | | |
| | UNITS | WG-11222680-180723 -KH-11 | WG-11222680-180723 -KH-11 Lab-Dup | RDL | QC Batch |
| **ANIONS** | | | | | |
| Nitrite (N) | mg/L | <0.0050 | N/A | 0.0050 | B041712 |
| **Calculated Parameters** | | | | | |
| Nitrate (N) | mg/L | <0.020 | N/A | 0.020 | B040742 |
| Sulphide (as H2S) | mg/L | 0.0028 | N/A | 0.0020 | B040445 |
| **Field Parameters** | | | | | |
| Field pH | pH | 0 | N/A | N/A | ONSITE |
| Field Temperature | °C | 0 | N/A | N/A | ONSITE |
| **Misc. Inorganics** | | | | | |
| Conductivity | uS/cm | <2.0 | <2.0 | 2.0 | B041769 |
| pH | pH | 5.48 | 5.47 | N/A | B042566 |
| Total Dissolved Solids | mg/L | <10 | N/A | 10 | B045215 |
| **Anions** | | | | | |
| Alkalinity (PP as CaCO3) | mg/L | <1.0 | <1.0 | 1.0 | B041770 |
| Alkalinity (Total as CaCO3) | mg/L | <1.0 | <1.0 | 1.0 | B041770 |
| Bicarbonate (HCO3) | mg/L | <1.0 | <1.0 | 1.0 | B041770 |
| Carbonate (CO3) | mg/L | <1.0 | <1.0 | 1.0 | B041770 |
| Hydroxide (OH) | mg/L | <1.0 | <1.0 | 1.0 | B041770 |
| Total Sulphide | mg/L | 0.0027 | N/A | 0.0018 | B046711 |
| Chloride (Cl) | mg/L | <1.0 | N/A | 1.0 | B045835 |
| Sulphate (SO4) | mg/L | <1.0 | N/A | 1.0 | B045835 |
| **Nutrients** | | | | | |
| Total Ammonia (N) | mg/L | <0.015 | N/A | 0.015 | B046617 |
| Orthophosphate (P) | mg/L | <0.0030 | N/A | 0.0030 | B041593 |
| Nitrate plus Nitrite (N) | mg/L | <0.020 | N/A | 0.020 | B041707 |

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



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354973
Report Date: 2023/07/28

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## SEMIVOLATILE ORGANICS BY GC-MS (WATER)

| Bureau Veritas ID | | BUZ261 | BUZ262 | | BUZ263 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/07/18 10:40 | 2023/07/18 12:10 | | 2023/07/18 13:45 | | |
| COC Number | | 694569-02-01 | 694569-02-01 | | 694569-02-01 | | |
| | UNITS | WG-11222680-180723-KH-05 | WG-11222680-180723-KH-06 | QC Batch | WG-11222680-180723-KH-07 | RDL | QC Batch |
| **Polycyclic Aromatics** | | | | | | | |
| Naphthalene | ug/L | <0.10 | <0.10 | B042787 | <0.10 | 0.10 | B044779 |
| Acenaphthene | ug/L | <0.050 | <0.050 | B042787 | <0.050 | 0.050 | B044779 |
| Fluorene | ug/L | <0.050 | <0.050 | B042787 | <0.050 | 0.050 | B044779 |
| Phenanthrene | ug/L | <0.050 | <0.050 | B042787 | <0.050 | 0.050 | B044779 |
| Anthracene | ug/L | <0.010 | <0.010 | B042787 | <0.010 | 0.010 | B044779 |
| Acridine | ug/L | <0.050 | <0.050 | B042787 | <0.050 | 0.050 | B044779 |
| Fluoranthene | ug/L | <0.020 | <0.020 | B042787 | <0.020 | 0.020 | B044779 |
| Pyrene | ug/L | <0.020 | <0.020 | B042787 | <0.020 | 0.020 | B044779 |
| Benzo(a)anthracene | ug/L | <0.010 | <0.010 | B042787 | <0.010 | 0.010 | B044779 |
| Benzo(a)pyrene | ug/L | <0.0050 | <0.0050 | B042787 | <0.0050 | 0.0050 | B044779 |
| **Surrogate Recovery (%)** | | | | | | | |
| D10-ANTHRACENE (sur.) | % | 83 | 85 | B042787 | 91 | N/A | B044779 |
| D8-ACENAPHTHYLENE (sur.) | % | 83 | 84 | B042787 | 90 | N/A | B044779 |
| D8-NAPHTHALENE (sur.) | % | 74 | 76 | B042787 | 84 | N/A | B044779 |
| TERPHENYL-D14 (sur.) | % | 78 | 78 | B042787 | 79 | N/A | B044779 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354973
Report Date: 2023/07/28

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## SEMIVOLATILE ORGANICS BY GC-MS (WATER)

| Bureau Veritas ID | | BUZ264 | | BUZ265 | BUZ266 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/07/18 14:00 | | 2023/07/18 15:30 | 2023/07/19 08:30 | | |
| COC Number | | 694569-02-01 | | 694569-02-01 | 694569-02-01 | | |
| | UNITS | WG-11222680-180723-KH-08 | QC Batch | WG-11222680-180723-KH-09 | WG-11222680-180723-KH-10 | RDL | QC Batch |
| **Polycyclic Aromatics** | | | | | | | |
| Naphthalene | ug/L | <0.10 | B044779 | <0.10 | <0.10 | 0.10 | B045204 |
| Acenaphthene | ug/L | <0.050 | B044779 | <0.050 | <0.050 | 0.050 | B045204 |
| Fluorene | ug/L | <0.050 | B044779 | <0.050 | <0.050 | 0.050 | B045204 |
| Phenanthrene | ug/L | <0.050 | B044779 | <0.050 | <0.050 | 0.050 | B045204 |
| Anthracene | ug/L | <0.010 | B044779 | <0.010 | <0.010 | 0.010 | B045204 |
| Acridine | ug/L | <0.050 | B044779 | <0.050 | <0.050 | 0.050 | B045204 |
| Fluoranthene | ug/L | <0.020 | B044779 | <0.020 | <0.020 | 0.020 | B045204 |
| Pyrene | ug/L | <0.020 | B044779 | <0.020 | 0.030 | 0.020 | B045204 |
| Benzo(a)anthracene | ug/L | <0.010 | B044779 | <0.010 | <0.010 | 0.010 | B045204 |
| Benzo(a)pyrene | ug/L | <0.0050 | B044779 | <0.0050 | 0.013 (1) | 0.0050 | B045204 |
| **Surrogate Recovery (%)** | | | | | | | |
| D10-ANTHRACENE (sur.) | % | 91 | B044779 | 94 | 90 | N/A | B045204 |
| D8-ACENAPHTHYLENE (sur.) | % | 89 | B044779 | 91 | 91 | N/A | B045204 |
| D8-NAPHTHALENE (sur.) | % | 82 | B044779 | 76 | 72 | N/A | B045204 |
| TERPHENYL-D14 (sur.) | % | 79 | B044779 | 103 | 96 | N/A | B045204 |

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Tentatively identified result and may be potentially biased high due to matrix interference.



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## SEMIVOLATILE ORGANICS BY GC-MS (WATER)

| Bureau Veritas ID | | BUZ267 | | |
|---|---|---|---|---|
| Sampling Date | | 2023/07/19 09:30 | | |
| COC Number | | 694569-02-01 | | |
| | UNITS | WG-11222680-180723 -KH-11 | RDL | QC Batch |
| **Polycyclic Aromatics** | | | | |
| Naphthalene | ug/L | <0.10 | 0.10 | B045204 |
| Acenaphthene | ug/L | <0.050 | 0.050 | B045204 |
| Fluorene | ug/L | <0.050 | 0.050 | B045204 |
| Phenanthrene | ug/L | <0.050 | 0.050 | B045204 |
| Anthracene | ug/L | <0.010 | 0.010 | B045204 |
| Acridine | ug/L | <0.050 | 0.050 | B045204 |
| Fluoranthene | ug/L | <0.020 | 0.020 | B045204 |
| Pyrene | ug/L | <0.020 | 0.020 | B045204 |
| Benzo(a)anthracene | ug/L | <0.010 | 0.010 | B045204 |
| Benzo(a)pyrene | ug/L | <0.0050 | 0.0050 | B045204 |
| **Surrogate Recovery (%)** | | | | |
| D10-ANTHRACENE (sur.) | % | 92 | N/A | B045204 |
| D8-ACENAPHTHYLENE (sur.) | % | 88 | N/A | B045204 |
| D8-NAPHTHALENE (sur.) | % | 67 | N/A | B045204 |
| TERPHENYL-D14 (sur.) | % | 100 | N/A | B045204 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354973
Report Date: 2023/07/28

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## TOTAL PETROLEUM HYDROCARBONS (WATER)

| Bureau Veritas ID | | BUZ261 | BUZ262 | | BUZ263 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/07/18 10:40 | 2023/07/18 12:10 | | 2023/07/18 13:45 | | |
| COC Number | | 694569-02-01 | 694569-02-01 | | 694569-02-01 | | |
| | UNITS | WG-11222680-180723-KH-05 | WG-11222680-180723-KH-06 | QC Batch | WG-11222680-180723-KH-07 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | | |
| LEPH (C10-C19 less PAH) | mg/L | <0.20 | <0.20 | B041128 | <0.20 | 0.20 | B041128 |
| HEPH (C19-C32 less PAH) | mg/L | <0.20 | <0.20 | B041128 | <0.20 | 0.20 | B041128 |
| **Ext. Pet. Hydrocarbon** | | | | | | | |
| EPH (C10-C19) | mg/L | <0.20 | <0.20 | B042796 | <0.20 | 0.20 | B044780 |
| EPH (C19-C32) | mg/L | <0.20 | <0.20 | B042796 | <0.20 | 0.20 | B044780 |
| **Surrogate Recovery (%)** | | | | | | | |
| O-TERPHENYL (sur.) | % | 98 | 96 | B042796 | 97 | N/A | B044780 |

RDL = Reportable Detection Limit
N/A = Not Applicable

| Bureau Veritas ID | | BUZ264 | | BUZ265 | BUZ266 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/07/18 14:00 | | 2023/07/18 15:30 | 2023/07/19 08:30 | | |
| COC Number | | 694569-02-01 | | 694569-02-01 | 694569-02-01 | | |
| | UNITS | WG-11222680-180723-KH-08 | QC Batch | WG-11222680-180723-KH-09 | WG-11222680-180723-KH-10 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | | |
| LEPH (C10-C19 less PAH) | mg/L | <0.20 | B041128 | <0.20 | <0.20 | 0.20 | B041128 |
| HEPH (C19-C32 less PAH) | mg/L | <0.20 | B041128 | <0.20 | 0.29 | 0.20 | B041128 |
| **Ext. Pet. Hydrocarbon** | | | | | | | |
| EPH (C10-C19) | mg/L | <0.20 | B044780 | <0.20 | <0.20 | 0.20 | B045218 |
| EPH (C19-C32) | mg/L | <0.20 | B044780 | <0.20 | 0.29 | 0.20 | B045218 |
| **Surrogate Recovery (%)** | | | | | | | |
| O-TERPHENYL (sur.) | % | 95 | B044780 | 94 | 86 | N/A | B045218 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## TOTAL PETROLEUM HYDROCARBONS (WATER)

| Bureau Veritas ID | | BUZ267 | | |
|---|---|---|---|---|
| Sampling Date | | 2023/07/19 09:30 | | |
| COC Number | | 694569-02-01 | | |
| | UNITS | WG-11222680-180723-KH-11 | RDL | QC Batch |
| **Calculated Parameters** | | | | |
| LEPH (C10-C19 less PAH) | mg/L | <0.20 | 0.20 | B041128 |
| HEPH (C19-C32 less PAH) | mg/L | <0.20 | 0.20 | B041128 |
| **Ext. Pet. Hydrocarbon** | | | | |
| EPH (C10-C19) | mg/L | <0.20 | 0.20 | B045218 |
| EPH (C19-C32) | mg/L | <0.20 | 0.20 | B045218 |
| **Surrogate Recovery (%)** | | | | |
| O-TERPHENYL (sur.) | % | 95 | N/A | B045218 |

RDL = Reportable Detection Limit
N/A = Not Applicable

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## MISCELLANEOUS (WATER)

| Bureau Veritas ID | | BUZ261 | BUZ262 | BUZ263 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2023/07/18 10:40 | 2023/07/18 12:10 | 2023/07/18 13:45 | | |
| COC Number | | 694569-02-01 | 694569-02-01 | 694569-02-01 | | |
| | UNITS | WG-11222680-180723-KH-05 | WG-11222680-180723-KH-06 | WG-11222680-180723-KH-07 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | |
| Total Un-ionized Hydrogen Sulfide as S | mg/L | <0.0050 | <0.0050 | <0.0050 | 0.0050 | B041137 |
| Total Un-ionized Hydrogen Sulfide as H2S | mg/L | <0.0050 | <0.0050 | <0.0050 | 0.0050 | B041137 |
| RDL = Reportable Detection Limit | | | | | | |

| Bureau Veritas ID | | BUZ264 | BUZ265 | BUZ266 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2023/07/18 14:00 | 2023/07/18 15:30 | 2023/07/19 08:30 | | |
| COC Number | | 694569-02-01 | 694569-02-01 | 694569-02-01 | | |
| | UNITS | WG-11222680-180723-KH-08 | WG-11222680-180723-KH-09 | WG-11222680-180723-KH-10 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | |
| Total Un-ionized Hydrogen Sulfide as S | mg/L | <0.0050 | <0.0050 | <0.0050 | 0.0050 | B041137 |
| Total Un-ionized Hydrogen Sulfide as H2S | mg/L | <0.0050 | <0.0050 | <0.0050 | 0.0050 | B041137 |
| RDL = Reportable Detection Limit | | | | | | |

| Bureau Veritas ID | | BUZ267 | | |
|---|---|---|---|---|
| Sampling Date | | 2023/07/19 09:30 | | |
| COC Number | | 694569-02-01 | | |
| | UNITS | WG-11222680-180723-KH-11 | RDL | QC Batch |
| **Calculated Parameters** | | | | |
| Total Un-ionized Hydrogen Sulfide as S | mg/L | <0.0050 | 0.0050 | B041137 |
| Total Un-ionized Hydrogen Sulfide as H2S | mg/L | <0.0050 | 0.0050 | B041137 |
| RDL = Reportable Detection Limit | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354973
Report Date: 2023/07/28

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## CSR D. METALS W/CV HG-DISS (WATER)

| Bureau Veritas ID | | BUZ261 | BUZ261 | | BUZ262 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/07/18 10:40 | 2023/07/18 10:40 | | 2023/07/18 12:10 | | |
| COC Number | | 694569-02-01 | 694569-02-01 | | 694569-02-01 | | |
| | UNITS | WG-11222680-180723-KH-05 | WG-11222680-180723-KH-05 Lab-Dup | QC Batch | WG-11222680-180723-KH-06 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | | |
| Dissolved Hardness (CaCO3) | mg/L | 87.7 | N/A | B040635 | 30.7 | 0.50 | B047969 |
| **Elements** | | | | | | | |
| Dissolved Mercury (Hg) | ug/L | <0.0019 | <0.0019 | B050172 | <0.0019 | 0.0019 | B050172 |
| **Dissolved Metals by ICPMS** | | | | | | | |
| Dissolved Aluminum (Al) | ug/L | <3.0 | N/A | B042783 | 3.6 | 3.0 | B049143 |
| Dissolved Antimony (Sb) | ug/L | <0.50 | N/A | B042783 | <0.50 | 0.50 | B049143 |
| Dissolved Arsenic (As) | ug/L | 0.23 | N/A | B042783 | <0.10 | 0.10 | B049143 |
| Dissolved Barium (Ba) | ug/L | 5.3 | N/A | B042783 | <1.0 | 1.0 | B049143 |
| Dissolved Beryllium (Be) | ug/L | <0.10 | N/A | B042783 | <0.10 | 0.10 | B049143 |
| Dissolved Bismuth (Bi) | ug/L | <1.0 | N/A | B042783 | <1.0 | 1.0 | B049143 |
| Dissolved Boron (B) | ug/L | <50 | N/A | B042783 | <50 | 50 | B049143 |
| Dissolved Cadmium (Cd) | ug/L | <0.010 | N/A | B042783 | <0.010 | 0.010 | B049143 |
| Dissolved Chromium (Cr) | ug/L | <1.0 | N/A | B042783 | <1.0 | 1.0 | B049143 |
| Dissolved Cobalt (Co) | ug/L | <0.20 | N/A | B042783 | <0.20 | 0.20 | B049143 |
| Dissolved Copper (Cu) | ug/L | <0.20 | N/A | B042783 | <0.20 | 0.20 | B049143 |
| Dissolved Iron (Fe) | ug/L | <5.0 | N/A | B042783 | <5.0 | 5.0 | B049143 |
| Dissolved Lead (Pb) | ug/L | <0.20 | N/A | B042783 | <0.20 | 0.20 | B049143 |
| Dissolved Lithium (Li) | ug/L | <2.0 | N/A | B042783 | <2.0 | 2.0 | B049143 |
| Dissolved Manganese (Mn) | ug/L | <1.0 | N/A | B042783 | <1.0 | 1.0 | B049143 |
| Dissolved Molybdenum (Mo) | ug/L | <1.0 | N/A | B042783 | <1.0 | 1.0 | B049143 |
| Dissolved Nickel (Ni) | ug/L | <1.0 | N/A | B042783 | <1.0 | 1.0 | B049143 |
| Dissolved Phosphorus (P) | ug/L | 13 | N/A | B042783 | <10 | 10 | B049143 |
| Dissolved Selenium (Se) | ug/L | 0.19 | N/A | B042783 | <0.10 | 0.10 | B049143 |
| Dissolved Silicon (Si) | ug/L | 8440 | N/A | B042783 | 3810 | 100 | B049143 |
| Dissolved Silver (Ag) | ug/L | <0.020 | N/A | B042783 | <0.020 | 0.020 | B049143 |
| Dissolved Strontium (Sr) | ug/L | 42.3 | N/A | B042783 | 16.1 | 1.0 | B049143 |
| Dissolved Thallium (Tl) | ug/L | <0.010 | N/A | B042783 | <0.010 | 0.010 | B049143 |
| Dissolved Tin (Sn) | ug/L | <5.0 | N/A | B042783 | <5.0 | 5.0 | B049143 |
| Dissolved Titanium (Ti) | ug/L | <5.0 | N/A | B042783 | <5.0 | 5.0 | B049143 |

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



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354973
Report Date: 2023/07/28

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## CSR D. METALS W/CV HG-DISS (WATER)

| Bureau Veritas ID | | BUZ261 | BUZ261 | | BUZ262 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/07/18 10:40 | 2023/07/18 10:40 | | 2023/07/18 12:10 | | |
| COC Number | | 694569-02-01 | 694569-02-01 | | 694569-02-01 | | |
| | UNITS | WG-11222680-180723 -KH-05 | WG-11222680-180723 -KH-05 Lab-Dup | QC Batch | WG-11222680-180723 -KH-06 | RDL | QC Batch |
| Dissolved Uranium (U) | ug/L | <0.10 | N/A | B042783 | <0.10 | 0.10 | B049143 |
| Dissolved Vanadium (V) | ug/L | <5.0 | N/A | B042783 | <5.0 | 5.0 | B049143 |
| Dissolved Zinc (Zn) | ug/L | <5.0 | N/A | B042783 | <5.0 | 5.0 | B049143 |
| Dissolved Zirconium (Zr) | ug/L | <0.10 | N/A | B042783 | <0.10 | 0.10 | B049143 |
| Dissolved Calcium (Ca) | mg/L | 27.8 | N/A | B040637 | 10.1 | 0.050 | B048034 |
| Dissolved Magnesium (Mg) | mg/L | 4.45 | N/A | B040637 | 1.35 | 0.050 | B048034 |
| Dissolved Potassium (K) | mg/L | 0.405 | N/A | B040637 | 0.139 | 0.050 | B048034 |
| Dissolved Sodium (Na) | mg/L | 6.10 | N/A | B040637 | 2.07 | 0.050 | B048034 |
| Dissolved Sulphur (S) | mg/L | <3.0 | N/A | B040637 | <3.0 | 3.0 | B048034 |

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



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354973
Report Date: 2023/07/28

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## CSR D. METALS W/CV HG-DISS (WATER)

| Bureau Veritas ID | | BUZ263 | BUZ264 | BUZ265 | BUZ266 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/07/18 13:45 | 2023/07/18 14:00 | 2023/07/18 15:30 | 2023/07/19 08:30 | | |
| COC Number | | 694569-02-01 | 694569-02-01 | 694569-02-01 | 694569-02-01 | | |
| | UNITS | WG-11222680-180723-KH-07 | WG-11222680-180723-KH-08 | WG-11222680-180723-KH-09 | WG-11222680-180723-KH-10 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | | |
| Dissolved Hardness (CaCO3) | mg/L | 85.9 | 32.5 | 49.2 | 155 | 0.50 | B040635 |
| **Elements** | | | | | | | |
| Dissolved Mercury (Hg) | ug/L | <0.0019 | <0.0019 | <0.0019 | <0.0019 | 0.0019 | B050172 |
| **Dissolved Metals by ICPMS** | | | | | | | |
| Dissolved Aluminum (Al) | ug/L | 41.3 | 4.1 | <3.0 | 6.9 | 3.0 | B042783 |
| Dissolved Antimony (Sb) | ug/L | <0.50 | <0.50 | <0.50 | <0.50 | 0.50 | B042783 |
| Dissolved Arsenic (As) | ug/L | <0.10 | 0.83 | <0.10 | 0.20 | 0.10 | B042783 |
| Dissolved Barium (Ba) | ug/L | 2.4 | 1.8 | 1.1 | 18.0 | 1.0 | B042783 |
| Dissolved Beryllium (Be) | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B042783 |
| Dissolved Bismuth (Bi) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B042783 |
| Dissolved Boron (B) | ug/L | <50 | <50 | <50 | <50 | 50 | B042783 |
| Dissolved Cadmium (Cd) | ug/L | <0.010 | <0.010 | <0.010 | 0.015 | 0.010 | B042783 |
| Dissolved Chromium (Cr) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B042783 |
| Dissolved Cobalt (Co) | ug/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B042783 |
| Dissolved Copper (Cu) | ug/L | 0.37 | <0.20 | 0.23 | 0.35 | 0.20 | B042783 |
| Dissolved Iron (Fe) | ug/L | <5.0 | <5.0 | 7.5 | 7.3 | 5.0 | B042783 |
| Dissolved Lead (Pb) | ug/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B042783 |
| Dissolved Lithium (Li) | ug/L | <2.0 | <2.0 | <2.0 | <2.0 | 2.0 | B042783 |
| Dissolved Manganese (Mn) | ug/L | <1.0 | <1.0 | <1.0 | 19.0 | 1.0 | B042783 |
| Dissolved Molybdenum (Mo) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B042783 |
| Dissolved Nickel (Ni) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B042783 |
| Dissolved Phosphorus (P) | ug/L | <10 | 29 | <10 | 23 | 10 | B042783 |
| Dissolved Selenium (Se) | ug/L | 0.14 | <0.10 | 0.17 | <0.10 | 0.10 | B042783 |
| Dissolved Silicon (Si) | ug/L | 6480 | 3880 | 7370 | 12800 | 100 | B042783 |
| Dissolved Silver (Ag) | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | B042783 |
| Dissolved Strontium (Sr) | ug/L | 44.5 | 13.2 | 29.0 | 102 | 1.0 | B042783 |
| Dissolved Thallium (Tl) | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | B042783 |
| Dissolved Tin (Sn) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B042783 |
| Dissolved Titanium (Ti) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B042783 |
| Dissolved Uranium (U) | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B042783 |
| Dissolved Vanadium (V) | ug/L | <5.0 | 6.8 | <5.0 | <5.0 | 5.0 | B042783 |

RDL = Reportable Detection Limit



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C354973
Report Date: 2023/07/28

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## CSR D. METALS W/CV HG-DISS (WATER)

| Bureau Veritas ID | | BUZ263 | BUZ264 | BUZ265 | BUZ266 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/07/18 13:45 | 2023/07/18 14:00 | 2023/07/18 15:30 | 2023/07/19 08:30 | | |
| COC Number | | 694569-02-01 | 694569-02-01 | 694569-02-01 | 694569-02-01 | | |
| | UNITS | WG-11222680-180723-KH-07 | WG-11222680-180723-KH-08 | WG-11222680-180723-KH-09 | WG-11222680-180723-KH-10 | RDL | QC Batch |
| Dissolved Zinc (Zn) | ug/L | <5.0 | <5.0 | <5.0 | 8.0 | 5.0 | B042783 |
| Dissolved Zirconium (Zr) | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B042783 |
| Dissolved Calcium (Ca) | mg/L | 26.9 | 10.5 | 14.2 | 39.3 | 0.050 | B040637 |
| Dissolved Magnesium (Mg) | mg/L | 4.54 | 1.55 | 3.37 | 13.9 | 0.050 | B040637 |
| Dissolved Potassium (K) | mg/L | 0.271 | 0.174 | 0.223 | 1.19 | 0.050 | B040637 |
| Dissolved Sodium (Na) | mg/L | 4.01 | 0.990 | 5.91 | 26.5 | 0.050 | B040637 |
| Dissolved Sulphur (S) | mg/L | 3.0 | <3.0 | <3.0 | <3.0 | 3.0 | B040637 |
| RDL = Reportable Detection Limit | | | | | | | |

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## CSR D. METALS W/CV HG-DISS (WATER)

| Bureau Veritas ID | | BUZ267 | | |
|---|---|---|---|---|
| Sampling Date | | 2023/07/19 09:30 | | |
| COC Number | | 694569-02-01 | | |
| | UNITS | WG-11222680-180723 -KH-11 | RDL | QC Batch |
| **Calculated Parameters** | | | | |
| Dissolved Hardness (CaCO3) | mg/L | <0.50 | 0.50 | B040635 |
| **Elements** | | | | |
| Dissolved Mercury (Hg) | ug/L | <0.0019 | 0.0019 | B050172 |
| **Dissolved Metals by ICPMS** | | | | |
| Dissolved Aluminum (Al) | ug/L | <3.0 | 3.0 | B042772 |
| Dissolved Antimony (Sb) | ug/L | <0.50 | 0.50 | B042772 |
| Dissolved Arsenic (As) | ug/L | <0.10 | 0.10 | B042772 |
| Dissolved Barium (Ba) | ug/L | <1.0 | 1.0 | B042772 |
| Dissolved Beryllium (Be) | ug/L | <0.10 | 0.10 | B042772 |
| Dissolved Bismuth (Bi) | ug/L | <1.0 | 1.0 | B042772 |
| Dissolved Boron (B) | ug/L | <50 | 50 | B042772 |
| Dissolved Cadmium (Cd) | ug/L | <0.010 | 0.010 | B042772 |
| Dissolved Chromium (Cr) | ug/L | <1.0 | 1.0 | B042772 |
| Dissolved Cobalt (Co) | ug/L | <0.20 | 0.20 | B042772 |
| Dissolved Copper (Cu) | ug/L | <0.20 | 0.20 | B042772 |
| Dissolved Iron (Fe) | ug/L | <5.0 | 5.0 | B042772 |
| Dissolved Lead (Pb) | ug/L | <0.20 | 0.20 | B042772 |
| Dissolved Lithium (Li) | ug/L | <2.0 | 2.0 | B042772 |
| Dissolved Manganese (Mn) | ug/L | <1.0 | 1.0 | B042772 |
| Dissolved Molybdenum (Mo) | ug/L | <1.0 | 1.0 | B042772 |
| Dissolved Nickel (Ni) | ug/L | <1.0 | 1.0 | B042772 |
| Dissolved Phosphorus (P) | ug/L | <10 | 10 | B042772 |
| Dissolved Selenium (Se) | ug/L | <0.10 | 0.10 | B042772 |
| Dissolved Silicon (Si) | ug/L | <100 | 100 | B042772 |
| Dissolved Silver (Ag) | ug/L | <0.020 | 0.020 | B042772 |
| Dissolved Strontium (Sr) | ug/L | <1.0 | 1.0 | B042772 |
| Dissolved Thallium (Tl) | ug/L | <0.010 | 0.010 | B042772 |
| Dissolved Tin (Sn) | ug/L | <5.0 | 5.0 | B042772 |
| Dissolved Titanium (Ti) | ug/L | <5.0 | 5.0 | B042772 |
| Dissolved Uranium (U) | ug/L | <0.10 | 0.10 | B042772 |
| Dissolved Vanadium (V) | ug/L | <5.0 | 5.0 | B042772 |
| RDL = Reportable Detection Limit | | | | |

## CSR D. METALS W/CV HG-DISS (WATER)

| Bureau Veritas ID | | BUZ267 | | |
|---|---|---|---|---|
| Sampling Date | | 2023/07/19 09:30 | | |
| COC Number | | 694569-02-01 | | |
| | UNITS | WG-11222680-180723-KH-11 | RDL | QC Batch |
| Dissolved Zinc (Zn) | ug/L | <5.0 | 5.0 | B042772 |
| Dissolved Zirconium (Zr) | ug/L | <0.10 | 0.10 | B042772 |
| Dissolved Calcium (Ca) | mg/L | <0.050 | 0.050 | B040637 |
| Dissolved Magnesium (Mg) | mg/L | <0.050 | 0.050 | B040637 |
| Dissolved Potassium (K) | mg/L | <0.050 | 0.050 | B040637 |
| Dissolved Sodium (Na) | mg/L | <0.050 | 0.050 | B040637 |
| Dissolved Sulphur (S) | mg/L | <3.0 | 3.0 | B040637 |
| RDL = Reportable Detection Limit | | | | |

## GENERAL COMMENTS

Sample BUZ262 [WG-11222680-180723-KH-06] : Sample was analyzed past method specified hold time for Orthophosphate by Konelab. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) by CFA.

**Results relate only to the items tested.**



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## QUALITY ASSURANCE REPORT



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B042787 | D10-ANTHRACENE (sur.) | 2023/07/21 | | | 90 | 50 - 140 | 89 | % | | |
| B042787 | D8-ACENAPHTHYLENE (sur.) | 2023/07/21 | | | 93 | 50 - 140 | 89 | % | | |
| B042787 | D8-NAPHTHALENE (sur.) | 2023/07/21 | | | 85 | 50 - 140 | 80 | % | | |
| B042787 | TERPHENYL-D14 (sur.) | 2023/07/21 | | | 86 | 50 - 140 | 82 | % | | |
| B042796 | O-TERPHENYL (sur.) | 2023/07/21 | | | 94 | 60 - 140 | 98 | % | | |
| B044779 | D10-ANTHRACENE (sur.) | 2023/07/24 | | | 92 | 50 - 140 | 92 | % | | |
| B044779 | D8-ACENAPHTHYLENE (sur.) | 2023/07/24 | | | 95 | 50 - 140 | 89 | % | | |
| B044779 | D8-NAPHTHALENE (sur.) | 2023/07/24 | | | 80 | 50 - 140 | 72 | % | | |
| B044779 | TERPHENYL-D14 (sur.) | 2023/07/24 | | | 82 | 50 - 140 | 84 | % | | |
| B044780 | O-TERPHENYL (sur.) | 2023/07/24 | | | 95 | 60 - 140 | 93 | % | | |
| B045204 | D10-ANTHRACENE (sur.) | 2023/07/24 | | | 101 | 50 - 140 | 98 | % | | |
| B045204 | D8-ACENAPHTHYLENE (sur.) | 2023/07/24 | | | 101 | 50 - 140 | 97 | % | | |
| B045204 | D8-NAPHTHALENE (sur.) | 2023/07/24 | | | 84 | 50 - 140 | 80 | % | | |
| B045204 | TERPHENYL-D14 (sur.) | 2023/07/24 | | | 107 | 50 - 140 | 109 | % | | |
| B045218 | O-TERPHENYL (sur.) | 2023/07/24 | | | 97 | 60 - 140 | 94 | % | | |
| B041593 | Orthophosphate (P) | 2023/07/20 | 102 (1) | 80 - 120 | 109 | 80 - 120 | <0.0030 | mg/L | 1.4 (2) | 20 |
| B041707 | Nitrate plus Nitrite (N) | 2023/07/20 | 102 | 80 - 120 | 107 | 80 - 120 | <0.020 | mg/L | 0.47 (3) | 25 |
| B041712 | Nitrite (N) | 2023/07/20 | 100 | 80 - 120 | 103 | 80 - 120 | <0.0050 | mg/L | NC (3) | 20 |
| B041758 | pH | 2023/07/20 | | | 100 | 97 - 103 | | | | |
| B041769 | Conductivity | 2023/07/20 | | | 100 | 90 - 110 | <2.0 | uS/cm | NC (4) | 10 |
| B041770 | Alkalinity (PP as CaCO3) | 2023/07/20 | | | | | <1.0 | mg/L | NC (4) | 20 |
| B041770 | Alkalinity (Total as CaCO3) | 2023/07/20 | | | 97 | 80 - 120 | <1.0 | mg/L | NC (4) | 20 |
| B041770 | Bicarbonate (HCO3) | 2023/07/20 | | | | | <1.0 | mg/L | NC (4) | 20 |
| B041770 | Carbonate (CO3) | 2023/07/20 | | | | | <1.0 | mg/L | NC (4) | 20 |
| B041770 | Hydroxide (OH) | 2023/07/20 | | | | | <1.0 | mg/L | NC (4) | 20 |
| B042566 | pH | 2023/07/21 | | | 100 | 97 - 103 | | | 1.1 (3) | N/A |
| B042634 | Total Dissolved Solids | 2023/07/24 | 101 | 80 - 120 | 97 | 80 - 120 | <10 | mg/L | 2.5 (3) | 20 |
| B042772 | Dissolved Aluminum (Al) | 2023/07/22 | 117 | 80 - 120 | 97 | 80 - 120 | <3.0 | ug/L | 4.4 (3) | 20 |
| B042772 | Dissolved Antimony (Sb) | 2023/07/22 | 123 (5) | 80 - 120 | 100 | 80 - 120 | <0.50 | ug/L | NC (3) | 20 |
| B042772 | Dissolved Arsenic (As) | 2023/07/22 | 123 (5) | 80 - 120 | 100 | 80 - 120 | <0.10 | ug/L | 0.18 (3) | 20 |
| B042772 | Dissolved Barium (Ba) | 2023/07/22 | 119 | 80 - 120 | 100 | 80 - 120 | <1.0 | ug/L | 0.71 (3) | 20 |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B042772 | Dissolved Beryllium (Be) | 2023/07/22 | 116 | 80 - 120 | 95 | 80 - 120 | <0.10 | ug/L | NC (3) | 20 |
| B042772 | Dissolved Bismuth (Bi) | 2023/07/22 | 114 | 80 - 120 | 95 | 80 - 120 | <1.0 | ug/L | NC (3) | 20 |
| B042772 | Dissolved Boron (B) | 2023/07/22 | 118 | 80 - 120 | 99 | 80 - 120 | <50 | ug/L | NC (3) | 20 |
| B042772 | Dissolved Cadmium (Cd) | 2023/07/22 | 117 | 80 - 120 | 96 | 80 - 120 | <0.010 | ug/L | NC (3) | 20 |
| B042772 | Dissolved Chromium (Cr) | 2023/07/22 | 114 | 80 - 120 | 96 | 80 - 120 | <1.0 | ug/L | NC (3) | 20 |
| B042772 | Dissolved Cobalt (Co) | 2023/07/22 | 114 | 80 - 120 | 93 | 80 - 120 | <0.20 | ug/L | NC (3) | 20 |
| B042772 | Dissolved Copper (Cu) | 2023/07/22 | 107 | 80 - 120 | 91 | 80 - 120 | <0.20 | ug/L | 0.93 (3) | 20 |
| B042772 | Dissolved Iron (Fe) | 2023/07/22 | 121 (5) | 80 - 120 | 100 | 80 - 120 | <5.0 | ug/L | NC (3) | 20 |
| B042772 | Dissolved Lead (Pb) | 2023/07/22 | 115 | 80 - 120 | 94 | 80 - 120 | <0.20 | ug/L | NC (3) | 20 |
| B042772 | Dissolved Lithium (Li) | 2023/07/22 | 113 | 80 - 120 | 94 | 80 - 120 | <2.0 | ug/L | NC (3) | 20 |
| B042772 | Dissolved Manganese (Mn) | 2023/07/22 | 113 | 80 - 120 | 94 | 80 - 120 | <1.0 | ug/L | 0.10 (3) | 20 |
| B042772 | Dissolved Molybdenum (Mo) | 2023/07/22 | 123 (5) | 80 - 120 | 99 | 80 - 120 | <1.0 | ug/L | NC (3) | 20 |
| B042772 | Dissolved Nickel (Ni) | 2023/07/22 | 112 | 80 - 120 | 95 | 80 - 120 | <1.0 | ug/L | NC (3) | 20 |
| B042772 | Dissolved Phosphorus (P) | 2023/07/22 | 100 | 80 - 120 | 97 | 80 - 120 | <10 | ug/L | NC (3) | 20 |
| B042772 | Dissolved Selenium (Se) | 2023/07/22 | 120 | 80 - 120 | 100 | 80 - 120 | <0.10 | ug/L | 0.35 (3) | 20 |
| B042772 | Dissolved Silicon (Si) | 2023/07/22 | NC | 80 - 120 | 107 | 80 - 120 | <100 | ug/L | 0.32 (3) | 20 |
| B042772 | Dissolved Silver (Ag) | 2023/07/22 | 118 | 80 - 120 | 97 | 80 - 120 | <0.020 | ug/L | NC (3) | 20 |
| B042772 | Dissolved Strontium (Sr) | 2023/07/22 | NC | 80 - 120 | 96 | 80 - 120 | <1.0 | ug/L | 0.98 (3) | 20 |
| B042772 | Dissolved Thallium (Tl) | 2023/07/22 | 117 | 80 - 120 | 94 | 80 - 120 | <0.010 | ug/L | NC (3) | 20 |
| B042772 | Dissolved Tin (Sn) | 2023/07/22 | 119 | 80 - 120 | 104 | 80 - 120 | <5.0 | ug/L | NC (3) | 20 |
| B042772 | Dissolved Titanium (Ti) | 2023/07/22 | 115 | 80 - 120 | 97 | 80 - 120 | <5.0 | ug/L | NC (3) | 20 |
| B042772 | Dissolved Uranium (U) | 2023/07/22 | 115 | 80 - 120 | 92 | 80 - 120 | <0.10 | ug/L | NC (3) | 20 |
| B042772 | Dissolved Vanadium (V) | 2023/07/22 | 119 | 80 - 120 | 96 | 80 - 120 | <5.0 | ug/L | NC (3) | 20 |
| B042772 | Dissolved Zinc (Zn) | 2023/07/22 | 114 | 80 - 120 | 96 | 80 - 120 | <5.0 | ug/L | NC (3) | 20 |
| B042772 | Dissolved Zirconium (Zr) | 2023/07/22 | 120 | 80 - 120 | 96 | 80 - 120 | <0.10 | ug/L | NC (3) | 20 |
| B042783 | Dissolved Aluminum (Al) | 2023/07/22 | 99 | 80 - 120 | 103 | 80 - 120 | <3.0 | ug/L | NC (3) | 20 |
| B042783 | Dissolved Antimony (Sb) | 2023/07/22 | 100 | 80 - 120 | 103 | 80 - 120 | <0.50 | ug/L | NC (3) | 20 |
| B042783 | Dissolved Arsenic (As) | 2023/07/22 | 101 | 80 - 120 | 103 | 80 - 120 | <0.10 | ug/L | NC (3) | 20 |
| B042783 | Dissolved Barium (Ba) | 2023/07/22 | 95 | 80 - 120 | 99 | 80 - 120 | <1.0 | ug/L | 2.4 (3) | 20 |
| B042783 | Dissolved Beryllium (Be) | 2023/07/22 | 102 | 80 - 120 | 104 | 80 - 120 | <0.10 | ug/L | NC (3) | 20 |
| B042783 | Dissolved Bismuth (Bi) | 2023/07/22 | 98 | 80 - 120 | 98 | 80 - 120 | <1.0 | ug/L | NC (3) | 20 |

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B042783 | Dissolved Boron (B) | 2023/07/22 | 102 | 80 - 120 | 107 | 80 - 120 | <50 | ug/L | NC (3) | 20 |
| B042783 | Dissolved Cadmium (Cd) | 2023/07/22 | 97 | 80 - 120 | 101 | 80 - 120 | <0.010 | ug/L | NC (3) | 20 |
| B042783 | Dissolved Chromium (Cr) | 2023/07/22 | 96 | 80 - 120 | 99 | 80 - 120 | <1.0 | ug/L | NC (3) | 20 |
| B042783 | Dissolved Cobalt (Co) | 2023/07/22 | 93 | 80 - 120 | 98 | 80 - 120 | <0.20 | ug/L | NC (3) | 20 |
| B042783 | Dissolved Copper (Cu) | 2023/07/22 | 93 | 80 - 120 | 98 | 80 - 120 | <0.20 | ug/L | NC (3) | 20 |
| B042783 | Dissolved Iron (Fe) | 2023/07/22 | 103 | 80 - 120 | 105 | 80 - 120 | <5.0 | ug/L | NC (3) | 20 |
| B042783 | Dissolved Lead (Pb) | 2023/07/22 | 104 | 80 - 120 | 101 | 80 - 120 | <0.20 | ug/L | NC (3) | 20 |
| B042783 | Dissolved Lithium (Li) | 2023/07/22 | 100 | 80 - 120 | 102 | 80 - 120 | <2.0 | ug/L | NC (3) | 20 |
| B042783 | Dissolved Manganese (Mn) | 2023/07/22 | 96 | 80 - 120 | 100 | 80 - 120 | <1.0 | ug/L | 0.52 (3) | 20 |
| B042783 | Dissolved Molybdenum (Mo) | 2023/07/22 | 101 | 80 - 120 | 104 | 80 - 120 | <1.0 | ug/L | NC (3) | 20 |
| B042783 | Dissolved Nickel (Ni) | 2023/07/22 | 94 | 80 - 120 | 99 | 80 - 120 | <1.0 | ug/L | NC (3) | 20 |
| B042783 | Dissolved Phosphorus (P) | 2023/07/22 | 100 | 80 - 120 | 103 | 80 - 120 | <10 | ug/L | NC (3) | 20 |
| B042783 | Dissolved Selenium (Se) | 2023/07/22 | 100 | 80 - 120 | 102 | 80 - 120 | <0.10 | ug/L | 0.55 (3) | 20 |
| B042783 | Dissolved Silicon (Si) | 2023/07/22 | NC | 80 - 120 | 111 | 80 - 120 | <100 | ug/L | 1.2 (3) | 20 |
| B042783 | Dissolved Silver (Ag) | 2023/07/22 | 97 | 80 - 120 | 100 | 80 - 120 | <0.020 | ug/L | NC (3) | 20 |
| B042783 | Dissolved Strontium (Sr) | 2023/07/22 | 99 | 80 - 120 | 101 | 80 - 120 | <1.0 | ug/L | 0.26 (3) | 20 |
| B042783 | Dissolved Thallium (Tl) | 2023/07/22 | 99 | 80 - 120 | 99 | 80 - 120 | <0.010 | ug/L | NC (3) | 20 |
| B042783 | Dissolved Tin (Sn) | 2023/07/22 | 97 | 80 - 120 | 105 | 80 - 120 | <5.0 | ug/L | NC (3) | 20 |
| B042783 | Dissolved Titanium (Ti) | 2023/07/22 | 97 | 80 - 120 | 101 | 80 - 120 | <5.0 | ug/L | NC (3) | 20 |
| B042783 | Dissolved Uranium (U) | 2023/07/22 | 103 | 80 - 120 | 100 | 80 - 120 | <0.10 | ug/L | NC (3) | 20 |
| B042783 | Dissolved Vanadium (V) | 2023/07/22 | 97 | 80 - 120 | 101 | 80 - 120 | <5.0 | ug/L | NC (3) | 20 |
| B042783 | Dissolved Zinc (Zn) | 2023/07/22 | 98 | 80 - 120 | 102 | 80 - 120 | <5.0 | ug/L | NC (3) | 20 |
| B042783 | Dissolved Zirconium (Zr) | 2023/07/22 | 100 | 80 - 120 | 101 | 80 - 120 | <0.10 | ug/L | NC (3) | 20 |
| B042787 | Acenaphthene | 2023/07/21 | | | 82 | 50 - 140 | <0.050 | ug/L | | |
| B042787 | Acridine | 2023/07/21 | | | 89 | 50 - 140 | <0.050 | ug/L | | |
| B042787 | Anthracene | 2023/07/21 | | | 84 | 50 - 140 | <0.010 | ug/L | | |
| B042787 | Benzo(a)anthracene | 2023/07/21 | | | 81 | 50 - 140 | <0.010 | ug/L | | |
| B042787 | Benzo(a)pyrene | 2023/07/21 | | | 83 | 50 - 140 | <0.0050 | ug/L | | |
| B042787 | Fluoranthene | 2023/07/21 | | | 77 | 50 - 140 | <0.020 | ug/L | | |
| B042787 | Fluorene | 2023/07/21 | | | 81 | 50 - 140 | <0.050 | ug/L | | |
| B042787 | Naphthalene | 2023/07/21 | | | 81 | 50 - 140 | <0.10 | ug/L | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B042787 | Phenanthrene | 2023/07/21 | | | 80 | 50 - 140 | <0.050 | ug/L | | |
| B042787 | Pyrene | 2023/07/21 | | | 77 | 50 - 140 | <0.020 | ug/L | | |
| B042796 | EPH (C10-C19) | 2023/07/21 | | | 103 | 70 - 130 | <0.20 | mg/L | | |
| B042796 | EPH (C19-C32) | 2023/07/21 | | | 108 | 70 - 130 | <0.20 | mg/L | | |
| B044779 | Acenaphthene | 2023/07/24 | | | 80 | 50 - 140 | <0.050 | ug/L | | |
| B044779 | Acridine | 2023/07/24 | | | 83 | 50 - 140 | <0.050 | ug/L | | |
| B044779 | Anthracene | 2023/07/24 | | | 80 | 50 - 140 | <0.010 | ug/L | | |
| B044779 | Benzo(a)anthracene | 2023/07/24 | | | 79 | 50 - 140 | <0.010 | ug/L | | |
| B044779 | Benzo(a)pyrene | 2023/07/24 | | | 84 | 50 - 140 | <0.0050 | ug/L | | |
| B044779 | Fluoranthene | 2023/07/24 | | | 68 | 50 - 140 | <0.020 | ug/L | | |
| B044779 | Fluorene | 2023/07/24 | | | 78 | 50 - 140 | <0.050 | ug/L | | |
| B044779 | Naphthalene | 2023/07/24 | | | 75 | 50 - 140 | <0.10 | ug/L | | |
| B044779 | Phenanthrene | 2023/07/24 | | | 78 | 50 - 140 | <0.050 | ug/L | | |
| B044779 | Pyrene | 2023/07/24 | | | 67 | 50 - 140 | <0.020 | ug/L | | |
| B044780 | EPH (C10-C19) | 2023/07/24 | | | 102 | 70 - 130 | <0.20 | mg/L | | |
| B044780 | EPH (C19-C32) | 2023/07/24 | | | 102 | 70 - 130 | <0.20 | mg/L | | |
| B045204 | Acenaphthene | 2023/07/24 | | | 95 | 50 - 140 | <0.050 | ug/L | NC (3) | 40 |
| B045204 | Acridine | 2023/07/24 | | | 99 | 50 - 140 | <0.050 | ug/L | NC (3) | 40 |
| B045204 | Anthracene | 2023/07/24 | | | 106 | 50 - 140 | <0.010 | ug/L | NC (3) | 40 |
| B045204 | Benzo(a)anthracene | 2023/07/24 | | | 95 | 50 - 140 | <0.010 | ug/L | NC (3) | 40 |
| B045204 | Benzo(a)pyrene | 2023/07/24 | | | 102 | 50 - 140 | <0.0050 | ug/L | NC (3) | 40 |
| B045204 | Fluoranthene | 2023/07/24 | | | 102 | 50 - 140 | <0.020 | ug/L | NC (3) | 40 |
| B045204 | Fluorene | 2023/07/24 | | | 100 | 50 - 140 | <0.050 | ug/L | NC (3) | 40 |
| B045204 | Naphthalene | 2023/07/24 | | | 88 | 50 - 140 | <0.10 | ug/L | NC (3) | 40 |
| B045204 | Phenanthrene | 2023/07/24 | | | 92 | 50 - 140 | <0.050 | ug/L | NC (3) | 40 |
| B045204 | Pyrene | 2023/07/24 | | | 104 | 50 - 140 | <0.020 | ug/L | NC (3) | 40 |
| B045215 | Total Dissolved Solids | 2023/07/25 | 101 | 80 - 120 | 108 | 80 - 120 | <10 | mg/L | 3.3 (3) | 20 |
| B045218 | EPH (C10-C19) | 2023/07/24 | | | 101 | 70 - 130 | <0.20 | mg/L | 0.85 (3) | 30 |
| B045218 | EPH (C19-C32) | 2023/07/24 | | | 104 | 70 - 130 | <0.20 | mg/L | 29 (3) | 30 |
| B045835 | Chloride (Cl) | 2023/07/25 | 106 (1) | 80 - 120 | 101 | 80 - 120 | <1.0 | mg/L | NC (2) | 20 |
| B045835 | Sulphate (SO4) | 2023/07/25 | 120 (1) | 80 - 120 | 98 | 80 - 120 | <1.0 | mg/L | 3.7 (2) | 20 |

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B046614 | Total Ammonia (N) | 2023/07/25 | 124 (5) | 80 - 120 | 109 | 80 - 120 | <0.015 | mg/L | NC (3) | 20 |
| B046617 | Total Ammonia (N) | 2023/07/25 | NC | 80 - 120 | 109 | 80 - 120 | <0.015 | mg/L | 0.22 (3) | 20 |
| B046711 | Total Sulphide | 2023/07/25 | 61 (5,6) | 80 - 120 | 105 | 80 - 120 | <0.0018 | mg/L | NC (7) | 20 |
| B049143 | Dissolved Aluminum (Al) | 2023/07/26 | | | 105 | 80 - 120 | <3.0 | ug/L | | |
| B049143 | Dissolved Antimony (Sb) | 2023/07/26 | | | 108 | 80 - 120 | <0.50 | ug/L | | |
| B049143 | Dissolved Arsenic (As) | 2023/07/26 | | | 106 | 80 - 120 | <0.10 | ug/L | | |
| B049143 | Dissolved Barium (Ba) | 2023/07/26 | | | 102 | 80 - 120 | <1.0 | ug/L | | |
| B049143 | Dissolved Beryllium (Be) | 2023/07/26 | | | 103 | 80 - 120 | <0.10 | ug/L | | |
| B049143 | Dissolved Bismuth (Bi) | 2023/07/26 | | | 103 | 80 - 120 | <1.0 | ug/L | | |
| B049143 | Dissolved Boron (B) | 2023/07/26 | | | 94 | 80 - 120 | <50 | ug/L | | |
| B049143 | Dissolved Cadmium (Cd) | 2023/07/26 | | | 105 | 80 - 120 | <0.010 | ug/L | | |
| B049143 | Dissolved Chromium (Cr) | 2023/07/26 | | | 105 | 80 - 120 | <1.0 | ug/L | | |
| B049143 | Dissolved Cobalt (Co) | 2023/07/26 | | | 102 | 80 - 120 | <0.20 | ug/L | | |
| B049143 | Dissolved Copper (Cu) | 2023/07/26 | | | 102 | 80 - 120 | <0.20 | ug/L | | |
| B049143 | Dissolved Iron (Fe) | 2023/07/26 | | | 105 | 80 - 120 | <5.0 | ug/L | | |
| B049143 | Dissolved Lead (Pb) | 2023/07/26 | | | 101 | 80 - 120 | <0.20 | ug/L | | |
| B049143 | Dissolved Lithium (Li) | 2023/07/26 | | | 92 | 80 - 120 | <2.0 | ug/L | | |
| B049143 | Dissolved Manganese (Mn) | 2023/07/26 | | | 104 | 80 - 120 | <1.0 | ug/L | | |
| B049143 | Dissolved Molybdenum (Mo) | 2023/07/26 | | | 107 | 80 - 120 | <1.0 | ug/L | | |
| B049143 | Dissolved Nickel (Ni) | 2023/07/26 | | | 103 | 80 - 120 | <1.0 | ug/L | | |
| B049143 | Dissolved Phosphorus (P) | 2023/07/26 | | | 100 | 80 - 120 | <10 | ug/L | | |
| B049143 | Dissolved Selenium (Se) | 2023/07/26 | | | 107 | 80 - 120 | <0.10 | ug/L | | |
| B049143 | Dissolved Silicon (Si) | 2023/07/26 | | | 108 | 80 - 120 | <100 | ug/L | | |
| B049143 | Dissolved Silver (Ag) | 2023/07/26 | | | 104 | 80 - 120 | <0.020 | ug/L | | |
| B049143 | Dissolved Strontium (Sr) | 2023/07/26 | | | 102 | 80 - 120 | <1.0 | ug/L | | |
| B049143 | Dissolved Thallium (Tl) | 2023/07/26 | | | 105 | 80 - 120 | <0.010 | ug/L | | |
| B049143 | Dissolved Tin (Sn) | 2023/07/26 | | | 109 | 80 - 120 | <5.0 | ug/L | | |
| B049143 | Dissolved Titanium (Ti) | 2023/07/26 | | | 104 | 80 - 120 | <5.0 | ug/L | | |
| B049143 | Dissolved Uranium (U) | 2023/07/26 | | | 103 | 80 - 120 | <0.10 | ug/L | | |
| B049143 | Dissolved Vanadium (V) | 2023/07/26 | | | 105 | 80 - 120 | <5.0 | ug/L | | |
| B049143 | Dissolved Zinc (Zn) | 2023/07/26 | | | 107 | 80 - 120 | <5.0 | ug/L | | |

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B049143 | Dissolved Zirconium (Zr) | 2023/07/26 | | | 105 | 80 - 120 | <0.10 | ug/L | | |
| B050172 | Dissolved Mercury (Hg) | 2023/07/28 | 92 (8) | 80 - 120 | 98 | 80 - 120 | <0.0019 | ug/L | NC (9) | 20 |
| B050548 | Orthophosphate (P) | 2023/07/27 | | | 100 | 80 - 120 | <0.0030 | mg/L | | |
| B050697 | Chloride (Cl) | 2023/07/27 | 102 (10) | 80 - 120 | 102 | 80 - 120 | <1.0 | mg/L | 1.3 (11) | 20 |
| B050697 | Sulphate (SO4) | 2023/07/27 | 99 (10) | 80 - 120 | 107 | 80 - 120 | <1.0 | mg/L | 3.2 (11) | 20 |
| B050725 | pH | 2023/07/28 | | | 100 | 97 - 103 | | | 0.15 (3) | N/A |
| B050736 | Conductivity | 2023/07/28 | | | 99 | 90 - 110 | <2.0 | uS/cm | | |
| B050737 | Alkalinity (PP as CaCO3) | 2023/07/28 | | | | | <1.0 | mg/L | NC (3) | 20 |
| B050737 | Alkalinity (Total as CaCO3) | 2023/07/28 | | | 100 | 80 - 120 | <1.0 | mg/L | 2.5 (3) | 20 |
| B050737 | Bicarbonate (HCO3) | 2023/07/28 | | | | | <1.0 | mg/L | 2.5 (3) | 20 |
| B050737 | Carbonate (CO3) | 2023/07/28 | | | | | <1.0 | mg/L | NC (3) | 20 |
| B050737 | Hydroxide (OH) | 2023/07/28 | | | | | <1.0 | mg/L | NC (3) | 20 |
| B050809 | Nitrate plus Nitrite (N) | 2023/07/27 | 103 | 80 - 120 | 110 | 80 - 120 | <0.020 | mg/L | NC (3) | 25 |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B050812 | Nitrite (N) | 2023/07/27 | 98 | 80 - 120 | 107 | 80 - 120 | <0.0050 | mg/L | NC (3) | 20 |

N/A = Not Applicable

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

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

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

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

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

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

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Matrix Spike Parent ID [BUZ264-01]

(2) Duplicate Parent ID [BUZ264-01]

(3) Duplicate Parent ID

(4) Duplicate Parent ID [BUZ267-01]

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

(6) Matrix Spike Parent ID [BUZ262-05]

(7) Duplicate Parent ID [BUZ261-05]

(8) Matrix Spike Parent ID [BUZ262-04]

(9) Duplicate Parent ID [BUZ261-04]

(10) Matrix Spike Parent ID [BUZ262-01]

(11) Duplicate Parent ID [BUZ262-01]

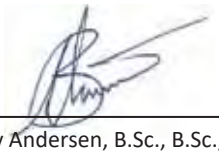


Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

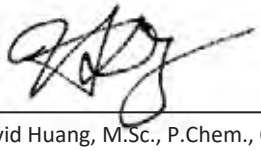
GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-3
Sampler Initials: KH

## VALIDATION SIGNATURE PAGE

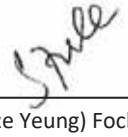
The analytical data and all QC contained in this report were reviewed and validated by:



Brody Andersen, B.Sc., B.Sc., Program Specialist–Emergency Spill Response



David Huang, M.Sc., P.Chem., QP, Scientific Services Manager



Suwan (Sze Yeung) Fock, B.Sc., Scientific Specialist

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by {0}, {1} responsible for {2} {3} laboratory operations.



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

C354973_ACTR

# ADDITIONAL COOLER TEMPERATURE RECORD

## CHAIN-OF-CUSTODY RECORD

| CHAIN OF CUSTODY # | |
|---|---|
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |
| Page ___ of ___ | |

COOLER OBSERVATIONS:

MAXXAM JOB#:

| | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| CUSTODY SEAL PRESENT | | | TEMP | 8 | 9 | 4 |
| CUSTODY SEAL INTACT | | | | 1 | 2 | 3 |
| ICE PRESENT | | | | | | |

| | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| CUSTODY SEAL PRESENT | | | TEMP | 9 | 4 | 6 |
| CUSTODY SEAL INTACT | | | | 1 | 2 | 3 |
| ICE PRESENT | | | | | | |

| | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| CUSTODY SEAL PRESENT | | | TEMP | 1 | 2 | 3 |
| CUSTODY SEAL INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| CUSTODY SEAL PRESENT | | | TEMP | 1 | 2 | 3 |
| CUSTODY SEAL INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| CUSTODY SEAL PRESENT | | | TEMP | 1 | 2 | 3 |
| CUSTODY SEAL INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| CUSTODY SEAL PRESENT | | | TEMP | 1 | 2 | 3 |
| CUSTODY SEAL INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| CUSTODY SEAL PRESENT | | | TEMP | 1 | 2 | 3 |
| CUSTODY SEAL INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| CUSTODY SEAL PRESENT | | | TEMP | 1 | 2 | 3 |
| CUSTODY SEAL INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| CUSTODY SEAL PRESENT | | | TEMP | 1 | 2 | 3 |
| CUSTODY SEAL INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| | YES | NO | COOLER ID | | | |
|---|---|---|---|---|---|---|
| CUSTODY SEAL PRESENT | | | TEMP | 1 | 2 | 3 |
| CUSTODY SEAL INTACT | | | | | | |
| ICE PRESENT | | | | | | |

| RECEIVED BY (SIGN & PRINT) | | DATE (YYYY/MM/DD) | TIME (HH:MM) |
|---|---|---|---|
| | EDELANE CACULI | 2023/07/20 | 0820 |

Bureau Veritas
4606 Canada Way, Burnaby, British Columbia, Canada V5G 1K5. Tel (604) 734-7276 Toll Free 800-563-6266 Fax (604) 731-2386 www.bvna.com

# Chain Of Custody Record

Page 1 of 1

| INVOICE TO: | | Report Information: | | Project Information: | | Laboratory Use Only | |
|---|---|---|---|---|---|---|---|
| Company Name: | #163 GHD Limited | Company Name: | GHD Limited | Quotation #: | C30090 | Bureau Veritas Job #: | Bottle Order #: |
| Contact Name: | AP Invoices - 735 | Contact Name: | Stephanie Berton | P.O. #: | 735-002640-3 | | |
| Address: | 455 PHILLIP STREET<br>WATERLOO ON N2L 3X2 | Address: | | Project #: | 11222680-15.1 | Chain Of Custody Record | Project Manager |
| Phone: | (519) 884-0510 Fax: (519) 725-1394 | Phone: | Fax: | Project Name: | | | |
| Email: | APinvoices-735@ghd.com | Email: | NationalEDDSupport@maxxam.ca,stephanie.berton@g | Site #: | Groundwater | | |
| | | | | Sampled By: | Kathleen Hosier | | |

Regulatory Criteria:
- [X] CSR
- [ ] CCME
- [ ] BC Water Quality
- [ ] Other: _____

Special Instructions: Bottles field filtered and preserved as indicated on bottle

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT: [X]
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days; contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
1 DAY [ ] 2 Day [ ] 3 Day [ ] Date Required: _____ [ ]
Rush Confirmation Number: _____
(call lab for #)

SAMPLES MUST BE KEPT COOL ( < 10°C ) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

ANALYSIS REQUESTED (PLEASE BE SPECIFIC):

| | Sample Barcode Label | Sample (Location) Identification | Date Sampled | Time Sampled | Matrix | Metals Field Filtered (Y/N) | Conductivity, Cl, SO4, NO2, NO3, N+N, PO4 | Speciated Alkalinity | Sulphide + H2S Calc | Sulphide, Un-ionized (as H2S) (Calc) | Ammonia-N (Total) | Dissolved Metals with CV Hg, Hardness | Total Dissolved Solids (Filt. Residue) | LEPH/HEPH with subtracted PAHs | Field pH | Field Temperature | # of Bottles | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | WG-11222680-180723-KH-05 | 18/07/23 | 1040 | W | X | X | X | X | X | X | X | X | X | 7.70 | 16.92 | | |
| 2 | | WG-11222680-180723-KH-06 | 18/07/23 | 1210 | W | X | X | X | X | X | X | X | X | X | 7.65 | 16.90 | | |
| 3 | | WG-11222680-180723-KH-07 | 18/07/23 | 1345 | W | X | X | X | X | X | X | X | X | X | 6.99 | 14.96 | | |
| 4 | | WG-11222680-180723-KH-08 | 18/07/23 | 1400 | W | X | X | X | X | X | X | X | X | X | 8.59 | 15.95 | | |
| 5 | | WG-11222680-180723-KH-DUP | 18/07/23 | 1530 | W | X | X | X | X | X | X | X | X | X | 7.57 | 15.20 | | |
| 6 | | WG-11222680-190723-KH-10 | 19/07/23 | 830 | W | X | X | X | X | X | X | X | X | X | 6.99 | 14.54 | | |
| 7 | | WG-11222680-190723-KH-11 | 19/07/23 | 930 | W | X | X | X | X | X | X | X | X | X | 0 | 0 | | |
| 8 | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | |

C354973_COC

| * RELINQUISHED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | RECEIVED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | # jars used and not submitted | Lab Use Only: Time Sensitive | Temperature (°C) on Receipt | Custody Seal Intact on Cooler? |
|---|---|---|---|---|---|---|---|---|---|
| Kathleen Hosier KH | 19/07/23 | 8:45 | NAME | 23/07/19 | 11:02 | | [ ] | 3.5.2 | [ ] Yes [ ] No |
| | | | EDELANE CAOILI | 23/07/20 | 08:20 | | | 7.2.5 | |

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC_TERMS-AND-CONDITIONS

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

Ice-Yes

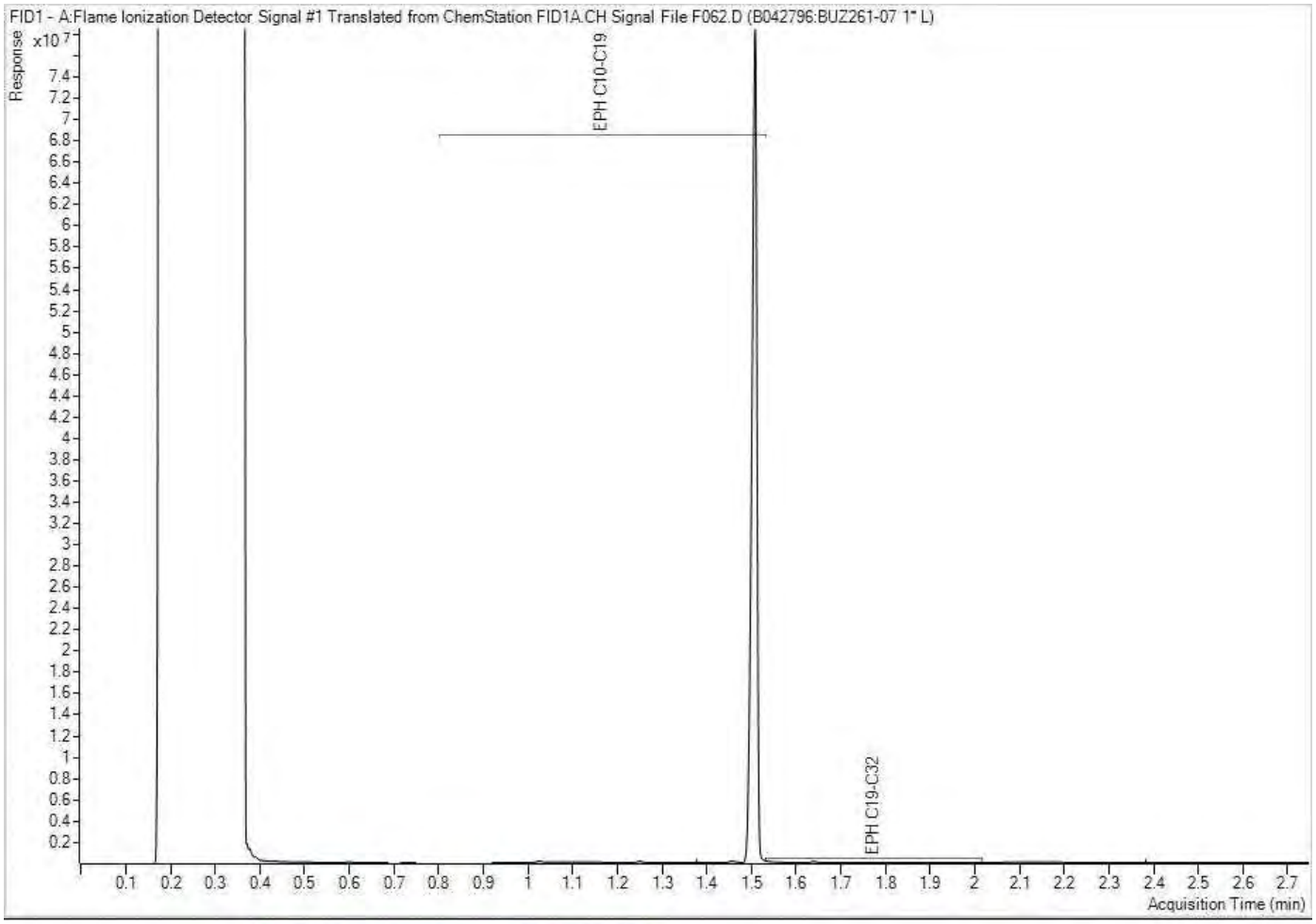
see ACTR for RBY temps

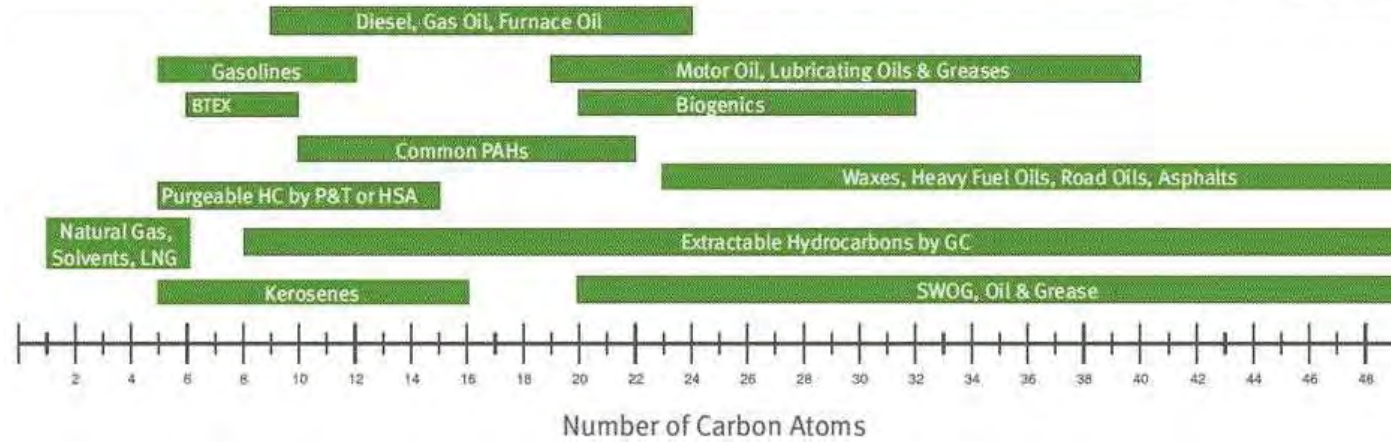
Bureau Veritas Canada (2019) Inc.

Bureau Veritas Job #: C354973
Report Date: 2023/07/28
Bureau Veritas Sample: BUZ261

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WG-11222680-180723-KH-05

**EPH in Water when PAH required Chromatogram**



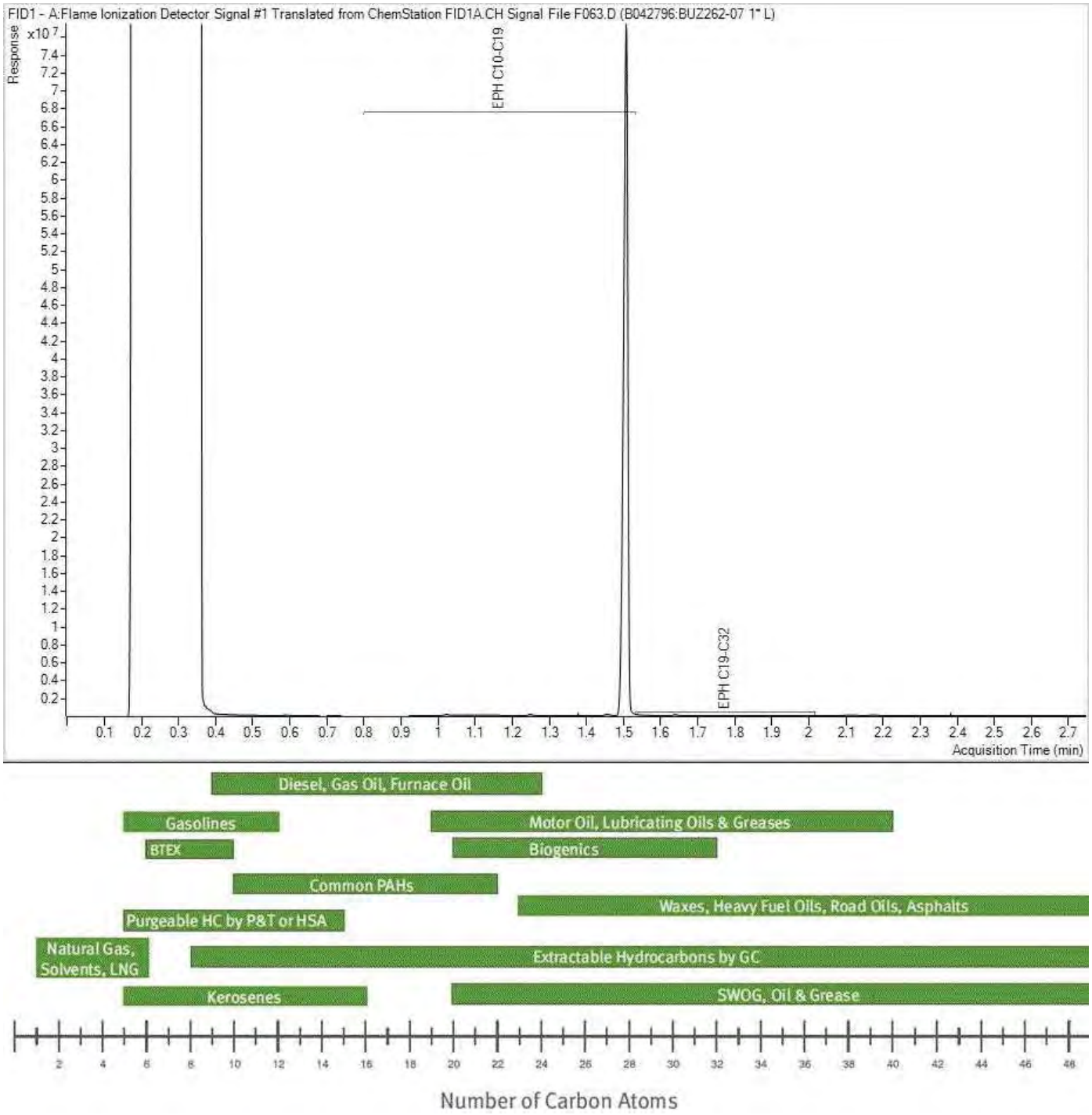




**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

Bureau Veritas Job #: C354973
Report Date: 2023/07/28
Bureau Veritas Sample: BUZ262

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WG-11222680-180723-KH-06

**EPH in Water when PAH required Chromatogram**

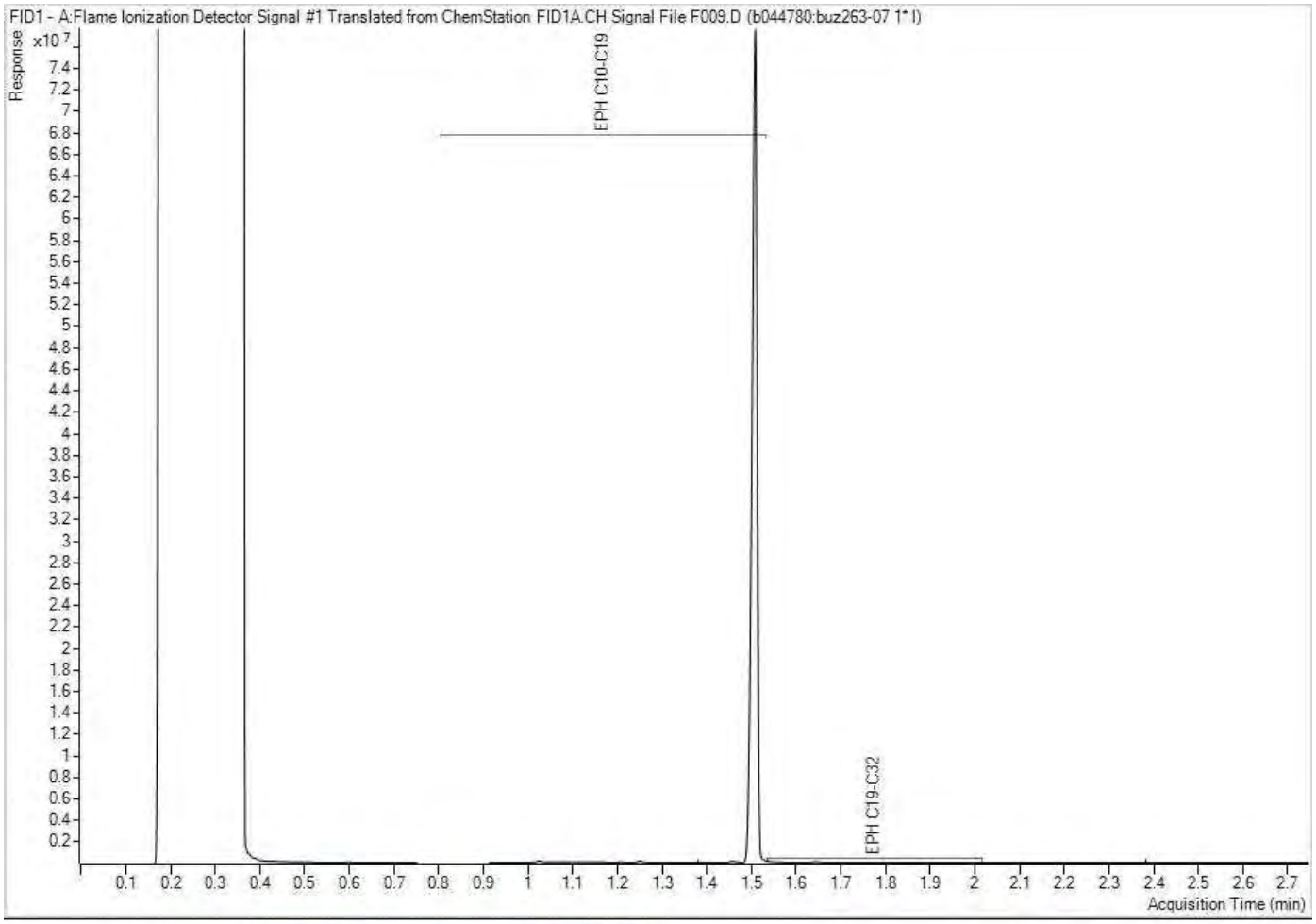


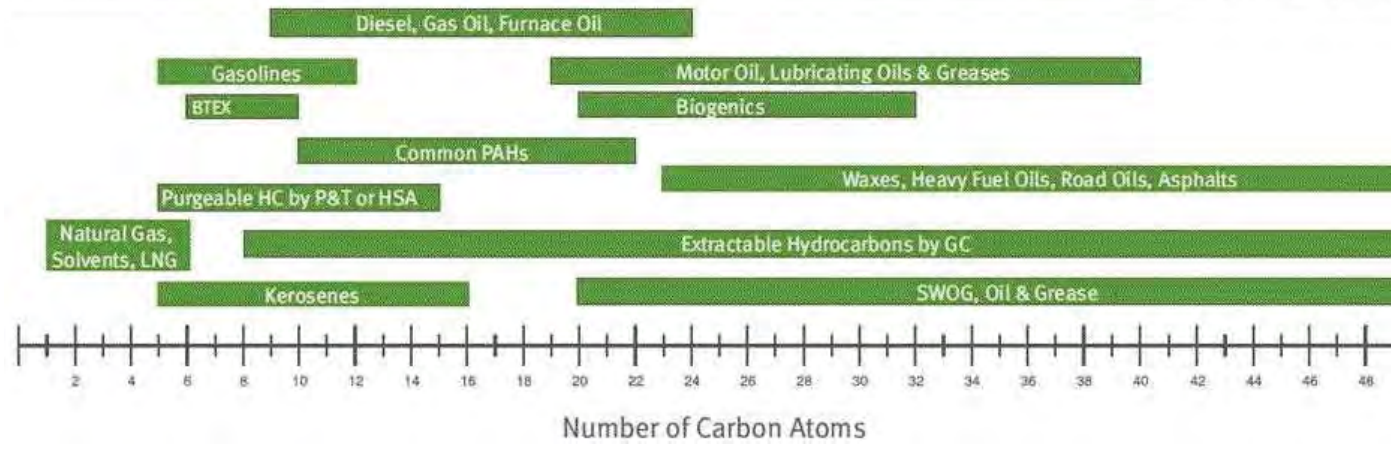

**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

Bureau Veritas Job #: C354973
Report Date: 2023/07/28
Bureau Veritas Sample: BUZ263

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WG-11222680-180723-KH-07

**EPH in Water when PAH required Chromatogram**



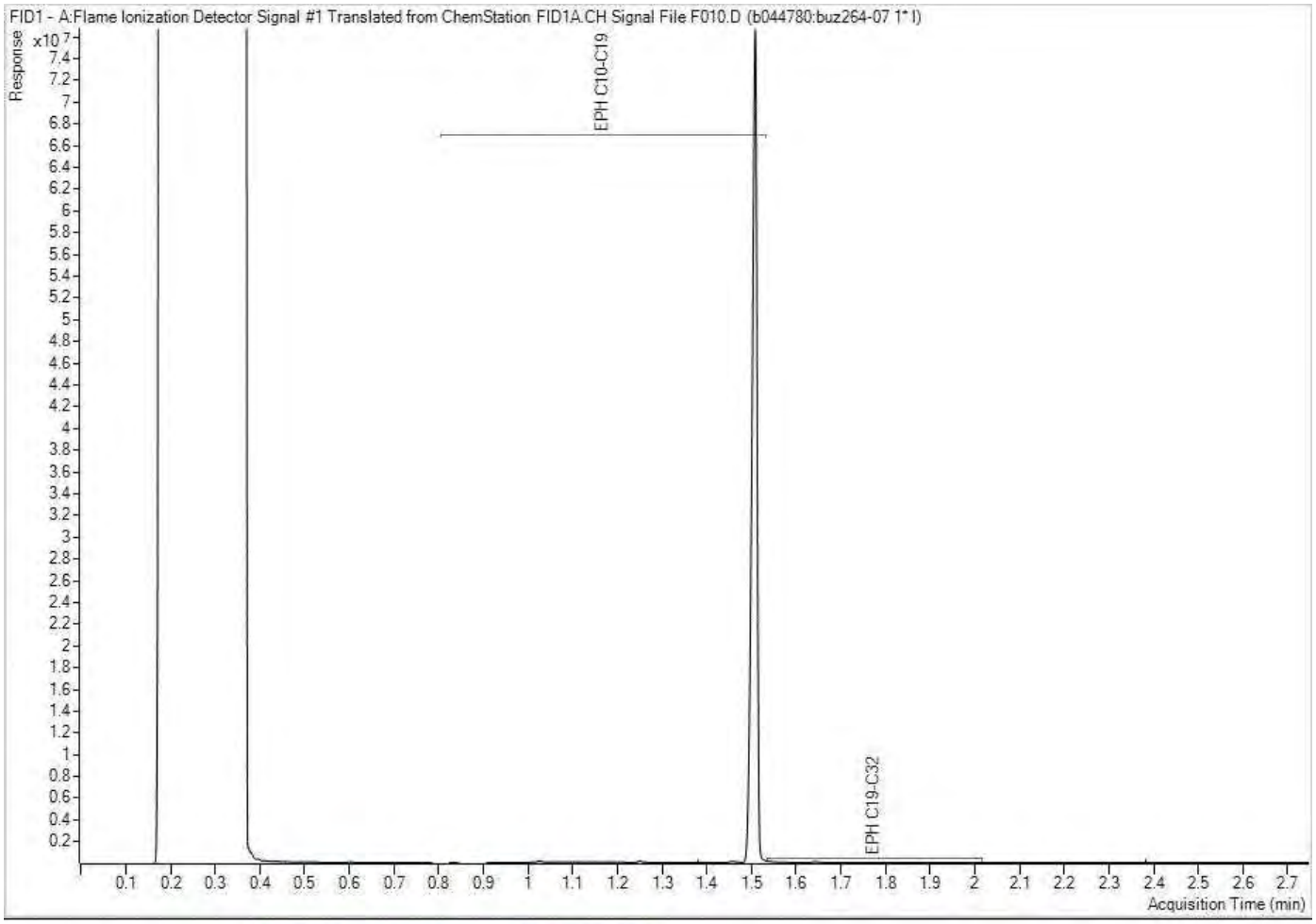



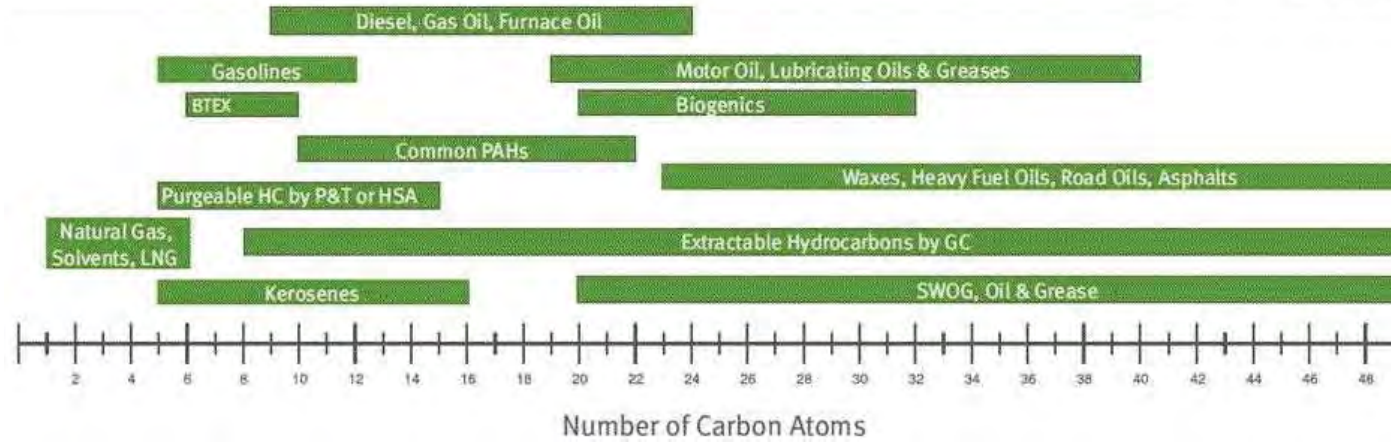

**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

Bureau Veritas Job #: C354973
Report Date: 2023/07/28
Bureau Veritas Sample: BUZ264

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WG-11222680-180723-KH-08

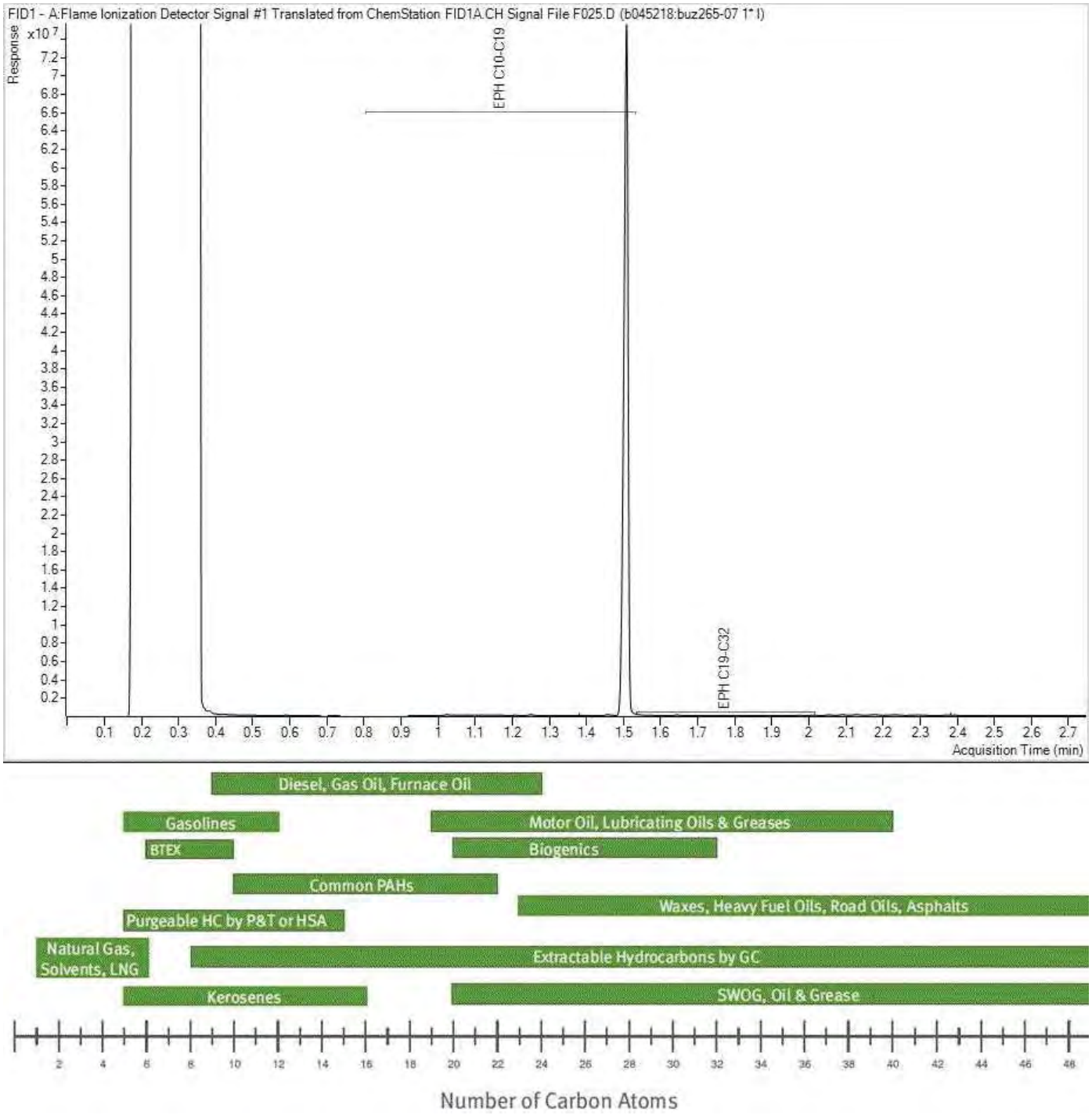
**EPH in Water when PAH required Chromatogram**



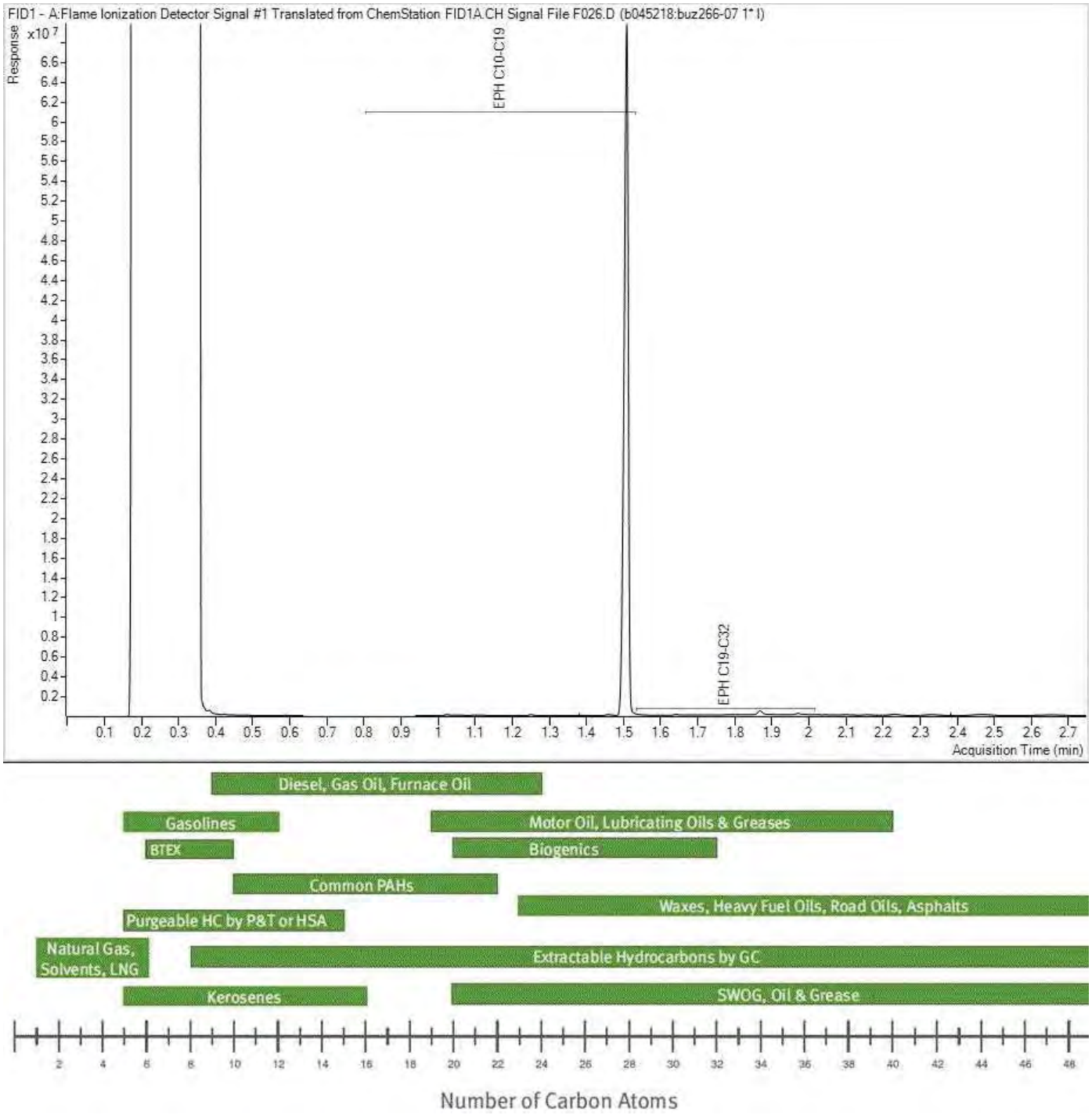

**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

**EPH in Water when PAH required Chromatogram**




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

**EPH in Water when PAH required Chromatogram**

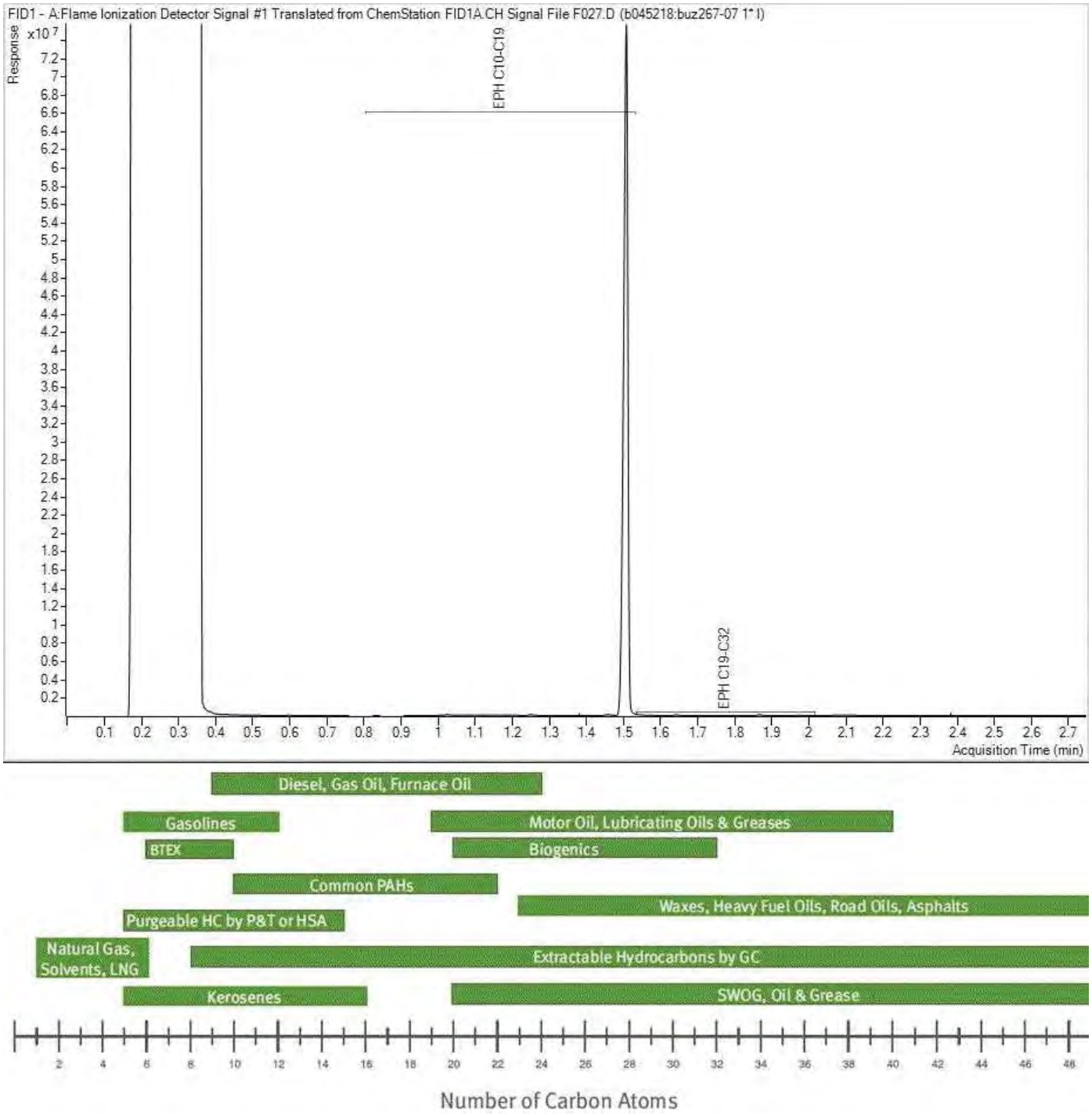



**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

Bureau Veritas Job #: C354973
Report Date: 2023/07/28
Bureau Veritas Sample: BUZ267

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WG-11222680-180723-KH-11

**EPH in Water when PAH required Chromatogram**




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

Your P.O. #: 735-002640-4
Your Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your C.O.C. #: 700911-01-01, 700911-03-01

**Attention: Stephanie Berton**

GHD Limited
455 PHILLIP STREET
WATERLOO, ON
CANADA N2L 3X2

**Report Date: 2023/09/18**
Report #: R3396694
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**BUREAU VERITAS JOB #: C371107**
**Received: 2023/09/08, 16:36**

Sample Matrix: Water
# Samples Received: 11

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Analytical Method |
|---|---|---|---|---|---|
| Alkalinity @25C (pp, total), CO3,HCO3,OH | 9 | N/A | 2023/09/11 | BBY6SOP-00026 | SM 24 2320 B m |
| Alkalinity @25C (pp, total), CO3,HCO3,OH | 2 | N/A | 2023/09/12 | BBY6SOP-00026 | SM 24 2320 B m |
| Chloride/Sulphate by Auto Colourimetry | 5 | N/A | 2023/09/11 | BBY6SOP-00011 / BBY6SOP-00017 | SM24-4500-Cl/SO4-E m |
| Chloride/Sulphate by Auto Colourimetry | 6 | N/A | 2023/09/12 | BBY6SOP-00011 / BBY6SOP-00017 | SM24-4500-Cl/SO4-E m |
| Conductivity @25C | 9 | N/A | 2023/09/11 | BBY6SOP-00026 | SM 24 2510 B m |
| Conductivity @25C | 2 | N/A | 2023/09/12 | BBY6SOP-00026 | SM 24 2510 B m |
| Sulphide (as H2S) (1) | 10 | N/A | 2023/09/12 | | Auto Calc |
| Sulphide (as H2S) (1) | 1 | N/A | 2023/09/13 | | Auto Calc |
| Un-ionized Hydrogen Sulphide as S Calc (1) | 10 | N/A | 2023/09/12 | | |
| Hardness (calculated as CaCO3) | 11 | N/A | 2023/09/14 | BBY WI-00033 | Auto Calc |
| Mercury (Dissolved) by CV (2) | 11 | 2023/09/13 | 2023/09/13 | AB SOP-00084 | BCMOE BCLM Oct2013 m |
| EPH in Water when PAH required | 11 | 2023/09/14 | 2023/09/14 | BBY8SOP-00029 | BCMOE BCLM Sep2017 m |
| Na, K, Ca, Mg, S by CRC ICPMS (diss.) | 11 | N/A | 2023/09/14 | BBY WI-00033 | Auto Calc |
| Elements by CRC ICPMS (dissolved) (2) | 11 | N/A | 2023/09/14 | BBY7SOP-00002 | EPA 6020b R2 m |
| Ammonia-N (Total) | 6 | N/A | 2023/09/11 | AB SOP-00007 | SM 24 4500 NH3 A G m |
| Ammonia-N (Total) | 5 | N/A | 2023/09/13 | AB SOP-00007 | SM 24 4500 NH3 A G m |
| Nitrate + Nitrite (N) | 11 | N/A | 2023/09/09 | BBY6SOP-00010 | SM 24 4500-NO3- H m |
| Nitrite (N) Regular Level Water | 11 | N/A | 2023/09/09 | BBY6SOP-00010 | SM 24 4500-NO2- m |
| Nitrogen - Nitrate (as N) | 11 | N/A | 2023/09/12 | BBY WI-00033 | Auto Calc |
| PAH in Water by GC/MS (SIM) | 11 | 2023/09/14 | 2023/09/14 | BBY8SOP-00021 | BCMOE BCLM Jul2017m |
| Total LMW, HMW, Total PAH Calc (3) | 11 | N/A | 2023/09/15 | BBY WI-00033 | Auto Calc |
| Orthophosphate by Automated Analyzer (4) | 11 | N/A | 2023/09/09 | BBY6SOP-00013 | SM 24 4500-P E m |
| Total Sulphide (1) | 10 | N/A | 2023/09/12 | AB SOP-00080 | SM 23 4500 S2-A D Fm |
| Total Sulphide (1) | 1 | N/A | 2023/09/13 | AB SOP-00080 | SM 23 4500 S2-A D Fm |
| Total Dissolved Solids (Filt. Residue) | 11 | 2023/09/11 | 2023/09/12 | BBY6SOP-00033 | SM 24 2540 C m |
| EPH less PAH in Water by GC/FID (5) | 11 | N/A | 2023/09/15 | BBY WI-00033 | Auto Calc |
| Field pH | 10 | N/A | 2023/09/08 | | |
| Field Temperature | 10 | N/A | 2023/09/08 | | |

**Remarks:**

Your P.O. #: 735-002640-4
Your Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your C.O.C. #: 700911-01-01, 700911-03-01

**Attention: Stephanie Berton**

GHD Limited
455 PHILLIP STREET
WATERLOO, ON
CANADA N2L 3X2

**Report Date: 2023/09/18**
Report #: R3396694
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**BUREAU VERITAS JOB #: C371107**
**Received: 2023/09/08, 16:36**

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Bureau Veritas Calgary, 4000 - 19 St. , Calgary, AB, T2E 6P8
(2) Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.
(3) Total PAHs in Water include: Quinoline, Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Acridine, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b&j)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, and Benzo(g,h,i)perylene.
(4) Orthophosphate > Total Phosphorus Imbalance: When applicable, Orthophosphate, Total Phosphorus and dissolved Phosphorus results were reviewed and data quality meets acceptable levels unless otherwise noted.
(5) LEPH = EPH (C10 to C19) - (Acenaphthene + Acridine + Anthracene + Fluorene + Naphthalene + Phenanthrene)
HEPH = EPH (C19 to C32) - (Benzo(a)anthracene + Benzo(a)pyrene + Fluoranthene + Pyrene)


Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your P.O. #: 735-002640-4
Your Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your C.O.C. #: 700911-01-01, 700911-03-01

**Attention: Stephanie Berton**

GHD Limited
455 PHILLIP STREET
WATERLOO, ON
CANADA N2L 3X2

**Report Date: 2023/09/18**
Report #: R3396694
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**BUREAU VERITAS JOB #: C371107**
**Received: 2023/09/08, 16:36**

Encryption Key

Bureau Veritas
18 Sep 2023 11:50:13

Please direct all questions regarding this Certificate of Analysis to:
Brody Andersen, B.Sc., B.Sc., Program Specialist–Emergency Spill Response
Email: Brody.Andersen@bureauveritas.com
Phone# (780)577-7120

==========

This report has been generated and distributed using a secure automated process.
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Raphael Kwan, Senior Manager, BC and Yukon Regions responsible for British Columbia Environmental laboratory operations.



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C371107
Report Date: 2023/09/18

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: CXW

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | BYQ312 | BYQ313 | | | BYQ314 | | |
|---|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/09/06 16:00 | 2023/09/06 16:55 | | | 2023/09/07 08:45 | | |
| COC Number | | 700911-01-01 | 700911-01-01 | | | 700911-01-01 | | |
| | UNITS | WG-11222680-060923 -CXW-01 | WG-11222680-060923 -CXW-02 | RDL | QC Batch | WG-11222680-070923 -CXW-03 | RDL | QC Batch |
| **ANIONS** | | | | | | | | |
| Nitrite (N) | mg/L | <0.0050 | <0.0050 | 0.0050 | B101391 | <0.0050 | 0.0050 | B101391 |
| **Calculated Parameters** | | | | | | | | |
| Nitrate (N) | mg/L | 0.637 | 1.06 | 0.020 | B099920 | 2.33 | 0.040 | B099920 |
| Sulphide (as H2S) | mg/L | <0.0020 | <0.0020 | 0.0020 | B100168 | <0.0020 | 0.0020 | B100168 |
| **Field Parameters** | | | | | | | | |
| Field pH | pH | 7.89 | 7.37 | N/A | ONSITE | 6.61 | N/A | ONSITE |
| Field Temperature | °C | 12.57 | 10.61 | N/A | ONSITE | 11.02 | N/A | ONSITE |
| **Misc. Inorganics** | | | | | | | | |
| Conductivity | uS/cm | 180 | 200 | 2.0 | B102512 | 140 | 2.0 | B102524 |
| Total Dissolved Solids | mg/L | 110 | 120 | 10 | B102287 | 84 | 10 | B102287 |
| **Anions** | | | | | | | | |
| Alkalinity (PP as CaCO3) | mg/L | <1.0 | <1.0 | 1.0 | B102506 | <1.0 | 1.0 | B102520 |
| Alkalinity (Total as CaCO3) | mg/L | 72 | 85 | 1.0 | B102506 | 45 | 1.0 | B102520 |
| Bicarbonate (HCO3) | mg/L | 87 | 100 | 1.0 | B102506 | 55 | 1.0 | B102520 |
| Carbonate (CO3) | mg/L | <1.0 | <1.0 | 1.0 | B102506 | <1.0 | 1.0 | B102520 |
| Hydroxide (OH) | mg/L | <1.0 | <1.0 | 1.0 | B102506 | <1.0 | 1.0 | B102520 |
| Total Sulphide | mg/L | <0.0018 | <0.0018 | 0.0018 | B104312 | <0.0018 | 0.0018 | B104312 |
| Chloride (Cl) | mg/L | 4.2 | 1.9 | 1.0 | B102798 | 2.2 | 1.0 | B102798 |
| Sulphate (SO4) | mg/L | 9.4 | 9.2 | 1.0 | B102798 | 8.4 | 1.0 | B102798 |
| **Nutrients** | | | | | | | | |
| Total Ammonia (N) | mg/L | <0.015 | <0.015 | 0.015 | B103325 | <0.015 | 0.015 | B103325 |
| Orthophosphate (P) | mg/L | 0.012 | 0.0048 | 0.0030 | B101105 | 0.0048 | 0.0030 | B101105 |
| Nitrate plus Nitrite (N) | mg/L | 0.637 | 1.06 | 0.020 | B101390 | 2.33 | 0.040 | B101390 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C371107
Report Date: 2023/09/18

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: CXW

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | BYQ314 | | | BYQ315 | BYQ315 | | |
|---|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/09/07 08:45 | | | 2023/09/07 09:55 | 2023/09/07 09:55 | | |
| COC Number | | 700911-01-01 | | | 700911-01-01 | 700911-01-01 | | |
| | UNITS | WG-11222680-070923-CXW-03 Lab-Dup | RDL | QC Batch | WG-11222680-070923-CXW-04 | WG-11222680-070923-CXW-04 Lab-Dup | RDL | QC Batch |
| **ANIONS** | | | | | | | | |
| Nitrite (N) | mg/L | N/A | 0.0050 | B101391 | <0.0050 | N/A | 0.0050 | B101391 |
| **Calculated Parameters** | | | | | | | | |
| Nitrate (N) | mg/L | N/A | 0.040 | B099920 | 0.062 | N/A | 0.020 | B099920 |
| Sulphide (as H2S) | mg/L | N/A | 0.0020 | B100168 | <0.0020 | N/A | 0.0020 | B100168 |
| **Field Parameters** | | | | | | | | |
| Field pH | pH | N/A | N/A | ONSITE | 8.20 | N/A | N/A | ONSITE |
| Field Temperature | °C | N/A | N/A | ONSITE | 10.56 | N/A | N/A | ONSITE |
| **Misc. Inorganics** | | | | | | | | |
| Conductivity | uS/cm | 140 | 2.0 | B102524 | 87 | N/A | 2.0 | B102512 |
| Total Dissolved Solids | mg/L | N/A | 10 | B102287 | 60 | N/A | 10 | B102287 |
| **Anions** | | | | | | | | |
| Alkalinity (PP as CaCO3) | mg/L | <1.0 | 1.0 | B102520 | <1.0 | N/A | 1.0 | B102506 |
| Alkalinity (Total as CaCO3) | mg/L | 43 | 1.0 | B102520 | 39 | N/A | 1.0 | B102506 |
| Bicarbonate (HCO3) | mg/L | 53 | 1.0 | B102520 | 48 | N/A | 1.0 | B102506 |
| Carbonate (CO3) | mg/L | <1.0 | 1.0 | B102520 | <1.0 | N/A | 1.0 | B102506 |
| Hydroxide (OH) | mg/L | <1.0 | 1.0 | B102520 | <1.0 | N/A | 1.0 | B102506 |
| Total Sulphide | mg/L | N/A | 0.0018 | B104312 | <0.0018 | N/A | 0.0018 | B104312 |
| Chloride (Cl) | mg/L | N/A | 1.0 | B102798 | <1.0 | <1.0 | 1.0 | B103224 |
| Sulphate (SO4) | mg/L | N/A | 1.0 | B102798 | 2.8 | 2.7 | 1.0 | B103224 |
| **Nutrients** | | | | | | | | |
| Total Ammonia (N) | mg/L | N/A | 0.015 | B103325 | <0.015 | N/A | 0.015 | B103325 |
| Orthophosphate (P) | mg/L | N/A | 0.0030 | B101105 | 0.021 | N/A | 0.0030 | B101105 |
| Nitrate plus Nitrite (N) | mg/L | N/A | 0.040 | B101390 | 0.062 | N/A | 0.020 | B101390 |

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



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C371107
Report Date: 2023/09/18

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: CXW

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | BYQ316 | BYQ317 | | BYQ318 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/09/07 10:05 | 2023/09/07 10:07 | | 2023/09/07 11:20 | | |
| COC Number | | 700911-01-01 | 700911-01-01 | | 700911-01-01 | | |
| | UNITS | WG-11222680-070923-CXW-05 | WG-11222680-070923-CXW-06 | QC Batch | WG-11222680-070923-CXW-07 | RDL | QC Batch |
| **ANIONS** | | | | | | | |
| Nitrite (N) | mg/L | <0.0050 | <0.0050 | B101391 | <0.0050 | 0.0050 | B101391 |
| **Calculated Parameters** | | | | | | | |
| Nitrate (N) | mg/L | 0.325 | 0.326 | B099920 | 0.127 | 0.020 | B099920 |
| Sulphide (as H2S) | mg/L | <0.0020 | <0.0020 | B100168 | <0.0020 | 0.0020 | B100168 |
| **Field Parameters** | | | | | | | |
| Field pH | pH | 6.74 | 6.74 | ONSITE | 7.32 | N/A | ONSITE |
| Field Temperature | °C | 11.84 | 11.84 | ONSITE | 12.36 | N/A | ONSITE |
| **Misc. Inorganics** | | | | | | | |
| Conductivity | uS/cm | 170 | 170 | B102512 | 88 | 2.0 | B102512 |
| Total Dissolved Solids | mg/L | 96 | 100 | B102287 | 54 | 10 | B102287 |
| **Anions** | | | | | | | |
| Alkalinity (PP as CaCO3) | mg/L | <1.0 | <1.0 | B102506 | <1.0 | 1.0 | B102506 |
| Alkalinity (Total as CaCO3) | mg/L | 67 | 67 | B102506 | 35 | 1.0 | B102506 |
| Bicarbonate (HCO3) | mg/L | 81 | 82 | B102506 | 43 | 1.0 | B102506 |
| Carbonate (CO3) | mg/L | <1.0 | <1.0 | B102506 | <1.0 | 1.0 | B102506 |
| Hydroxide (OH) | mg/L | <1.0 | <1.0 | B102506 | <1.0 | 1.0 | B102506 |
| Total Sulphide | mg/L | <0.0018 | <0.0018 | B104312 | <0.0018 | 0.0018 | B104312 |
| Chloride (Cl) | mg/L | 4.5 | 4.7 | B102798 | 3.3 | 1.0 | B103224 |
| Sulphate (SO4) | mg/L | 7.3 | 7.4 | B102798 | 3.0 | 1.0 | B103224 |
| **Nutrients** | | | | | | | |
| Total Ammonia (N) | mg/L | <0.015 | <0.015 | B103325 | <0.015 | 0.015 | B106275 |
| Orthophosphate (P) | mg/L | 0.0033 | <0.0030 | B101105 | 0.0047 | 0.0030 | B101105 |
| Nitrate plus Nitrite (N) | mg/L | 0.325 | 0.326 | B101390 | 0.127 | 0.020 | B101390 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C371107
Report Date: 2023/09/18

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: CXW

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | BYQ319 | BYQ319 | BYQ320 | BYQ321 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/09/07 12:15 | 2023/09/07 12:15 | 2023/09/07 12:40 | 2023/09/07 15:15 | | |
| COC Number | | 700911-01-01 | 700911-01-01 | 700911-01-01 | 700911-01-01 | | |
| | UNITS | WG-11222680-070923 -CXW-08 | WG-11222680-070923 -CXW-08 Lab-Dup | WG-11222680-070923 -CXW-09 | WG-11222680-070923 -CXW-10 | RDL | QC Batch |
| **ANIONS** | | | | | | | |
| Nitrite (N) | mg/L | <0.0050 | N/A | <0.0050 | <0.0050 | 0.0050 | B101391 |
| **Calculated Parameters** | | | | | | | |
| Nitrate (N) | mg/L | 0.740 | N/A | 0.521 | 0.079 | 0.020 | B099920 |
| Sulphide (as H2S) | mg/L | <0.0020 | N/A | <0.0020 | <0.0020 | 0.0020 | B100168 |
| **Field Parameters** | | | | | | | |
| Field pH | pH | 6.74 | N/A | 6.74 | 7.73 | N/A | ONSITE |
| Field Temperature | °C | 18.24 | N/A | 18.72 | 12.35 | N/A | ONSITE |
| **Misc. Inorganics** | | | | | | | |
| Conductivity | uS/cm | 450 | 460 | 250 | 76 | 2.0 | B102512 |
| Total Dissolved Solids | mg/L | 300 | N/A | 140 | 36 | 10 | B102287 |
| **Anions** | | | | | | | |
| Alkalinity (PP as CaCO3) | mg/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B102506 |
| Alkalinity (Total as CaCO3) | mg/L | 78 | 78 | 100 | 34 | 1.0 | B102506 |
| Bicarbonate (HCO3) | mg/L | 95 | 96 | 130 | 42 | 1.0 | B102506 |
| Carbonate (CO3) | mg/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B102506 |
| Hydroxide (OH) | mg/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B102506 |
| Total Sulphide | mg/L | <0.0018 | N/A | <0.0018 | <0.0018 | 0.0018 | B104312 |
| Chloride (Cl) | mg/L | 85 | N/A | 8.6 | <1.0 | 1.0 | B103224 |
| Sulphate (SO4) | mg/L | 5.8 | N/A | 7.3 | 2.9 | 1.0 | B103224 |
| **Nutrients** | | | | | | | |
| Total Ammonia (N) | mg/L | <0.015 | N/A | <0.015 | <0.015 | 0.015 | B106275 |
| Orthophosphate (P) | mg/L | 0.0045 | N/A | 0.025 | 0.0055 | 0.0030 | B101105 |
| Nitrate plus Nitrite (N) | mg/L | 0.740 | N/A | 0.521 | 0.079 | 0.020 | B101390 |

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



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C371107
Report Date: 2023/09/18

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: CXW

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | BYQ322 | | |
|---|---|---|---|---|
| Sampling Date | | 2023/09/08 08:25 | | |
| COC Number | | 700911-03-01 | | |
| | UNITS | WG-11222680-080923 -CXW-11 | RDL | QC Batch |
| **ANIONS** | | | | |
| Nitrite (N) | mg/L | <0.0050 | 0.0050 | B101391 |
| **Calculated Parameters** | | | | |
| Nitrate (N) | mg/L | <0.020 | 0.020 | B099920 |
| Sulphide (as H2S) | mg/L | <0.0020 | 0.0020 | B100168 |
| **Misc. Inorganics** | | | | |
| Conductivity | uS/cm | <2.0 | 2.0 | B102512 |
| Total Dissolved Solids | mg/L | <10 | 10 | B102287 |
| **Anions** | | | | |
| Alkalinity (PP as CaCO3) | mg/L | <1.0 | 1.0 | B102506 |
| Alkalinity (Total as CaCO3) | mg/L | <1.0 | 1.0 | B102506 |
| Bicarbonate (HCO3) | mg/L | <1.0 | 1.0 | B102506 |
| Carbonate (CO3) | mg/L | <1.0 | 1.0 | B102506 |
| Hydroxide (OH) | mg/L | <1.0 | 1.0 | B102506 |
| Total Sulphide | mg/L | <0.0018 | 0.0018 | B105624 |
| Chloride (Cl) | mg/L | <1.0 | 1.0 | B103224 |
| Sulphate (SO4) | mg/L | <1.0 | 1.0 | B103224 |
| **Nutrients** | | | | |
| Total Ammonia (N) | mg/L | 0.025 | 0.015 | B106275 |
| Orthophosphate (P) | mg/L | <0.0030 | 0.0030 | B101105 |
| Nitrate plus Nitrite (N) | mg/L | <0.020 | 0.020 | B101390 |
| RDL = Reportable Detection Limit | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C371107
Report Date: 2023/09/18

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: CXW

## MISCELLANEOUS (WATER)

| Bureau Veritas ID | | BYQ312 | | BYQ313 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2023/09/06 16:00 | | 2023/09/06 16:55 | | |
| COC Number | | 700911-01-01 | | 700911-01-01 | | |
| | UNITS | WG-11222680-060923-CXW-01 | QC Batch | WG-11222680-060923-CXW-02 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | |
| Total Un-ionized Hydrogen Sulfide as S | mg/L | <0.0050 | B100835 | <0.0050 | 0.0050 | B100837 |
| Total Un-ionized Hydrogen Sulfide as H2S | mg/L | <0.0050 | B100835 | <0.0050 | 0.0050 | B100837 |
| RDL = Reportable Detection Limit | | | | | | |

| Bureau Veritas ID | | BYQ314 | | BYQ315 | BYQ316 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/09/07 08:45 | | 2023/09/07 09:55 | 2023/09/07 10:05 | | |
| COC Number | | 700911-01-01 | | 700911-01-01 | 700911-01-01 | | |
| | UNITS | WG-11222680-070923-CXW-03 | QC Batch | WG-11222680-070923-CXW-04 | WG-11222680-070923-CXW-05 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | | |
| Total Un-ionized Hydrogen Sulfide as S | mg/L | <0.0050 | B100835 | <0.0050 | <0.0050 | 0.0050 | B100837 |
| Total Un-ionized Hydrogen Sulfide as H2S | mg/L | <0.0050 | B100835 | <0.0050 | <0.0050 | 0.0050 | B100837 |
| RDL = Reportable Detection Limit | | | | | | | |

| Bureau Veritas ID | | BYQ317 | BYQ318 | BYQ319 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2023/09/07 10:07 | 2023/09/07 11:20 | 2023/09/07 12:15 | | |
| COC Number | | 700911-01-01 | 700911-01-01 | 700911-01-01 | | |
| | UNITS | WG-11222680-070923-CXW-06 | WG-11222680-070923-CXW-07 | WG-11222680-070923-CXW-08 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | |
| Total Un-ionized Hydrogen Sulfide as S | mg/L | <0.0050 | <0.0050 | <0.0050 | 0.0050 | B100837 |
| Total Un-ionized Hydrogen Sulfide as H2S | mg/L | <0.0050 | <0.0050 | <0.0050 | 0.0050 | B100837 |
| RDL = Reportable Detection Limit | | | | | | |

| Bureau Veritas ID | | BYQ320 | BYQ321 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2023/09/07 12:40 | 2023/09/07 15:15 | | |
| COC Number | | 700911-01-01 | 700911-01-01 | | |
| | UNITS | WG-11222680-070923-CXW-09 | WG-11222680-070923-CXW-10 | RDL | QC Batch |
| **Calculated Parameters** | | | | | |
| Total Un-ionized Hydrogen Sulfide as S | mg/L | <0.0050 | <0.0050 | 0.0050 | B100837 |
| Total Un-ionized Hydrogen Sulfide as H2S | mg/L | <0.0050 | <0.0050 | 0.0050 | B100837 |
| RDL = Reportable Detection Limit | | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C371107
Report Date: 2023/09/18

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: CXW

## LEPH & HEPH WITH CSR/CCME PAH IN WATER (WATER)

| Bureau Veritas ID | | BYQ312 | BYQ313 | BYQ314 | BYQ315 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/09/06 16:00 | 2023/09/06 16:55 | 2023/09/07 08:45 | 2023/09/07 09:55 | | |
| COC Number | | 700911-01-01 | 700911-01-01 | 700911-01-01 | 700911-01-01 | | |
| | UNITS | WG-11222680-060923-CXW-01 | WG-11222680-060923-CXW-02 | WG-11222680-070923-CXW-03 | WG-11222680-070923-CXW-04 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | | |
| Low Molecular Weight PAH`s | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B099705 |
| High Molecular Weight PAH`s | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B099705 |
| Total PAH | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B099705 |
| **Polycyclic Aromatics** | | | | | | | |
| Quinoline | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | B107283 |
| Naphthalene | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B107283 |
| 1-Methylnaphthalene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B107283 |
| 2-Methylnaphthalene | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B107283 |
| Acenaphthylene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B107283 |
| Acenaphthene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B107283 |
| Fluorene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B107283 |
| Phenanthrene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B107283 |
| Anthracene | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | B107283 |
| Acridine | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B107283 |
| Fluoranthene | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | B107283 |
| Pyrene | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | B107283 |
| Benzo(a)anthracene | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | B107283 |
| Chrysene | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | B107283 |
| Benzo(b&j)fluoranthene | ug/L | <0.030 | <0.030 | <0.030 | <0.030 | 0.030 | B107283 |
| Benzo(k)fluoranthene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B107283 |
| Benzo(a)pyrene | ug/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | 0.0050 | B107283 |
| Indeno(1,2,3-cd)pyrene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B107283 |
| Dibenz(a,h)anthracene | ug/L | <0.0030 | <0.0030 | <0.0030 | <0.0030 | 0.0030 | B107283 |
| Benzo(g,h,i)perylene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B107283 |
| **Calculated Parameters** | | | | | | | |
| LEPH (C10-C19 less PAH) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B099707 |
| HEPH (C19-C32 less PAH) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B099707 |
| **Ext. Pet. Hydrocarbon** | | | | | | | |
| EPH (C10-C19) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B107289 |
| EPH (C19-C32) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B107289 |
| RDL = Reportable Detection Limit | | | | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C371107
Report Date: 2023/09/18

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: CXW

## LEPH & HEPH WITH CSR/CCME PAH IN WATER (WATER)

| Bureau Veritas ID | | BYQ312 | BYQ313 | BYQ314 | BYQ315 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/09/06 16:00 | 2023/09/06 16:55 | 2023/09/07 08:45 | 2023/09/07 09:55 | | |
| COC Number | | 700911-01-01 | 700911-01-01 | 700911-01-01 | 700911-01-01 | | |
| | UNITS | WG-11222680-060923-CXW-01 | WG-11222680-060923-CXW-02 | WG-11222680-070923-CXW-03 | WG-11222680-070923-CXW-04 | RDL | QC Batch |
| **Surrogate Recovery (%)** | | | | | | | |
| O-TERPHENYL (sur.) | % | 91 | 93 | 92 | 109 | N/A | B107289 |
| D10-ANTHRACENE (sur.) | % | 85 | 88 | 88 | 89 | N/A | B107283 |
| D8-ACENAPHTHYLENE (sur.) | % | 85 | 88 | 89 | 90 | N/A | B107283 |
| D8-NAPHTHALENE (sur.) | % | 77 | 81 | 87 | 85 | N/A | B107283 |
| TERPHENYL-D14 (sur.) | % | 78 | 80 | 78 | 81 | N/A | B107283 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: CXW

## LEPH & HEPH WITH CSR/CCME PAH IN WATER (WATER)

| Bureau Veritas ID | | BYQ316 | | BYQ317 | BYQ318 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/09/07 10:05 | | 2023/09/07 10:07 | 2023/09/07 11:20 | | |
| COC Number | | 700911-01-01 | | 700911-01-01 | 700911-01-01 | | |
| | UNITS | WG-11222680-070923-CXW-05 | QC Batch | WG-11222680-070923-CXW-06 | WG-11222680-070923-CXW-07 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | | |
| Low Molecular Weight PAH`s | ug/L | <0.10 | B099705 | <0.10 | <0.10 | 0.10 | B099705 |
| High Molecular Weight PAH`s | ug/L | <0.050 | B099705 | <0.050 | <0.050 | 0.050 | B099705 |
| Total PAH | ug/L | <0.10 | B099705 | <0.10 | <0.10 | 0.10 | B099705 |
| **Polycyclic Aromatics** | | | | | | | |
| Quinoline | ug/L | <0.020 | B107283 | <0.020 | <0.020 | 0.020 | B107307 |
| Naphthalene | ug/L | <0.10 | B107283 | <0.10 | <0.10 | 0.10 | B107307 |
| 1-Methylnaphthalene | ug/L | <0.050 | B107283 | <0.050 | <0.050 | 0.050 | B107307 |
| 2-Methylnaphthalene | ug/L | <0.10 | B107283 | <0.10 | <0.10 | 0.10 | B107307 |
| Acenaphthylene | ug/L | <0.050 | B107283 | <0.050 | <0.050 | 0.050 | B107307 |
| Acenaphthene | ug/L | <0.050 | B107283 | <0.050 | <0.050 | 0.050 | B107307 |
| Fluorene | ug/L | <0.050 | B107283 | <0.050 | <0.050 | 0.050 | B107307 |
| Phenanthrene | ug/L | <0.050 | B107283 | <0.050 | <0.050 | 0.050 | B107307 |
| Anthracene | ug/L | <0.010 | B107283 | <0.010 | <0.010 | 0.010 | B107307 |
| Acridine | ug/L | <0.050 | B107283 | <0.050 | <0.050 | 0.050 | B107307 |
| Fluoranthene | ug/L | <0.020 | B107283 | <0.020 | <0.020 | 0.020 | B107307 |
| Pyrene | ug/L | <0.020 | B107283 | <0.020 | <0.020 | 0.020 | B107307 |
| Benzo(a)anthracene | ug/L | <0.010 | B107283 | <0.010 | <0.010 | 0.010 | B107307 |
| Chrysene | ug/L | <0.020 | B107283 | <0.020 | <0.020 | 0.020 | B107307 |
| Benzo(b&j)fluoranthene | ug/L | <0.030 | B107283 | <0.030 | <0.030 | 0.030 | B107307 |
| Benzo(k)fluoranthene | ug/L | <0.050 | B107283 | <0.050 | <0.050 | 0.050 | B107307 |
| Benzo(a)pyrene | ug/L | <0.0050 | B107283 | <0.0050 | <0.0050 | 0.0050 | B107307 |
| Indeno(1,2,3-cd)pyrene | ug/L | <0.050 | B107283 | <0.050 | <0.050 | 0.050 | B107307 |
| Dibenz(a,h)anthracene | ug/L | <0.0030 | B107283 | <0.0030 | <0.0030 | 0.0030 | B107307 |
| Benzo(g,h,i)perylene | ug/L | <0.050 | B107283 | <0.050 | <0.050 | 0.050 | B107307 |
| **Calculated Parameters** | | | | | | | |
| LEPH (C10-C19 less PAH) | mg/L | <0.20 | B099707 | <0.20 | <0.20 | 0.20 | B099707 |
| HEPH (C19-C32 less PAH) | mg/L | <0.20 | B099707 | <0.20 | <0.20 | 0.20 | B099707 |
| **Ext. Pet. Hydrocarbon** | | | | | | | |
| EPH (C10-C19) | mg/L | <0.20 | B107289 | <0.20 | <0.20 | 0.20 | B107314 |
| EPH (C19-C32) | mg/L | <0.20 | B107289 | <0.20 | <0.20 | 0.20 | B107314 |
| RDL = Reportable Detection Limit | | | | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C371107
Report Date: 2023/09/18

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: CXW

## LEPH & HEPH WITH CSR/CCME PAH IN WATER (WATER)

| Bureau Veritas ID | | BYQ316 | | BYQ317 | BYQ318 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/09/07 10:05 | | 2023/09/07 10:07 | 2023/09/07 11:20 | | |
| COC Number | | 700911-01-01 | | 700911-01-01 | 700911-01-01 | | |
| | UNITS | WG-11222680-070923-CXW-05 | QC Batch | WG-11222680-070923-CXW-06 | WG-11222680-070923-CXW-07 | RDL | QC Batch |
| **Surrogate Recovery (%)** | | | | | | | |
| O-TERPHENYL (sur.) | % | 111 | B107289 | 93 | 98 | N/A | B107314 |
| D10-ANTHRACENE (sur.) | % | 87 | B107283 | 98 | 97 | N/A | B107307 |
| D8-ACENAPHTHYLENE (sur.) | % | 87 | B107283 | 93 | 91 | N/A | B107307 |
| D8-NAPHTHALENE (sur.) | % | 81 | B107283 | 79 | 75 | N/A | B107307 |
| TERPHENYL-D14 (sur.) | % | 78 | B107283 | 77 | 73 | N/A | B107307 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C371107
Report Date: 2023/09/18

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: CXW

## LEPH & HEPH WITH CSR/CCME PAH IN WATER (WATER)

| Bureau Veritas ID | | BYQ319 | BYQ320 | BYQ321 | BYQ322 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/09/07 12:15 | 2023/09/07 12:40 | 2023/09/07 15:15 | 2023/09/08 08:25 | | |
| COC Number | | 700911-01-01 | 700911-01-01 | 700911-01-01 | 700911-03-01 | | |
| | UNITS | WG-11222680-070923-CXW-08 | WG-11222680-070923-CXW-09 | WG-11222680-070923-CXW-10 | WG-11222680-080923-CXW-11 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | | |
| Low Molecular Weight PAH`s | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B099705 |
| High Molecular Weight PAH`s | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B099705 |
| Total PAH | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B099705 |
| **Polycyclic Aromatics** | | | | | | | |
| Quinoline | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | B107307 |
| Naphthalene | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B107307 |
| 1-Methylnaphthalene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B107307 |
| 2-Methylnaphthalene | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B107307 |
| Acenaphthylene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B107307 |
| Acenaphthene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B107307 |
| Fluorene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B107307 |
| Phenanthrene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B107307 |
| Anthracene | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | B107307 |
| Acridine | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B107307 |
| Fluoranthene | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | B107307 |
| Pyrene | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | B107307 |
| Benzo(a)anthracene | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | B107307 |
| Chrysene | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | B107307 |
| Benzo(b&j)fluoranthene | ug/L | <0.030 | <0.030 | <0.030 | <0.030 | 0.030 | B107307 |
| Benzo(k)fluoranthene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B107307 |
| Benzo(a)pyrene | ug/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | 0.0050 | B107307 |
| Indeno(1,2,3-cd)pyrene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B107307 |
| Dibenz(a,h)anthracene | ug/L | <0.0030 | <0.0030 | <0.0030 | <0.0030 | 0.0030 | B107307 |
| Benzo(g,h,i)perylene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B107307 |
| **Calculated Parameters** | | | | | | | |
| LEPH (C10-C19 less PAH) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B099707 |
| HEPH (C19-C32 less PAH) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B099707 |
| **Ext. Pet. Hydrocarbon** | | | | | | | |
| EPH (C10-C19) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B107314 |
| EPH (C19-C32) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B107314 |
| RDL = Reportable Detection Limit | | | | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C371107
Report Date: 2023/09/18

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: CXW

## LEPH & HEPH WITH CSR/CCME PAH IN WATER (WATER)

| Bureau Veritas ID | | BYQ319 | BYQ320 | BYQ321 | BYQ322 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/09/07 12:15 | 2023/09/07 12:40 | 2023/09/07 15:15 | 2023/09/08 08:25 | | |
| COC Number | | 700911-01-01 | 700911-01-01 | 700911-01-01 | 700911-03-01 | | |
| | UNITS | WG-11222680-070923 -CXW-08 | WG-11222680-070923 -CXW-09 | WG-11222680-070923 -CXW-10 | WG-11222680-080923 -CXW-11 | RDL | QC Batch |
| **Surrogate Recovery (%)** | | | | | | | |
| O-TERPHENYL (sur.) | % | 92 | 93 | 93 | 92 | N/A | B107314 |
| D10-ANTHRACENE (sur.) | % | 97 | 94 | 95 | 97 | N/A | B107307 |
| D8-ACENAPHTHYLENE (sur.) | % | 92 | 90 | 92 | 92 | N/A | B107307 |
| D8-NAPHTHALENE (sur.) | % | 76 | 75 | 94 | 78 | N/A | B107307 |
| TERPHENYL-D14 (sur.) | % | 79 | 79 | 98 | 80 | N/A | B107307 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C371107
Report Date: 2023/09/18

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: CXW

## CSR D. METALS W/CV HG-DISS (WATER)

| Bureau Veritas ID | | BYQ312 | BYQ312 | BYQ313 | BYQ314 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/09/06 16:00 | 2023/09/06 16:00 | 2023/09/06 16:55 | 2023/09/07 08:45 | | |
| COC Number | | 700911-01-01 | 700911-01-01 | 700911-01-01 | 700911-01-01 | | |
| | UNITS | WG-11222680-060923-CXW-01 | WG-11222680-060923-CXW-01 Lab-Dup | WG-11222680-060923-CXW-02 | WG-11222680-070923-CXW-03 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | | |
| Dissolved Hardness (CaCO3) | mg/L | 70.5 | N/A | 81.5 | 47.7 | 0.50 | B099702 |
| **Elements** | | | | | | | |
| Dissolved Mercury (Hg) | ug/L | 0.0019 | <0.0019 | <0.0019 | <0.0019 | 0.0019 | B105296 |
| **Dissolved Metals by ICPMS** | | | | | | | |
| Dissolved Aluminum (Al) | ug/L | <3.0 | <3.0 | <3.0 | <3.0 | 3.0 | B105833 |
| Dissolved Antimony (Sb) | ug/L | <0.50 | <0.50 | <0.50 | <0.50 | 0.50 | B105833 |
| Dissolved Arsenic (As) | ug/L | 0.32 | 0.32 | <0.10 | <0.10 | 0.10 | B105833 |
| Dissolved Barium (Ba) | ug/L | 3.3 | 3.2 | 3.1 | 1.1 | 1.0 | B105833 |
| Dissolved Beryllium (Be) | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B105833 |
| Dissolved Bismuth (Bi) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B105833 |
| Dissolved Boron (B) | ug/L | 52 | 52 | <50 | <50 | 50 | B105833 |
| Dissolved Cadmium (Cd) | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | B105833 |
| Dissolved Chromium (Cr) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B105833 |
| Dissolved Cobalt (Co) | ug/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B105833 |
| Dissolved Copper (Cu) | ug/L | 0.79 | 0.83 | <0.20 | <0.20 | 0.20 | B105833 |
| Dissolved Iron (Fe) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B105833 |
| Dissolved Lead (Pb) | ug/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B105833 |
| Dissolved Lithium (Li) | ug/L | <2.0 | <2.0 | <2.0 | <2.0 | 2.0 | B105833 |
| Dissolved Manganese (Mn) | ug/L | <1.0 | <1.0 | 2.4 | <1.0 | 1.0 | B105833 |
| Dissolved Molybdenum (Mo) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B105833 |
| Dissolved Nickel (Ni) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B105833 |
| Dissolved Phosphorus (P) | ug/L | 14 | 15 | <10 | <10 | 10 | B105833 |
| Dissolved Selenium (Se) | ug/L | <0.10 | <0.10 | <0.10 | 0.23 | 0.10 | B105833 |
| Dissolved Silicon (Si) | ug/L | 6490 | 6390 | 7250 | 6650 | 100 | B105833 |
| Dissolved Silver (Ag) | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | B105833 |
| Dissolved Strontium (Sr) | ug/L | 33.5 | 33.0 | 38.7 | 29.5 | 1.0 | B105833 |
| Dissolved Thallium (Tl) | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | B105833 |
| Dissolved Tin (Sn) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B105833 |
| Dissolved Titanium (Ti) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B105833 |

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



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C371107
Report Date: 2023/09/18

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: CXW

## CSR D. METALS W/CV HG-DISS (WATER)

| Bureau Veritas ID | | BYQ312 | BYQ312 | BYQ313 | BYQ314 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/09/06 16:00 | 2023/09/06 16:00 | 2023/09/06 16:55 | 2023/09/07 08:45 | | |
| COC Number | | 700911-01-01 | 700911-01-01 | 700911-01-01 | 700911-01-01 | | |
| | UNITS | WG-11222680-060923 -CXW-01 | WG-11222680-060923 -CXW-01 Lab-Dup | WG-11222680-060923 -CXW-02 | WG-11222680-070923 -CXW-03 | RDL | QC Batch |
| Dissolved Uranium (U) | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B105833 |
| Dissolved Vanadium (V) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B105833 |
| Dissolved Zinc (Zn) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B105833 |
| Dissolved Zirconium (Zr) | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B105833 |
| Dissolved Calcium (Ca) | mg/L | 22.8 | N/A | 24.8 | 13.8 | 0.050 | B099703 |
| Dissolved Magnesium (Mg) | mg/L | 3.32 | N/A | 4.73 | 3.23 | 0.050 | B099703 |
| Dissolved Potassium (K) | mg/L | 0.361 | N/A | 0.315 | 0.190 | 0.050 | B099703 |
| Dissolved Sodium (Na) | mg/L | 6.89 | N/A | 5.94 | 6.27 | 0.050 | B099703 |
| Dissolved Sulphur (S) | mg/L | <3.0 | N/A | <3.0 | <3.0 | 3.0 | B099703 |

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



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C371107
Report Date: 2023/09/18

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: CXW

## CSR D. METALS W/CV HG-DISS (WATER)

| Bureau Veritas ID | | BYQ315 | BYQ316 | BYQ317 | BYQ318 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/09/07 09:55 | 2023/09/07 10:05 | 2023/09/07 10:07 | 2023/09/07 11:20 | | |
| COC Number | | 700911-01-01 | 700911-01-01 | 700911-01-01 | 700911-01-01 | | |
| | UNITS | WG-11222680-070923-CXW-04 | WG-11222680-070923-CXW-05 | WG-11222680-070923-CXW-06 | WG-11222680-070923-CXW-07 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | | |
| Dissolved Hardness (CaCO3) | mg/L | 36.2 | 69.2 | 68.8 | 33.2 | 0.50 | B099702 |
| **Elements** | | | | | | | |
| Dissolved Mercury (Hg) | ug/L | <0.0019 | <0.0019 | <0.0019 | <0.0019 | 0.0019 | B105296 |
| **Dissolved Metals by ICPMS** | | | | | | | |
| Dissolved Aluminum (Al) | ug/L | <3.0 | <3.0 | <3.0 | <3.0 | 3.0 | B105833 |
| Dissolved Antimony (Sb) | ug/L | <0.50 | <0.50 | <0.50 | <0.50 | 0.50 | B105833 |
| Dissolved Arsenic (As) | ug/L | 0.72 | <0.10 | <0.10 | <0.10 | 0.10 | B105833 |
| Dissolved Barium (Ba) | ug/L | 2.0 | 2.0 | 1.9 | <1.0 | 1.0 | B105833 |
| Dissolved Beryllium (Be) | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B105833 |
| Dissolved Bismuth (Bi) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B105833 |
| Dissolved Boron (B) | ug/L | <50 | <50 | <50 | <50 | 50 | B105833 |
| Dissolved Cadmium (Cd) | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | B105833 |
| Dissolved Chromium (Cr) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B105833 |
| Dissolved Cobalt (Co) | ug/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B105833 |
| Dissolved Copper (Cu) | ug/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B105833 |
| Dissolved Iron (Fe) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B105833 |
| Dissolved Lead (Pb) | ug/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B105833 |
| Dissolved Lithium (Li) | ug/L | <2.0 | <2.0 | <2.0 | <2.0 | 2.0 | B105833 |
| Dissolved Manganese (Mn) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B105833 |
| Dissolved Molybdenum (Mo) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B105833 |
| Dissolved Nickel (Ni) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B105833 |
| Dissolved Phosphorus (P) | ug/L | 25 | <10 | <10 | <10 | 10 | B105833 |
| Dissolved Selenium (Se) | ug/L | <0.10 | 0.14 | 0.11 | <0.10 | 0.10 | B105833 |
| Dissolved Silicon (Si) | ug/L | 3380 | 5960 | 5750 | 3430 | 100 | B105833 |
| Dissolved Silver (Ag) | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | B105833 |
| Dissolved Strontium (Sr) | ug/L | 15.5 | 36.9 | 37.3 | 16.1 | 1.0 | B105833 |
| Dissolved Thallium (Tl) | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | B105833 |
| Dissolved Tin (Sn) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B105833 |
| Dissolved Titanium (Ti) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B105833 |
| Dissolved Uranium (U) | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B105833 |
| Dissolved Vanadium (V) | ug/L | 5.9 | <5.0 | <5.0 | <5.0 | 5.0 | B105833 |

RDL = Reportable Detection Limit



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C371107
Report Date: 2023/09/18

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: CXW

## CSR D. METALS W/CV HG-DISS (WATER)

| Bureau Veritas ID | | BYQ315 | BYQ316 | BYQ317 | BYQ318 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/09/07 09:55 | 2023/09/07 10:05 | 2023/09/07 10:07 | 2023/09/07 11:20 | | |
| COC Number | | 700911-01-01 | 700911-01-01 | 700911-01-01 | 700911-01-01 | | |
| | UNITS | WG-11222680-070923-CXW-04 | WG-11222680-070923-CXW-05 | WG-11222680-070923-CXW-06 | WG-11222680-070923-CXW-07 | RDL | QC Batch |
| Dissolved Zinc (Zn) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B105833 |
| Dissolved Zirconium (Zr) | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B105833 |
| Dissolved Calcium (Ca) | mg/L | 11.8 | 21.9 | 21.5 | 11.0 | 0.050 | B099703 |
| Dissolved Magnesium (Mg) | mg/L | 1.65 | 3.54 | 3.65 | 1.36 | 0.050 | B099703 |
| Dissolved Potassium (K) | mg/L | 0.165 | 0.225 | 0.238 | 0.124 | 0.050 | B099703 |
| Dissolved Sodium (Na) | mg/L | 0.932 | 3.57 | 3.61 | 1.21 | 0.050 | B099703 |
| Dissolved Sulphur (S) | mg/L | <3.0 | <3.0 | <3.0 | <3.0 | 3.0 | B099703 |
| RDL = Reportable Detection Limit | | | | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C371107
Report Date: 2023/09/18

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: CXW

## CSR D. METALS W/CV HG-DISS (WATER)

| Bureau Veritas ID | | BYQ319 | BYQ320 | BYQ321 | BYQ322 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/09/07 12:15 | 2023/09/07 12:40 | 2023/09/07 15:15 | 2023/09/08 08:25 | | |
| COC Number | | 700911-01-01 | 700911-01-01 | 700911-01-01 | 700911-03-01 | | |
| | UNITS | WG-11222680-070923-CXW-08 | WG-11222680-070923-CXW-09 | WG-11222680-070923-CXW-10 | WG-11222680-080923-CXW-11 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | | |
| Dissolved Hardness (CaCO3) | mg/L | 134 | 103 | 32.0 | <0.50 | 0.50 | B099702 |
| **Elements** | | | | | | | |
| Dissolved Mercury (Hg) | ug/L | <0.0019 | <0.0019 | <0.0019 | <0.0019 | 0.0019 | B105296 |
| **Dissolved Metals by ICPMS** | | | | | | | |
| Dissolved Aluminum (Al) | ug/L | <3.0 | <3.0 | <3.0 | <3.0 | 3.0 | B105833 |
| Dissolved Antimony (Sb) | ug/L | <0.50 | <0.50 | <0.50 | <0.50 | 0.50 | B105833 |
| Dissolved Arsenic (As) | ug/L | 0.12 | 0.17 | <0.10 | <0.10 | 0.10 | B105833 |
| Dissolved Barium (Ba) | ug/L | 11.4 | 7.0 | <1.0 | <1.0 | 1.0 | B105833 |
| Dissolved Beryllium (Be) | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B105833 |
| Dissolved Bismuth (Bi) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B105833 |
| Dissolved Boron (B) | ug/L | <50 | <50 | <50 | <50 | 50 | B105833 |
| Dissolved Cadmium (Cd) | ug/L | 0.011 | <0.010 | <0.010 | <0.010 | 0.010 | B105833 |
| Dissolved Chromium (Cr) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B105833 |
| Dissolved Cobalt (Co) | ug/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B105833 |
| Dissolved Copper (Cu) | ug/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B105833 |
| Dissolved Iron (Fe) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B105833 |
| Dissolved Lead (Pb) | ug/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B105833 |
| Dissolved Lithium (Li) | ug/L | <2.0 | <2.0 | <2.0 | <2.0 | 2.0 | B105833 |
| Dissolved Manganese (Mn) | ug/L | 13.8 | 2.8 | <1.0 | <1.0 | 1.0 | B105833 |
| Dissolved Molybdenum (Mo) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B105833 |
| Dissolved Nickel (Ni) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B105833 |
| Dissolved Phosphorus (P) | ug/L | <10 | 26 | <10 | <10 | 10 | B105833 |
| Dissolved Selenium (Se) | ug/L | <0.10 | 0.16 | <0.10 | <0.10 | 0.10 | B105833 |
| Dissolved Silicon (Si) | ug/L | 13300 | 9540 | 2930 | <100 | 100 | B105833 |
| Dissolved Silver (Ag) | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | B105833 |
| Dissolved Strontium (Sr) | ug/L | 96.6 | 53.2 | 14.8 | <1.0 | 1.0 | B105833 |
| Dissolved Thallium (Tl) | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | B105833 |
| Dissolved Tin (Sn) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B105833 |
| Dissolved Titanium (Ti) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B105833 |
| Dissolved Uranium (U) | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B105833 |
| Dissolved Vanadium (V) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B105833 |

RDL = Reportable Detection Limit



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: CXW

## CSR D. METALS W/CV HG-DISS (WATER)

| Bureau Veritas ID | | BYQ319 | BYQ320 | BYQ321 | BYQ322 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/09/07 12:15 | 2023/09/07 12:40 | 2023/09/07 15:15 | 2023/09/08 08:25 | | |
| COC Number | | 700911-01-01 | 700911-01-01 | 700911-01-01 | 700911-03-01 | | |
| | UNITS | WG-11222680-070923-CXW-08 | WG-11222680-070923-CXW-09 | WG-11222680-070923-CXW-10 | WG-11222680-080923-CXW-11 | RDL | QC Batch |
| Dissolved Zinc (Zn) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B105833 |
| Dissolved Zirconium (Zr) | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B105833 |
| Dissolved Calcium (Ca) | mg/L | 33.8 | 32.6 | 10.8 | <0.050 | 0.050 | B099703 |
| Dissolved Magnesium (Mg) | mg/L | 12.2 | 5.13 | 1.24 | <0.050 | 0.050 | B099703 |
| Dissolved Potassium (K) | mg/L | 0.976 | 0.476 | 0.135 | <0.050 | 0.050 | B099703 |
| Dissolved Sodium (Na) | mg/L | 22.9 | 4.94 | 0.765 | <0.050 | 0.050 | B099703 |
| Dissolved Sulphur (S) | mg/L | <3.0 | <3.0 | <3.0 | <3.0 | 3.0 | B099703 |
| RDL = Reportable Detection Limit | | | | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## GENERAL COMMENTS

**Results relate only to the items tested.**



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## QUALITY ASSURANCE REPORT



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B107283 | D10-ANTHRACENE (sur.) | 2023/09/14 | 87 | 50 - 140 | 88 | 50 - 140 | 92 | % | | |
| B107283 | D8-ACENAPHTHYLENE (sur.) | 2023/09/14 | 88 | 50 - 140 | 93 | 50 - 140 | 92 | % | | |
| B107283 | D8-NAPHTHALENE (sur.) | 2023/09/14 | 85 | 50 - 140 | 77 | 50 - 140 | 77 | % | | |
| B107283 | TERPHENYL-D14 (sur.) | 2023/09/14 | 80 | 50 - 140 | 87 | 50 - 140 | 87 | % | | |
| B107289 | O-TERPHENYL (sur.) | 2023/09/14 | 92 | 60 - 140 | 92 | 60 - 140 | 92 | % | | |
| B107307 | D10-ANTHRACENE (sur.) | 2023/09/14 | 75 | 50 - 140 | 95 | 50 - 140 | 94 | % | | |
| B107307 | D8-ACENAPHTHYLENE (sur.) | 2023/09/14 | 85 | 50 - 140 | 91 | 50 - 140 | 88 | % | | |
| B107307 | D8-NAPHTHALENE (sur.) | 2023/09/14 | 80 | 50 - 140 | 71 | 50 - 140 | 66 | % | | |
| B107307 | TERPHENYL-D14 (sur.) | 2023/09/14 | 46 (6) | 50 - 140 | 86 | 50 - 140 | 85 | % | | |
| B107314 | O-TERPHENYL (sur.) | 2023/09/14 | | | 94 | 60 - 140 | 91 | % | | |
| B101105 | Orthophosphate (P) | 2023/09/09 | 110 | 80 - 120 | 100 | 80 - 120 | <0.0030 | mg/L | NC (1) | 20 |
| B101390 | Nitrate plus Nitrite (N) | 2023/09/09 | NC | 80 - 120 | 104 | 80 - 120 | <0.020 | mg/L | 1.3 (1) | 25 |
| B101391 | Nitrite (N) | 2023/09/09 | NC | N/A | 102 | 80 - 120 | <0.0050 | mg/L | 1.4 (1) | 20 |
| B102287 | Total Dissolved Solids | 2023/09/12 | 101 | 80 - 120 | 102 | 80 - 120 | <10 | mg/L | 1.3 (1) | 20 |
| B102506 | Alkalinity (PP as CaCO3) | 2023/09/12 | | | | | <1.0 | mg/L | NC (2) | 20 |
| B102506 | Alkalinity (Total as CaCO3) | 2023/09/12 | | | 98 | 80 - 120 | <1.0 | mg/L | 0.53 (2) | 20 |
| B102506 | Bicarbonate (HCO3) | 2023/09/12 | | | | | <1.0 | mg/L | 0.53 (2) | 20 |
| B102506 | Carbonate (CO3) | 2023/09/12 | | | | | <1.0 | mg/L | NC (2) | 20 |
| B102506 | Hydroxide (OH) | 2023/09/12 | | | | | <1.0 | mg/L | NC (2) | 20 |
| B102512 | Conductivity | 2023/09/12 | | | 100 | 90 - 110 | <2.0 | uS/cm | 1.1 (2) | 10 |
| B102520 | Alkalinity (PP as CaCO3) | 2023/09/12 | | | | | <1.0 | mg/L | NC (3) | 20 |
| B102520 | Alkalinity (Total as CaCO3) | 2023/09/12 | | | 101 | 80 - 120 | <1.0 | mg/L | 4.7 (3) | 20 |
| B102520 | Bicarbonate (HCO3) | 2023/09/12 | | | | | <1.0 | mg/L | 4.7 (3) | 20 |
| B102520 | Carbonate (CO3) | 2023/09/12 | | | | | <1.0 | mg/L | NC (3) | 20 |
| B102520 | Hydroxide (OH) | 2023/09/12 | | | | | <1.0 | mg/L | NC (3) | 20 |
| B102524 | Conductivity | 2023/09/12 | | | 100 | 90 - 110 | <2.0 | uS/cm | 0.22 (3) | 10 |
| B102798 | Chloride (Cl) | 2023/09/11 | NC | 80 - 120 | 100 | 80 - 120 | <1.0 | mg/L | 1.3 (1) | 20 |
| B102798 | Sulphate (SO4) | 2023/09/11 | NC | 80 - 120 | 97 | 80 - 120 | <1.0 | mg/L | 0.0021 (1) | 20 |
| B103224 | Chloride (Cl) | 2023/09/12 | 109 (4) | 80 - 120 | 97 | 80 - 120 | <1.0 | mg/L | NC (5) | 20 |
| B103224 | Sulphate (SO4) | 2023/09/12 | 107 (4) | 80 - 120 | 97 | 80 - 120 | <1.0 | mg/L | 2.3 (5) | 20 |
| B103325 | Total Ammonia (N) | 2023/09/11 | NC | 80 - 120 | 112 | 80 - 120 | <0.015 | mg/L | 7.5 (1) | 20 |

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B104312 | Total Sulphide | 2023/09/12 | 63 (6) | 80 - 120 | 94 | 80 - 120 | <0.0018 | mg/L | 13 (1) | 20 |
| B105296 | Dissolved Mercury (Hg) | 2023/09/13 | 88 (7) | 80 - 120 | 99 | 80 - 120 | <0.0019 | ug/L | 2.1 (8) | 20 |
| B105624 | Total Sulphide | 2023/09/13 | 89 | 80 - 120 | 107 | 80 - 120 | <0.0018 | mg/L | NC (1) | 20 |
| B105833 | Dissolved Aluminum (Al) | 2023/09/14 | 88 (9) | 80 - 120 | 91 | 80 - 120 | <3.0 | ug/L | NC (10) | 20 |
| B105833 | Dissolved Antimony (Sb) | 2023/09/14 | 98 (9) | 80 - 120 | 101 | 80 - 120 | <0.50 | ug/L | NC (10) | 20 |
| B105833 | Dissolved Arsenic (As) | 2023/09/14 | 98 (9) | 80 - 120 | 99 | 80 - 120 | <0.10 | ug/L | 1.3 (10) | 20 |
| B105833 | Dissolved Barium (Ba) | 2023/09/14 | 93 (9) | 80 - 120 | 98 | 80 - 120 | <1.0 | ug/L | 2.1 (10) | 20 |
| B105833 | Dissolved Beryllium (Be) | 2023/09/14 | 91 (9) | 80 - 120 | 96 | 80 - 120 | <0.10 | ug/L | NC (10) | 20 |
| B105833 | Dissolved Bismuth (Bi) | 2023/09/14 | 91 (9) | 80 - 120 | 99 | 80 - 120 | <1.0 | ug/L | NC (10) | 20 |
| B105833 | Dissolved Boron (B) | 2023/09/14 | 85 (9) | 80 - 120 | 87 | 80 - 120 | <50 | ug/L | 0.77 (10) | 20 |
| B105833 | Dissolved Cadmium (Cd) | 2023/09/14 | 97 (9) | 80 - 120 | 99 | 80 - 120 | <0.010 | ug/L | NC (10) | 20 |
| B105833 | Dissolved Chromium (Cr) | 2023/09/14 | 96 (9) | 80 - 120 | 99 | 80 - 120 | <1.0 | ug/L | NC (10) | 20 |
| B105833 | Dissolved Cobalt (Co) | 2023/09/14 | 93 (9) | 80 - 120 | 97 | 80 - 120 | <0.20 | ug/L | NC (10) | 20 |
| B105833 | Dissolved Copper (Cu) | 2023/09/14 | 93 (9) | 80 - 120 | 98 | 80 - 120 | <0.20 | ug/L | 4.8 (10) | 20 |
| B105833 | Dissolved Iron (Fe) | 2023/09/14 | 97 (9) | 80 - 120 | 99 | 80 - 120 | <5.0 | ug/L | NC (10) | 20 |
| B105833 | Dissolved Lead (Pb) | 2023/09/14 | 94 (9) | 80 - 120 | 100 | 80 - 120 | <0.20 | ug/L | NC (10) | 20 |
| B105833 | Dissolved Lithium (Li) | 2023/09/14 | 85 (9) | 80 - 120 | 93 | 80 - 120 | <2.0 | ug/L | NC (10) | 20 |
| B105833 | Dissolved Manganese (Mn) | 2023/09/14 | 97 (9) | 80 - 120 | 100 | 80 - 120 | <1.0 | ug/L | NC (10) | 20 |
| B105833 | Dissolved Molybdenum (Mo) | 2023/09/14 | 99 (9) | 80 - 120 | 101 | 80 - 120 | <1.0 | ug/L | NC (10) | 20 |
| B105833 | Dissolved Nickel (Ni) | 2023/09/14 | 96 (9) | 80 - 120 | 102 | 80 - 120 | <1.0 | ug/L | NC (10) | 20 |
| B105833 | Dissolved Phosphorus (P) | 2023/09/14 | 93 (9) | 80 - 120 | 94 | 80 - 120 | <10 | ug/L | 6.2 (10) | 20 |
| B105833 | Dissolved Selenium (Se) | 2023/09/14 | 97 (9) | 80 - 120 | 99 | 80 - 120 | <0.10 | ug/L | NC (10) | 20 |
| B105833 | Dissolved Silicon (Si) | 2023/09/14 | NC (9) | 80 - 120 | 102 | 80 - 120 | <100 | ug/L | 1.6 (10) | 20 |
| B105833 | Dissolved Silver (Ag) | 2023/09/14 | 98 (9) | 80 - 120 | 100 | 80 - 120 | <0.020 | ug/L | NC (10) | 20 |
| B105833 | Dissolved Strontium (Sr) | 2023/09/14 | 95 (9) | 80 - 120 | 98 | 80 - 120 | <1.0 | ug/L | 1.6 (10) | 20 |
| B105833 | Dissolved Thallium (Tl) | 2023/09/14 | 96 (9) | 80 - 120 | 97 | 80 - 120 | <0.010 | ug/L | NC (10) | 20 |
| B105833 | Dissolved Tin (Sn) | 2023/09/14 | 99 (9) | 80 - 120 | 101 | 80 - 120 | <5.0 | ug/L | NC (10) | 20 |
| B105833 | Dissolved Titanium (Ti) | 2023/09/14 | 98 (9) | 80 - 120 | 100 | 80 - 120 | <5.0 | ug/L | NC (10) | 20 |
| B105833 | Dissolved Uranium (U) | 2023/09/14 | 101 (9) | 80 - 120 | 103 | 80 - 120 | <0.10 | ug/L | NC (10) | 20 |
| B105833 | Dissolved Vanadium (V) | 2023/09/14 | 99 (9) | 80 - 120 | 101 | 80 - 120 | <5.0 | ug/L | NC (10) | 20 |
| B105833 | Dissolved Zinc (Zn) | 2023/09/14 | 100 (9) | 80 - 120 | 105 | 80 - 120 | <5.0 | ug/L | NC (10) | 20 |

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B105833 | Dissolved Zirconium (Zr) | 2023/09/14 | 97 (9) | 80 - 120 | 96 | 80 - 120 | <0.10 | ug/L | NC (10) | 20 |
| B106275 | Total Ammonia (N) | 2023/09/13 | 111 | 80 - 120 | 106 | 80 - 120 | <0.015 | mg/L | NC (1) | 20 |
| B107283 | 1-Methylnaphthalene | 2023/09/14 | 92 | 50 - 140 | 84 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B107283 | 2-Methylnaphthalene | 2023/09/14 | 90 | 50 - 140 | 83 | 50 - 140 | <0.10 | ug/L | NC (1) | 40 |
| B107283 | Acenaphthene | 2023/09/14 | 93 | 50 - 140 | 86 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B107283 | Acenaphthylene | 2023/09/14 | 94 | 50 - 140 | 91 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B107283 | Acridine | 2023/09/14 | 97 | 50 - 140 | 91 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B107283 | Anthracene | 2023/09/14 | 95 | 50 - 140 | 98 | 50 - 140 | <0.010 | ug/L | NC (1) | 40 |
| B107283 | Benzo(a)anthracene | 2023/09/14 | 88 | 50 - 140 | 97 | 50 - 140 | <0.010 | ug/L | NC (1) | 40 |
| B107283 | Benzo(a)pyrene | 2023/09/14 | 83 | 50 - 140 | 99 | 50 - 140 | <0.0050 | ug/L | NC (1) | 40 |
| B107283 | Benzo(b&j)fluoranthene | 2023/09/14 | 78 | 50 - 140 | 80 | 50 - 140 | <0.030 | ug/L | NC (1) | 40 |
| B107283 | Benzo(g,h,i)perylene | 2023/09/14 | 32 (6) | 50 - 140 | 89 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B107283 | Benzo(k)fluoranthene | 2023/09/14 | 83 | 50 - 140 | 100 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B107283 | Chrysene | 2023/09/14 | 92 | 50 - 140 | 89 | 50 - 140 | <0.020 | ug/L | NC (1) | 40 |
| B107283 | Dibenz(a,h)anthracene | 2023/09/14 | 32 (6) | 50 - 140 | 100 | 50 - 140 | <0.0030 | ug/L | NC (1) | 40 |
| B107283 | Fluoranthene | 2023/09/14 | 76 | 50 - 140 | 101 | 50 - 140 | <0.020 | ug/L | NC (1) | 40 |
| B107283 | Fluorene | 2023/09/14 | 93 | 50 - 140 | 91 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B107283 | Indeno(1,2,3-cd)pyrene | 2023/09/14 | 34 (6) | 50 - 140 | 110 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B107283 | Naphthalene | 2023/09/14 | 95 | 50 - 140 | 86 | 50 - 140 | <0.10 | ug/L | NC (1) | 40 |
| B107283 | Phenanthrene | 2023/09/14 | 94 | 50 - 140 | 82 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B107283 | Pyrene | 2023/09/14 | 76 | 50 - 140 | 101 | 50 - 140 | <0.020 | ug/L | NC (1) | 40 |
| B107283 | Quinoline | 2023/09/14 | 109 | 50 - 140 | 110 | 50 - 140 | <0.020 | ug/L | NC (1) | 40 |
| B107289 | EPH (C10-C19) | 2023/09/14 | 90 | 60 - 140 | 94 | 70 - 130 | <0.20 | mg/L | NC (1) | 30 |
| B107289 | EPH (C19-C32) | 2023/09/14 | 97 | 60 - 140 | 95 | 70 - 130 | <0.20 | mg/L | NC (1) | 30 |
| B107307 | 1-Methylnaphthalene | 2023/09/15 | 76 | 50 - 140 | 82 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B107307 | 2-Methylnaphthalene | 2023/09/15 | 77 | 50 - 140 | 76 | 50 - 140 | <0.10 | ug/L | NC (1) | 40 |
| B107307 | Acenaphthene | 2023/09/15 | 78 | 50 - 140 | 82 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B107307 | Acenaphthylene | 2023/09/15 | 81 | 50 - 140 | 82 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B107307 | Acridine | 2023/09/15 | 88 | 50 - 140 | 85 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B107307 | Anthracene | 2023/09/15 | 72 | 50 - 140 | 85 | 50 - 140 | <0.010 | ug/L | NC (1) | 40 |
| B107307 | Benzo(a)anthracene | 2023/09/15 | 51 | 50 - 140 | 81 | 50 - 140 | <0.010 | ug/L | NC (1) | 40 |

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B107307 | Benzo(a)pyrene | 2023/09/15 | 33 (6) | 50 - 140 | 86 | 50 - 140 | <0.0050 | ug/L | NC (1) | 40 |
| B107307 | Benzo(b&j)fluoranthene | 2023/09/15 | 33 (6) | 50 - 140 | 82 | 50 - 140 | <0.030 | ug/L | NC (1) | 40 |
| B107307 | Benzo(g,h,i)perylene | 2023/09/15 | 24 (6) | 50 - 140 | 83 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B107307 | Benzo(k)fluoranthene | 2023/09/15 | 30 (6) | 50 - 140 | 83 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B107307 | Chrysene | 2023/09/15 | 52 | 50 - 140 | 83 | 50 - 140 | <0.020 | ug/L | NC (1) | 40 |
| B107307 | Dibenz(a,h)anthracene | 2023/09/15 | 26 (6) | 50 - 140 | 84 | 50 - 140 | <0.0030 | ug/L | NC (1) | 40 |
| B107307 | Fluoranthene | 2023/09/15 | 65 | 50 - 140 | 66 | 50 - 140 | <0.020 | ug/L | NC (1) | 40 |
| B107307 | Fluorene | 2023/09/15 | 78 | 50 - 140 | 83 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B107307 | Indeno(1,2,3-cd)pyrene | 2023/09/15 | 26 (6) | 50 - 140 | 85 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B107307 | Naphthalene | 2023/09/15 | 78 | 50 - 140 | 76 | 50 - 140 | <0.10 | ug/L | NC (1) | 40 |
| B107307 | Phenanthrene | 2023/09/15 | 71 | 50 - 140 | 86 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B107307 | Pyrene | 2023/09/15 | 62 | 50 - 140 | 77 | 50 - 140 | <0.020 | ug/L | NC (1) | 40 |
| B107307 | Quinoline | 2023/09/15 | 95 | 50 - 140 | 94 | 50 - 140 | <0.020 | ug/L | NC (1) | 40 |
| B107314 | EPH (C10-C19) | 2023/09/14 | | | 93 | 70 - 130 | <0.20 | mg/L | NC (1) | 30 |

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B107314 | EPH (C19-C32) | 2023/09/14 | | | 97 | 70 - 130 | <0.20 | mg/L | NC (1) | 30 |

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

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

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

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

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

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

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Duplicate Parent ID

(2) Duplicate Parent ID [BYQ319-01]

(3) Duplicate Parent ID [BYQ314-01]

(4) Matrix Spike Parent ID [BYQ315-01]

(5) Duplicate Parent ID [BYQ315-01]

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

(7) Matrix Spike Parent ID [BYQ313-04]

(8) Duplicate Parent ID [BYQ312-04]

(9) Matrix Spike Parent ID [BYQ312-03]

(10) Duplicate Parent ID [BYQ312-03]



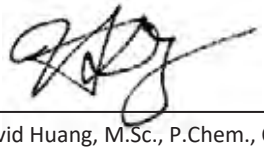
Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C371107
Report Date: 2023/09/18

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: CXW

## VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:



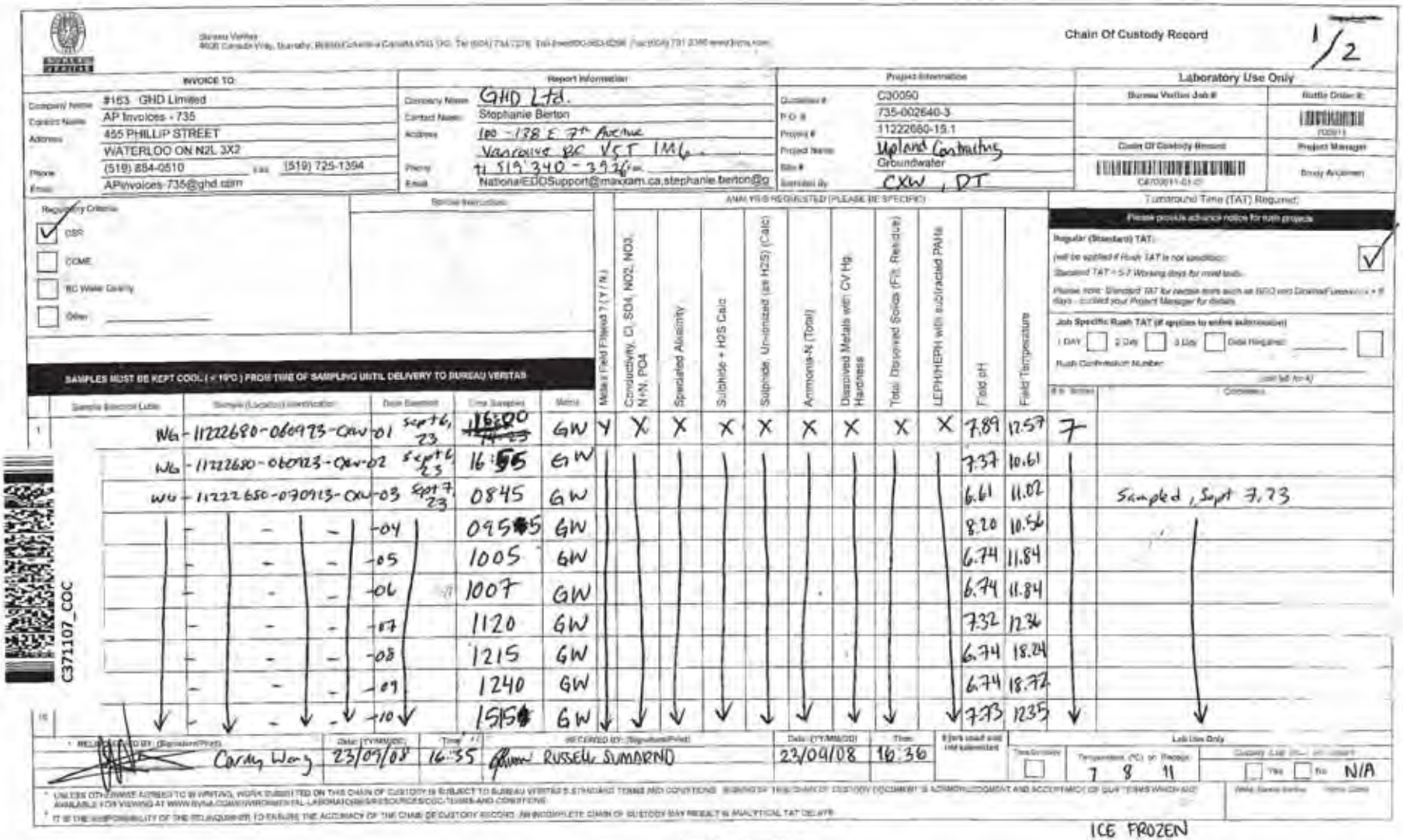
David Huang, M.Sc., P.Chem., QP, Scientific Services Manager

Ghayasuddin Khan, M.Sc., P.Chem., QP, Scientific Specialist, Inorganics

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Raphael Kwan, Senior Manager, BC and Yukon Regions responsible for British Columbia Environmental laboratory operations.



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386



Chain Of Custody Record 1/2

INVOICE TO: #163 GHD Limited; AP Invoices - 735; 455 PHILLIP STREET; WATERLOO ON N2L 3X2; (519) 884-0510 fax (519) 725-1394; APinvoices-735@ghd.com

Report Information: Company GHD Ltd.; Contact Stephanie Berton; Address 100 - 178 E 7th Avenue Vancouver BC V5T 1M6; Phone ph 519 340 - 3926; Email National EDDSupport@maxxam.ca, stephanie.berton@g

Project Information: Quotation # C30090; P.O. # 735-002640-3; Project # 11222680-15.1; Project Name Upland Contracting Groundwater; Site # ; Sampled By CXW, DT

Laboratory Use Only: Bureau Veritas Job #; Bottle Order #; COC (Chain Of Custody) Number; Project Manager; Bruce Anderson

Regulatory Criteria: [x] DSR; [ ] CCME; [ ] BC Water Quality; [ ] Other

Special Instructions:

SAMPLES MUST BE KEPT COOL ( < 10°C ) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

Turnaround Time (TAT) Required: Please provide advance notice for rush projects. Regular (Standard) TAT: [x]

| Sample Barcode Label | Sample (Location) Identification | Date Sampled | Time Sampled | Matrix | Metals Field Filtered ? (Y / N) | Conductivity, Cl, SO4, NO2, NO3, N-N, PO4 | Speciated Alkalinity | Sulphide + H2S Calc | Sulphide, Un-ionized (as H2S) (Calc) | Ammonia-N (Total) | Dissolved Metals with CV Hg Hardness | Total Dissolved Solids (Fit Residue) | LEPH/HEPH with subtracted PAHs | Field pH | Field Temperature | # of Bottles | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | WG-11222680-060923-CXW-01 | Sept 6, 23 | ~~16:50~~ 14:23 | GW | Y | X | X | X | X | X | X | X | X | 7.89 | 12.57 | 7 | |
| | WG-11222680-060923-CXW-02 | Sept 6, 23 | 16:55 | GW | | | | | | | | | | 7.37 | 10.61 | | |
| | WG-11222680-070923-CXW-03 | Sept 7, 23 | 0845 | GW | | | | | | | | | | 6.61 | 11.02 | | Sampled, Sept 7, 23 |
| | - - - -04 | | 0955 | GW | | | | | | | | | | 8.20 | 10.56 | | |
| | - - - -05 | | 1005 | GW | | | | | | | | | | 6.74 | 11.84 | | |
| | - - - -06 | | 1007 | GW | | | | | | | | | | 6.74 | 11.84 | | |
| | - - - -07 | | 1120 | GW | | | | | | | | | | 7.32 | 12.36 | | |
| | - - - -08 | | 1215 | GW | | | | | | | | | | 6.74 | 18.24 | | |
| | - - - -09 | | 1240 | GW | | | | | | | | | | 6.74 | 18.72 | | |
| 10 | - - - -10 | | 1515 | GW | | | | | | | | | | 7.73 | 12.35 | | |

C371107_COC

| Relinquished By (Signature/Print) | Date (YY/MM/DD) | Time | Received By (Signature/Print) | Date (YY/MM/DD) | Time | Lab Use Only |
|---|---|---|---|---|---|---|
| Corey Way | 23/09/08 | 16:55 | RUSSELL SUMARNO | 23/09/08 | 16:36 | Temperature (°C) on Receipt: 7 8 11; Custody Seal Present: [ ] Yes [ ] No [x] N/A |

ICE FROZEN

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORY/RESOURCES/COC-TERMS-AND-CONDITIONS

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

Bureau Veritas
4606 Canada Way Burnaby, British Columbia Canada V5G 1K5 Tel (604) 734 7276 Toll-free 800 563 6266 Fax (604) 731 2386 www.bvlabs.com

# Chain Of Custody Record

2/2

| Invoice To: | | Report Information | | Project Information | | Laboratory Use Only | |
|---|---|---|---|---|---|---|---|
| Company Name: | #163 GHD Limited | Company Name: | GHD Ltd. | Quotation #: | C30090 | Bureau Veritas Job #: | Bottle Order #: |
| Contact Name: | AP Invoices - 735 | Contact Name: | Stephanie Berton | P.O. #: | 735-002840-3 | | |
| Address: | 455 PHILLIP STREET<br>WATERLOO ON N2L 3X2 | Address: | 100-138 E 7th Avenue<br>Vancouver BC V5T 1M6 | Project #: | 11222080-15.1 | Chain Of Custody Record | Project Manager: |
| Phone: | (519) 884-0510 Fax: (519) 725-1394 | Phone: | +1 519 340-3926 Fax: | Project Name: | Upland Contracting | | |
| Email: | APinvoices-735@ghd.com | Email: | NationalEDDSupport@maxxam.ca,stephanie.berton@g | Site #: | Groundwater | C#C00115-0501 | Brady Anderson |
| | | | | Sampled By: | CXW, DT | | |

Regulatory Criteria: ☑ CSR ☐ CCME ☐ SC Water Quality ☐ Other: _____

Special Instructions:

**SAMPLES MUST BE KEPT COOL ( < 10°C ) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS**

Turnaround Time (TAT) Required

Please provide advance notice for rush projects

Regular (Standard) TAT: ☑
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
☐ 1 DAY ☐ 2 Day ☐ 3 Day ☐ Date Required: _____
Rush Confirmation Number: _____ (call lab for #)

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

| | Sample Barcode Label | Sample Identification (and Location) | Date Sampled | Time Sampled | Matrix | # of Bottles | Metals Field Filtered ? (Y / N) | Conductivity, Cl, SO4, NO2, NO3, N+N, PO4 | Specialized Alkalinity | Sulphide + H2S Calc | Sulphide, Un-Ionized (as H2S) (Calc) | Ammonia-N (Total) | Dissolved Metals with CV Hg Hardness | Total Dissolved Solids (Filt. Residue) | LEPH/HEPH with subtracted PAHs | Field pH | Field Temperature | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | WG - 11222680 | -080923-CXW-11 | Sept 8, 23 | 0825 | W | 4 | | X | X | X | X | X | X | X | X | N/A | N/A | 7 |
| 2 | | | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | |

C371107_COC

| RELINQUISHED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | RECEIVED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | # jars used and not submitted | Lab Use Only: Time Sensitive | Temperature (°C) on Receipt | Custody Seal Intact on Cooler? |
|---|---|---|---|---|---|---|---|---|---|
| Carey Wong | 23/09/08 | 1635 | RUSSELL SUMARNO | 23/09/08 | 16:36 | | ☐ | 7 8 11 | ☐ Yes ☐ No ☑ N/A |

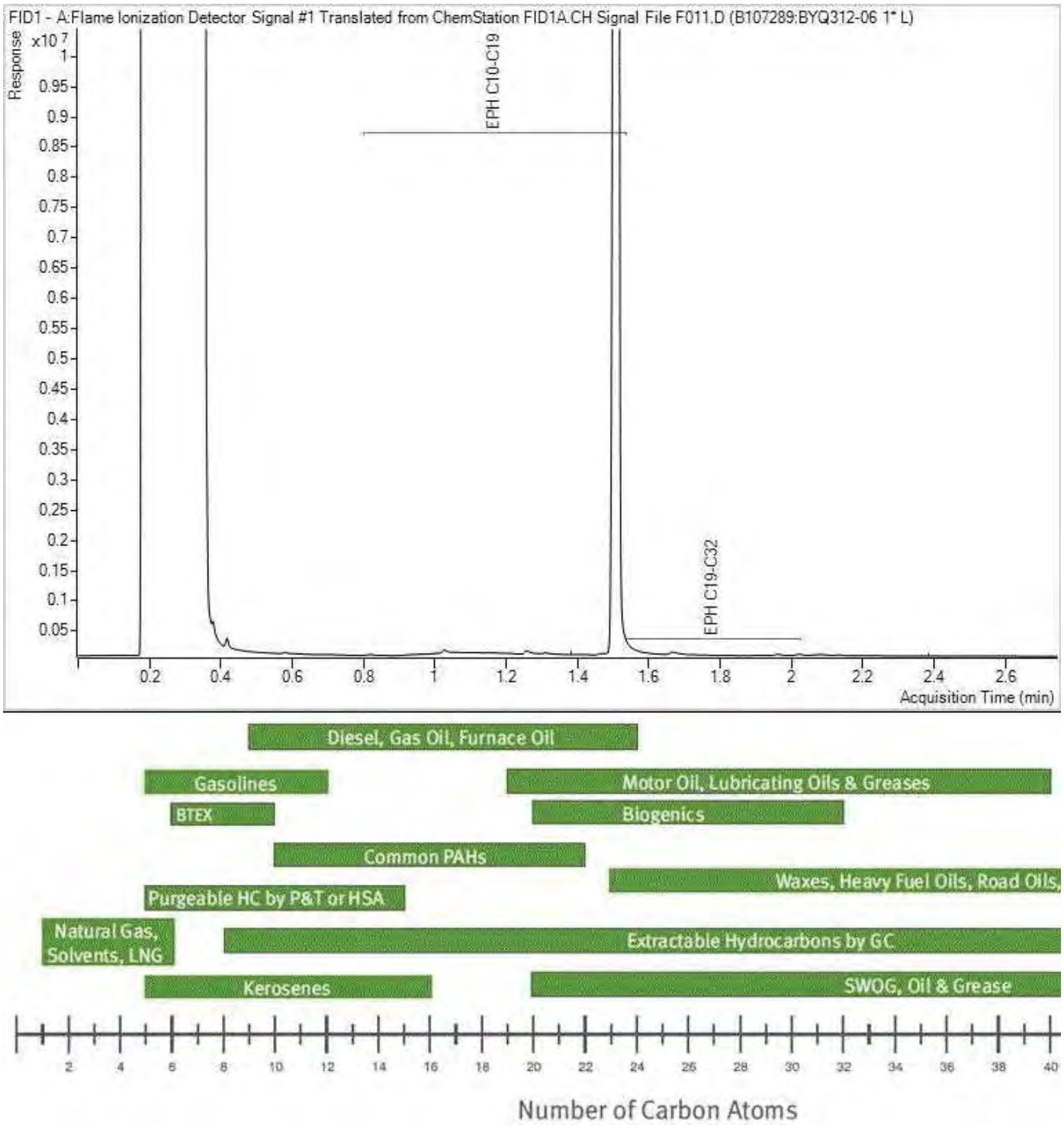
ICE FROZEN

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-FORMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE SUBMITTER TO ENSURE THE ACCURACY OF THIS CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

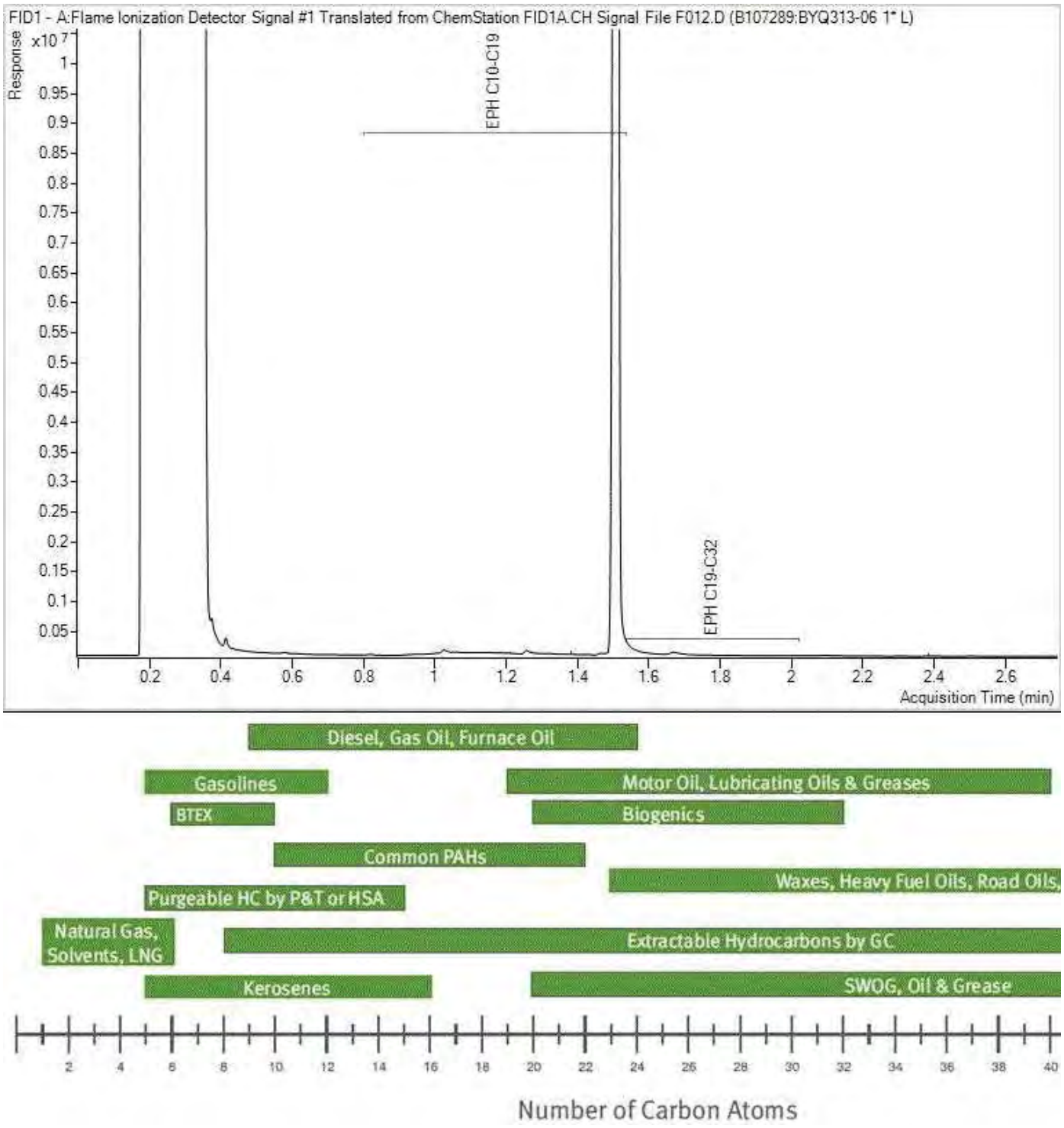
Bureau Veritas Canada (2019) Inc.

**EPH in Water when PAH required Chromatogram**




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

**EPH in Water when PAH required Chromatogram**

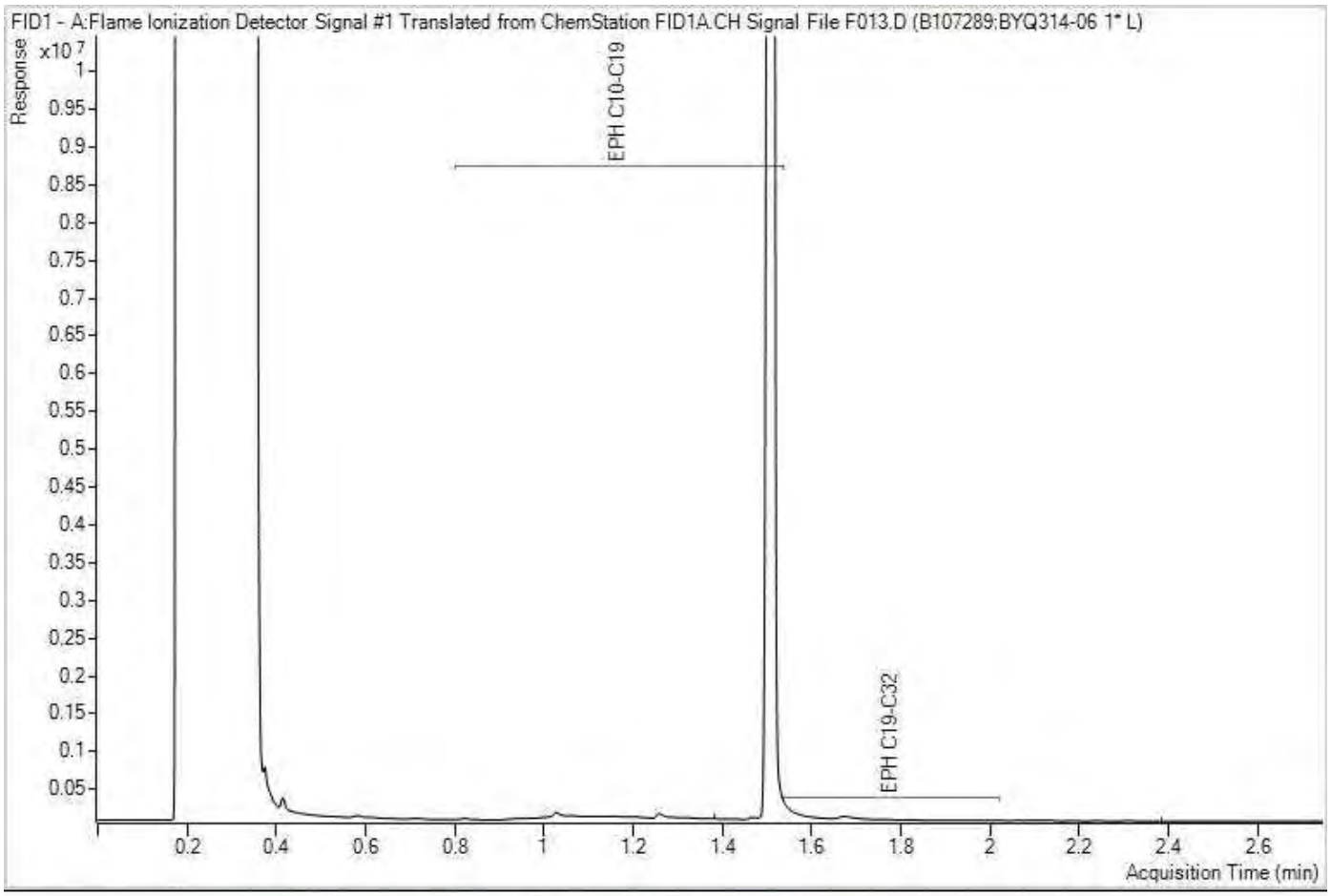


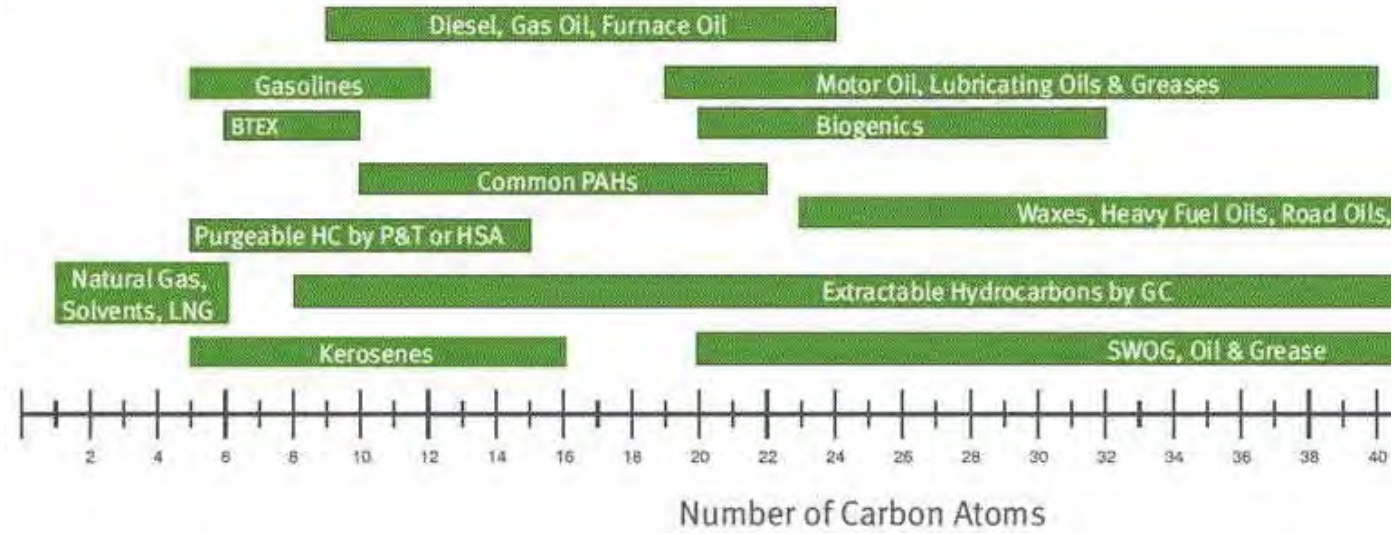

**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

Bureau Veritas Job #: C371107
Report Date: 2023/09/18
Bureau Veritas Sample: BYQ314

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WG-11222680-070923-CXW-03

**EPH in Water when PAH required Chromatogram**



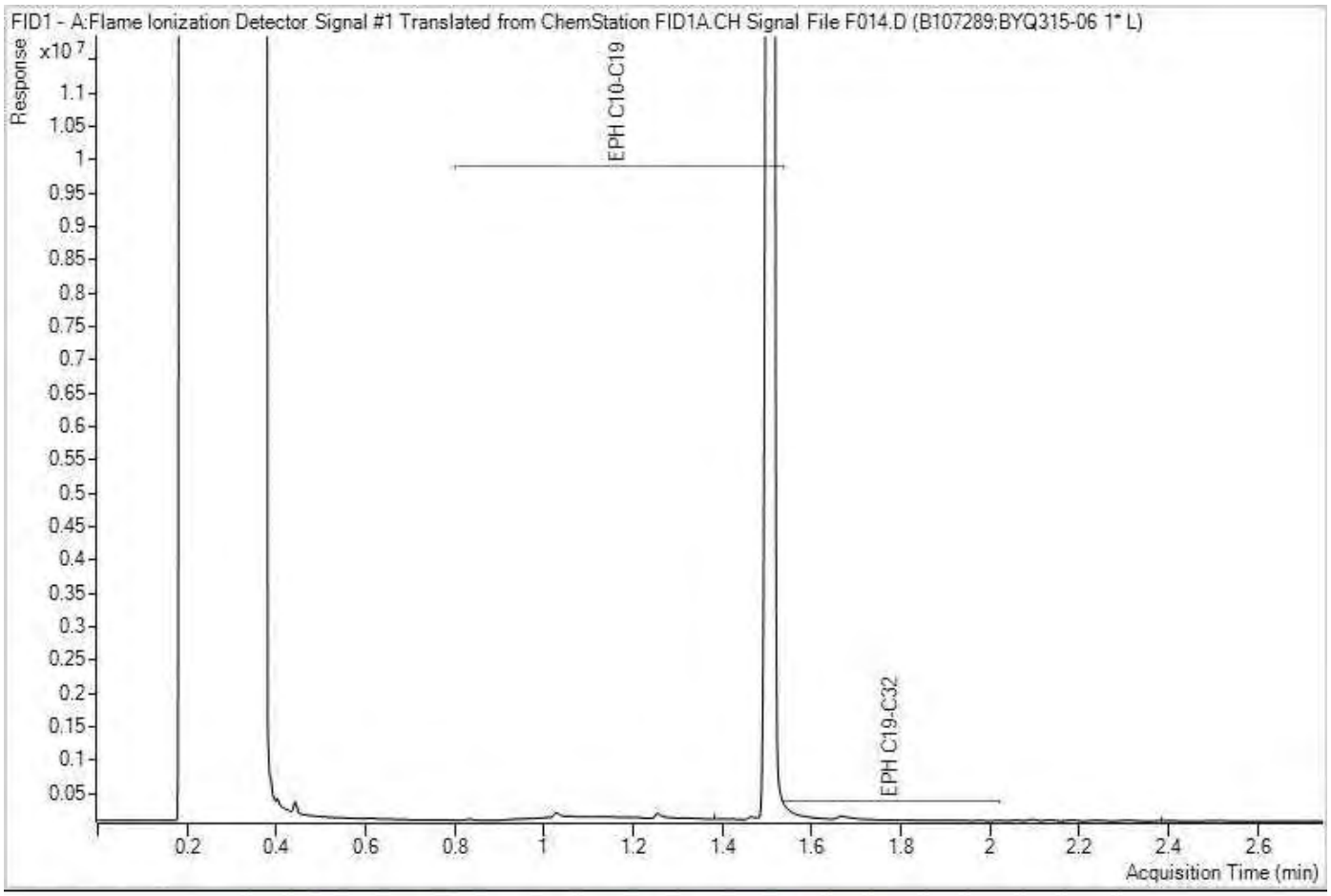



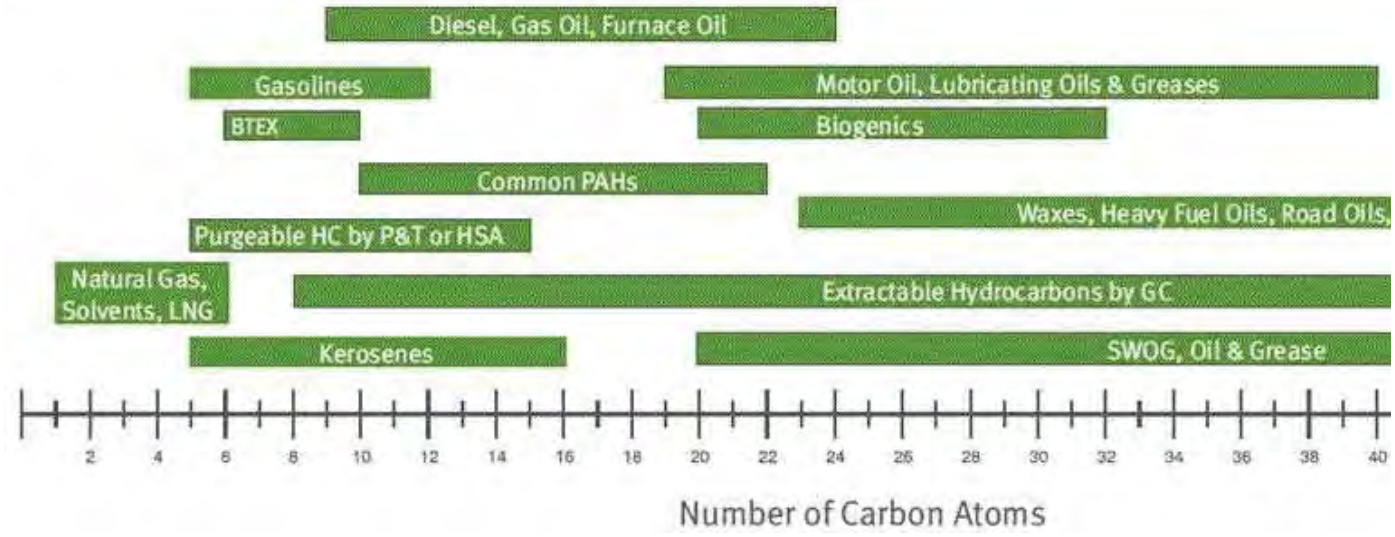

**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

Bureau Veritas Job #: C371107
Report Date: 2023/09/18
Bureau Veritas Sample: BYQ315

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WG-11222680-070923-CXW-04

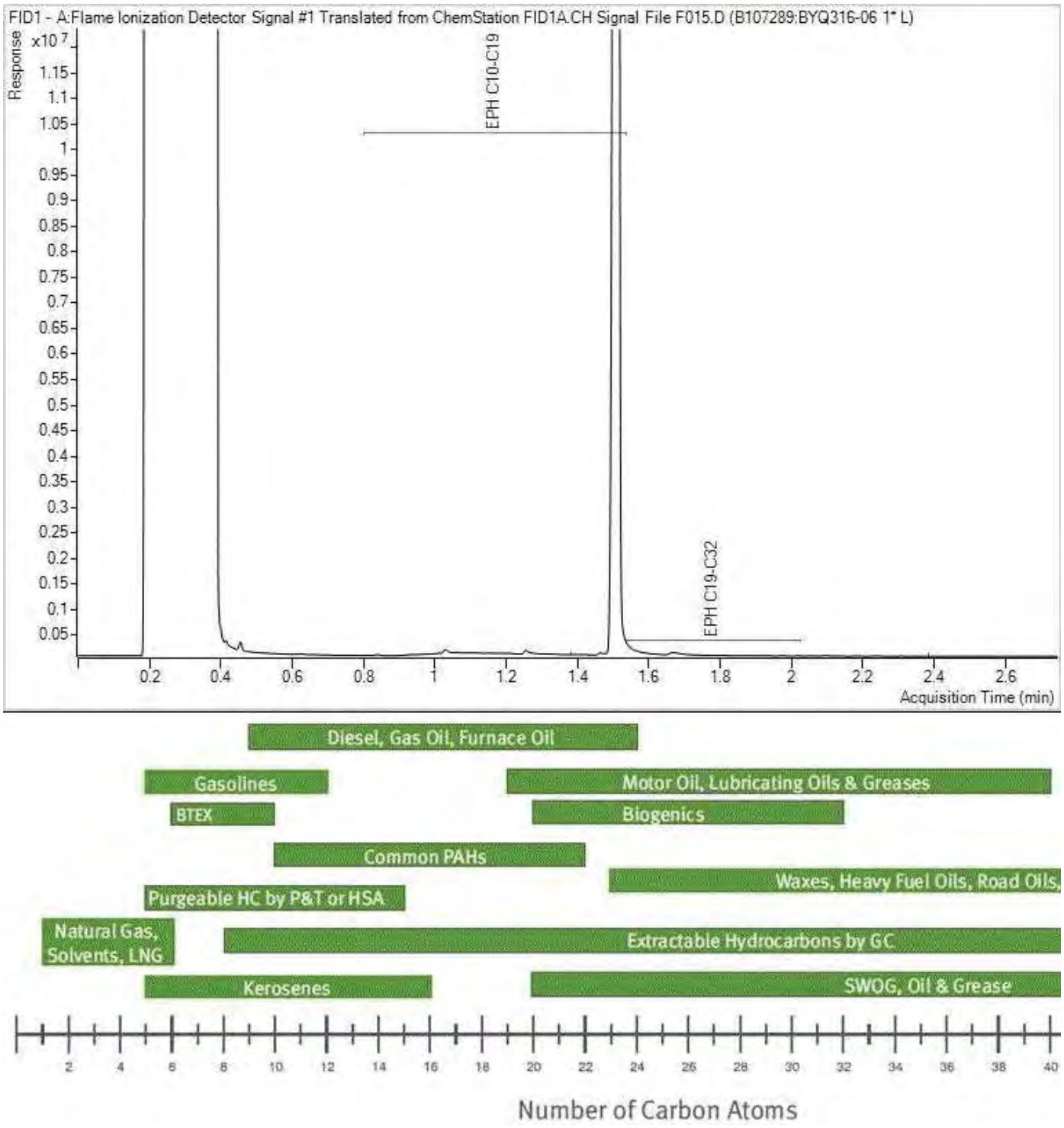
**EPH in Water when PAH required Chromatogram**



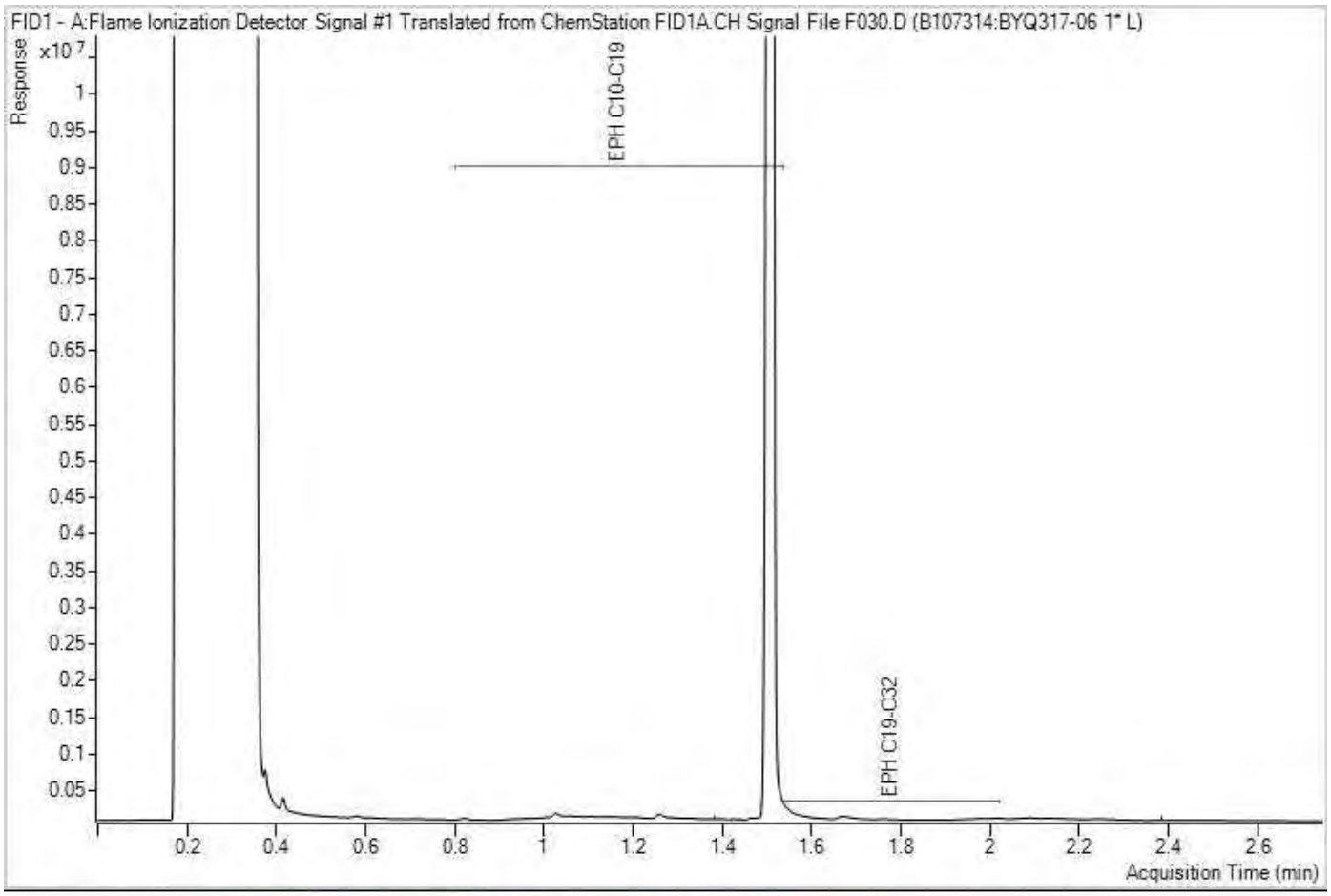

**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

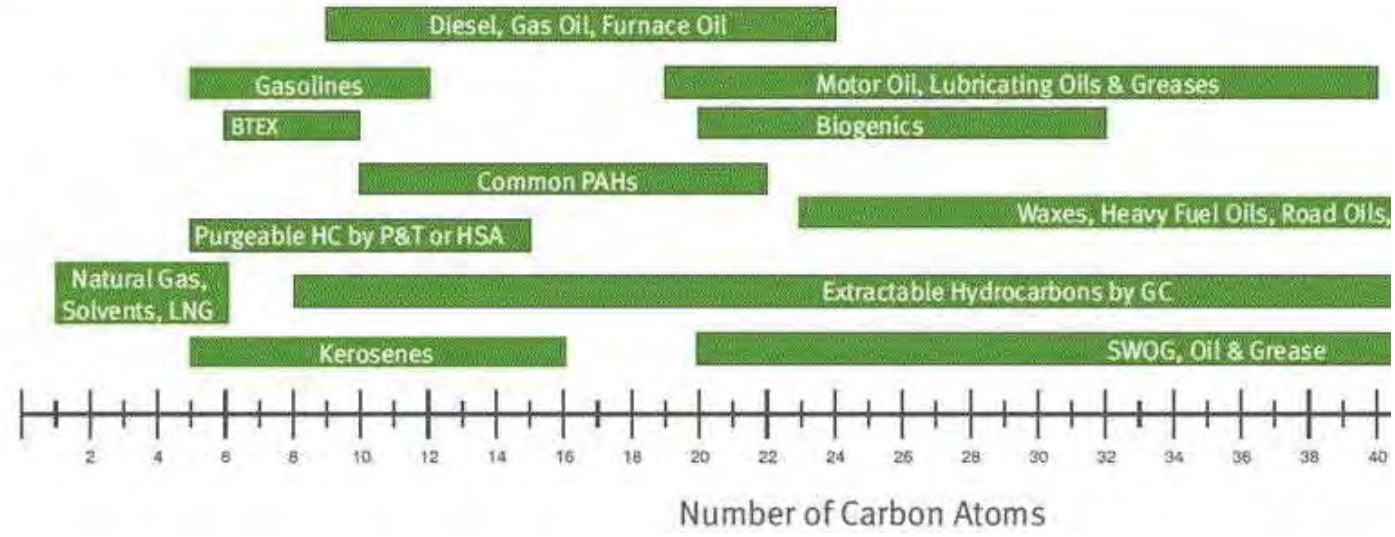
**EPH in Water when PAH required Chromatogram**




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

**EPH in Water when PAH required Chromatogram**



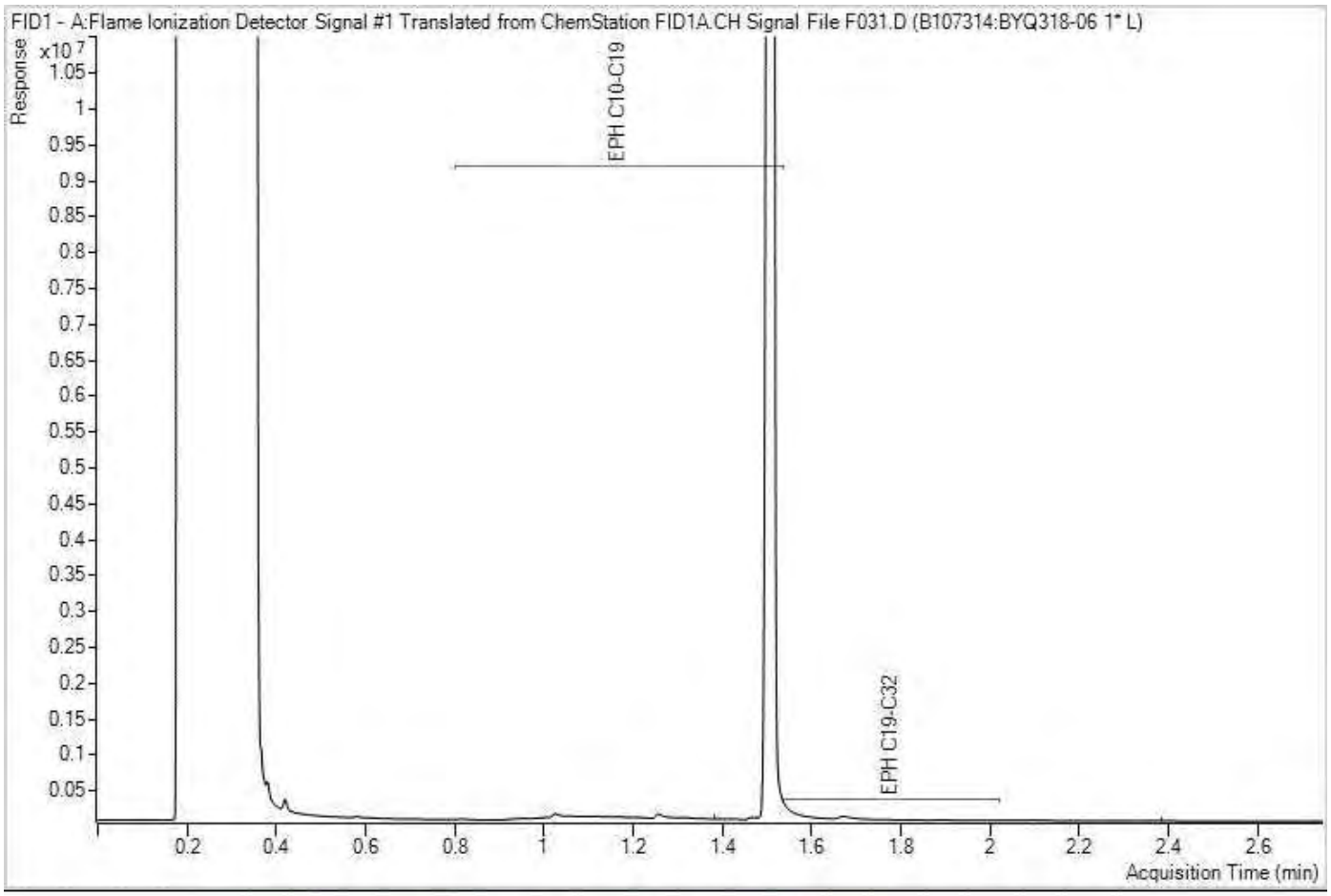



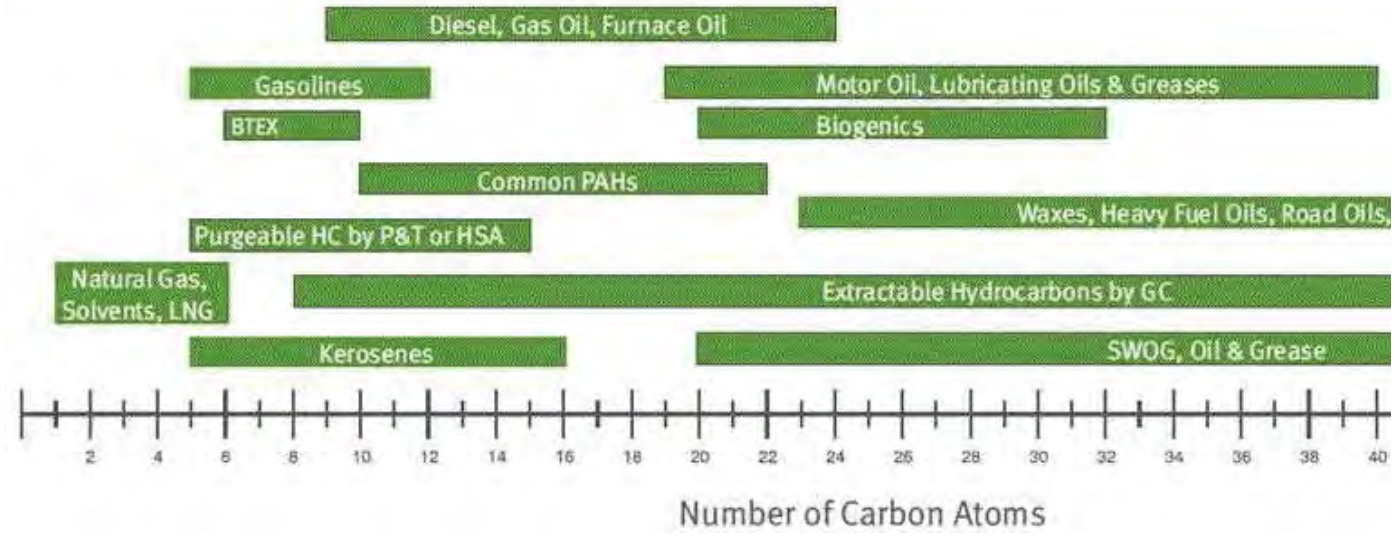

**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

Bureau Veritas Job #: C371107
Report Date: 2023/09/18
Bureau Veritas Sample: BYQ318

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WG-11222680-070923-CXW-07

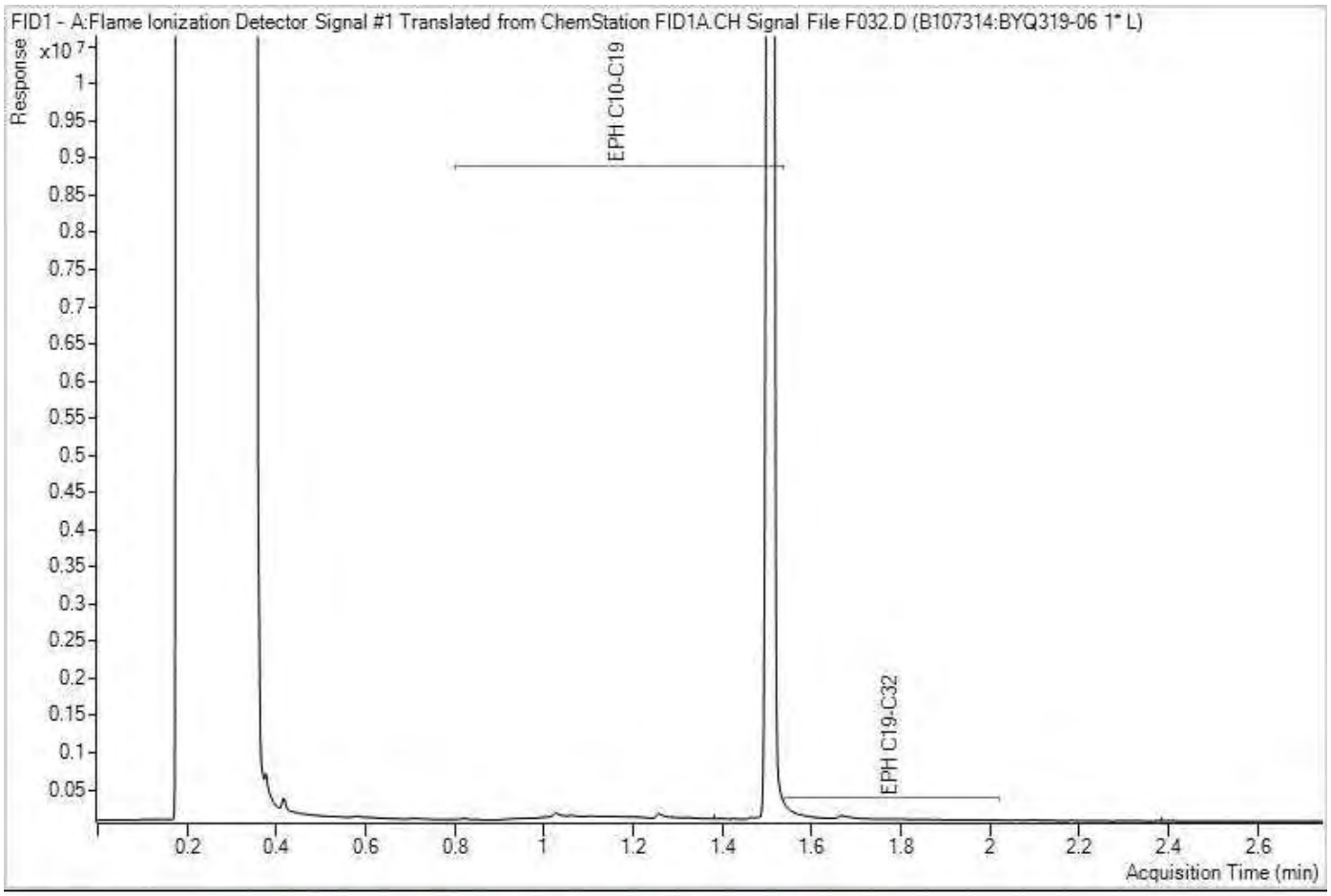
**EPH in Water when PAH required Chromatogram**

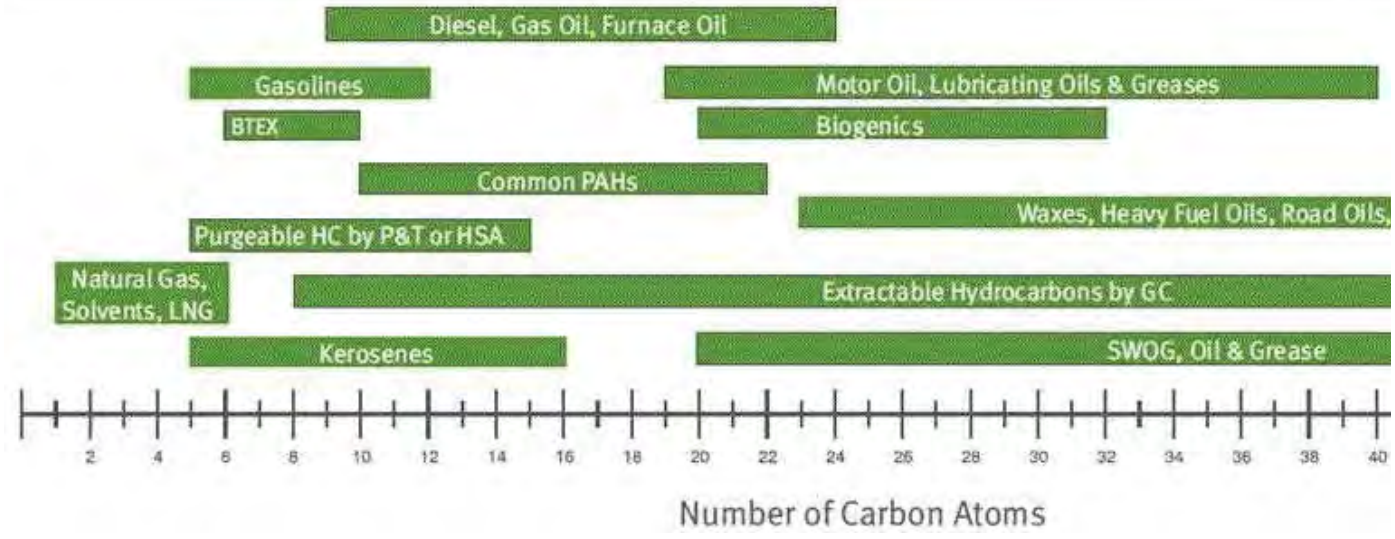



**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

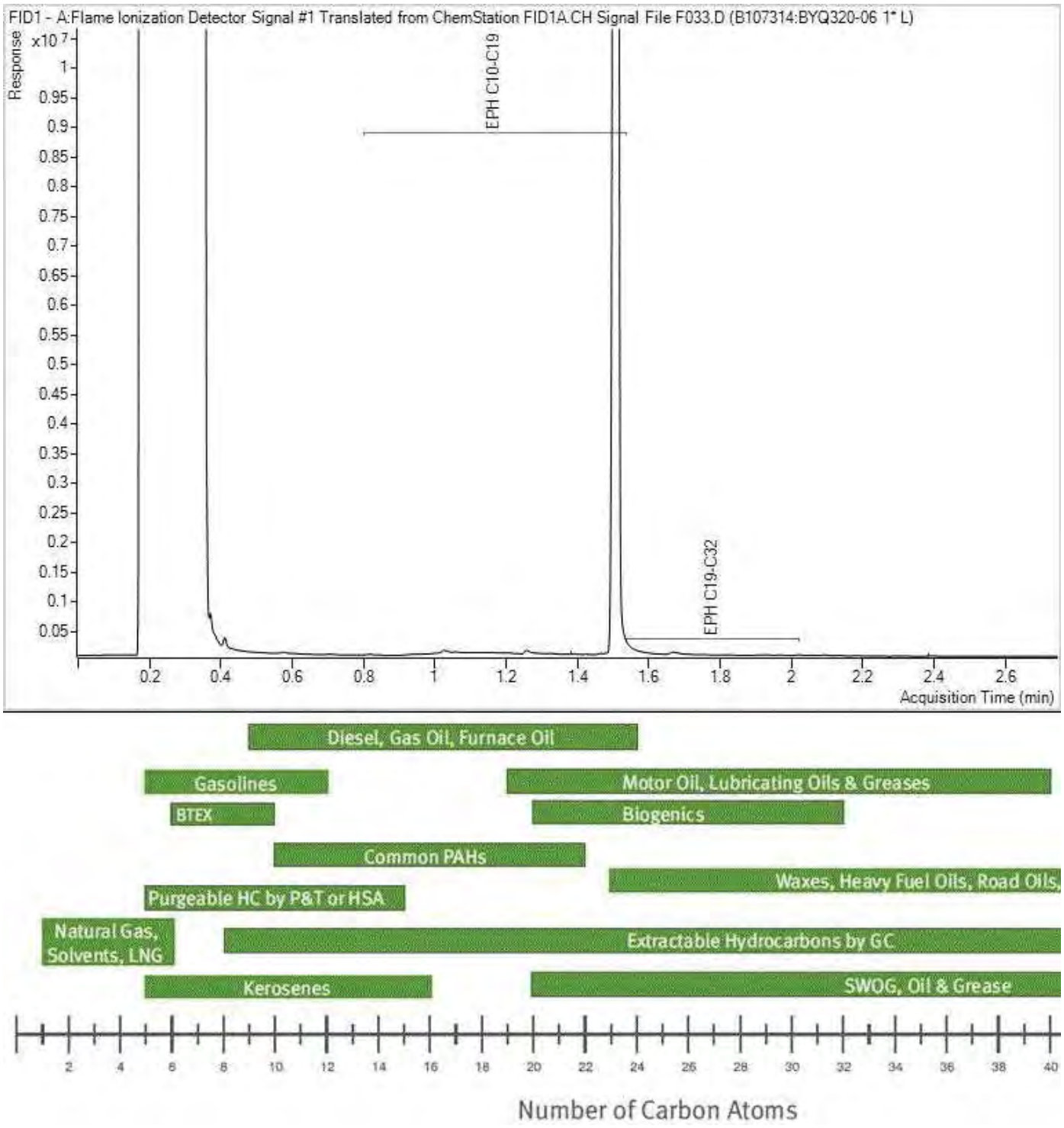
**EPH in Water when PAH required Chromatogram**




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

**EPH in Water when PAH required Chromatogram**

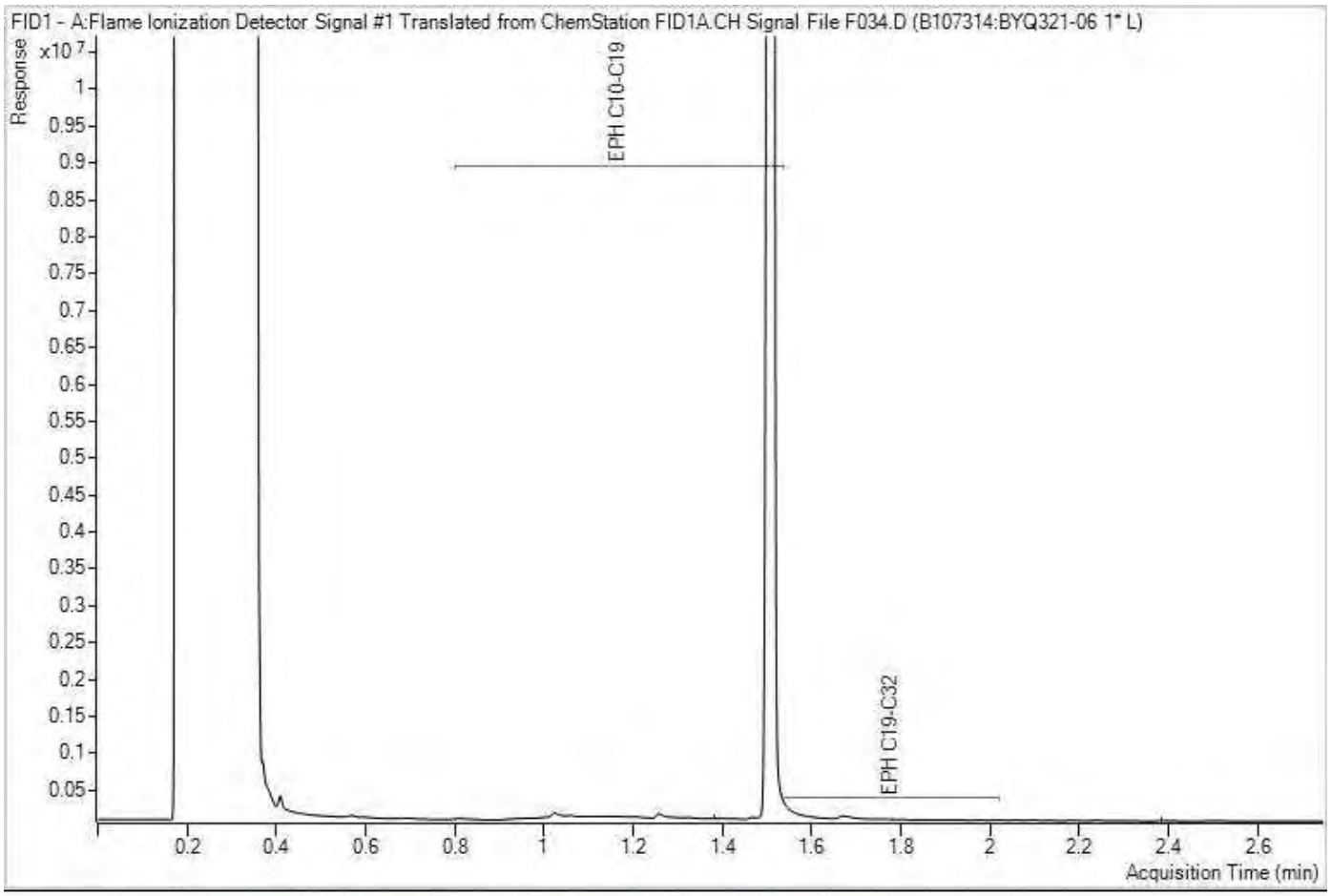


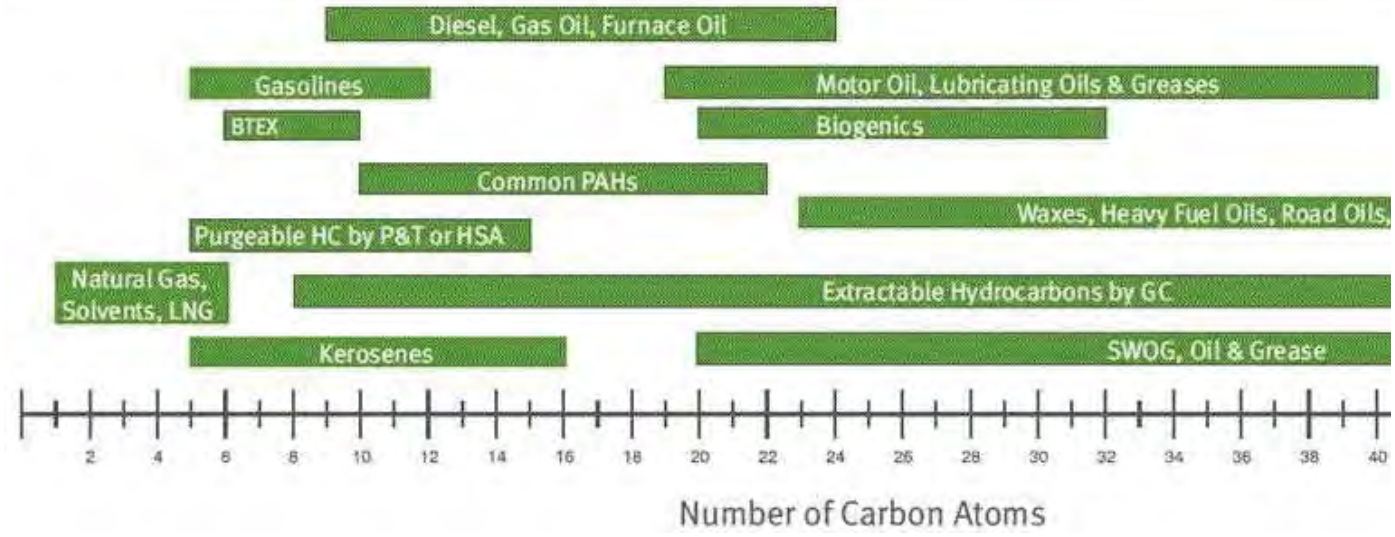

**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

Bureau Veritas Job #: C371107
Report Date: 2023/09/18
Bureau Veritas Sample: BYQ321

GHD Limited
Client Project #: 11222680-15.1
Site Reference: NEW LANDFILL
Client ID: WG-11222680-070923-CXW-10

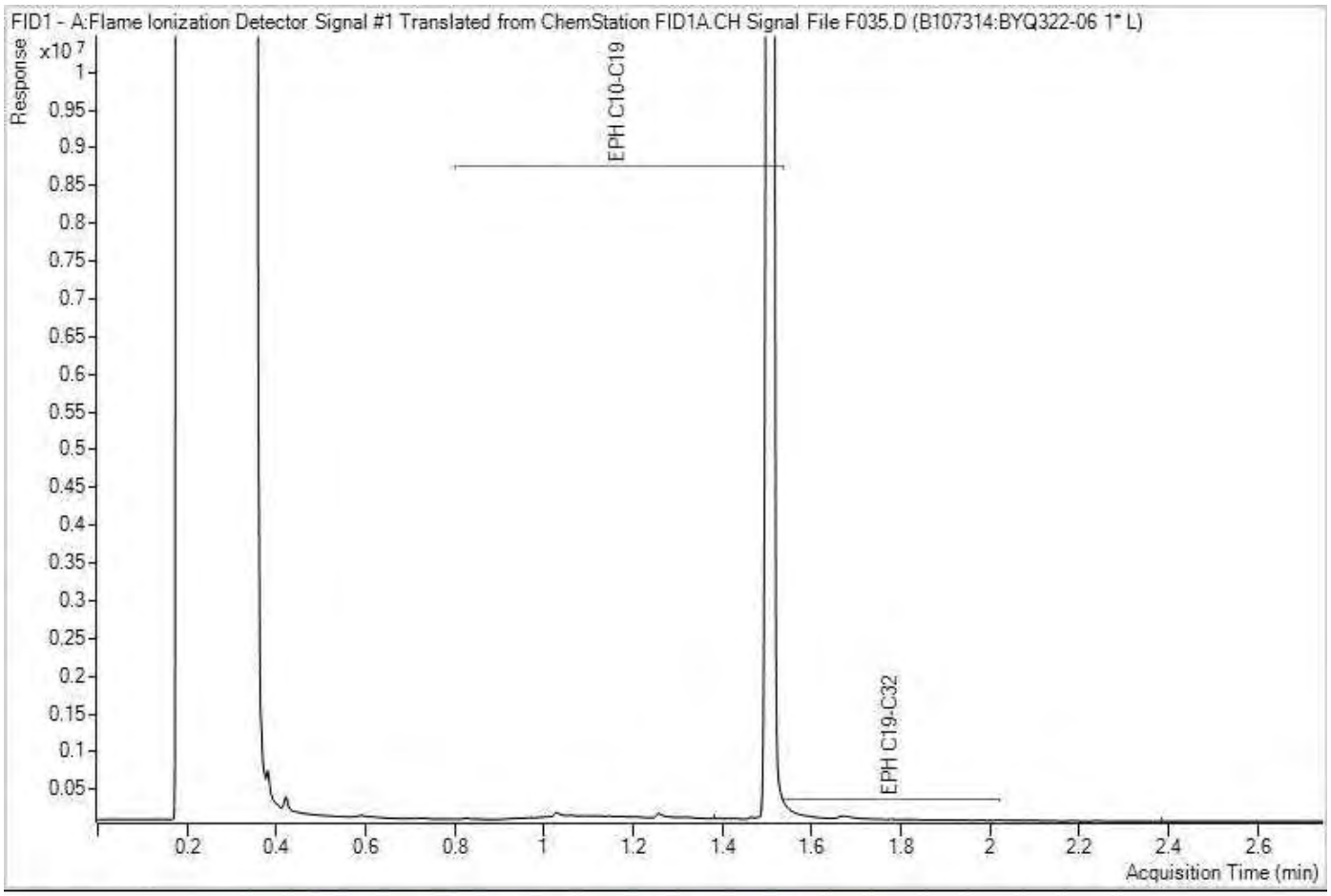
**EPH in Water when PAH required Chromatogram**

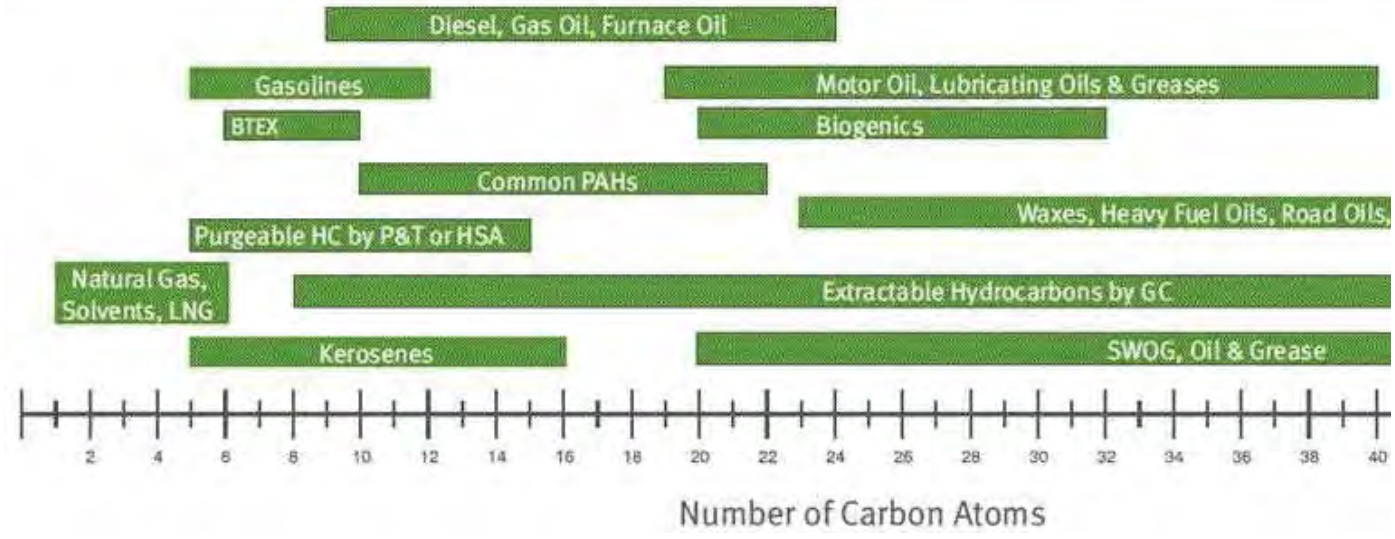



**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

**EPH in Water when PAH required Chromatogram**




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

Your P.O. #: 735-002640-5
Your Project #: 11222680-15.1
Site#: GROUND WATER
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your C.O.C. #: 705547-01-01

**Attention: Stephanie Berton**

GHD Limited
455 PHILLIP STREET
WATERLOO, ON
CANADA N2L 3X2

**Report Date: 2023/12/05**
Report #: R3436670
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**BUREAU VERITAS JOB #: C397191**
**Received: 2023/11/29, 09:55**

Sample Matrix: Water
# Samples Received: 5

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Analytical Method |
|---|---|---|---|---|---|
| Alkalinity @25C (pp, total), CO3,HCO3,OH (1) | 5 | N/A | 2023/11/30 | BBY6SOP-00026 | SM 24 2320 B m |
| Chloride/Sulphate by Auto Colourimetry (1) | 5 | N/A | 2023/12/01 | BBY6SOP-00011 / BBY6SOP-00017 | SM24-4500-Cl/SO4-E m |
| Conductivity @25C (1) | 5 | N/A | 2023/11/30 | BBY6SOP-00026 | SM 24 2510 B m |
| Sulphide (as H2S) (2) | 5 | N/A | 2023/12/04 | | Auto Calc |
| Un-ionized Hydrogen Sulphide as S Calc (1) | 5 | N/A | 2023/12/04 | BBY WI-00033 | Auto Calc |
| Hardness (calculated as CaCO3) (1) | 5 | N/A | 2023/12/05 | BBY WI-00033 | Auto Calc |
| Mercury (Dissolved) by CV (1, 3) | 5 | 2023/12/05 | 2023/12/05 | AB SOP-00084 | BCMOE BCLM Oct2013 m |
| EPH in Water when PAH required (1) | 5 | 2023/12/01 | 2023/12/01 | BBY8SOP-00029 | BCMOE BCLM Sep2017 m |
| Na, K, Ca, Mg, S by CRC ICPMS (diss.) (1) | 5 | N/A | 2023/12/05 | BBY WI-00033 | Auto Calc |
| Elements by CRC ICPMS (dissolved) (1, 3) | 5 | N/A | 2023/12/04 | BBY7SOP-00002 | EPA 6020b R2 m |
| Ammonia-N (Total) (1) | 5 | N/A | 2023/12/01 | AB SOP-00007 | SM 24 4500 NH3 A G m |
| Nitrate + Nitrite (N) (1) | 5 | N/A | 2023/11/30 | BBY6SOP-00010 | SM 24 4500-NO3- H m |
| Nitrite (N) Regular Level Water (1) | 5 | N/A | 2023/11/30 | BBY6SOP-00010 | SM 24 4500-NO2- m |
| Nitrogen - Nitrate (as N) (1) | 5 | N/A | 2023/11/30 | BBY WI-00033 | Auto Calc |
| PAH in Water by GC/MS (SIM) (1) | 5 | 2023/12/01 | 2023/12/02 | BBY8SOP-00021 | BCMOE BCLM Jul2017m |
| Total LMW, HMW, Total PAH Calc (1, 4) | 5 | N/A | 2023/12/02 | BBY WI-00033 | Auto Calc |
| Orthophosphate by Automated Analyzer (1, 5) | 5 | N/A | 2023/11/30 | BBY6SOP-00013 | SM 24 4500-P E m |
| Total Sulphide (2) | 5 | N/A | 2023/12/04 | AB SOP-00080 | SM 23 4500 S2-A D Fm |
| Total Dissolved Solids (Filt. Residue) (1) | 5 | 2023/11/30 | 2023/12/01 | BBY6SOP-00033 | SM 24 2540 C m |
| EPH less PAH in Water by GC/FID (1, 6) | 5 | N/A | 2023/12/02 | BBY WI-00033 | Auto Calc |
| Field pH (1) | 5 | N/A | 2023/12/01 | | |
| Field Temperature (1) | 5 | N/A | 2023/12/01 | | |

**Remarks:**

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Your P.O. #: 735-002640-5
Your Project #: 11222680-15.1
Site#: GROUND WATER
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your C.O.C. #: 705547-01-01

**Attention: Stephanie Berton**

GHD Limited
455 PHILLIP STREET
WATERLOO, ON
CANADA N2L 3X2

**Report Date: 2023/12/05**
Report #: R3436670
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**BUREAU VERITAS JOB #: C397191**
**Received: 2023/11/29, 09:55**

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Bureau Veritas Vancouver, 4606 Canada Way , Burnaby, BC, V5G 1K5
(2) This test was performed by Bureau Veritas Calgary, 4000 - 19 St. , Calgary, AB, T2E 6P8
(3) Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.
(4) Total PAHs in Water include: Quinoline, Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Acridine, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b&j)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, and Benzo(g,h,i)perylene.
(5) Orthophosphate > Total Phosphorus Imbalance: When applicable, Orthophosphate, Total Phosphorus and dissolved Phosphorus results were reviewed and data quality meets acceptable levels unless otherwise noted.
(6) LEPH = EPH (C10 to C19) - (Acenaphthene + Acridine + Anthracene + Fluorene + Naphthalene + Phenanthrene)
HEPH = EPH (C19 to C32) - (Benzo(a)anthracene + Benzo(a)pyrene + Fluoranthene + Pyrene)

Encryption Key

Bureau Veritas
05 Dec 2023 16:35:00

Please direct all questions regarding this Certificate of Analysis to:
Brody Andersen, B.Sc., B.Sc., Program Specialist–Emergency Spill Response
Email: brody.andersen@bureauveritas.com
Phone# (780)742-1616

==========

This report has been generated and distributed using a secure automated process.
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Raphael Kwan, Senior Manager, BC and Yukon Regions responsible for British Columbia Food laboratory operations.

Bureau Veritas Job #: C397191
Report Date: 2023/12/05

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-5
Sampler Initials: KH

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | CFQ135 | CFQ135 | CFQ136 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2023/11/27 13:10 | 2023/11/27 13:10 | 2023/11/27 14:15 | | |
| COC Number | | 705547-01-01 | 705547-01-01 | 705547-01-01 | | |
| | UNITS | WG-11222680-271123 -KH-01 | WG-11222680-271123 -KH-01 Lab-Dup | WG-11222680-271123 -KH-02 | RDL | QC Batch |
| **ANIONS** | | | | | | |
| Nitrite (N) | mg/L | <0.0050 | N/A | <0.0050 | 0.0050 | B219129 |
| **Calculated Parameters** | | | | | | |
| Dissolved Hardness (CaCO3) | mg/L | 32.0 | N/A | 156 | 0.50 | B218178 |
| Nitrate (N) | mg/L | 0.044 | N/A | 0.804 | 0.020 | B218461 |
| Sulphide (as H2S) | mg/L | <0.0020 | N/A | <0.0020 | 0.0020 | B217989 |
| Low Molecular Weight PAH`s | ug/L | <0.10 | N/A | <0.10 | 0.10 | B218123 |
| High Molecular Weight PAH`s | ug/L | <0.050 | N/A | <0.050 | 0.050 | B218123 |
| Total PAH | ug/L | <0.10 | N/A | <0.10 | 0.10 | B218123 |
| **Field Parameters** | | | | | | |
| Field pH | pH | 7.63 | N/A | 7.98 | N/A | ONSITE |
| Field Temperature | °C | 17.08 | N/A | 10.84 | N/A | ONSITE |
| **Misc. Inorganics** | | | | | | |
| Conductivity | uS/cm | 68 | N/A | 360 | 2.0 | B219142 |
| Total Dissolved Solids | mg/L | 56 | N/A | 220 | 10 | B218644 |
| **Anions** | | | | | | |
| Alkalinity (PP as CaCO3) | mg/L | <1.0 | N/A | <1.0 | 1.0 | B219127 |
| Alkalinity (Total as CaCO3) | mg/L | 29 | N/A | 110 | 1.0 | B219127 |
| Bicarbonate (HCO3) | mg/L | 36 | N/A | 140 | 1.0 | B219127 |
| Carbonate (CO3) | mg/L | <1.0 | N/A | <1.0 | 1.0 | B219127 |
| Hydroxide (OH) | mg/L | <1.0 | N/A | <1.0 | 1.0 | B219127 |
| Total Sulphide | mg/L | <0.0018 | <0.0018 | <0.0018 | 0.0018 | B221917 |
| Chloride (Cl) | mg/L | <1.0 | N/A | 14 | 1.0 | B219884 |
| Sulphate (SO4) | mg/L | 2.9 | N/A | 40 | 1.0 | B219884 |
| **Nutrients** | | | | | | |
| Total Ammonia (N) | mg/L | <0.015 | N/A | <0.015 | 0.015 | B220627 |
| Orthophosphate (P) | mg/L | <0.0030 | N/A | 0.0069 | 0.0030 | B218450 |
| Nitrate plus Nitrite (N) | mg/L | 0.044 | N/A | 0.804 | 0.020 | B219125 |

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



Bureau Veritas Courtenay: 2755B Moray Avenue V9N 8M9, Phone: (250) 338-7786. Toll free: (800) 665-8566

Bureau Veritas Job #: C397191
Report Date: 2023/12/05

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-5
Sampler Initials: KH

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | CFQ137 | | CFQ138 | CFQ138 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/11/27 16:00 | | 2023/11/27 16:10 | 2023/11/27 16:10 | | |
| COC Number | | 705547-01-01 | | 705547-01-01 | 705547-01-01 | | |
| | UNITS | WG-11222680-271123 -KH-03 | QC Batch | WG-11222680-271123 -KH-04 | WG-11222680-271123 -KH-04 Lab-Dup | RDL | QC Batch |
| **ANIONS** | | | | | | | |
| Nitrite (N) | mg/L | <0.0050 | B219129 | <0.0050 | <0.0050 | 0.0050 | B219129 |
| **Calculated Parameters** | | | | | | | |
| Dissolved Hardness (CaCO3) | mg/L | 143 | B218178 | 144 | N/A | 0.50 | B218178 |
| Nitrate (N) | mg/L | 3.51 | B218461 | 3.49 | N/A | 0.10 | B218461 |
| Sulphide (as H2S) | mg/L | <0.0020 | B217989 | <0.0020 | N/A | 0.0020 | B217989 |
| Low Molecular Weight PAH`s | ug/L | <0.10 | B218123 | <0.10 | N/A | 0.10 | B218123 |
| High Molecular Weight PAH`s | ug/L | <0.050 | B218123 | <0.050 | N/A | 0.050 | B218123 |
| Total PAH | ug/L | <0.10 | B218123 | <0.10 | N/A | 0.10 | B218123 |
| **Field Parameters** | | | | | | | |
| Field pH | pH | 7.25 | ONSITE | 7.25 | N/A | N/A | ONSITE |
| Field Temperature | °C | 9.48 | ONSITE | 9.48 | N/A | N/A | ONSITE |
| **Misc. Inorganics** | | | | | | | |
| Conductivity | uS/cm | 340 | B219142 | 340 | N/A | 2.0 | B219142 |
| Total Dissolved Solids | mg/L | 220 | B218644 | 240 | N/A | 10 | B218644 |
| **Anions** | | | | | | | |
| Alkalinity (PP as CaCO3) | mg/L | <1.0 | B219127 | <1.0 | N/A | 1.0 | B219127 |
| Alkalinity (Total as CaCO3) | mg/L | 90 | B219127 | 89 | N/A | 1.0 | B219127 |
| Bicarbonate (HCO3) | mg/L | 110 | B219127 | 110 | N/A | 1.0 | B219127 |
| Carbonate (CO3) | mg/L | <1.0 | B219127 | <1.0 | N/A | 1.0 | B219127 |
| Hydroxide (OH) | mg/L | <1.0 | B219127 | <1.0 | N/A | 1.0 | B219127 |
| Total Sulphide | mg/L | <0.0018 | B221917 | <0.0018 | N/A | 0.0018 | B221917 |
| Chloride (Cl) | mg/L | 8.2 | B219884 | 8.3 | N/A | 1.0 | B219887 |
| Sulphate (SO4) | mg/L | 48 | B219884 | 47 | N/A | 1.0 | B219887 |
| **Nutrients** | | | | | | | |
| Total Ammonia (N) | mg/L | <0.015 | B220627 | <0.015 | N/A | 0.015 | B220627 |
| Orthophosphate (P) | mg/L | 0.0032 | B218450 | 0.0031 | N/A | 0.0030 | B218450 |
| Nitrate plus Nitrite (N) | mg/L | 3.51 | B219125 | 3.49 | 3.46 | 0.10 | B219125 |

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

Bureau Veritas Job #: C397191
Report Date: 2023/12/05

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-5
Sampler Initials: KH

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | CFQ139 | | |
|---|---|---|---|---|
| Sampling Date | | 2023/11/27 16:50 | | |
| COC Number | | 705547-01-01 | | |
| | UNITS | WG-11222680-271123 -KH-05 | RDL | QC Batch |
| **ANIONS** | | | | |
| Nitrite (N) | mg/L | <0.0050 | 0.0050 | B219129 |
| **Calculated Parameters** | | | | |
| Dissolved Hardness (CaCO3) | mg/L | 41.7 | 0.50 | B218178 |
| Nitrate (N) | mg/L | 0.416 | 0.020 | B218461 |
| Sulphide (as H2S) | mg/L | <0.0020 | 0.0020 | B217989 |
| Low Molecular Weight PAH`s | ug/L | <0.10 | 0.10 | B218123 |
| High Molecular Weight PAH`s | ug/L | <0.050 | 0.050 | B218123 |
| Total PAH | ug/L | <0.10 | 0.10 | B218123 |
| **Field Parameters** | | | | |
| Field pH | pH | 7.54 | N/A | ONSITE |
| Field Temperature | °C | 13.12 | N/A | ONSITE |
| **Misc. Inorganics** | | | | |
| Conductivity | uS/cm | 100 | 2.0 | B219142 |
| Total Dissolved Solids | mg/L | 78 | 10 | B218644 |
| **Anions** | | | | |
| Alkalinity (PP as CaCO3) | mg/L | <1.0 | 1.0 | B219127 |
| Alkalinity (Total as CaCO3) | mg/L | 41 | 1.0 | B219127 |
| Bicarbonate (HCO3) | mg/L | 50 | 1.0 | B219127 |
| Carbonate (CO3) | mg/L | <1.0 | 1.0 | B219127 |
| Hydroxide (OH) | mg/L | <1.0 | 1.0 | B219127 |
| Total Sulphide | mg/L | <0.0018 | 0.0018 | B221917 |
| Chloride (Cl) | mg/L | 3.3 | 1.0 | B219887 |
| Sulphate (SO4) | mg/L | 2.9 | 1.0 | B219887 |
| **Nutrients** | | | | |
| Total Ammonia (N) | mg/L | <0.015 | 0.015 | B220627 |
| Orthophosphate (P) | mg/L | 0.0042 | 0.0030 | B218450 |
| Nitrate plus Nitrite (N) | mg/L | 0.416 | 0.020 | B219125 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Courtenay: 2755B Moray Avenue V9N 8M9, Phone: (250) 338-7786. Toll free: (800) 665-8566

Bureau Veritas Job #: C397191
Report Date: 2023/12/05

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-5
Sampler Initials: KH

## SEMIVOLATILE ORGANICS BY GC-MS (WATER)

| Bureau Veritas ID | | CFQ135 | CFQ136 | CFQ137 | CFQ138 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/11/27 13:10 | 2023/11/27 14:15 | 2023/11/27 16:00 | 2023/11/27 16:10 | | |
| COC Number | | 705547-01-01 | 705547-01-01 | 705547-01-01 | 705547-01-01 | | |
| | UNITS | WG-11222680-271123-KH-01 | WG-11222680-271123-KH-02 | WG-11222680-271123-KH-03 | WG-11222680-271123-KH-04 | RDL | QC Batch |
| **Polycyclic Aromatics** | | | | | | | |
| Quinoline | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | B220005 |
| Naphthalene | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B220005 |
| 1-Methylnaphthalene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B220005 |
| 2-Methylnaphthalene | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B220005 |
| Acenaphthylene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B220005 |
| Acenaphthene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B220005 |
| Fluorene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B220005 |
| Phenanthrene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B220005 |
| Anthracene | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | B220005 |
| Acridine | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B220005 |
| Fluoranthene | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | B220005 |
| Pyrene | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | B220005 |
| Benzo(a)anthracene | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | B220005 |
| Chrysene | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | B220005 |
| Benzo(b&j)fluoranthene | ug/L | <0.030 | <0.030 | <0.030 | <0.030 | 0.030 | B220005 |
| Benzo(k)fluoranthene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B220005 |
| Benzo(a)pyrene | ug/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | 0.0050 | B220005 |
| Indeno(1,2,3-cd)pyrene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B220005 |
| Dibenz(a,h)anthracene | ug/L | <0.0030 | <0.0030 | <0.0030 | <0.0030 | 0.0030 | B220005 |
| Benzo(g,h,i)perylene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B220005 |
| **Surrogate Recovery (%)** | | | | | | | |
| D10-ANTHRACENE (sur.) | % | 99 | 95 | 94 | 92 | N/A | B220005 |
| D8-ACENAPHTHYLENE (sur.) | % | 95 | 92 | 89 | 87 | N/A | B220005 |
| D8-NAPHTHALENE (sur.) | % | 97 | 94 | 93 | 90 | N/A | B220005 |
| TERPHENYL-D14 (sur.) | % | 93 | 90 | 92 | 89 | N/A | B220005 |

RDL = Reportable Detection Limit
N/A = Not Applicable

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-5
Sampler Initials: KH

## SEMIVOLATILE ORGANICS BY GC-MS (WATER)

| Bureau Veritas ID | | CFQ139 | | |
|---|---|---|---|---|
| Sampling Date | | 2023/11/27 16:50 | | |
| COC Number | | 705547-01-01 | | |
| | UNITS | WG-11222680-271123 -KH-05 | RDL | QC Batch |
| **Polycyclic Aromatics** | | | | |
| Quinoline | ug/L | <0.020 | 0.020 | B220005 |
| Naphthalene | ug/L | <0.10 | 0.10 | B220005 |
| 1-Methylnaphthalene | ug/L | <0.050 | 0.050 | B220005 |
| 2-Methylnaphthalene | ug/L | <0.10 | 0.10 | B220005 |
| Acenaphthylene | ug/L | <0.050 | 0.050 | B220005 |
| Acenaphthene | ug/L | <0.050 | 0.050 | B220005 |
| Fluorene | ug/L | <0.050 | 0.050 | B220005 |
| Phenanthrene | ug/L | <0.050 | 0.050 | B220005 |
| Anthracene | ug/L | <0.010 | 0.010 | B220005 |
| Acridine | ug/L | <0.050 | 0.050 | B220005 |
| Fluoranthene | ug/L | <0.020 | 0.020 | B220005 |
| Pyrene | ug/L | <0.020 | 0.020 | B220005 |
| Benzo(a)anthracene | ug/L | <0.010 | 0.010 | B220005 |
| Chrysene | ug/L | <0.020 | 0.020 | B220005 |
| Benzo(b&j)fluoranthene | ug/L | <0.030 | 0.030 | B220005 |
| Benzo(k)fluoranthene | ug/L | <0.050 | 0.050 | B220005 |
| Benzo(a)pyrene | ug/L | <0.0050 | 0.0050 | B220005 |
| Indeno(1,2,3-cd)pyrene | ug/L | <0.050 | 0.050 | B220005 |
| Dibenz(a,h)anthracene | ug/L | <0.0030 | 0.0030 | B220005 |
| Benzo(g,h,i)perylene | ug/L | <0.050 | 0.050 | B220005 |
| **Surrogate Recovery (%)** | | | | |
| D10-ANTHRACENE (sur.) | % | 93 | N/A | B220005 |
| D8-ACENAPHTHYLENE (sur.) | % | 86 | N/A | B220005 |
| D8-NAPHTHALENE (sur.) | % | 89 | N/A | B220005 |
| TERPHENYL-D14 (sur.) | % | 91 | N/A | B220005 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Courtenay: 2755B Moray Avenue V9N 8M9, Phone: (250) 338-7786. Toll free: (800) 665-8566

Bureau Veritas Job #: C397191
Report Date: 2023/12/05

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-5
Sampler Initials: KH

## MERCURY BY COLD VAPOR (WATER)

| Bureau Veritas ID | | CFQ135 | CFQ136 | CFQ137 | CFQ138 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/11/27 13:10 | 2023/11/27 14:15 | 2023/11/27 16:00 | 2023/11/27 16:10 | | |
| COC Number | | 705547-01-01 | 705547-01-01 | 705547-01-01 | 705547-01-01 | | |
| | UNITS | WG-11222680-271123-KH-01 | WG-11222680-271123-KH-02 | WG-11222680-271123-KH-03 | WG-11222680-271123-KH-04 | RDL | QC Batch |
| **Elements** | | | | | | | |
| Dissolved Mercury (Hg) | ug/L | <0.0019 | 0.0055 | <0.0019 | <0.0019 | 0.0019 | B223426 |
| RDL = Reportable Detection Limit | | | | | | | |

| Bureau Veritas ID | | CFQ139 | | |
|---|---|---|---|---|
| Sampling Date | | 2023/11/27 16:50 | | |
| COC Number | | 705547-01-01 | | |
| | UNITS | WG-11222680-271123-KH-05 | RDL | QC Batch |
| **Elements** | | | | |
| Dissolved Mercury (Hg) | ug/L | <0.0019 | 0.0019 | B223426 |
| RDL = Reportable Detection Limit | | | | |



Bureau Veritas Courtenay: 2755B Moray Avenue V9N 8M9, Phone: (250) 338-7786. Toll free: (800) 665-8566

Bureau Veritas Job #: C397191
Report Date: 2023/12/05

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-5
Sampler Initials: KH

## ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

| Bureau Veritas ID | | CFQ135 | CFQ136 | CFQ137 | CFQ138 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/11/27 13:10 | 2023/11/27 14:15 | 2023/11/27 16:00 | 2023/11/27 16:10 | | |
| COC Number | | 705547-01-01 | 705547-01-01 | 705547-01-01 | 705547-01-01 | | |
| | UNITS | WG-11222680-271123-KH-01 | WG-11222680-271123-KH-02 | WG-11222680-271123-KH-03 | WG-11222680-271123-KH-04 | RDL | QC Batch |
| **Dissolved Metals by ICPMS** | | | | | | | |
| Dissolved Aluminum (Al) | ug/L | <3.0 | <3.0 | <3.0 | <3.0 | 3.0 | B221019 |
| Dissolved Antimony (Sb) | ug/L | <0.50 | <0.50 | <0.50 | <0.50 | 0.50 | B221019 |
| Dissolved Arsenic (As) | ug/L | <0.10 | 0.34 | <0.10 | <0.10 | 0.10 | B221019 |
| Dissolved Barium (Ba) | ug/L | 1.3 | 6.8 | 4.4 | 4.4 | 1.0 | B221019 |
| Dissolved Beryllium (Be) | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B221019 |
| Dissolved Bismuth (Bi) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B221019 |
| Dissolved Boron (B) | ug/L | <50 | 742 | 171 | 167 | 50 | B221019 |
| Dissolved Cadmium (Cd) | ug/L | <0.010 | 0.012 | <0.010 | 0.010 | 0.010 | B221019 |
| Dissolved Chromium (Cr) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B221019 |
| Dissolved Cobalt (Co) | ug/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B221019 |
| Dissolved Copper (Cu) | ug/L | <0.20 | 1.92 | 0.68 | 0.66 | 0.20 | B221019 |
| Dissolved Iron (Fe) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B221019 |
| Dissolved Lead (Pb) | ug/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B221019 |
| Dissolved Lithium (Li) | ug/L | <2.0 | <2.0 | <2.0 | <2.0 | 2.0 | B221019 |
| Dissolved Manganese (Mn) | ug/L | <1.0 | <1.0 | 1.8 | 1.9 | 1.0 | B221019 |
| Dissolved Molybdenum (Mo) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B221019 |
| Dissolved Nickel (Ni) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | B221019 |
| Dissolved Phosphorus (P) | ug/L | <10 | 13 | <10 | <10 | 10 | B221019 |
| Dissolved Selenium (Se) | ug/L | <0.10 | 0.14 | 0.23 | 0.22 | 0.10 | B221019 |
| Dissolved Silicon (Si) | ug/L | 4550 | 7400 | 8240 | 8280 | 100 | B221019 |
| Dissolved Silver (Ag) | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | B221019 |
| Dissolved Strontium (Sr) | ug/L | 15.5 | 74.8 | 76.2 | 76.1 | 1.0 | B221019 |
| Dissolved Thallium (Tl) | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | B221019 |
| Dissolved Tin (Sn) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B221019 |
| Dissolved Titanium (Ti) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B221019 |
| Dissolved Uranium (U) | ug/L | <0.10 | 0.17 | <0.10 | <0.10 | 0.10 | B221019 |
| Dissolved Vanadium (V) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B221019 |
| Dissolved Zinc (Zn) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | B221019 |
| Dissolved Zirconium (Zr) | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B221019 |
| Dissolved Calcium (Ca) | mg/L | 10.7 | 49.8 | 43.2 | 43.7 | 0.050 | B218179 |
| Dissolved Magnesium (Mg) | mg/L | 1.30 | 7.59 | 8.54 | 8.52 | 0.050 | B218179 |

RDL = Reportable Detection Limit

Bureau Veritas Job #: C397191
Report Date: 2023/12/05

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-5
Sampler Initials: KH

## ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

| Bureau Veritas ID | | CFQ135 | CFQ136 | CFQ137 | CFQ138 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/11/27 13:10 | 2023/11/27 14:15 | 2023/11/27 16:00 | 2023/11/27 16:10 | | |
| COC Number | | 705547-01-01 | 705547-01-01 | 705547-01-01 | 705547-01-01 | | |
| | UNITS | WG-11222680-271123-KH-01 | WG-11222680-271123-KH-02 | WG-11222680-271123-KH-03 | WG-11222680-271123-KH-04 | RDL | QC Batch |
| Dissolved Potassium (K) | mg/L | 0.208 | 0.529 | 0.404 | 0.402 | 0.050 | B218179 |
| Dissolved Sodium (Na) | mg/L | 1.10 | 10.2 | 8.67 | 8.67 | 0.050 | B218179 |
| Dissolved Sulphur (S) | mg/L | <3.0 | 13.4 | 16.4 | 16.4 | 3.0 | B218179 |
| RDL = Reportable Detection Limit | | | | | | | |



Bureau Veritas Courtenay: 2755B Moray Avenue V9N 8M9, Phone: (250) 338-7786. Toll free: (800) 665-8566

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-5
Sampler Initials: KH

## ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

| Bureau Veritas ID | | CFQ139 | | |
|---|---|---|---|---|
| Sampling Date | | 2023/11/27 16:50 | | |
| COC Number | | 705547-01-01 | | |
| | UNITS | WG-11222680-271123 -KH-05 | RDL | QC Batch |
| **Dissolved Metals by ICPMS** | | | | |
| Dissolved Aluminum (Al) | ug/L | <3.0 | 3.0 | B221019 |
| Dissolved Antimony (Sb) | ug/L | <0.50 | 0.50 | B221019 |
| Dissolved Arsenic (As) | ug/L | 0.13 | 0.10 | B221019 |
| Dissolved Barium (Ba) | ug/L | 1.2 | 1.0 | B221019 |
| Dissolved Beryllium (Be) | ug/L | <0.10 | 0.10 | B221019 |
| Dissolved Bismuth (Bi) | ug/L | <1.0 | 1.0 | B221019 |
| Dissolved Boron (B) | ug/L | <50 | 50 | B221019 |
| Dissolved Cadmium (Cd) | ug/L | <0.010 | 0.010 | B221019 |
| Dissolved Chromium (Cr) | ug/L | <1.0 | 1.0 | B221019 |
| Dissolved Cobalt (Co) | ug/L | <0.20 | 0.20 | B221019 |
| Dissolved Copper (Cu) | ug/L | 1.30 | 0.20 | B221019 |
| Dissolved Iron (Fe) | ug/L | <5.0 | 5.0 | B221019 |
| Dissolved Lead (Pb) | ug/L | <0.20 | 0.20 | B221019 |
| Dissolved Lithium (Li) | ug/L | <2.0 | 2.0 | B221019 |
| Dissolved Manganese (Mn) | ug/L | <1.0 | 1.0 | B221019 |
| Dissolved Molybdenum (Mo) | ug/L | <1.0 | 1.0 | B221019 |
| Dissolved Nickel (Ni) | ug/L | <1.0 | 1.0 | B221019 |
| Dissolved Phosphorus (P) | ug/L | <10 | 10 | B221019 |
| Dissolved Selenium (Se) | ug/L | 0.12 | 0.10 | B221019 |
| Dissolved Silicon (Si) | ug/L | 4990 | 100 | B221019 |
| Dissolved Silver (Ag) | ug/L | <0.020 | 0.020 | B221019 |
| Dissolved Strontium (Sr) | ug/L | 21.0 | 1.0 | B221019 |
| Dissolved Thallium (Tl) | ug/L | <0.010 | 0.010 | B221019 |
| Dissolved Tin (Sn) | ug/L | <5.0 | 5.0 | B221019 |
| Dissolved Titanium (Ti) | ug/L | <5.0 | 5.0 | B221019 |
| Dissolved Uranium (U) | ug/L | <0.10 | 0.10 | B221019 |
| Dissolved Vanadium (V) | ug/L | <5.0 | 5.0 | B221019 |
| Dissolved Zinc (Zn) | ug/L | <5.0 | 5.0 | B221019 |
| Dissolved Zirconium (Zr) | ug/L | <0.10 | 0.10 | B221019 |
| Dissolved Calcium (Ca) | mg/L | 13.8 | 0.050 | B218179 |
| Dissolved Magnesium (Mg) | mg/L | 1.74 | 0.050 | B218179 |
| RDL = Reportable Detection Limit | | | | |



Bureau Veritas Courtenay: 2755B Moray Avenue V9N 8M9, Phone: (250) 338-7786. Toll free: (800) 665-8566

## ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

| **Bureau Veritas ID** | | CFQ139 | | |
|---|---|---|---|---|
| **Sampling Date** | | 2023/11/27 16:50 | | |
| **COC Number** | | 705547-01-01 | | |
| | **UNITS** | **WG-11222680-271123 -KH-05** | **RDL** | **QC Batch** |
| Dissolved Potassium (K) | mg/L | 0.176 | 0.050 | B218179 |
| Dissolved Sodium (Na) | mg/L | 1.86 | 0.050 | B218179 |
| Dissolved Sulphur (S) | mg/L | <3.0 | 3.0 | B218179 |
| RDL = Reportable Detection Limit | | | | |

Bureau Veritas Job #: C397191
Report Date: 2023/12/05

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-5
Sampler Initials: KH

## TOTAL PETROLEUM HYDROCARBONS (WATER)

| Bureau Veritas ID | | CFQ135 | CFQ136 | CFQ137 | CFQ138 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/11/27 13:10 | 2023/11/27 14:15 | 2023/11/27 16:00 | 2023/11/27 16:10 | | |
| COC Number | | 705547-01-01 | 705547-01-01 | 705547-01-01 | 705547-01-01 | | |
| | UNITS | WG-11222680-271123 -KH-01 | WG-11222680-271123 -KH-02 | WG-11222680-271123 -KH-03 | WG-11222680-271123 -KH-04 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | | |
| LEPH (C10-C19 less PAH) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B218097 |
| HEPH (C19-C32 less PAH) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B218097 |
| **Ext. Pet. Hydrocarbon** | | | | | | | |
| EPH (C10-C19) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B220011 |
| EPH (C19-C32) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B220011 |
| **Surrogate Recovery (%)** | | | | | | | |
| O-TERPHENYL (sur.) | % | 100 | 99 | 101 | 100 | N/A | B220011 |

RDL = Reportable Detection Limit
N/A = Not Applicable

| Bureau Veritas ID | | CFQ139 | | |
|---|---|---|---|---|
| Sampling Date | | 2023/11/27 16:50 | | |
| COC Number | | 705547-01-01 | | |
| | UNITS | WG-11222680-271123 -KH-05 | RDL | QC Batch |
| **Calculated Parameters** | | | | |
| LEPH (C10-C19 less PAH) | mg/L | <0.20 | 0.20 | B218097 |
| HEPH (C19-C32 less PAH) | mg/L | <0.20 | 0.20 | B218097 |
| **Ext. Pet. Hydrocarbon** | | | | |
| EPH (C10-C19) | mg/L | <0.20 | 0.20 | B220011 |
| EPH (C19-C32) | mg/L | <0.20 | 0.20 | B220011 |
| **Surrogate Recovery (%)** | | | | |
| O-TERPHENYL (sur.) | % | 101 | N/A | B220011 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Courtenay: 2755B Moray Avenue V9N 8M9, Phone: (250) 338-7786. Toll free: (800) 665-8566

Bureau Veritas Job #: C397191
Report Date: 2023/12/05

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-5
Sampler Initials: KH

## MISCELLANEOUS (WATER)

| Bureau Veritas ID | | CFQ135 | CFQ136 | CFQ137 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2023/11/27 13:10 | 2023/11/27 14:15 | 2023/11/27 16:00 | | |
| COC Number | | 705547-01-01 | 705547-01-01 | 705547-01-01 | | |
| | UNITS | WG-11222680-271123-KH-01 | WG-11222680-271123-KH-02 | WG-11222680-271123-KH-03 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | |
| Total Un-ionized Hydrogen Sulfide as S | mg/L | <0.0050 | <0.0050 | <0.0050 | 0.0050 | B218692 |
| Total Un-ionized Hydrogen Sulfide as H2S | mg/L | <0.0050 | <0.0050 | <0.0050 | 0.0050 | B218692 |
| RDL = Reportable Detection Limit | | | | | | |

| Bureau Veritas ID | | CFQ138 | CFQ139 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2023/11/27 16:10 | 2023/11/27 16:50 | | |
| COC Number | | 705547-01-01 | 705547-01-01 | | |
| | UNITS | WG-11222680-271123-KH-04 | WG-11222680-271123-KH-05 | RDL | QC Batch |
| **Calculated Parameters** | | | | | |
| Total Un-ionized Hydrogen Sulfide as S | mg/L | <0.0050 | <0.0050 | 0.0050 | B218692 |
| Total Un-ionized Hydrogen Sulfide as H2S | mg/L | <0.0050 | <0.0050 | 0.0050 | B218692 |
| RDL = Reportable Detection Limit | | | | | |

## GENERAL COMMENTS

**Results relate only to the items tested.**



Bureau Veritas Courtenay: 2755B Moray Avenue V9N 8M9, Phone: (250) 338-7786. Toll free: (800) 665-8566

## QUALITY ASSURANCE REPORT



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B220005 | D10-ANTHRACENE (sur.) | 2023/12/01 | | | 101 | 50 - 140 | 95 | % | | |
| B220005 | D8-ACENAPHTHYLENE (sur.) | 2023/12/01 | | | 99 | 50 - 140 | 93 | % | | |
| B220005 | D8-NAPHTHALENE (sur.) | 2023/12/01 | | | 99 | 50 - 140 | 94 | % | | |
| B220005 | TERPHENYL-D14 (sur.) | 2023/12/01 | | | 97 | 50 - 140 | 95 | % | | |
| B220011 | O-TERPHENYL (sur.) | 2023/12/01 | | | 100 | 60 - 140 | 99 | % | | |
| B218450 | Orthophosphate (P) | 2023/11/30 | | | 94 | 80 - 120 | <0.0030 | mg/L | | |
| B218644 | Total Dissolved Solids | 2023/12/01 | 101 | 80 - 120 | 103 | 80 - 120 | <10 | mg/L | 6.5 (1) | 20 |
| B219125 | Nitrate plus Nitrite (N) | 2023/11/30 | NC (2) | 80 - 120 | 110 | 80 - 120 | <0.020 | mg/L | 0.91 (3) | 25 |
| B219127 | Alkalinity (PP as CaCO3) | 2023/11/30 | | | | | <1.0 | mg/L | NC (1) | 20 |
| B219127 | Alkalinity (Total as CaCO3) | 2023/11/30 | | | 92 | 80 - 120 | <1.0 | mg/L | 0.41 (1) | 20 |
| B219127 | Bicarbonate (HCO3) | 2023/11/30 | | | | | <1.0 | mg/L | 0.41 (1) | 20 |
| B219127 | Carbonate (CO3) | 2023/11/30 | | | | | <1.0 | mg/L | NC (1) | 20 |
| B219127 | Hydroxide (OH) | 2023/11/30 | | | | | <1.0 | mg/L | NC (1) | 20 |
| B219129 | Nitrite (N) | 2023/11/30 | 105 (2) | 80 - 120 | 105 | 80 - 120 | <0.0050 | mg/L | NC (3) | 20 |
| B219142 | Conductivity | 2023/11/30 | | | 99 | 90 - 110 | <2.0 | uS/cm | 0 (1) | 10 |
| B219884 | Chloride (Cl) | 2023/12/01 | NC | 80 - 120 | 96 | 80 - 120 | <1.0 | mg/L | 0.15 (1) | 20 |
| B219884 | Sulphate (SO4) | 2023/12/01 | NC | 80 - 120 | 96 | 80 - 120 | <1.0 | mg/L | 0.78 (1) | 20 |
| B219887 | Chloride (Cl) | 2023/12/01 | 97 | 80 - 120 | 96 | 80 - 120 | <1.0 | mg/L | NC (1) | 20 |
| B219887 | Sulphate (SO4) | 2023/12/01 | NC | 80 - 120 | 96 | 80 - 120 | <1.0 | mg/L | 0.71 (1) | 20 |
| B220005 | 1-Methylnaphthalene | 2023/12/02 | | | 103 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B220005 | 2-Methylnaphthalene | 2023/12/02 | | | 100 | 50 - 140 | <0.10 | ug/L | NC (1) | 40 |
| B220005 | Acenaphthene | 2023/12/02 | | | 102 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B220005 | Acenaphthylene | 2023/12/02 | | | 103 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B220005 | Acridine | 2023/12/02 | | | 99 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B220005 | Anthracene | 2023/12/02 | | | 106 | 50 - 140 | <0.010 | ug/L | NC (1) | 40 |
| B220005 | Benzo(a)anthracene | 2023/12/02 | | | 85 | 50 - 140 | <0.010 | ug/L | NC (1) | 40 |
| B220005 | Benzo(a)pyrene | 2023/12/02 | | | 89 | 50 - 140 | <0.0050 | ug/L | NC (1) | 40 |
| B220005 | Benzo(b&j)fluoranthene | 2023/12/02 | | | 102 | 50 - 140 | <0.030 | ug/L | NC (1) | 40 |
| B220005 | Benzo(g,h,i)perylene | 2023/12/02 | | | 86 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B220005 | Benzo(k)fluoranthene | 2023/12/02 | | | 98 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B220005 | Chrysene | 2023/12/02 | | | 89 | 50 - 140 | <0.020 | ug/L | NC (1) | 40 |

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B220005 | Dibenz(a,h)anthracene | 2023/12/02 | | | 89 | 50 - 140 | <0.0030 | ug/L | NC (1) | 40 |
| B220005 | Fluoranthene | 2023/12/02 | | | 79 | 50 - 140 | <0.020 | ug/L | NC (1) | 40 |
| B220005 | Fluorene | 2023/12/02 | | | 99 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B220005 | Indeno(1,2,3-cd)pyrene | 2023/12/02 | | | 90 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B220005 | Naphthalene | 2023/12/02 | | | 101 | 50 - 140 | <0.10 | ug/L | NC (1) | 40 |
| B220005 | Phenanthrene | 2023/12/02 | | | 102 | 50 - 140 | <0.050 | ug/L | NC (1) | 40 |
| B220005 | Pyrene | 2023/12/02 | | | 82 | 50 - 140 | <0.020 | ug/L | NC (1) | 40 |
| B220005 | Quinoline | 2023/12/02 | | | 106 | 50 - 140 | <0.020 | ug/L | NC (1) | 40 |
| B220011 | EPH (C10-C19) | 2023/12/01 | | | 90 | 70 - 130 | <0.20 | mg/L | NC (1) | 30 |
| B220011 | EPH (C19-C32) | 2023/12/01 | | | 94 | 70 - 130 | <0.20 | mg/L | NC (1) | 30 |
| B220627 | Total Ammonia (N) | 2023/12/01 | -6.6 (4) | 80 - 120 | 101 | 80 - 120 | <0.015 | mg/L | 5.4 (1) | 20 |
| B221019 | Dissolved Aluminum (Al) | 2023/12/04 | 103 | 80 - 120 | 102 | 80 - 120 | <3.0 | ug/L | 20 (1) | 20 |
| B221019 | Dissolved Antimony (Sb) | 2023/12/04 | 105 | 80 - 120 | 102 | 80 - 120 | <0.50 | ug/L | NC (1) | 20 |
| B221019 | Dissolved Arsenic (As) | 2023/12/04 | 108 | 80 - 120 | 103 | 80 - 120 | <0.10 | ug/L | 0.80 (1) | 20 |
| B221019 | Dissolved Barium (Ba) | 2023/12/04 | NC | 80 - 120 | 102 | 80 - 120 | <1.0 | ug/L | 1.1 (1) | 20 |
| B221019 | Dissolved Beryllium (Be) | 2023/12/04 | 106 | 80 - 120 | 101 | 80 - 120 | <0.10 | ug/L | NC (1) | 20 |
| B221019 | Dissolved Bismuth (Bi) | 2023/12/04 | 99 | 80 - 120 | 99 | 80 - 120 | <1.0 | ug/L | NC (1) | 20 |
| B221019 | Dissolved Boron (B) | 2023/12/04 | 113 | 80 - 120 | 110 | 80 - 120 | <50 | ug/L | NC (1) | 20 |
| B221019 | Dissolved Cadmium (Cd) | 2023/12/04 | 101 | 80 - 120 | 99 | 80 - 120 | <0.010 | ug/L | 2.2 (1) | 20 |
| B221019 | Dissolved Chromium (Cr) | 2023/12/04 | 96 | 80 - 120 | 96 | 80 - 120 | <1.0 | ug/L | NC (1) | 20 |
| B221019 | Dissolved Cobalt (Co) | 2023/12/04 | 93 | 80 - 120 | 95 | 80 - 120 | <0.20 | ug/L | NC (1) | 20 |
| B221019 | Dissolved Copper (Cu) | 2023/12/04 | 92 | 80 - 120 | 95 | 80 - 120 | <0.20 | ug/L | 3.8 (1) | 20 |
| B221019 | Dissolved Iron (Fe) | 2023/12/04 | 103 | 80 - 120 | 101 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |
| B221019 | Dissolved Lead (Pb) | 2023/12/04 | 101 | 80 - 120 | 100 | 80 - 120 | <0.20 | ug/L | NC (1) | 20 |
| B221019 | Dissolved Lithium (Li) | 2023/12/04 | 101 | 80 - 120 | 101 | 80 - 120 | <2.0 | ug/L | NC (1) | 20 |
| B221019 | Dissolved Manganese (Mn) | 2023/12/04 | 99 | 80 - 120 | 100 | 80 - 120 | <1.0 | ug/L | 1.4 (1) | 20 |
| B221019 | Dissolved Molybdenum (Mo) | 2023/12/04 | 106 | 80 - 120 | 102 | 80 - 120 | <1.0 | ug/L | NC (1) | 20 |
| B221019 | Dissolved Nickel (Ni) | 2023/12/04 | 97 | 80 - 120 | 99 | 80 - 120 | <1.0 | ug/L | 0.59 (1) | 20 |
| B221019 | Dissolved Phosphorus (P) | 2023/12/04 | 107 | 80 - 120 | 101 | 80 - 120 | <10 | ug/L | | |
| B221019 | Dissolved Selenium (Se) | 2023/12/04 | 105 | 80 - 120 | 100 | 80 - 120 | <0.10 | ug/L | 3.1 (1) | 20 |
| B221019 | Dissolved Silicon (Si) | 2023/12/04 | NC | 80 - 120 | 114 | 80 - 120 | <100 | ug/L | 1.0 (1) | 20 |

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B221019 | Dissolved Silver (Ag) | 2023/12/04 | 103 | 80 - 120 | 101 | 80 - 120 | <0.020 | ug/L | NC (1) | 20 |
| B221019 | Dissolved Strontium (Sr) | 2023/12/04 | NC | 80 - 120 | 102 | 80 - 120 | <1.0 | ug/L | 0.018 (1) | 20 |
| B221019 | Dissolved Thallium (Tl) | 2023/12/04 | 102 | 80 - 120 | 101 | 80 - 120 | <0.010 | ug/L | 6.8 (1) | 20 |
| B221019 | Dissolved Tin (Sn) | 2023/12/04 | 103 | 80 - 120 | 101 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |
| B221019 | Dissolved Titanium (Ti) | 2023/12/04 | 104 | 80 - 120 | 103 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |
| B221019 | Dissolved Uranium (U) | 2023/12/04 | 105 | 80 - 120 | 101 | 80 - 120 | <0.10 | ug/L | 0.89 (1) | 20 |
| B221019 | Dissolved Vanadium (V) | 2023/12/04 | 102 | 80 - 120 | 100 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |
| B221019 | Dissolved Zinc (Zn) | 2023/12/04 | 96 | 80 - 120 | 99 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |
| B221019 | Dissolved Zirconium (Zr) | 2023/12/04 | 106 | 80 - 120 | 101 | 80 - 120 | <0.10 | ug/L | NC (1) | 20 |
| B221917 | Total Sulphide | 2023/12/04 | 108 (5) | 80 - 120 | 101 | 80 - 120 | <0.0018 | mg/L | NC (6) | 20 |
| B223426 | Dissolved Mercury (Hg) | 2023/12/05 | 99 | 80 - 120 | 111 | 80 - 120 | <0.0019 | ug/L | NC (1) | 20 |

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

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

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

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

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

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

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Duplicate Parent ID

(2) Matrix Spike Parent ID [CFQ138-01]

(3) Duplicate Parent ID [CFQ138-01]

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

(5) Matrix Spike Parent ID [CFQ136-03]

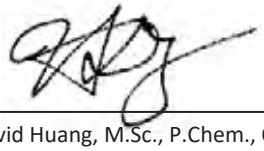
(6) Duplicate Parent ID [CFQ135-03]

Bureau Veritas Job #: C397191
Report Date: 2023/12/05

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-5
Sampler Initials: KH

## VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:



David Huang, M.Sc., P.Chem., QP, Scientific Services Manager

Suwan (Sze Yeung) Fock, B.Sc., Scientific Specialist

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Raphael Kwan, Senior Manager, BC and Yukon Regions responsible for British Columbia Food laboratory operations.



Bureau Veritas Courtenay: 2755B Moray Avenue V9N 8M9, Phone: (250) 338-7786. Toll free: (800) 665-8566

Bureau Veritas
4606 Canada Way, Burnaby, British Columbia Canada V5G 1K5 Tel:(604) 734 7276 Toll-free:800-563-6266 Fax:(604) 731 2386 www.bvna.com

C397191_COC

| INVOICE TO: | | Report Information | | Project Information | |
|---|---|---|---|---|---|
| Company Name | #163 GHD Limited | Company Name | | Quotation # | C30090 |
| Contact Name | AP Invoices - 735 | Contact Name | Stephanie Berton | P.O. # | 735-002640-3 |
| Address | 455 PHILLIP STREET | Address | | Project # | 11222680-15.1 |
| | WATERLOO ON N2L 3X2 | | | Project Name | Upland LandFill |
| Phone | (519) 884-0510 Fax: (519) 725-1394 | Phone | Fax: | Site # / Sampled By | Groundwater / Kathleen Hasler |
| Email | APinvoices-735@ghd.com | Email | NationalEDDSupport@maxxam.ca,stephanie.berton@ghd.com | | |

Bottle Order #: 705947
Project Manager: Brody Anderson
C#705947-01-01

Regulatory Criteria: ☐ CSR ☐ CCME ☐ BC Water Quality ☐ Other _____

Special Instructions: Bottles were field filtered and preserved as indicated.

**SAMPLES MUST BE KEPT COOL ( < 10°C ) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS**

ANALYSIS REQUESTED (PLEASE BE SPECIFIC):

| | Sample Barcode Label | Sample (Location) Identification | Date Sampled | Time Sampled | Matrix | Metals Field Filtered ? ( Y / N ) | Conductivity, Cl, SO4, NO2, NO3, N+N, PO4 | Speciated Alkalinity | Sulphide + H2S Calc | Sulphide, Un-ionized (as H2S) (Calc) | Ammonia-N (Total) | Dissolved Metals with CV Hg, Hardness | Total Dissolved Solids (Filt. Residue) | LEPH/HEPH with subtracted PAHs | Field pH | Field Temperature | # of Bottles | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | WG-11222680-271123-KH-01 | 27/11/23 | 13:10 | W | Y | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 7 | |
| 2 | | WG-11222680-271123-KH-02 | " | 14:15 | " | Y | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 7 | |
| 3 | | WG-11222680-271123-KH-03 | " | 16:00 | " | Y | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 7 | |
| 4 | | WG-11222680-271123-KH-04 | " | 16:10 | " | Y | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 7 | |
| 5 | | WG-11222680-271123-KH-05 | " | 16:50 | " | Y | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 7 | |
| 6 | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | |

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT: ☒
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
1 DAY ☐ 2 Day ☐ 3 Day ☐ Date Required: _____ ☐
Rush Confirmation Number: _____ (call lab for #)

| * RELINQUISHED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | RECEIVED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | # jars used and not submitted |
|---|---|---|---|---|---|---|
| Debra Tong | 23/11/28 | 07:00 | | 23/11/29 | 09:55 | |

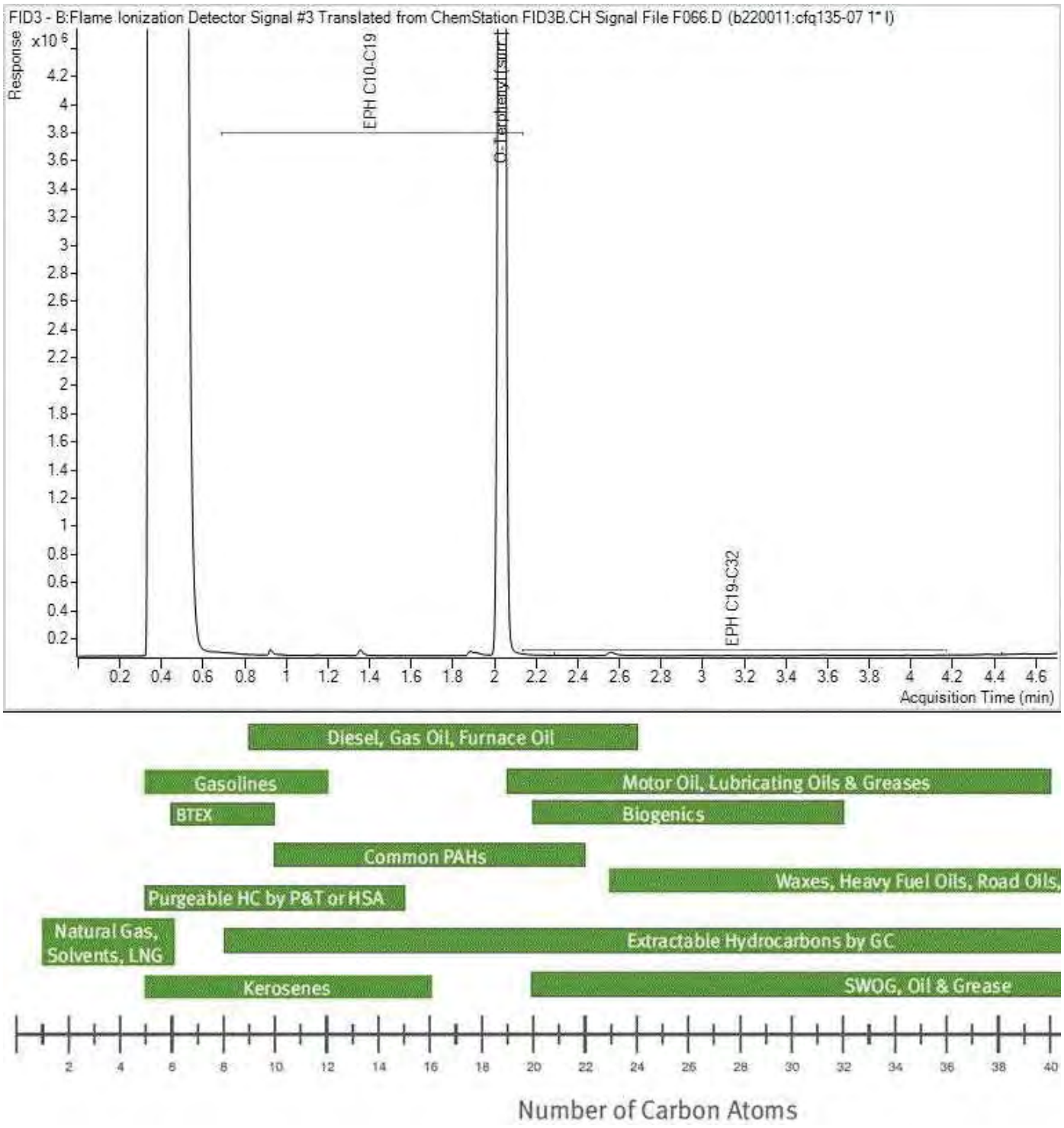
Lab Use Only: Time Sensitive ☐ | Temperature (°C) on Receipt 5 6 6 | Custody Seal Intact on Cooler? ☐ Yes ☐ No

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.
* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Bureau Veritas Yellow: Client

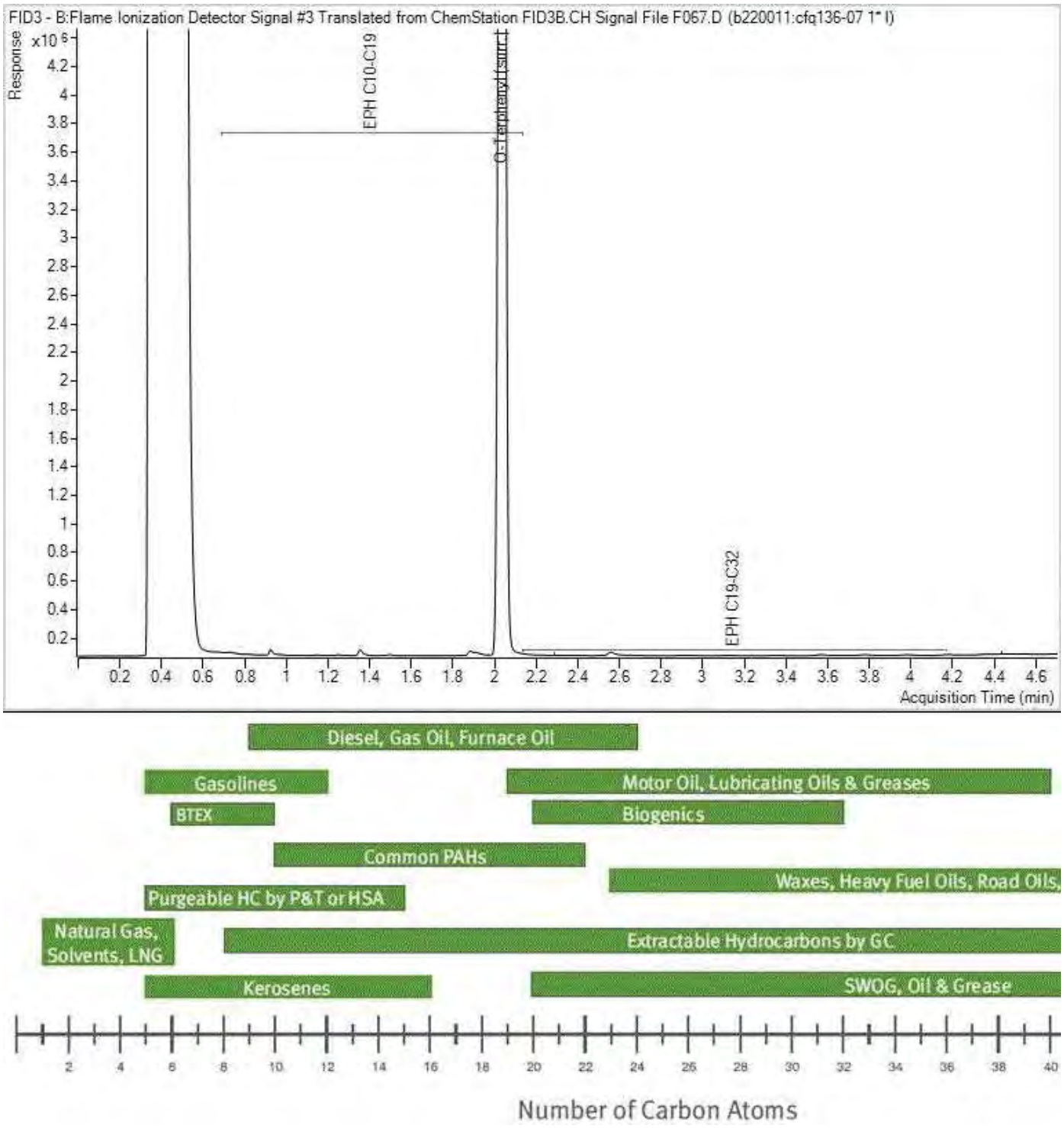
Bureau Veritas Canada (2019) Inc.

**EPH in Water when PAH required Chromatogram**



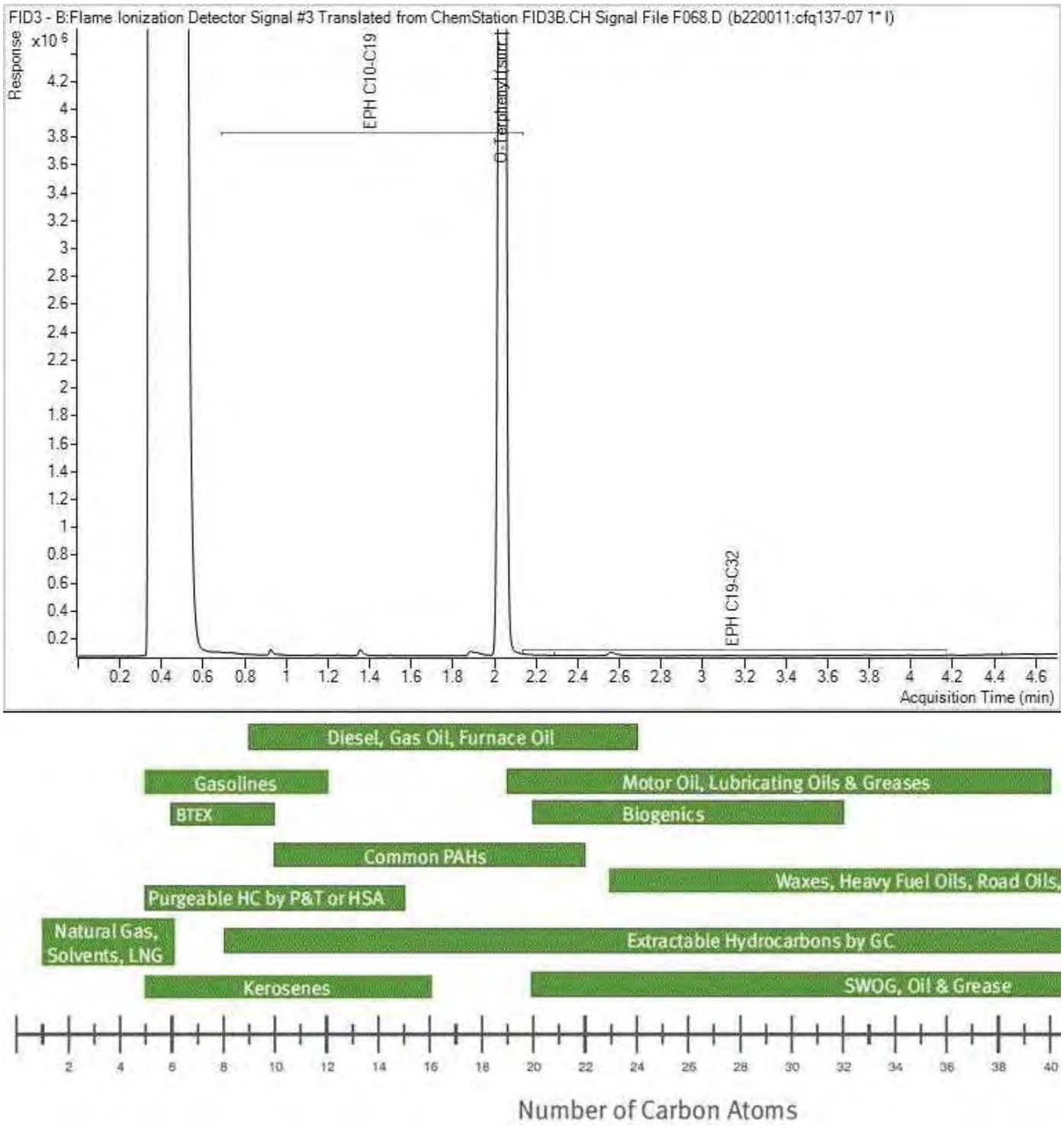

**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

**EPH in Water when PAH required Chromatogram**



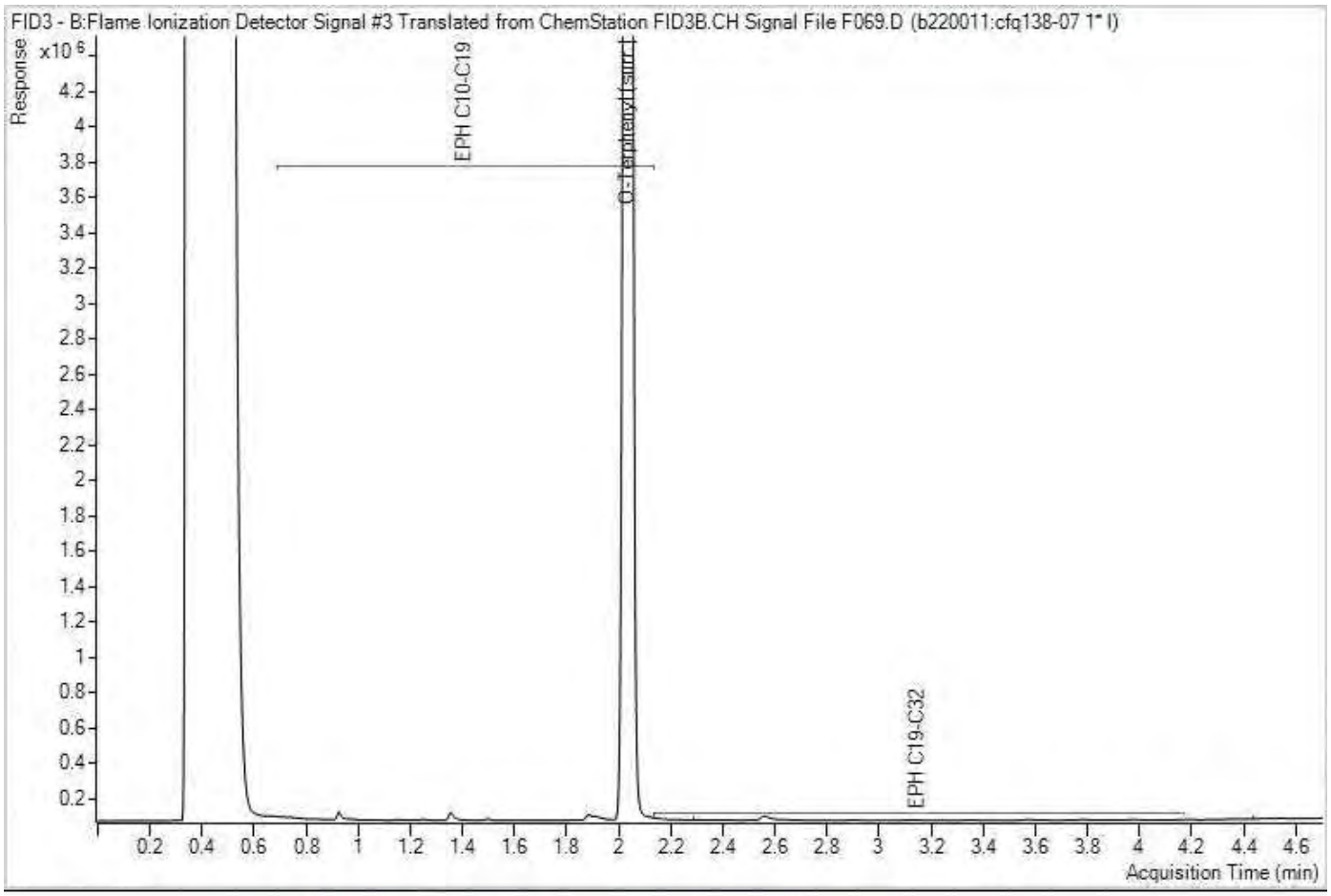

**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

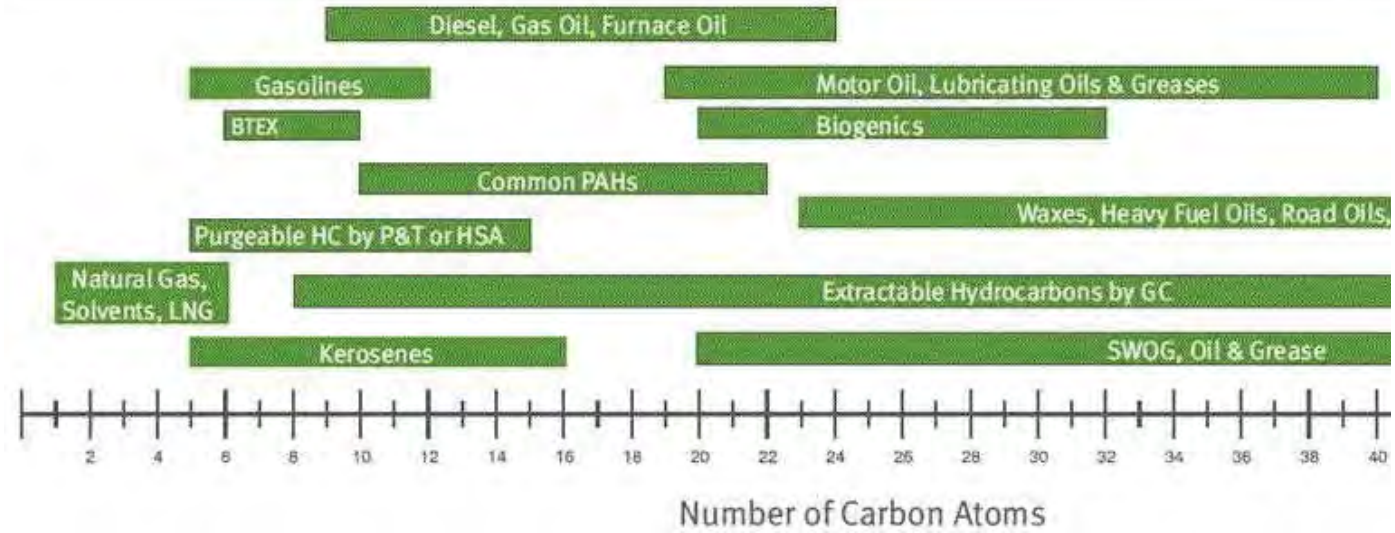
**EPH in Water when PAH required Chromatogram**




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

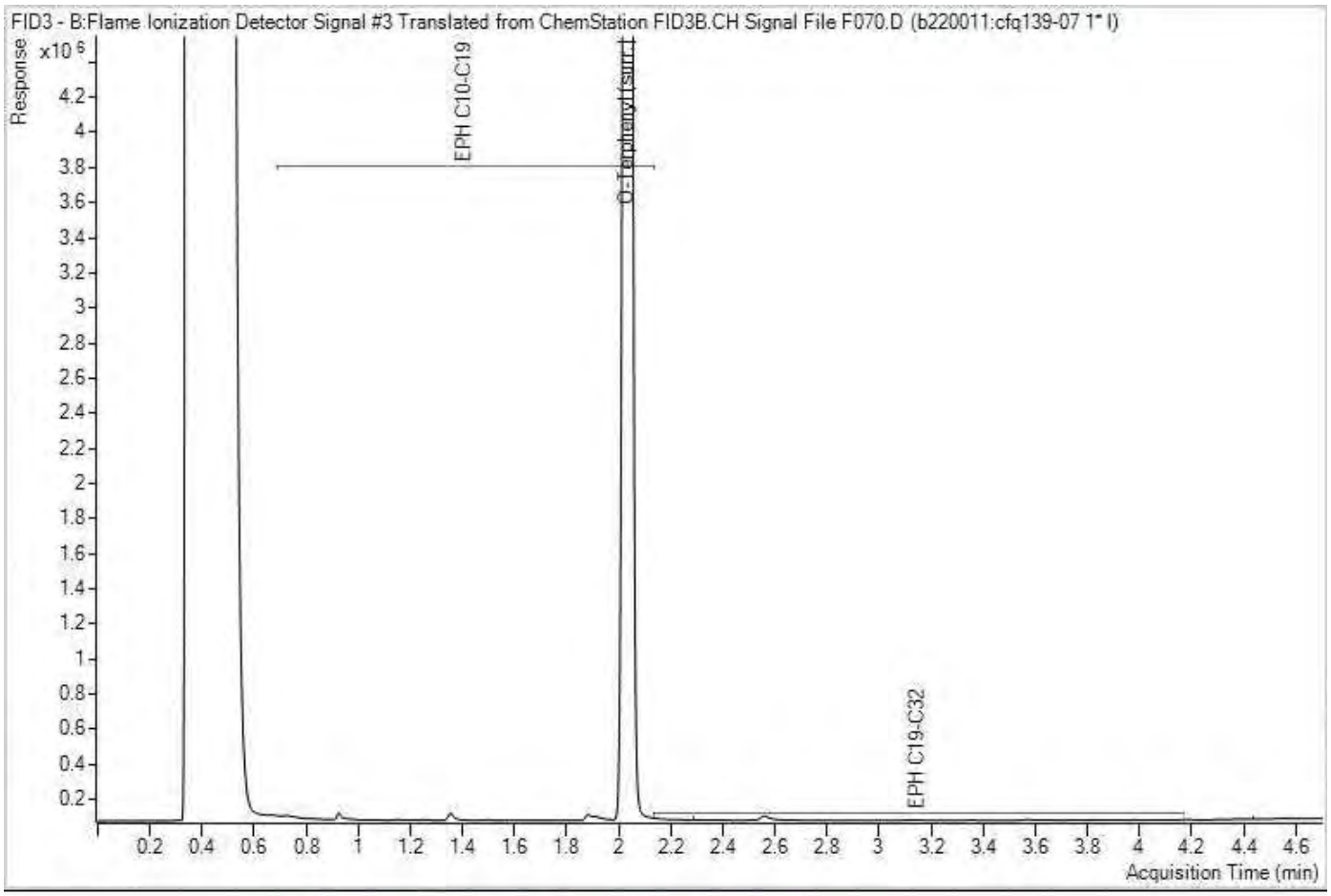
**EPH in Water when PAH required Chromatogram**

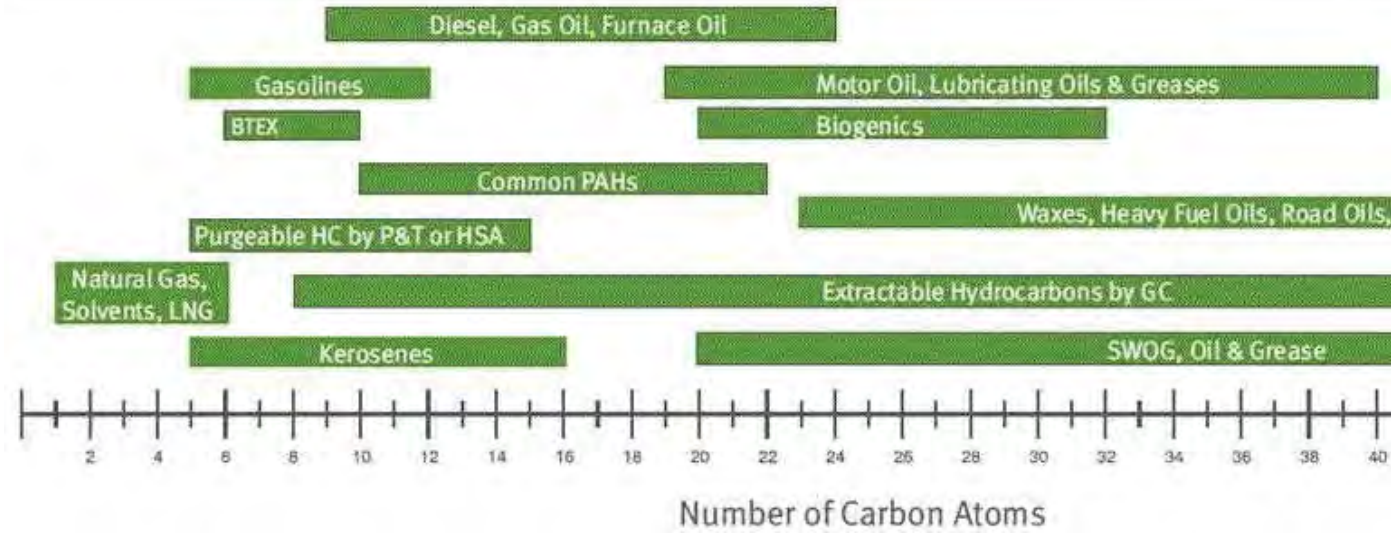



**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

**EPH in Water when PAH required Chromatogram**




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

Your P.O. #: 735-002640-4
Your Project #: 11222680-15.1
Site#: GROUNDWATER
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your C.O.C. #: 705547-03-01, 705547-01-01

**Attention: Stephanie Berton**

GHD Limited
455 PHILLIP STREET
WATERLOO, ON
CANADA N2L 3X2

**Report Date: 2023/12/07**
Report #: R3437781
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**BUREAU VERITAS JOB #: C397797**
**Received: 2023/11/30, 11:42**

Sample Matrix: Water
# Samples Received: 9

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Analytical Method |
|---|---|---|---|---|---|
| Alkalinity @25C (pp, total), CO3,HCO3,OH | 8 | N/A | 2023/12/01 | BBY6SOP-00026 | SM 24 2320 B m |
| Biochemical Oxygen Demand | 1 | 2023/12/01 | 2023/12/06 | BBY6SOP-00045 | SM 23 5210 B m |
| BTEX/MTBE LH, VH, F1 SIM/MS | 1 | N/A | 2023/12/01 | BBY8SOP-00010 / BBY8SOP-00011 / BBY8SOP-00012 | BCMOE BCLM Jul 2017 |
| Chloride/Sulphate by Auto Colourimetry | 8 | N/A | 2023/12/01 | BBY6SOP-00011 / BBY6SOP-00017 | SM24-4500-Cl/SO4-E m |
| COD by Colorimeter | 1 | N/A | 2023/12/04 | BBY6SOP-00024 | SM 24 5220 D m |
| Phenols in Water by GCMS | 1 | 2023/12/06 | 2023/12/06 | BBY8SOP-00025 / BBY8SOP-00054 | BCMOE BCLM Jul2017 m |
| Conductivity @25C | 8 | N/A | 2023/12/01 | BBY6SOP-00026 | SM 24 2510 B m |
| Fluoride | 8 | N/A | 2023/12/02 | BBY6SOP-00048 | SM 24 4500-F C m |
| Sulphide (as H2S) (1) | 8 | N/A | 2023/12/04 | | Auto Calc |
| Un-ionized Hydrogen Sulphide as S Calc | 8 | N/A | 2023/12/04 | BBY WI-00033 | Auto Calc |
| Hardness Total (calculated as CaCO3) (2) | 3 | N/A | 2023/12/04 | BBY WI-00033 | Auto Calc |
| Hardness (calculated as CaCO3) | 3 | N/A | 2023/12/04 | BBY WI-00033 | Auto Calc |
| Hardness (calculated as CaCO3) | 5 | N/A | 2023/12/06 | BBY WI-00033 | Auto Calc |
| Mercury (Dissolved) by CV (3) | 5 | 2023/12/05 | 2023/12/05 | AB SOP-00084 | BCMOE BCLM Oct2013 m |
| Mercury (Total) by CV | 3 | 2023/12/05 | 2023/12/05 | AB SOP-00084 | BCMOE BCLM Oct2013 m |
| ICP-OES Dissolved Metals in Water (3) | 3 | N/A | 2023/12/04 | BBY7SOP-00018 | EPA 6010d m |
| EPH in Water when PAH required | 6 | 2023/12/04 | 2023/12/04 | BBY8SOP-00029 | BCMOE BCLM Sep2017 m |
| Na, K, Ca, Mg, S by CRC ICPMS (diss.) | 5 | N/A | 2023/12/06 | BBY WI-00033 | Auto Calc |
| Elements by CRC ICPMS (dissolved) (3) | 5 | N/A | 2023/12/05 | BBY7SOP-00002 | EPA 6020b R2 m |
| Na, K, Ca, Mg, S by CRC ICPMS (total) | 3 | 2023/12/01 | 2023/12/04 | BBY WI-00033 | Auto Calc |
| Elements by CRC ICPMS (total) | 3 | 2023/12/04 | 2023/12/04 | BBY7SOP-00003 / BBY7SOP-00002 | EPA 6020b R2 m |
| Non-Chlorinated Phenols in Water by GCMS | 1 | 2023/12/06 | 2023/12/06 | BBY8SOP-00054 | BCMOE BCLM Jul 2017 |
| Ammonia-N (Total) | 8 | N/A | 2023/12/05 | AB SOP-00007 | SM 24 4500 NH3 A G m |
| Nitrate + Nitrite (N) | 8 | N/A | 2023/12/01 | BBY6SOP-00010 | SM 24 4500-NO3- H m |
| Nitrite (N) Regular Level Water | 8 | N/A | 2023/12/01 | BBY6SOP-00010 | SM 24 4500-NO2- m |
| Nitrogen - Nitrate (as N) | 8 | N/A | 2023/12/01 | BBY WI-00033 | Auto Calc |
| PAH in Water by GC/MS (SIM) | 6 | 2023/12/04 | 2023/12/05 | BBY8SOP-00021 | BCMOE BCLM Jul2017m |

Your P.O. #: 735-002640-4
Your Project #: 11222680-15.1
Site#: GROUNDWATER
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your C.O.C. #: 705547-03-01, 705547-01-01

**Attention: Stephanie Berton**

GHD Limited
455 PHILLIP STREET
WATERLOO, ON
CANADA N2L 3X2

**Report Date: 2023/12/07**
Report #: R3437781
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**BUREAU VERITAS JOB #: C397797**
**Received: 2023/11/30, 11:42**

Sample Matrix: Water
# Samples Received: 9

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Analytical Method |
|---|---|---|---|---|---|
| pH @25°C (4) | 8 | N/A | 2023/12/01 | BBY6SOP-00026 | SM 24 4500-H+ B m |
| Phenols (Totals) in Water - Calc. (5) | 1 | N/A | 2023/12/07 | BBY WI-00033 | Auto Calc |
| Orthophosphate by Automated Analyzer (6) | 8 | N/A | 2023/12/01 | BBY6SOP-00013 | SM 24 4500-P E m |
| Total Sulphide (1) | 8 | N/A | 2023/12/05 | AB SOP-00080 | SM 23 4500 S2-A D Fm |
| Total Dissolved Solids (Filt. Residue) | 8 | 2023/12/01 | 2023/12/02 | BBY6SOP-00033 | SM 24 2540 C m |
| EPH less PAH in Water by GC/FID (7) | 6 | N/A | 2023/12/05 | BBY WI-00033 | Auto Calc |
| Total Suspended Solids (NFR) | 3 | 2023/12/01 | 2023/12/02 | BBY6SOP-00034 | SM 24 2540 D m |
| Field pH | 8 | N/A | 2023/12/01 | | |
| Field Temperature | 8 | N/A | 2023/12/01 | | |
| VOCs, VH, F1, LH in Water by HS GC/MS | 1 | N/A | 2023/12/04 | BBY8SOP-00009 / BBY8SOP-00011 / BBY8SOP-00012 | BCMOE BCLM Jul2017 m |
| Volatile HC-BTEX (8) | 1 | N/A | 2023/12/03 | BBY WI-00033 | Auto Calc |
| Volatile HC-BTEX (8) | 1 | N/A | 2023/12/05 | BBY WI-00033 | Auto Calc |

**Remarks:**

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your P.O. #: 735-002640-4
Your Project #: 11222680-15.1
Site#: GROUNDWATER
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your C.O.C. #: 705547-03-01, 705547-01-01

**Attention: Stephanie Berton**

GHD Limited
455 PHILLIP STREET
WATERLOO, ON
CANADA N2L 3X2

**Report Date: 2023/12/07**
Report #: R3437781
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**BUREAU VERITAS JOB #: C397797**
**Received: 2023/11/30, 11:42**

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

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

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

(1) This test was performed by Bureau Veritas Calgary, 4000 - 19 St. , Calgary, AB, T2E 6P8
(2) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).
(3) Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.
(4) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Bureau Veritas endeavours to analyze samples as soon as possible after receipt.
(5) Total Phenols include (from BC Lab Manual): Nonchlorinated Phenols [Phenol, 2,4-Dimethylphenol, 2,6-Dimethylphenol, 3,4-Dimethylphenol, 2-Methylphenol (ortho-Cresol), 3-Methylphenol (meta-Cresol), 4-Methylphenol (para-Cresol), 2-Hydroxyphenol (Catechol), 3-Hydroxyphenol (Resorcinol), 4-Hydroxyphenol(Hydroquinone)]; Nitrophenols [2,4-Dinitrophenol, 2-Methyl-4,6-Dinitrophenol, 2-Nitrophenol, 4-Nitrophenol]; Chlorophenols [2-Chlorophenol, 3-Chlorophenol, 4-Chlorophenol, 4-Chloro-3-Methylphenol, 2,3-Dichlorophenol, 2,4-Dichlorophenol, 2,5-Dichlorophenol, 2,6-Dichlorophenol, 3,4-Dichlorophenol, 3,5-Dichlorophenol, 2,3,4-Trichlorophenol, 2,3,5-Trichlorophenol, 2,3,6-Trichlorophenol, 2,4,5-Trichlorophenol, 2,4,6-Trichlorophenol, 3,4,5-Trichlorophenol, 2,3,4,5-Tetrachlorophenol, 2,3,4,6-Tetrachlorophenol, 2,3,5,6-Tetrachlorophenol, Pentachlorophenol].
(6) Orthophosphate > Total Phosphorus Imbalance: When applicable, Orthophosphate, Total Phosphorus and dissolved Phosphorus results were reviewed and data quality meets acceptable levels unless otherwise noted.
(7) LEPH = EPH (C10 to C19) - (Acenaphthene + Acridine + Anthracene + Fluorene + Naphthalene + Phenanthrene)
HEPH = EPH (C19 to C32) - (Benzo(a)anthracene + Benzo(a)pyrene + Fluoranthene + Pyrene)
(8) VPH = VH - (Benzene + Toluene + Ethylbenzene + m & p-Xylene + o-Xylene + Styrene)

Encryption Key

Bureau Veritas
07 Dec 2023 13:03:55

Please direct all questions regarding this Certificate of Analysis to:
Brody Andersen, B.Sc., B.Sc., Program Specialist–Emergency Spill Response
Email: brody.andersen@bureauveritas.com
Phone# (780)742-1616

==========

This report has been generated and distributed using a secure automated process.
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Raphael Kwan, Senior Manager, BC and Yukon Regions responsible for British Columbia Environmental laboratory operations.

Bureau Veritas Job #: C397797
Report Date: 2023/12/07

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: KH

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | CFS920 | CFS920 | | CFS921 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/11/28 09:30 | 2023/11/28 09:30 | | 2023/11/28 14:45 | | |
| COC Number | | 705547-03-01 | 705547-03-01 | | 705547-03-01 | | |
| | UNITS | WG-11222680-281123 -KH-06 | WG-11222680-281123 -KH-06 Lab-Dup | QC Batch | WG-11222680-281123 -KH-07 | RDL | QC Batch |
| **ANIONS** | | | | | | | |
| Nitrite (N) | mg/L | <0.0050 | <0.0050 | B220651 | <0.0050 | 0.0050 | B220651 |
| **Calculated Parameters** | | | | | | | |
| Nitrate (N) | mg/L | 0.719 | N/A | B219834 | 0.237 | 0.020 | B219834 |
| Sulphide (as H2S) | mg/L | <0.0020 | N/A | B219572 | <0.0020 | 0.0020 | B220226 |
| **Field Parameters** | | | | | | | |
| Field pH | pH | 7.37 | N/A | ONSITE | 7.73 | N/A | ONSITE |
| Field Temperature | °C | 10.72 | N/A | ONSITE | 10.55 | N/A | ONSITE |
| **Misc. Inorganics** | | | | | | | |
| Conductivity | uS/cm | 320 | N/A | B220395 | 180 | 2.0 | B220395 |
| pH | pH | 7.40 | N/A | B220393 | 7.32 | N/A | B220393 |
| Total Dissolved Solids | mg/L | 180 | N/A | B220589 | 88 | 10 | B220589 |
| **Anions** | | | | | | | |
| Alkalinity (PP as CaCO3) | mg/L | <1.0 | N/A | B220389 | <1.0 | 1.0 | B220389 |
| Alkalinity (Total as CaCO3) | mg/L | 140 | N/A | B220389 | 72 | 1.0 | B220389 |
| Bicarbonate (HCO3) | mg/L | 170 | N/A | B220389 | 87 | 1.0 | B220389 |
| Carbonate (CO3) | mg/L | <1.0 | N/A | B220389 | <1.0 | 1.0 | B220389 |
| Dissolved Fluoride (F) | mg/L | <0.050 | N/A | B220735 | <0.050 | 0.050 | B220735 |
| Hydroxide (OH) | mg/L | <1.0 | N/A | B220389 | <1.0 | 1.0 | B220389 |
| Total Sulphide | mg/L | <0.0018 | N/A | B221929 | <0.0018 | 0.0018 | B221929 |
| Chloride (Cl) | mg/L | 4.7 | N/A | B220245 | 4.1 | 1.0 | B220590 |
| Sulphate (SO4) | mg/L | 7.7 | N/A | B220245 | 7.1 | 1.0 | B220590 |
| **Nutrients** | | | | | | | |
| Total Ammonia (N) | mg/L | <0.015 | N/A | B223595 | <0.015 | 0.015 | B223595 |
| Orthophosphate (P) | mg/L | 0.0081 | N/A | B220019 | <0.0030 | 0.0030 | B220019 |
| Nitrate plus Nitrite (N) | mg/L | 0.719 | 0.719 | B220649 | 0.237 | 0.020 | B220649 |

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



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C397797
Report Date: 2023/12/07

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: KH

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | CFS921 | CFS922 | CFS923 | CFS924 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/11/28 14:45 | 2023/11/28 15:00 | 2023/11/28 16:30 | 2023/11/29 09:45 | | |
| COC Number | | 705547-03-01 | 705547-03-01 | 705547-03-01 | 705547-03-01 | | |
| | UNITS | WG-11222680-281123 -KH-07 Lab-Dup | WG-11222680-281123 -KH-08 | WG-11222680-281123 -KH-09 | WG-11222680-291123 -KH-10 | RDL | QC Batch |
| **ANIONS** | | | | | | | |
| Nitrite (N) | mg/L | N/A | <0.0050 | <0.0050 | <0.0050 | 0.0050 | B220651 |
| **Calculated Parameters** | | | | | | | |
| Nitrate (N) | mg/L | N/A | 0.043 | 0.610 | 1.52 | 0.020 | B219834 |
| Sulphide (as H2S) | mg/L | N/A | <0.0020 | <0.0020 | <0.0020 | 0.0020 | B220226 |
| **Field Parameters** | | | | | | | |
| Field pH | pH | N/A | 8.38 | 7.19 | 6.50 | N/A | ONSITE |
| Field Temperature | °C | N/A | 10.97 | 9.64 | 9.54 | N/A | ONSITE |
| **Misc. Inorganics** | | | | | | | |
| Conductivity | uS/cm | N/A | 84 | 490 | 130 | 2.0 | B220395 |
| pH | pH | N/A | 7.25 | 7.12 | 6.91 | N/A | B220393 |
| Total Dissolved Solids | mg/L | 88 | 44 | 280 | 80 | 10 | B220589 |
| **Anions** | | | | | | | |
| Alkalinity (PP as CaCO3) | mg/L | N/A | <1.0 | <1.0 | <1.0 | 1.0 | B220389 |
| Alkalinity (Total as CaCO3) | mg/L | N/A | 36 | 78 | 43 | 1.0 | B220389 |
| Bicarbonate (HCO3) | mg/L | N/A | 44 | 96 | 53 | 1.0 | B220389 |
| Carbonate (CO3) | mg/L | N/A | <1.0 | <1.0 | <1.0 | 1.0 | B220389 |
| Dissolved Fluoride (F) | mg/L | N/A | <0.050 | <0.050 | <0.050 | 0.050 | B220735 |
| Hydroxide (OH) | mg/L | N/A | <1.0 | <1.0 | <1.0 | 1.0 | B220389 |
| Total Sulphide | mg/L | N/A | <0.0018 | <0.0018 | <0.0018 | 0.0018 | B221929 |
| Chloride (Cl) | mg/L | 4.1 | <1.0 | 85 | 2.6 | 1.0 | B220590 |
| Sulphate (SO4) | mg/L | 6.9 | 2.6 | 5.3 | 6.7 | 1.0 | B220590 |
| **Nutrients** | | | | | | | |
| Total Ammonia (N) | mg/L | N/A | <0.015 | <0.015 | <0.015 | 0.015 | B223595 |
| Orthophosphate (P) | mg/L | N/A | 0.022 | 0.0052 | 0.0039 | 0.0030 | B220019 |
| Nitrate plus Nitrite (N) | mg/L | N/A | 0.043 | 0.610 | 1.52 | 0.020 | B220649 |

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



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C397797
Report Date: 2023/12/07

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: KH

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | CFS925 | CFS925 | | | CFS932 | | |
|---|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/11/28 14:45 | 2023/11/28 14:45 | | | 2023/11/28 10:00 | | |
| COC Number | | 705547-03-01 | 705547-03-01 | | | 705547-01-01 | | |
| | UNITS | WL-11222680-281123-KH-01 | WL-11222680-281123-KH-01 Lab-Dup | RDL | QC Batch | WS-11222680-281123-KH-01 | RDL | QC Batch |
| **ANIONS** | | | | | | | | |
| Nitrite (N) | mg/L | 0.0414 | N/A | 0.0050 | B220651 | <0.0050 | 0.0050 | B220651 |
| **Calculated Parameters** | | | | | | | | |
| Dissolved Hardness (CaCO3) | mg/L | 1090 | N/A | 0.50 | B220055 | 22.6 | 0.50 | B220055 |
| Nitrate (N) | mg/L | 7.37 | N/A | 0.10 | B219834 | <0.020 | 0.020 | B219834 |
| Sulphide (as H2S) | mg/L | 0.027 | N/A | 0.0020 | B220226 | <0.0020 | 0.0020 | B220226 |
| **Demand Parameters** | | | | | | | | |
| Biochemical Oxygen Demand | mg/L | 5.2 (1) | N/A | 3.0 | B220137 | N/A | N/A | B220137 |
| Chemical Oxygen Demand | mg/L | 311 | N/A | 10 | B222249 | N/A | N/A | B222249 |
| **Field Parameters** | | | | | | | | |
| Field pH | pH | 6.53 | N/A | N/A | ONSITE | 8.12 | N/A | ONSITE |
| Field Temperature | °C | 9.61 | N/A | N/A | ONSITE | 8.26 | N/A | ONSITE |
| **Misc. Inorganics** | | | | | | | | |
| Conductivity | uS/cm | 3600 | N/A | 2.0 | B220395 | 55 | 2.0 | B220395 |
| pH | pH | 7.35 | 7.38 | N/A | B220393 | 6.85 | N/A | B220393 |
| Total Dissolved Solids | mg/L | 2400 | N/A | 10 | B220589 | 34 | 10 | B220589 |
| Total Suspended Solids | mg/L | 4.8 | N/A | 1.0 | B220197 | <1.1 (2) | 1.1 | B220197 |
| **Anions** | | | | | | | | |
| Alkalinity (PP as CaCO3) | mg/L | <1.0 | <1.0 | 1.0 | B220389 | <1.0 | 1.0 | B220389 |
| Alkalinity (Total as CaCO3) | mg/L | 690 | 700 | 1.0 | B220389 | 22 | 1.0 | B220389 |
| Bicarbonate (HCO3) | mg/L | 850 | 850 | 1.0 | B220389 | 27 | 1.0 | B220389 |
| Carbonate (CO3) | mg/L | <1.0 | <1.0 | 1.0 | B220389 | <1.0 | 1.0 | B220389 |
| Dissolved Fluoride (F) | mg/L | 0.19 | N/A | 0.050 | B220735 | <0.050 | 0.050 | B220735 |
| Hydroxide (OH) | mg/L | <1.0 | <1.0 | 1.0 | B220389 | <1.0 | 1.0 | B220389 |
| Total Sulphide | mg/L | 0.025 | N/A | 0.0018 | B221929 | <0.0018 | 0.0018 | B221929 |
| Chloride (Cl) | mg/L | 290 | N/A | 5.0 | B220590 | <1.0 | 1.0 | B220245 |
| Sulphate (SO4) | mg/L | 720 | N/A | 10 | B220590 | 2.6 | 1.0 | B220245 |

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Detection limit raised based on sample volume used for analysis. Sample overdiluted based on physical properties of sample.

(2) RDL raised due to limited initial sample amount.



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C397797
Report Date: 2023/12/07

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: KH

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | CFS925 | CFS925 | | | CFS932 | | |
|---|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/11/28 14:45 | 2023/11/28 14:45 | | | 2023/11/28 10:00 | | |
| COC Number | | 705547-03-01 | 705547-03-01 | | | 705547-01-01 | | |
| | UNITS | WL-11222680-281123-KH-01 | WL-11222680-281123-KH-01 Lab-Dup | RDL | QC Batch | WS-11222680-281123-KH-01 | RDL | QC Batch |
| **Nutrients** | | | | | | | | |
| Total Ammonia (N) | mg/L | 30 | N/A | 0.38 | B223595 | <0.015 | 0.015 | B223595 |
| Orthophosphate (P) | mg/L | 0.013 | N/A | 0.0030 | B220019 | <0.0030 | 0.0030 | B220019 |
| Nitrate plus Nitrite (N) | mg/L | 7.41 | N/A | 0.10 | B220649 | <0.020 | 0.020 | B220649 |

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



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C397797
Report Date: 2023/12/07

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: KH

## RESULTS OF CHEMICAL ANALYSES OF WATER

| Bureau Veritas ID | | CFS932 | CFS933 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2023/11/28 10:00 | 2023/11/28 10:30 | | |
| COC Number | | 705547-01-01 | 705547-01-01 | | |
| | UNITS | WS-11222680-281123-KH-01 Lab-Dup | WS-11222680-281123-KH-02 | RDL | QC Batch |
| **ANIONS** | | | | | |
| Nitrite (N) | mg/L | N/A | <0.0050 | 0.0050 | B220651 |
| **Calculated Parameters** | | | | | |
| Dissolved Hardness (CaCO3) | mg/L | N/A | 17.5 | 0.50 | B220055 |
| Nitrate (N) | mg/L | N/A | 0.357 | 0.020 | B219834 |
| Sulphide (as H2S) | mg/L | N/A | <0.0020 | 0.0020 | B220226 |
| **Field Parameters** | | | | | |
| Field pH | pH | N/A | 7.57 | N/A | ONSITE |
| Field Temperature | °C | N/A | 6.33 | N/A | ONSITE |
| **Misc. Inorganics** | | | | | |
| Conductivity | uS/cm | N/A | 65 | 2.0 | B220395 |
| pH | pH | N/A | 6.47 | N/A | B220393 |
| Total Dissolved Solids | mg/L | N/A | 38 | 10 | B220589 |
| Total Suspended Solids | mg/L | N/A | 2.3 (1) | 1.1 | B220197 |
| **Anions** | | | | | |
| Alkalinity (PP as CaCO3) | mg/L | N/A | <1.0 | 1.0 | B220389 |
| Alkalinity (Total as CaCO3) | mg/L | N/A | 18 | 1.0 | B220389 |
| Bicarbonate (HCO3) | mg/L | N/A | 22 | 1.0 | B220389 |
| Carbonate (CO3) | mg/L | N/A | <1.0 | 1.0 | B220389 |
| Dissolved Fluoride (F) | mg/L | <0.050 | <0.050 | 0.050 | B220735 |
| Hydroxide (OH) | mg/L | N/A | <1.0 | 1.0 | B220389 |
| Total Sulphide | mg/L | N/A | <0.0018 | 0.0018 | B221929 |
| Chloride (Cl) | mg/L | N/A | 5.5 | 1.0 | B220245 |
| Sulphate (SO4) | mg/L | N/A | 1.0 | 1.0 | B220245 |
| **Nutrients** | | | | | |
| Total Ammonia (N) | mg/L | N/A | 0.063 | 0.015 | B223595 |
| Orthophosphate (P) | mg/L | N/A | <0.0030 | 0.0030 | B220019 |
| Nitrate plus Nitrite (N) | mg/L | N/A | 0.357 | 0.020 | B220649 |

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) RDL raised due to limited initial sample amount.



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: KH

## SEMIVOLATILE ORGANICS BY GC-MS (WATER)

| Bureau Veritas ID | | CFS920 | CFS921 | CFS922 | CFS923 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/11/28 09:30 | 2023/11/28 14:45 | 2023/11/28 15:00 | 2023/11/28 16:30 | | |
| COC Number | | 705547-03-01 | 705547-03-01 | 705547-03-01 | 705547-03-01 | | |
| | UNITS | WG-11222680-281123 -KH-06 | WG-11222680-281123 -KH-07 | WG-11222680-281123 -KH-08 | WG-11222680-281123 -KH-09 | RDL | QC Batch |
| **Polycyclic Aromatics** | | | | | | | |
| Naphthalene | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | B222170 |
| Acenaphthene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B222170 |
| Fluorene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B222170 |
| Phenanthrene | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B222170 |
| Anthracene | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | B222170 |
| Acridine | ug/L | <0.050 | <0.050 | <0.050 | <0.050 | 0.050 | B222170 |
| Fluoranthene | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | B222170 |
| Pyrene | ug/L | <0.020 | <0.020 | <0.020 | <0.020 | 0.020 | B222170 |
| Benzo(a)anthracene | ug/L | <0.010 | <0.010 | <0.010 | <0.010 | 0.010 | B222170 |
| Benzo(a)pyrene | ug/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | 0.0050 | B222170 |
| **Surrogate Recovery (%)** | | | | | | | |
| D10-ANTHRACENE (sur.) | % | 83 | 83 | 84 | 83 | N/A | B222170 |
| D8-ACENAPHTHYLENE (sur.) | % | 78 | 78 | 78 | 76 | N/A | B222170 |
| D8-NAPHTHALENE (sur.) | % | 75 | 76 | 77 | 75 | N/A | B222170 |
| TERPHENYL-D14 (sur.) | % | 73 | 73 | 73 | 72 | N/A | B222170 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## SEMIVOLATILE ORGANICS BY GC-MS (WATER)

| Bureau Veritas ID | | CFS924 | CFS925 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2023/11/29 09:45 | 2023/11/28 14:45 | | |
| COC Number | | 705547-03-01 | 705547-03-01 | | |
| | UNITS | WG-11222680-291123-KH-10 | WL-11222680-281123-KH-01 | RDL | QC Batch |
| **Polycyclic Aromatics** | | | | | |
| Naphthalene | ug/L | <0.10 | 1.6 | 0.10 | B222170 |
| Acenaphthene | ug/L | <0.050 | 0.48 | 0.050 | B222170 |
| Fluorene | ug/L | <0.050 | 0.37 | 0.050 | B222170 |
| Phenanthrene | ug/L | <0.050 | 0.47 | 0.050 | B222170 |
| Anthracene | ug/L | <0.010 | 0.098 | 0.010 | B222170 |
| Acridine | ug/L | <0.050 | 0.078 | 0.050 | B222170 |
| Fluoranthene | ug/L | <0.020 | 0.25 | 0.020 | B222170 |
| Pyrene | ug/L | <0.020 | 0.26 | 0.020 | B222170 |
| Benzo(a)anthracene | ug/L | <0.010 | 0.031 | 0.010 | B222170 |
| Benzo(a)pyrene | ug/L | <0.0050 | <0.0050 | 0.0050 | B222170 |
| **Surrogate Recovery (%)** | | | | | |
| D10-ANTHRACENE (sur.) | % | 80 | 76 | N/A | B222170 |
| D8-ACENAPHTHYLENE (sur.) | % | 75 | 77 | N/A | B222170 |
| D8-NAPHTHALENE (sur.) | % | 74 | 72 | N/A | B222170 |
| TERPHENYL-D14 (sur.) | % | 70 | 63 | N/A | B222170 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C397797
Report Date: 2023/12/07

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: KH

## ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

| Bureau Veritas ID | | CFS925 | | CFS932 | CFS932 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/11/28 14:45 | | 2023/11/28 10:00 | 2023/11/28 10:00 | | |
| COC Number | | 705547-03-01 | | 705547-01-01 | 705547-01-01 | | |
| | UNITS | WL-11222680-281123-KH-01 | RDL | WS-11222680-281123-KH-01 | WS-11222680-281123-KH-01 Lab-Dup | RDL | QC Batch |
| **Dissolved Metals by ICP** | | | | | | | |
| Dissolved Calcium (Ca) | mg/L | 348 | 0.10 | 7.72 | 7.68 | 0.050 | B222471 |
| Dissolved Magnesium (Mg) | mg/L | 54.8 | 0.050 | 0.800 | 0.794 | 0.050 | B222471 |

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

| Bureau Veritas ID | | CFS933 | | |
|---|---|---|---|---|
| Sampling Date | | 2023/11/28 10:30 | | |
| COC Number | | 705547-01-01 | | |
| | UNITS | WS-11222680-281123-KH-02 | RDL | QC Batch |
| **Dissolved Metals by ICP** | | | | |
| Dissolved Calcium (Ca) | mg/L | 5.05 | 0.050 | B222471 |
| Dissolved Magnesium (Mg) | mg/L | 1.19 | 0.050 | B222471 |

RDL = Reportable Detection Limit



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C397797
Report Date: 2023/12/07

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: KH

## TOTAL PETROLEUM HYDROCARBONS (WATER)

| Bureau Veritas ID | | CFS920 | CFS921 | CFS922 | CFS923 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/11/28 09:30 | 2023/11/28 14:45 | 2023/11/28 15:00 | 2023/11/28 16:30 | | |
| COC Number | | 705547-03-01 | 705547-03-01 | 705547-03-01 | 705547-03-01 | | |
| | UNITS | WG-11222680-281123-KH-06 | WG-11222680-281123-KH-07 | WG-11222680-281123-KH-08 | WG-11222680-281123-KH-09 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | | |
| LEPH (C10-C19 less PAH) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B219718 |
| HEPH (C19-C32 less PAH) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B219718 |
| **Ext. Pet. Hydrocarbon** | | | | | | | |
| EPH (C10-C19) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B222174 |
| EPH (C19-C32) | mg/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | B222174 |
| **Surrogate Recovery (%)** | | | | | | | |
| O-TERPHENYL (sur.) | % | 100 | 100 | 100 | 99 | N/A | B222174 |

RDL = Reportable Detection Limit
N/A = Not Applicable

| Bureau Veritas ID | | CFS924 | CFS925 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2023/11/29 09:45 | 2023/11/28 14:45 | | |
| COC Number | | 705547-03-01 | 705547-03-01 | | |
| | UNITS | WG-11222680-291123-KH-10 | WL-11222680-281123-KH-01 | RDL | QC Batch |
| **Calculated Parameters** | | | | | |
| LEPH (C10-C19 less PAH) | mg/L | <0.20 | 0.21 | 0.20 | B219718 |
| HEPH (C19-C32 less PAH) | mg/L | <0.20 | <0.20 | 0.20 | B219718 |
| **Ext. Pet. Hydrocarbon** | | | | | |
| EPH (C10-C19) | mg/L | <0.20 | 0.21 | 0.20 | B222174 |
| EPH (C19-C32) | mg/L | <0.20 | <0.20 | 0.20 | B222174 |
| **Surrogate Recovery (%)** | | | | | |
| O-TERPHENYL (sur.) | % | 100 | 88 | N/A | B222174 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## MISCELLANEOUS (WATER)

| Bureau Veritas ID | | CFS920 | CFS921 | CFS922 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2023/11/28 09:30 | 2023/11/28 14:45 | 2023/11/28 15:00 | | |
| COC Number | | 705547-03-01 | 705547-03-01 | 705547-03-01 | | |
| | UNITS | WG-11222680-281123-KH-06 | WG-11222680-281123-KH-07 | WG-11222680-281123-KH-08 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | |
| Total Un-ionized Hydrogen Sulfide as S | mg/L | <0.0050 | <0.0050 | <0.0050 | 0.0050 | B220212 |
| Total Un-ionized Hydrogen Sulfide as H2S | mg/L | <0.0050 | <0.0050 | <0.0050 | 0.0050 | B220212 |
| RDL = Reportable Detection Limit | | | | | | |

| Bureau Veritas ID | | CFS923 | CFS924 | CFS925 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2023/11/28 16:30 | 2023/11/29 09:45 | 2023/11/28 14:45 | | |
| COC Number | | 705547-03-01 | 705547-03-01 | 705547-03-01 | | |
| | UNITS | WG-11222680-281123-KH-09 | WG-11222680-291123-KH-10 | WL-11222680-281123-KH-01 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | |
| Total Un-ionized Hydrogen Sulfide as S | mg/L | <0.0050 | <0.0050 | 0.020 | 0.0050 | B220212 |
| Total Un-ionized Hydrogen Sulfide as H2S | mg/L | <0.0050 | <0.0050 | 0.021 | 0.0050 | B220212 |
| RDL = Reportable Detection Limit | | | | | | |

| Bureau Veritas ID | | CFS932 | CFS933 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2023/11/28 10:00 | 2023/11/28 10:30 | | |
| COC Number | | 705547-01-01 | 705547-01-01 | | |
| | UNITS | WS-11222680-281123-KH-01 | WS-11222680-281123-KH-02 | RDL | QC Batch |
| **Calculated Parameters** | | | | | |
| Total Un-ionized Hydrogen Sulfide as S | mg/L | <0.0050 | <0.0050 | 0.0050 | B220212 |
| Total Un-ionized Hydrogen Sulfide as H2S | mg/L | <0.0050 | <0.0050 | 0.0050 | B220212 |
| RDL = Reportable Detection Limit | | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: KH

## CSR BTEX/VPH IN WATER (WATER)

| Bureau Veritas ID | | CFS925 | | |
|---|---|---|---|---|
| Sampling Date | | 2023/11/28 14:45 | | |
| COC Number | | 705547-03-01 | | |
| | UNITS | WL-11222680-281123-KH-01 | RDL | QC Batch |
| **Calculated Parameters** | | | | |
| VPH (VHW6 to 10 - BTEX) | ug/L | <300 | 300 | B219721 |
| **Volatiles** | | | | |
| Methyl-tert-butylether (MTBE) | ug/L | <4.0 | 4.0 | B220357 |
| Benzene | ug/L | <0.40 | 0.40 | B220357 |
| Toluene | ug/L | <0.40 | 0.40 | B220357 |
| Ethylbenzene | ug/L | <0.40 | 0.40 | B220357 |
| m & p-Xylene | ug/L | 0.63 (1) | 0.40 | B220357 |
| o-Xylene | ug/L | 0.65 | 0.40 | B220357 |
| Styrene | ug/L | <0.40 | 0.40 | B220357 |
| Xylenes (Total) | ug/L | 1.3 | 0.40 | B220357 |
| VH C6-C10 | ug/L | <300 | 300 | B220357 |
| **Surrogate Recovery (%)** | | | | |
| 1,4-Difluorobenzene (sur.) | % | 99 | N/A | B220357 |
| 4-Bromofluorobenzene (sur.) | % | 103 | N/A | B220357 |
| D4-1,2-Dichloroethane (sur.) | % | 104 | N/A | B220357 |

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Tentatively identified result and may be potentially biased high due to matrix interference.

## COMBINED CP/NCP PHENOLS IN WATER (WATER)

| Bureau Veritas ID | | CFS925 | | |
|---|---|---|---|---|
| Sampling Date | | 2023/11/28 14:45 | | |
| COC Number | | 705547-03-01 | | |
| | UNITS | WL-11222680-281123-KH-01 | RDL | QC Batch |
| **Calculated Parameters** | | | | |
| Total Monochlorophenols | ug/L | <0.080 | 0.080 | B220231 |
| Total Dichlorophenols | ug/L | <0.10 | 0.10 | B220231 |
| Total Trichlorophenols | ug/L | 0.16 | 0.10 | B220231 |
| Total Tetrachlorophenols | ug/L | <0.10 | 0.10 | B220231 |
| Total Chlorophenols | ug/L | 0.52 | 0.10 | B220231 |
| Total Nonchlorinated Phenols | ug/L | <10 | 10 | B220231 |
| Total Phenolic Compounds | ug/L | <10 | 10 | B220231 |
| **SEMI-VOLATILE ORGANICS** | | | | |
| Phenol | ug/L | <0.50 | 0.50 | B224440 |
| 2-chlorophenol | ug/L | <0.080 | 0.080 | B224439 |
| 3 & 4-chlorophenol | ug/L | <0.080 | 0.080 | B224439 |
| 2-methylphenol | ug/L | <0.50 | 0.50 | B224440 |
| 3 & 4-methylphenol | ug/L | <0.50 | 0.50 | B224440 |
| 2-nitrophenol | ug/L | <0.50 | 0.50 | B224440 |
| 2,4-dimethylphenol | ug/L | <0.50 | 0.50 | B224440 |
| 2,4 + 2,5-Dichlorophenol | ug/L | <0.10 | 0.10 | B224439 |
| 2,3-Dichlorophenol | ug/L | <0.10 | 0.10 | B224439 |
| 2,6-dichlorophenol | ug/L | <0.10 | 0.10 | B224439 |
| 3,5-Dichlorophenol | ug/L | <0.10 | 0.10 | B224439 |
| 3,4-Dichlorophenol | ug/L | <0.10 | 0.10 | B224439 |
| 2,4,5-trichlorophenol | ug/L | <0.10 | 0.10 | B224439 |
| 2,4,6-trichlorophenol | ug/L | 0.16 | 0.10 | B224439 |
| 2,3,5-trichlorophenol | ug/L | <0.10 | 0.10 | B224439 |
| 2,3,6-Trichlorophenol | ug/L | <0.10 | 0.10 | B224439 |
| 2,3,4-trichlorophenol | ug/L | <0.10 | 0.10 | B224439 |
| 3,4,5-Trichlorophenol | ug/L | <0.10 | 0.10 | B224439 |
| 2,4-dinitrophenol | ug/L | <0.50 | 0.50 | B224440 |
| 4,6-dinitro-2-methylphenol | ug/L | <0.50 | 0.50 | B224440 |
| 2,3,4,6-tetrachlorophenol | ug/L | <0.10 | 0.10 | B224439 |
| 2,3,4,5-tetrachlorophenol | ug/L | <0.10 | 0.10 | B224439 |
| 2,3,5,6-tetrachlorophenol | ug/L | <0.10 | 0.10 | B224439 |
| RDL = Reportable Detection Limit | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: KH

## COMBINED CP/NCP PHENOLS IN WATER (WATER)

| **Bureau Veritas ID** | | CFS925 | | |
|---|---|---|---|---|
| **Sampling Date** | | 2023/11/28 14:45 | | |
| **COC Number** | | 705547-03-01 | | |
| | **UNITS** | **WL-11222680-281123-KH-01** | **RDL** | **QC Batch** |
| 4-nitrophenol | ug/L | <0.50 | 0.50 | B224440 |
| 3,4-Dimethylphenol | ug/L | <0.50 | 0.50 | B224440 |
| 2,6-Dimethylphenol | ug/L | <0.50 | 0.50 | B224440 |
| Pentachlorophenol | ug/L | 0.37 | 0.10 | B224439 |
| 4-Chloro-3-Methylphenol | ug/L | <1.0 | 1.0 | B224439 |
| 2-Hydroxyphenol (Catechol) | ug/L | <10 | 10 | B224440 |
| 3-Hydroxyphenol (Resorcinol) | ug/L | <10 | 10 | B224440 |
| 4-Hydroxyphenol (Hydroquinone) | ug/L | <1.0 | 1.0 | B224440 |
| **Surrogate Recovery (%)** | | | | |
| 2,4,6-TRIBROMOPHENOL (sur.) | % | 95 | N/A | B224439 |
| 2,4-DIBROMOPHENOL (sur.) | % | 77 | N/A | B224439 |
| 2,4,6-TRIBROMOPHENOL (sur.) | % | 95 | N/A | B224440 |
| 2,4-DIBROMOPHENOL (sur.) | % | 77 | N/A | B224440 |

RDL = Reportable Detection Limit
N/A = Not Applicable



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## CSR TOTAL METALS IN WATER WITH CV HG (WATER)

| Bureau Veritas ID | | CFS925 | CFS932 | CFS933 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2023/11/28 14:45 | 2023/11/28 10:00 | 2023/11/28 10:30 | | |
| COC Number | | 705547-03-01 | 705547-01-01 | 705547-01-01 | | |
| | UNITS | WL-11222680-281123-KH-01 | WS-11222680-281123-KH-01 | WS-11222680-281123-KH-02 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | |
| Total Hardness (CaCO3) | mg/L | 934 | 19.8 | 16.0 | 0.50 | B220026 |
| **Elements** | | | | | | |
| Total Mercury (Hg) | ug/L | <0.0019 | <0.0019 | <0.0019 | 0.0019 | B223930 |
| **Total Metals by ICPMS** | | | | | | |
| Total Aluminum (Al) | ug/L | 313 | 5.8 | 19.9 | 3.0 | B221831 |
| Total Antimony (Sb) | ug/L | 3.21 | <0.50 | <0.50 | 0.50 | B221831 |
| Total Arsenic (As) | ug/L | 4.86 | <0.10 | <0.10 | 0.10 | B221831 |
| Total Barium (Ba) | ug/L | 116 | 2.3 | 2.4 | 1.0 | B221831 |
| Total Beryllium (Be) | ug/L | <0.10 | <0.10 | <0.10 | 0.10 | B221831 |
| Total Bismuth (Bi) | ug/L | <1.0 | <1.0 | <1.0 | 1.0 | B221831 |
| Total Boron (B) | ug/L | 11500 | 351 | 167 | 50 | B221831 |
| Total Cadmium (Cd) | ug/L | 0.111 | <0.010 | <0.010 | 0.010 | B221831 |
| Total Chromium (Cr) | ug/L | 7.8 | <1.0 | <1.0 | 1.0 | B221831 |
| Total Cobalt (Co) | ug/L | 4.38 | <0.20 | <0.20 | 0.20 | B221831 |
| Total Copper (Cu) | ug/L | 66.0 | <0.50 | 0.51 | 0.50 | B221831 |
| Total Iron (Fe) | ug/L | 1970 | <10 | 225 | 10 | B221831 |
| Total Lead (Pb) | ug/L | 0.29 | <0.20 | <0.20 | 0.20 | B221831 |
| Total Lithium (Li) | ug/L | 5.0 | <2.0 | <2.0 | 2.0 | B221831 |
| Total Manganese (Mn) | ug/L | 1530 | 1.8 | 11.8 | 1.0 | B221831 |
| Total Molybdenum (Mo) | ug/L | 7.7 | <1.0 | <1.0 | 1.0 | B221831 |
| Total Nickel (Ni) | ug/L | 11.5 | <1.0 | <1.0 | 1.0 | B221831 |
| Total Phosphorus (P) | ug/L | 164 | <10 | <10 | 10 | B221831 |
| Total Selenium (Se) | ug/L | 0.50 | <0.10 | <0.10 | 0.10 | B221831 |
| Total Silicon (Si) | ug/L | 14500 | 1590 | 956 | 100 | B221831 |
| Total Silver (Ag) | ug/L | <0.020 | <0.020 | <0.020 | 0.020 | B221831 |
| Total Strontium (Sr) | ug/L | 1890 | 9.4 | 13.9 | 1.0 | B221831 |
| Total Thallium (Tl) | ug/L | <0.010 | <0.010 | <0.010 | 0.010 | B221831 |
| Total Tin (Sn) | ug/L | <5.0 | <5.0 | <5.0 | 5.0 | B221831 |
| Total Titanium (Ti) | ug/L | 16.7 | <5.0 | <5.0 | 5.0 | B221831 |
| Total Uranium (U) | ug/L | 1.72 | <0.10 | <0.10 | 0.10 | B221831 |
| Total Vanadium (V) | ug/L | 6.0 | <5.0 | <5.0 | 5.0 | B221831 |
| RDL = Reportable Detection Limit | | | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: KH

## CSR TOTAL METALS IN WATER WITH CV HG (WATER)

| Bureau Veritas ID | | CFS925 | CFS932 | CFS933 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2023/11/28 14:45 | 2023/11/28 10:00 | 2023/11/28 10:30 | | |
| COC Number | | 705547-03-01 | 705547-01-01 | 705547-01-01 | | |
| | UNITS | WL-11222680-281123-KH-01 | WS-11222680-281123-KH-01 | WS-11222680-281123-KH-02 | RDL | QC Batch |
| Total Zinc (Zn) | ug/L | 67.0 | <5.0 | <5.0 | 5.0 | B221831 |
| Total Zirconium (Zr) | ug/L | 1.55 | <0.10 | <0.10 | 0.10 | B221831 |
| Total Calcium (Ca) | mg/L | 295 | 6.78 | 4.56 | 0.050 | B220008 |
| Total Magnesium (Mg) | mg/L | 47.7 | 0.696 | 1.11 | 0.050 | B220008 |
| Total Potassium (K) | mg/L | 39.2 | 0.069 | 0.130 | 0.050 | B220008 |
| Total Sodium (Na) | mg/L | 276 | 0.699 | 3.77 | 0.050 | B220008 |
| Total Sulphur (S) | mg/L | 235 | <3.0 | <3.0 | 3.0 | B220008 |
| RDL = Reportable Detection Limit | | | | | | |


Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## CSR D. METALS W/CV HG-DISS (WATER)

| Bureau Veritas ID | | CFS920 | CFS921 | | CFS922 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/11/28 09:30 | 2023/11/28 14:45 | | 2023/11/28 15:00 | | |
| COC Number | | 705547-03-01 | 705547-03-01 | | 705547-03-01 | | |
| | UNITS | WG-11222680-281123-KH-06 | WG-11222680-281123-KH-07 | QC Batch | WG-11222680-281123-KH-08 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | | |
| Dissolved Hardness (CaCO3) | mg/L | 145 | 78.1 | B220055 | 37.4 | 0.50 | B220055 |
| **Elements** | | | | | | | |
| Dissolved Mercury (Hg) | ug/L | <0.0019 | <0.0019 | B223962 | <0.0019 | 0.0019 | B223962 |
| **Dissolved Metals by ICPMS** | | | | | | | |
| Dissolved Aluminum (Al) | ug/L | <3.0 | <3.0 | B223175 | 3.9 | 3.0 | B223187 |
| Dissolved Antimony (Sb) | ug/L | <0.50 | <0.50 | B223175 | <0.50 | 0.50 | B223187 |
| Dissolved Arsenic (As) | ug/L | 0.21 | <0.10 | B223175 | 0.85 | 0.10 | B223187 |
| Dissolved Barium (Ba) | ug/L | 9.2 | 2.2 | B223175 | 1.9 | 1.0 | B223187 |
| Dissolved Beryllium (Be) | ug/L | <0.10 | <0.10 | B223175 | <0.10 | 0.10 | B223187 |
| Dissolved Bismuth (Bi) | ug/L | <1.0 | <1.0 | B223175 | <1.0 | 1.0 | B223187 |
| Dissolved Boron (B) | ug/L | <50 | <50 | B223175 | <50 | 50 | B223187 |
| Dissolved Cadmium (Cd) | ug/L | <0.010 | <0.010 | B223175 | <0.010 | 0.010 | B223187 |
| Dissolved Chromium (Cr) | ug/L | 1.0 | <1.0 | B223175 | <1.0 | 1.0 | B223187 |
| Dissolved Cobalt (Co) | ug/L | <0.20 | <0.20 | B223175 | <0.20 | 0.20 | B223187 |
| Dissolved Copper (Cu) | ug/L | <0.20 | 0.26 | B223175 | <0.20 | 0.20 | B223187 |
| Dissolved Iron (Fe) | ug/L | <5.0 | <5.0 | B223175 | <5.0 | 5.0 | B223187 |
| Dissolved Lead (Pb) | ug/L | <0.20 | <0.20 | B223175 | <0.20 | 0.20 | B223187 |
| Dissolved Lithium (Li) | ug/L | <2.0 | <2.0 | B223175 | <2.0 | 2.0 | B223187 |
| Dissolved Manganese (Mn) | ug/L | <1.0 | <1.0 | B223175 | <1.0 | 1.0 | B223187 |
| Dissolved Molybdenum (Mo) | ug/L | <1.0 | <1.0 | B223175 | <1.0 | 1.0 | B223187 |
| Dissolved Nickel (Ni) | ug/L | <1.0 | <1.0 | B223175 | <1.0 | 1.0 | B223187 |
| Dissolved Phosphorus (P) | ug/L | 14 | <10 | B223175 | 29 | 10 | B223187 |
| Dissolved Selenium (Se) | ug/L | 0.13 | <0.10 | B223175 | <0.10 | 0.10 | B223187 |
| Dissolved Silicon (Si) | ug/L | 13000 | 6950 | B223175 | 4250 | 100 | B223187 |
| Dissolved Silver (Ag) | ug/L | <0.020 | <0.020 | B223175 | <0.020 | 0.020 | B223187 |
| Dissolved Strontium (Sr) | ug/L | 74.7 | 40.2 | B223175 | 15.2 | 1.0 | B223187 |
| Dissolved Thallium (Tl) | ug/L | <0.010 | <0.010 | B223175 | <0.010 | 0.010 | B223187 |
| Dissolved Tin (Sn) | ug/L | <5.0 | <5.0 | B223175 | <5.0 | 5.0 | B223187 |
| Dissolved Titanium (Ti) | ug/L | <5.0 | <5.0 | B223175 | <5.0 | 5.0 | B223187 |
| Dissolved Uranium (U) | ug/L | <0.10 | <0.10 | B223175 | <0.10 | 0.10 | B223187 |
| Dissolved Vanadium (V) | ug/L | <5.0 | <5.0 | B223175 | 7.2 | 5.0 | B223187 |

RDL = Reportable Detection Limit



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: KH

## CSR D. METALS W/CV HG-DISS (WATER)

| Bureau Veritas ID | | CFS920 | CFS921 | | CFS922 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2023/11/28 09:30 | 2023/11/28 14:45 | | 2023/11/28 15:00 | | |
| COC Number | | 705547-03-01 | 705547-03-01 | | 705547-03-01 | | |
| | UNITS | WG-11222680-281123-KH-06 | WG-11222680-281123-KH-07 | QC Batch | WG-11222680-281123-KH-08 | RDL | QC Batch |
| Dissolved Zinc (Zn) | ug/L | <5.0 | <5.0 | B223175 | <5.0 | 5.0 | B223187 |
| Dissolved Zirconium (Zr) | ug/L | <0.10 | <0.10 | B223175 | <0.10 | 0.10 | B223187 |
| Dissolved Calcium (Ca) | mg/L | 46.0 | 24.7 | B220184 | 12.1 | 0.050 | B220184 |
| Dissolved Magnesium (Mg) | mg/L | 7.35 | 4.00 | B220184 | 1.73 | 0.050 | B220184 |
| Dissolved Potassium (K) | mg/L | 0.467 | 0.254 | B220184 | 0.178 | 0.050 | B220184 |
| Dissolved Sodium (Na) | mg/L | 5.88 | 3.84 | B220184 | 1.05 | 0.050 | B220184 |
| Dissolved Sulphur (S) | mg/L | <3.0 | <3.0 | B220184 | <3.0 | 3.0 | B220184 |
| RDL = Reportable Detection Limit | | | | | | | |


Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## CSR D. METALS W/CV HG-DISS (WATER)

| Bureau Veritas ID | | CFS923 | CFS924 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2023/11/28 16:30 | 2023/11/29 09:45 | | |
| COC Number | | 705547-03-01 | 705547-03-01 | | |
| | UNITS | WG-11222680-281123-KH-09 | WG-11222680-291123-KH-10 | RDL | QC Batch |
| **Calculated Parameters** | | | | | |
| Dissolved Hardness (CaCO3) | mg/L | 145 | 44.7 | 0.50 | B220055 |
| **Elements** | | | | | |
| Dissolved Mercury (Hg) | ug/L | <0.0019 | <0.0019 | 0.0019 | B223962 |
| **Dissolved Metals by ICPMS** | | | | | |
| Dissolved Aluminum (Al) | ug/L | <3.0 | <3.0 | 3.0 | B223187 |
| Dissolved Antimony (Sb) | ug/L | <0.50 | <0.50 | 0.50 | B223187 |
| Dissolved Arsenic (As) | ug/L | 0.14 | <0.10 | 0.10 | B223187 |
| Dissolved Barium (Ba) | ug/L | 13.2 | <1.0 | 1.0 | B223187 |
| Dissolved Beryllium (Be) | ug/L | <0.10 | <0.10 | 0.10 | B223187 |
| Dissolved Bismuth (Bi) | ug/L | <1.0 | <1.0 | 1.0 | B223187 |
| Dissolved Boron (B) | ug/L | <50 | <50 | 50 | B223187 |
| Dissolved Cadmium (Cd) | ug/L | 0.012 | <0.010 | 0.010 | B223187 |
| Dissolved Chromium (Cr) | ug/L | <1.0 | <1.0 | 1.0 | B223187 |
| Dissolved Cobalt (Co) | ug/L | <0.20 | <0.20 | 0.20 | B223187 |
| Dissolved Copper (Cu) | ug/L | 0.45 | <0.20 | 0.20 | B223187 |
| Dissolved Iron (Fe) | ug/L | <5.0 | <5.0 | 5.0 | B223187 |
| Dissolved Lead (Pb) | ug/L | <0.20 | <0.20 | 0.20 | B223187 |
| Dissolved Lithium (Li) | ug/L | <2.0 | <2.0 | 2.0 | B223187 |
| Dissolved Manganese (Mn) | ug/L | 15.7 | <1.0 | 1.0 | B223187 |
| Dissolved Molybdenum (Mo) | ug/L | <1.0 | <1.0 | 1.0 | B223187 |
| Dissolved Nickel (Ni) | ug/L | <1.0 | <1.0 | 1.0 | B223187 |
| Dissolved Phosphorus (P) | ug/L | <10 | <10 | 10 | B223187 |
| Dissolved Selenium (Se) | ug/L | <0.10 | 0.13 | 0.10 | B223187 |
| Dissolved Silicon (Si) | ug/L | 14500 | 7420 | 100 | B223187 |
| Dissolved Silver (Ag) | ug/L | <0.020 | <0.020 | 0.020 | B223187 |
| Dissolved Strontium (Sr) | ug/L | 98.7 | 24.8 | 1.0 | B223187 |
| Dissolved Thallium (Tl) | ug/L | <0.010 | <0.010 | 0.010 | B223187 |
| Dissolved Tin (Sn) | ug/L | <5.0 | <5.0 | 5.0 | B223187 |
| Dissolved Titanium (Ti) | ug/L | <5.0 | <5.0 | 5.0 | B223187 |
| Dissolved Uranium (U) | ug/L | <0.10 | <0.10 | 0.10 | B223187 |
| Dissolved Vanadium (V) | ug/L | <5.0 | <5.0 | 5.0 | B223187 |
| RDL = Reportable Detection Limit | | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## CSR D. METALS W/CV HG-DISS (WATER)

| Bureau Veritas ID | | CFS923 | CFS924 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2023/11/28 16:30 | 2023/11/29 09:45 | | |
| COC Number | | 705547-03-01 | 705547-03-01 | | |
| | UNITS | WG-11222680-281123 -KH-09 | WG-11222680-291123 -KH-10 | RDL | QC Batch |
| Dissolved Zinc (Zn) | ug/L | <5.0 | <5.0 | 5.0 | B223187 |
| Dissolved Zirconium (Zr) | ug/L | <0.10 | <0.10 | 0.10 | B223187 |
| Dissolved Calcium (Ca) | mg/L | 35.7 | 12.8 | 0.050 | B220184 |
| Dissolved Magnesium (Mg) | mg/L | 13.5 | 3.07 | 0.050 | B220184 |
| Dissolved Potassium (K) | mg/L | 1.04 | 0.175 | 0.050 | B220184 |
| Dissolved Sodium (Na) | mg/L | 26.9 | 6.77 | 0.050 | B220184 |
| Dissolved Sulphur (S) | mg/L | <3.0 | <3.0 | 3.0 | B220184 |
| RDL = Reportable Detection Limit | | | | | |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: KH

## CSR VOC + VPH IN WATER (WATER)

| Bureau Veritas ID | | CFS926 | CFS926 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2023/11/28 | 2023/11/28 | | |
| COC Number | | 705547-03-01 | 705547-03-01 | | |
| | UNITS | TRIP BLANK | TRIP BLANK Lab-Dup | RDL | QC Batch |
| **Calculated Parameters** | | | | | |
| VPH (VHW6 to 10 - BTEX) | ug/L | <300 | N/A | 300 | B219721 |
| **Volatiles** | | | | | |
| VH C6-C10 | ug/L | <300 | <300 | 300 | B222071 |
| Benzene | ug/L | <0.40 | <0.40 | 0.40 | B222071 |
| Ethylbenzene | ug/L | <0.40 | <0.40 | 0.40 | B222071 |
| Methyl-tert-butylether (MTBE) | ug/L | <4.0 | <4.0 | 4.0 | B222071 |
| Styrene | ug/L | <0.50 | <0.50 | 0.50 | B222071 |
| Toluene | ug/L | <0.40 | <0.40 | 0.40 | B222071 |
| m & p-Xylene | ug/L | <0.40 | <0.40 | 0.40 | B222071 |
| o-Xylene | ug/L | <0.40 | <0.40 | 0.40 | B222071 |
| Xylenes (Total) | ug/L | <0.40 | <0.40 | 0.40 | B222071 |
| **Surrogate Recovery (%)** | | | | | |
| 1,4-Difluorobenzene (sur.) | % | 102 | 102 | N/A | B222071 |
| 4-Bromofluorobenzene (sur.) | % | 96 | 95 | N/A | B222071 |
| D4-1,2-Dichloroethane (sur.) | % | 80 | 79 | N/A | B222071 |

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



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## GENERAL COMMENTS

**Results relate only to the items tested.**



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

# QUALITY ASSURANCE REPORT



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B220357 | 1,4-Difluorobenzene (sur.) | 2023/12/01 | 94 | 70 - 130 | 96 | 70 - 130 | 98 | % | | |
| B220357 | 4-Bromofluorobenzene (sur.) | 2023/12/01 | 105 | 70 - 130 | 105 | 70 - 130 | 104 | % | | |
| B220357 | D4-1,2-Dichloroethane (sur.) | 2023/12/01 | 100 | 70 - 130 | 101 | 70 - 130 | 104 | % | | |
| B222071 | 1,4-Difluorobenzene (sur.) | 2023/12/04 | 100 (11) | 50 - 140 | 100 | 50 - 140 | 102 | % | | |
| B222071 | 4-Bromofluorobenzene (sur.) | 2023/12/04 | 105 (11) | 50 - 140 | 105 | 50 - 140 | 97 | % | | |
| B222071 | D4-1,2-Dichloroethane (sur.) | 2023/12/04 | 78 (11) | 50 - 140 | 77 | 50 - 140 | 78 | % | | |
| B222170 | D10-ANTHRACENE (sur.) | 2023/12/04 | | | 90 | 50 - 140 | 84 | % | | |
| B222170 | D8-ACENAPHTHYLENE (sur.) | 2023/12/04 | | | 82 | 50 - 140 | 80 | % | | |
| B222170 | D8-NAPHTHALENE (sur.) | 2023/12/04 | | | 77 | 50 - 140 | 75 | % | | |
| B222170 | TERPHENYL-D14 (sur.) | 2023/12/04 | | | 76 | 50 - 140 | 73 | % | | |
| B222174 | O-TERPHENYL (sur.) | 2023/12/04 | | | 98 | 60 - 140 | 100 | % | | |
| B224439 | 2,4,6-TRIBROMOPHENOL (sur.) | 2023/12/06 | | | 109 | 60 - 130 | 101 | % | | |
| B224439 | 2,4-DIBROMOPHENOL (sur.) | 2023/12/06 | | | 96 | 60 - 130 | 93 | % | | |
| B224440 | 2,4,6-TRIBROMOPHENOL (sur.) | 2023/12/06 | | | 109 | 60 - 130 | 101 | % | | |
| B224440 | 2,4-DIBROMOPHENOL (sur.) | 2023/12/06 | | | 96 | 60 - 130 | 93 | % | | |
| B220019 | Orthophosphate (P) | 2023/12/01 | NC | 80 - 120 | 100 | 80 - 120 | <0.0030 | mg/L | 2.3 (1) | 20 |
| B220137 | Biochemical Oxygen Demand | 2023/12/06 | | | 101 | 85 - 115 | <2.0 (2) | mg/L | 4.9 (1) | 20 |
| B220197 | Total Suspended Solids | 2023/12/02 | 100 | 80 - 120 | 101 | 80 - 120 | <1.0 | mg/L | NC (1) | 20 |
| B220245 | Chloride (Cl) | 2023/12/01 | 104 | 80 - 120 | 102 | 80 - 120 | <1.0 | mg/L | 2.8 (1) | 20 |
| B220245 | Sulphate (SO4) | 2023/12/01 | NC | 80 - 120 | 99 | 80 - 120 | <1.0 | mg/L | 0.87 (1) | 20 |
| B220357 | Benzene | 2023/12/01 | 98 | 70 - 130 | 100 | 70 - 130 | <0.40 | ug/L | 5.0 (1) | 30 |
| B220357 | Ethylbenzene | 2023/12/01 | 113 | 70 - 130 | 106 | 70 - 130 | <0.40 | ug/L | NC (1) | 30 |
| B220357 | m & p-Xylene | 2023/12/01 | 111 | 70 - 130 | 106 | 70 - 130 | <0.40 | ug/L | NC (1) | 30 |
| B220357 | Methyl-tert-butylether (MTBE) | 2023/12/01 | 100 | 70 - 130 | 98 | 70 - 130 | <4.0 | ug/L | NC (1) | 30 |
| B220357 | o-Xylene | 2023/12/01 | 112 | 70 - 130 | 106 | 70 - 130 | <0.40 | ug/L | NC (1) | 30 |
| B220357 | Styrene | 2023/12/01 | 113 | 70 - 130 | 106 | 70 - 130 | <0.40 | ug/L | NC (1) | 30 |
| B220357 | Toluene | 2023/12/01 | 104 | 70 - 130 | 101 | 70 - 130 | <0.40 | ug/L | NC (1) | 30 |
| B220357 | VH C6-C10 | 2023/12/01 | | | 82 | 70 - 130 | <300 | ug/L | NC (1) | 30 |
| B220357 | Xylenes (Total) | 2023/12/01 | | | | | <0.40 | ug/L | NC (1) | 30 |
| B220389 | Alkalinity (PP as CaCO3) | 2023/12/01 | | | | | <1.0 | mg/L | NC (3) | 20 |
| B220389 | Alkalinity (Total as CaCO3) | 2023/12/01 | | | 99 | 80 - 120 | <1.0 | mg/L | 0.31 (3) | 20 |

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B220389 | Bicarbonate (HCO3) | 2023/12/01 | | | | | <1.0 | mg/L | 0.31 (3) | 20 |
| B220389 | Carbonate (CO3) | 2023/12/01 | | | | | <1.0 | mg/L | NC (3) | 20 |
| B220389 | Hydroxide (OH) | 2023/12/01 | | | | | <1.0 | mg/L | NC (3) | 20 |
| B220393 | pH | 2023/12/01 | | | 100 | 97 - 103 | | | 0.31 (3) | N/A |
| B220395 | Conductivity | 2023/12/01 | | | 102 | 90 - 110 | <2.0 | uS/cm | | |
| B220589 | Total Dissolved Solids | 2023/12/02 | 101 (4) | 80 - 120 | 100 | 80 - 120 | <10 | mg/L | 0 (5) | 20 |
| B220590 | Chloride (Cl) | 2023/12/01 | 106 (6) | 80 - 120 | 95 | 80 - 120 | <1.0 | mg/L | 0.71 (5) | 20 |
| B220590 | Sulphate (SO4) | 2023/12/01 | 106 (6) | 80 - 120 | 97 | 80 - 120 | <1.0 | mg/L | 3.1 (5) | 20 |
| B220649 | Nitrate plus Nitrite (N) | 2023/12/01 | NC (7) | 80 - 120 | 110 | 80 - 120 | <0.020 | mg/L | 0.033 (8) | 25 |
| B220651 | Nitrite (N) | 2023/12/01 | 106 (7) | 80 - 120 | 106 | 80 - 120 | <0.0050 | mg/L | NC (8) | 20 |
| B220735 | Dissolved Fluoride (F) | 2023/12/02 | 98 (9) | 80 - 120 | 101 | 80 - 120 | <0.050 | mg/L | NC (10) | 20 |
| B221831 | Total Aluminum (Al) | 2023/12/04 | NC | 80 - 120 | 99 | 80 - 120 | <3.0 | ug/L | 0.82 (1) | 20 |
| B221831 | Total Antimony (Sb) | 2023/12/04 | 101 | 80 - 120 | 101 | 80 - 120 | <0.50 | ug/L | NC (1) | 20 |
| B221831 | Total Arsenic (As) | 2023/12/04 | 104 | 80 - 120 | 99 | 80 - 120 | <0.10 | ug/L | 1.7 (1) | 20 |
| B221831 | Total Barium (Ba) | 2023/12/04 | 100 | 80 - 120 | 99 | 80 - 120 | <1.0 | ug/L | 1.5 (1) | 20 |
| B221831 | Total Beryllium (Be) | 2023/12/04 | 91 | 80 - 120 | 96 | 80 - 120 | <0.10 | ug/L | 1.4 (1) | 20 |
| B221831 | Total Bismuth (Bi) | 2023/12/04 | 93 | 80 - 120 | 96 | 80 - 120 | <1.0 | ug/L | NC (1) | 20 |
| B221831 | Total Boron (B) | 2023/12/04 | 85 | 80 - 120 | 101 | 80 - 120 | <50 | ug/L | 11 (1) | 20 |
| B221831 | Total Cadmium (Cd) | 2023/12/04 | NC | 80 - 120 | 99 | 80 - 120 | <0.010 | ug/L | 1.1 (1) | 20 |
| B221831 | Total Chromium (Cr) | 2023/12/04 | 89 | 80 - 120 | 93 | 80 - 120 | <1.0 | ug/L | NC (1) | 20 |
| B221831 | Total Cobalt (Co) | 2023/12/04 | NC | 80 - 120 | 94 | 80 - 120 | <0.20 | ug/L | 2.5 (1) | 20 |
| B221831 | Total Copper (Cu) | 2023/12/04 | 85 | 80 - 120 | 93 | 80 - 120 | <0.50 | ug/L | 0.65 (1) | 20 |
| B221831 | Total Iron (Fe) | 2023/12/04 | NC | 80 - 120 | 102 | 80 - 120 | <10 | ug/L | 0.50 (1) | 20 |
| B221831 | Total Lead (Pb) | 2023/12/04 | 96 | 80 - 120 | 97 | 80 - 120 | <0.20 | ug/L | NC (1) | 20 |
| B221831 | Total Lithium (Li) | 2023/12/04 | NC | 80 - 120 | 104 | 80 - 120 | <2.0 | ug/L | 1.7 (1) | 20 |
| B221831 | Total Manganese (Mn) | 2023/12/04 | NC | 80 - 120 | 97 | 80 - 120 | <1.0 | ug/L | 0.91 (1) | 20 |
| B221831 | Total Molybdenum (Mo) | 2023/12/04 | 104 | 80 - 120 | 100 | 80 - 120 | <1.0 | ug/L | NC (1) | 20 |
| B221831 | Total Nickel (Ni) | 2023/12/04 | NC | 80 - 120 | 96 | 80 - 120 | <1.0 | ug/L | 1.2 (1) | 20 |
| B221831 | Total Phosphorus (P) | 2023/12/04 | 105 | 80 - 120 | 100 | 80 - 120 | <10 | ug/L | NC (1) | 20 |
| B221831 | Total Selenium (Se) | 2023/12/04 | 104 | 80 - 120 | 100 | 80 - 120 | <0.10 | ug/L | 0.41 (1) | 20 |
| B221831 | Total Silicon (Si) | 2023/12/04 | NC | 80 - 120 | 114 | 80 - 120 | <100 | ug/L | 0.029 (1) | 20 |

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B221831 | Total Silver (Ag) | 2023/12/04 | 93 | 80 - 120 | 99 | 80 - 120 | <0.020 | ug/L | NC (1) | 20 |
| B221831 | Total Strontium (Sr) | 2023/12/04 | NC | 80 - 120 | 96 | 80 - 120 | <1.0 | ug/L | 0.074 (1) | 20 |
| B221831 | Total Thallium (Tl) | 2023/12/04 | 97 | 80 - 120 | 96 | 80 - 120 | <0.010 | ug/L | 0.063 (1) | 20 |
| B221831 | Total Tin (Sn) | 2023/12/04 | 98 | 80 - 120 | 100 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |
| B221831 | Total Titanium (Ti) | 2023/12/04 | 100 | 80 - 120 | 99 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |
| B221831 | Total Uranium (U) | 2023/12/04 | 105 | 80 - 120 | 100 | 80 - 120 | <0.10 | ug/L | 1.8 (1) | 20 |
| B221831 | Total Vanadium (V) | 2023/12/04 | 94 | 80 - 120 | 95 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |
| B221831 | Total Zinc (Zn) | 2023/12/04 | NC | 80 - 120 | 98 | 80 - 120 | <5.0 | ug/L | 1.4 (1) | 20 |
| B221831 | Total Zirconium (Zr) | 2023/12/04 | 105 | 80 - 120 | 98 | 80 - 120 | <0.10 | ug/L | NC (1) | 20 |
| B221929 | Total Sulphide | 2023/12/05 | 90 | 80 - 120 | 106 | 80 - 120 | <0.0018 | mg/L | NC (1) | 20 |
| B222071 | Benzene | 2023/12/05 | 114 (11) | 50 - 140 | 111 | 60 - 130 | <0.40 | ug/L | NC (12) | 30 |
| B222071 | Ethylbenzene | 2023/12/05 | 117 (11) | 50 - 140 | 115 | 60 - 130 | <0.40 | ug/L | NC (12) | 30 |
| B222071 | m & p-Xylene | 2023/12/05 | 101 (11) | 50 - 140 | 99 | 60 - 130 | <0.40 | ug/L | NC (12) | 30 |
| B222071 | Methyl-tert-butylether (MTBE) | 2023/12/05 | 110 (11) | 50 - 140 | 106 | 60 - 130 | <4.0 | ug/L | NC (12) | 30 |
| B222071 | o-Xylene | 2023/12/05 | 119 (11) | 50 - 140 | 117 | 60 - 130 | <0.40 | ug/L | NC (12) | 30 |
| B222071 | Styrene | 2023/12/05 | 98 (11) | 50 - 140 | 96 | 60 - 130 | <0.50 | ug/L | NC (12) | 30 |
| B222071 | Toluene | 2023/12/05 | 116 (11) | 50 - 140 | 115 | 60 - 130 | <0.40 | ug/L | NC (12) | 30 |
| B222071 | VH C6-C10 | 2023/12/05 | | | 87 | 70 - 130 | <300 | ug/L | NC (12) | 30 |
| B222071 | Xylenes (Total) | 2023/12/05 | | | | | <0.40 | ug/L | NC (12) | 30 |
| B222170 | Acenaphthene | 2023/12/05 | | | 82 | 50 - 140 | <0.050 | ug/L | 7.8 (1) | 40 |
| B222170 | Acridine | 2023/12/05 | | | 93 | 50 - 140 | <0.050 | ug/L | 6.4 (1) | 40 |
| B222170 | Anthracene | 2023/12/05 | | | 85 | 50 - 140 | <0.010 | ug/L | 4.7 (1) | 40 |
| B222170 | Benzo(a)anthracene | 2023/12/05 | | | 68 | 50 - 140 | <0.010 | ug/L | NC (1) | 40 |
| B222170 | Benzo(a)pyrene | 2023/12/05 | | | 83 | 50 - 140 | <0.0050 | ug/L | NC (1) | 40 |
| B222170 | Fluoranthene | 2023/12/05 | | | 65 | 50 - 140 | <0.020 | ug/L | 6.8 (1) | 40 |
| B222170 | Fluorene | 2023/12/05 | | | 82 | 50 - 140 | <0.050 | ug/L | 8.8 (1) | 40 |
| B222170 | Naphthalene | 2023/12/05 | | | 79 | 50 - 140 | <0.10 | ug/L | 9.6 (1) | 40 |
| B222170 | Phenanthrene | 2023/12/05 | | | 86 | 50 - 140 | <0.050 | ug/L | 7.4 (1) | 40 |
| B222170 | Pyrene | 2023/12/05 | | | 76 | 50 - 140 | <0.020 | ug/L | 7.5 (1) | 40 |
| B222174 | EPH (C10-C19) | 2023/12/04 | | | 91 | 70 - 130 | <0.20 | mg/L | NC (1) | 30 |
| B222174 | EPH (C19-C32) | 2023/12/04 | | | 92 | 70 - 130 | <0.20 | mg/L | NC (1) | 30 |

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B222249 | Chemical Oxygen Demand | 2023/12/04 | NC | 80 - 120 | 102 | 80 - 120 | <10 | mg/L | 0.85 (1) | 20 |
| B222471 | Dissolved Calcium (Ca) | 2023/12/04 | 95 (13) | 80 - 120 | 98 | 80 - 120 | <0.050 | mg/L | 0.54 (14) | 20 |
| B222471 | Dissolved Magnesium (Mg) | 2023/12/04 | 94 (13) | 80 - 120 | 95 | 80 - 120 | <0.050 | mg/L | 0.71 (14) | 20 |
| B223175 | Dissolved Aluminum (Al) | 2023/12/05 | 105 | 80 - 120 | 103 | 80 - 120 | <3.0 | ug/L | NC (1) | 20 |
| B223175 | Dissolved Antimony (Sb) | 2023/12/05 | 106 | 80 - 120 | 101 | 80 - 120 | <0.50 | ug/L | NC (1) | 20 |
| B223175 | Dissolved Arsenic (As) | 2023/12/05 | 109 | 80 - 120 | 102 | 80 - 120 | <0.10 | ug/L | 0.60 (1) | 20 |
| B223175 | Dissolved Barium (Ba) | 2023/12/05 | NC | 80 - 120 | 101 | 80 - 120 | <1.0 | ug/L | 0.056 (1) | 20 |
| B223175 | Dissolved Beryllium (Be) | 2023/12/05 | 106 | 80 - 120 | 105 | 80 - 120 | <0.10 | ug/L | NC (1) | 20 |
| B223175 | Dissolved Bismuth (Bi) | 2023/12/05 | 100 | 80 - 120 | 101 | 80 - 120 | <1.0 | ug/L | NC (1) | 20 |
| B223175 | Dissolved Boron (B) | 2023/12/05 | 109 | 80 - 120 | 115 | 80 - 120 | <50 | ug/L | NC (1) | 20 |
| B223175 | Dissolved Cadmium (Cd) | 2023/12/05 | 102 | 80 - 120 | 101 | 80 - 120 | <0.010 | ug/L | NC (1) | 20 |
| B223175 | Dissolved Chromium (Cr) | 2023/12/05 | 100 | 80 - 120 | 100 | 80 - 120 | <1.0 | ug/L | NC (1) | 20 |
| B223175 | Dissolved Cobalt (Co) | 2023/12/05 | 97 | 80 - 120 | 98 | 80 - 120 | <0.20 | ug/L | 3.8 (1) | 20 |
| B223175 | Dissolved Copper (Cu) | 2023/12/05 | 95 | 80 - 120 | 98 | 80 - 120 | <0.20 | ug/L | NC (1) | 20 |
| B223175 | Dissolved Iron (Fe) | 2023/12/05 | NC | 80 - 120 | 104 | 80 - 120 | <5.0 | ug/L | 0.59 (1) | 20 |
| B223175 | Dissolved Lead (Pb) | 2023/12/05 | 102 | 80 - 120 | 101 | 80 - 120 | <0.20 | ug/L | NC (1) | 20 |
| B223175 | Dissolved Lithium (Li) | 2023/12/05 | 104 | 80 - 120 | 104 | 80 - 120 | <2.0 | ug/L | NC (1) | 20 |
| B223175 | Dissolved Manganese (Mn) | 2023/12/05 | NC | 80 - 120 | 102 | 80 - 120 | <1.0 | ug/L | 0.083 (1) | 20 |
| B223175 | Dissolved Molybdenum (Mo) | 2023/12/05 | 107 | 80 - 120 | 102 | 80 - 120 | <1.0 | ug/L | 4.2 (1) | 20 |
| B223175 | Dissolved Nickel (Ni) | 2023/12/05 | 100 | 80 - 120 | 101 | 80 - 120 | <1.0 | ug/L | 1.1 (1) | 20 |
| B223175 | Dissolved Phosphorus (P) | 2023/12/05 | 112 | 80 - 120 | 102 | 80 - 120 | <10 | ug/L | 0.33 (1) | 20 |
| B223175 | Dissolved Selenium (Se) | 2023/12/05 | 110 | 80 - 120 | 103 | 80 - 120 | <0.10 | ug/L | NC (1) | 20 |
| B223175 | Dissolved Silicon (Si) | 2023/12/05 | NC | 80 - 120 | 118 | 80 - 120 | <100 | ug/L | 1.8 (1) | 20 |
| B223175 | Dissolved Silver (Ag) | 2023/12/05 | 96 | 80 - 120 | 102 | 80 - 120 | <0.020 | ug/L | NC (1) | 20 |
| B223175 | Dissolved Strontium (Sr) | 2023/12/05 | NC | 80 - 120 | 102 | 80 - 120 | <1.0 | ug/L | 1.3 (1) | 20 |
| B223175 | Dissolved Thallium (Tl) | 2023/12/05 | 103 | 80 - 120 | 102 | 80 - 120 | <0.010 | ug/L | NC (1) | 20 |
| B223175 | Dissolved Tin (Sn) | 2023/12/05 | 104 | 80 - 120 | 102 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |
| B223175 | Dissolved Titanium (Ti) | 2023/12/05 | 104 | 80 - 120 | 102 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |
| B223175 | Dissolved Uranium (U) | 2023/12/05 | 110 | 80 - 120 | 105 | 80 - 120 | <0.10 | ug/L | 0.62 (1) | 20 |
| B223175 | Dissolved Vanadium (V) | 2023/12/05 | 104 | 80 - 120 | 101 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |
| B223175 | Dissolved Zinc (Zn) | 2023/12/05 | 96 | 80 - 120 | 103 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B223175 | Dissolved Zirconium (Zr) | 2023/12/05 | 110 | 80 - 120 | 100 | 80 - 120 | <0.10 | ug/L | NC (1) | 20 |
| B223187 | Dissolved Aluminum (Al) | 2023/12/05 | 101 | 80 - 120 | 103 | 80 - 120 | <3.0 | ug/L | NC (1) | 20 |
| B223187 | Dissolved Antimony (Sb) | 2023/12/05 | 102 | 80 - 120 | 103 | 80 - 120 | <0.50 | ug/L | NC (1) | 20 |
| B223187 | Dissolved Arsenic (As) | 2023/12/05 | 104 | 80 - 120 | 103 | 80 - 120 | <0.10 | ug/L | 0.50 (1) | 20 |
| B223187 | Dissolved Barium (Ba) | 2023/12/05 | NC | 80 - 120 | 101 | 80 - 120 | <1.0 | ug/L | 2.9 (1) | 20 |
| B223187 | Dissolved Beryllium (Be) | 2023/12/05 | 100 | 80 - 120 | 99 | 80 - 120 | <0.10 | ug/L | NC (1) | 20 |
| B223187 | Dissolved Bismuth (Bi) | 2023/12/05 | 97 | 80 - 120 | 100 | 80 - 120 | <1.0 | ug/L | NC (1) | 20 |
| B223187 | Dissolved Boron (B) | 2023/12/05 | 105 | 80 - 120 | 105 | 80 - 120 | <50 | ug/L | NC (1) | 20 |
| B223187 | Dissolved Cadmium (Cd) | 2023/12/05 | 99 | 80 - 120 | 101 | 80 - 120 | <0.010 | ug/L | 6.8 (1) | 20 |
| B223187 | Dissolved Chromium (Cr) | 2023/12/05 | 97 | 80 - 120 | 100 | 80 - 120 | <1.0 | ug/L | NC (1) | 20 |
| B223187 | Dissolved Cobalt (Co) | 2023/12/05 | 94 | 80 - 120 | 98 | 80 - 120 | <0.20 | ug/L | NC (1) | 20 |
| B223187 | Dissolved Copper (Cu) | 2023/12/05 | 92 | 80 - 120 | 98 | 80 - 120 | <0.20 | ug/L | 0.14 (1) | 20 |
| B223187 | Dissolved Iron (Fe) | 2023/12/05 | 101 | 80 - 120 | 103 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |
| B223187 | Dissolved Lead (Pb) | 2023/12/05 | 98 | 80 - 120 | 100 | 80 - 120 | <0.20 | ug/L | NC (1) | 20 |
| B223187 | Dissolved Lithium (Li) | 2023/12/05 | 98 | 80 - 120 | 102 | 80 - 120 | <2.0 | ug/L | NC (1) | 20 |
| B223187 | Dissolved Manganese (Mn) | 2023/12/05 | 98 | 80 - 120 | 102 | 80 - 120 | <1.0 | ug/L | 2.2 (1) | 20 |
| B223187 | Dissolved Molybdenum (Mo) | 2023/12/05 | 103 | 80 - 120 | 101 | 80 - 120 | <1.0 | ug/L | 0.66 (1) | 20 |
| B223187 | Dissolved Nickel (Ni) | 2023/12/05 | 95 | 80 - 120 | 101 | 80 - 120 | <1.0 | ug/L | NC (1) | 20 |
| B223187 | Dissolved Phosphorus (P) | 2023/12/05 | 107 | 80 - 120 | 102 | 80 - 120 | <10 | ug/L | 0.053 (1) | 20 |
| B223187 | Dissolved Selenium (Se) | 2023/12/05 | 103 | 80 - 120 | 100 | 80 - 120 | <0.10 | ug/L | 0.15 (1) | 20 |
| B223187 | Dissolved Silicon (Si) | 2023/12/05 | NC | 80 - 120 | 114 | 80 - 120 | <100 | ug/L | 2.1 (1) | 20 |
| B223187 | Dissolved Silver (Ag) | 2023/12/05 | 98 | 80 - 120 | 102 | 80 - 120 | <0.020 | ug/L | NC (1) | 20 |
| B223187 | Dissolved Strontium (Sr) | 2023/12/05 | NC | 80 - 120 | 103 | 80 - 120 | <1.0 | ug/L | 1.9 (1) | 20 |
| B223187 | Dissolved Thallium (Tl) | 2023/12/05 | 100 | 80 - 120 | 100 | 80 - 120 | <0.010 | ug/L | 3.3 (1) | 20 |
| B223187 | Dissolved Tin (Sn) | 2023/12/05 | 100 | 80 - 120 | 102 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |
| B223187 | Dissolved Titanium (Ti) | 2023/12/05 | 101 | 80 - 120 | 102 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |
| B223187 | Dissolved Uranium (U) | 2023/12/05 | 104 | 80 - 120 | 104 | 80 - 120 | <0.10 | ug/L | 2.1 (1) | 20 |
| B223187 | Dissolved Vanadium (V) | 2023/12/05 | 100 | 80 - 120 | 103 | 80 - 120 | <5.0 | ug/L | NC (1) | 20 |
| B223187 | Dissolved Zinc (Zn) | 2023/12/05 | 94 | 80 - 120 | 103 | 80 - 120 | <5.0 | ug/L | 0.012 (1) | 20 |
| B223187 | Dissolved Zirconium (Zr) | 2023/12/05 | 103 | 80 - 120 | 101 | 80 - 120 | <0.10 | ug/L | NC (1) | 20 |
| B223595 | Total Ammonia (N) | 2023/12/05 | 9.9 (15) | 80 - 120 | 100 | 80 - 120 | <0.015 | mg/L | 1.4 (1) | 20 |



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B223930 | Total Mercury (Hg) | 2023/12/05 | 104 | 80 - 120 | 110 | 80 - 120 | <0.0019 | ug/L | NC (1) | 20 |
| B223962 | Dissolved Mercury (Hg) | 2023/12/05 | 100 | 80 - 120 | 105 | 80 - 120 | <0.0019 | ug/L | NC (1) | 20 |
| B224439 | 2,3,4,5-tetrachlorophenol | 2023/12/06 | | | 100 | 60 - 130 | <0.10 | ug/L | | |
| B224439 | 2,3,4,6-tetrachlorophenol | 2023/12/06 | | | 83 | 60 - 130 | <0.10 | ug/L | | |
| B224439 | 2,3,4-trichlorophenol | 2023/12/06 | | | 82 | 60 - 130 | <0.10 | ug/L | | |
| B224439 | 2,3,5,6-tetrachlorophenol | 2023/12/06 | | | 84 | 60 - 130 | <0.10 | ug/L | | |
| B224439 | 2,3,5-trichlorophenol | 2023/12/06 | | | 84 | 60 - 130 | <0.10 | ug/L | | |
| B224439 | 2,3,6-Trichlorophenol | 2023/12/06 | | | 75 | 60 - 130 | <0.10 | ug/L | | |
| B224439 | 2,3-Dichlorophenol | 2023/12/06 | | | 76 | 60 - 130 | <0.10 | ug/L | | |
| B224439 | 2,4 + 2,5-Dichlorophenol | 2023/12/06 | | | 74 | 60 - 130 | <0.10 | ug/L | | |
| B224439 | 2,4,5-trichlorophenol | 2023/12/06 | | | 84 | 60 - 130 | <0.10 | ug/L | | |
| B224439 | 2,4,6-trichlorophenol | 2023/12/06 | | | 75 | 60 - 130 | <0.10 | ug/L | | |
| B224439 | 2,6-dichlorophenol | 2023/12/06 | | | 72 | 60 - 130 | <0.10 | ug/L | | |
| B224439 | 2-chlorophenol | 2023/12/06 | | | 62 | 60 - 130 | <0.080 | ug/L | | |
| B224439 | 3 & 4-chlorophenol | 2023/12/06 | | | 84 | 60 - 130 | <0.080 | ug/L | | |
| B224439 | 3,4,5-Trichlorophenol | 2023/12/06 | | | 88 | 60 - 130 | <0.10 | ug/L | | |
| B224439 | 3,4-Dichlorophenol | 2023/12/06 | | | 91 | 60 - 130 | <0.10 | ug/L | | |
| B224439 | 3,5-Dichlorophenol | 2023/12/06 | | | 95 | 60 - 130 | <0.10 | ug/L | | |
| B224439 | 4-Chloro-3-Methylphenol | 2023/12/06 | | | 80 | 60 - 130 | <1.0 | ug/L | | |
| B224439 | Pentachlorophenol | 2023/12/06 | | | 89 | 60 - 130 | <0.10 | ug/L | | |
| B224440 | 2,4-dimethylphenol | 2023/12/06 | | | 128 | 60 - 130 | <0.50 | ug/L | | |
| B224440 | 2,4-dinitrophenol | 2023/12/06 | | | 96 | 30 - 130 | <0.50 | ug/L | | |
| B224440 | 2,6-Dimethylphenol | 2023/12/06 | | | 60 | 60 - 130 | <0.50 | ug/L | | |
| B224440 | 2-Hydroxyphenol (Catechol) | 2023/12/06 | | | 96 | 60 - 130 | <10 | ug/L | | |
| B224440 | 2-methylphenol | 2023/12/06 | | | 68 | 60 - 130 | <0.50 | ug/L | | |
| B224440 | 2-nitrophenol | 2023/12/06 | | | 53 | 30 - 130 | <0.50 | ug/L | | |
| B224440 | 3 & 4-methylphenol | 2023/12/06 | | | 70 | 60 - 130 | <0.50 | ug/L | | |
| B224440 | 3,4-Dimethylphenol | 2023/12/06 | | | 70 | 60 - 130 | <0.50 | ug/L | | |
| B224440 | 3-Hydroxyphenol (Resorcinol) | 2023/12/06 | | | 81 | 60 - 130 | <10 | ug/L | | |
| B224440 | 4,6-dinitro-2-methylphenol | 2023/12/06 | | | 85 | 30 - 130 | <0.50 | ug/L | | |
| B224440 | 4-Hydroxyphenol (Hydroquinone) | 2023/12/06 | | | 97 | 60 - 130 | <1.0 | ug/L | | |

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| B224440 | 4-nitrophenol | 2023/12/06 | | | 102 | 30 - 130 | <0.50 | ug/L | | |
| B224440 | Phenol | 2023/12/06 | | | 83 | 60 - 130 | <0.50 | ug/L | | |

N/A = Not Applicable

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

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

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

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

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

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

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Duplicate Parent ID

(2) Method blank exceeds 0.2 mg/L stipulated in Reference Method. No other Quality Control measures affected.

(3) Duplicate Parent ID [CFS925-01]

(4) Matrix Spike Parent ID [CFS922-01]

(5) Duplicate Parent ID [CFS921-01]

(6) Matrix Spike Parent ID [CFS921-01]

(7) Matrix Spike Parent ID [CFS920-01]

(8) Duplicate Parent ID [CFS920-01]

(9) Matrix Spike Parent ID [CFS933-01]

(10) Duplicate Parent ID [CFS932-01]

(11) Matrix Spike Parent ID [CFS926-01]

(12) Duplicate Parent ID [CFS926-01]

(13) Matrix Spike Parent ID [CFS932-06]

(14) Duplicate Parent ID [CFS932-06]

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



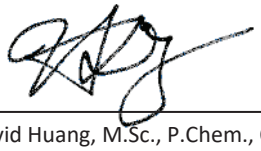
Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C397797
Report Date: 2023/12/07

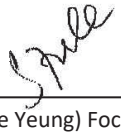
GHD Limited
Client Project #: 11222680-15.1
Site Location: NEW LANDFILL-UPLAND LANDFILL
Your P.O. #: 735-002640-4
Sampler Initials: KH

## VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:



David Huang, M.Sc., P.Chem., QP, Scientific Services Manager



Suwan (Sze Yeung) Fock, B.Sc., Scientific Specialist

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Raphael Kwan, Senior Manager, BC and Yukon Regions responsible for British Columbia Environmental laboratory operations.



Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas
4606 Canada Way, Burnaby, British Columbia Canada V5G 1K5 Tel:(604) 734 7276 Toll-free:800-563-6266 Fax:(604) 731 2386 www.bvna.com

Page of 1/2

C397797_COC

| INVOICE TO: | | Report Information | | Project Information | |
|---|---|---|---|---|---|
| Company Name | #163 GHD Limited | Company Name | | Quotation # | C30090 |
| Contact Name | AP Invoices - 735 | Contact Name | Stephanie Berton | P.O. # | 735-002640-3 |
| Address | 455 PHILLIP STREET | Address | | Project # | 11222680-15.1 |
| | WATERLOO ON N2L 3X2 | | | Project Name | Upland Landfill |
| Phone | (519) 884-0510 Fax: (519) 725-1394 | Phone | Fax: | Site # | Groundwater |
| Email | APInvoices-735@ghd.com invoicing-canada@ghd.com | Email | NationalEDDSupport@maxxam.ca,stephanie.berton@ghd.com | Sampled By | K. Hasler, D. Tong |

Bottle Order #: 705547

Chain Of Custody Record: C#705547-03-01

Project Manager: Brody Andersen

Regulatory Criteria: ☐ CSR ☐ CCME ☐ BC Water Quality ☐ Other

Special Instructions: Bottles field filtered and preserved as indicated. Temp/pH field measurements will be sent via email.

SAMPLES MUST BE KEPT COOL ( < 10°C ) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

| | Sample Barcode Label | Sample (Location) Identification | Date Sampled | Time Sampled | Matrix | Metals Field Filtered ? (Y / N) | Conductivity, Cl, SO4, NO2, NO3, N+N, PO4 | Speciated Alkalinity | Sulphide + H2S Calc | Sulphide, Un-ionized (as H2S) (Calc) | Ammonia-N (Total) | Dissolved Metals with CV Hg, Hardness | Total Dissolved Solids (Filt. Residue) | LEPH/HEPH with subtracted PAHs | BOD, COD, TSS | BTEX/VPH, Phenols, Total metals w/ CV Hg (inc. hardness) | # of Bottles | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | WG-11222680-281123-KH-06 | 28/11/23 | 0930 | W | Y | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | 7 | |
| 2 | | WG-11222680-281123-KH-07 | 28/11/23 | 1445 | W | Y | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | 7 | |
| 3 | | WG-11222680-281123-KH-08 | 28/11/23 | 1500 | W | Y | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | 7 | |
| 4 | | WG-11222680-281123-KH-09 | 28/11/23 | 1630 | W | Y | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | 7 | |
| 5 | | WG-11222680-291123-KH-10 | 29/11/23 | 0945 | W | Y | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | 7 | |
| 6 | | WL-11222680-281123-KH-01 | 28/11/23 | 1445 | W | Y | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | | |
| 7 | | TRIP BLANK (BTEX, VOC) | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | |

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT: (will be applied if Rush TAT is not specified): ☒

Standard TAT = 5-7 Working days for most tests..

Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)

1 DAY ☐ 2 Day ☐ 3 Day ☐ Date Required: ☐

Rush Confirmation Number: (call lab for #)

| * RELINQUISHED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | RECEIVED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | # jars used and not submitted | Lab Use Only: Time Sensitive | Temperature (°C) on Receipt | Custody Seal Intact on Cooler? |
|---|---|---|---|---|---|---|---|---|---|
| Debra Tong | 23/11/29 | 1130 | | 2023/11/30 | 1142 | | ☐ | 4, 7, 2 | ☐ Yes ☒ No |

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Bureau Veritas Yellow: Client

Ice packs: yes

Bureau Veritas Canada (2019) Inc.

Bureau Veritas
4606 Canada Way, Burnaby, British Columbia Canada V5G 1K5 Tel:(604) 734 7276 Toll-free:800-563-6266 Fax:(604) 731 2386 www.bvna.com

Page of 2 | 12

C397797_COC

Use Only

Bottle Order #: 705548

Chain Of Custody Record: C#705548-01-01

Project Manager: Brody Andersen

| INVOICE TO: | | Report Information | | Project Information | |
|---|---|---|---|---|---|
| Company Name | #163 GHD Limited | Company Name | | Quotation # | C30090 |
| Contact Name | AP Invoices - 735 | Contact Name | Stephanie Berton | P.O. # | 735-002640-3 |
| Address | 455 PHILLIP STREET | Address | | Project # | 11222680-15.1 |
| | WATERLOO ON N2L 3X2 | | | Project Name | Upland Landfill |
| Phone | (519) 884-0510 Fax: (519) 725-1394 | Phone | Fax: | Site # | Surface Water |
| Email | APinvoices-735@ghd.com invoicing-canada@ghd.com | Email | NationalEDDSupport@maxxam.ca;stephanie.berton@ghd.com | Sampled By | K. Haster, D. Tong |

Regulatory Criteria:
- [ ] CSR
- [ ] CCME
- [ ] BC Water Quality
- [ ] Other

Special Instructions: Bottles were field filtered and preserved as indicated.

SAMPLES MUST BE KEPT COOL ( < 10°C ) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

| | Sample Barcode Label | Sample (Location) Identification | Date Sampled | Time Sampled | Matrix | Metals Field Filtered ? (Y / N) | Conductivity, Cl, SO4, NO2, NO3, N+N, PO4 | Speciated Alkalinity | Sulphide + H2S Calc | Sulphide, Un-ionized (as H2S) (Calc) | Ammonia-N (Total) | Total Suspended Solids (TSS) | Total Metals with CV Hg | Dissolved Hardness | Field pH | Field Temperature | # of Bottles | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | WS-11222680-281123-KH-01 | 28/11/23 | 10 00 | W | Y | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 8 | LEPH/HEPH on hold |
| 2 | | WS-11222680-281123-KH-02 | 28/11/23 | 10 30 | W | Y | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 8 | LEPH/HEPH on hold. |
| 3 | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | |

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT: [X]
*(will be applied if Rush TAT is not specified):*
*Standard TAT = 5-7 Working days for most tests..*
*Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.*

Job Specific Rush TAT (if applies to entire submission)
1 DAY [ ] 2 Day [ ] 3 Day [ ] Date Required: [ ]
Rush Confirmation Number: (call lab for #)

| * RELINQUISHED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | RECEIVED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | # jars used and not submitted | Time Sensitive | Temperature (°C) on Receipt | Custody Seal Intact on Cooler? |
|---|---|---|---|---|---|---|---|---|---|
| Debora Tong | 23/11/29 | 1130 | Edelane Caoili | 2023/11/30 | 1142 | | [ ] | 4.7.2 | [ ] Yes [X] No |

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.

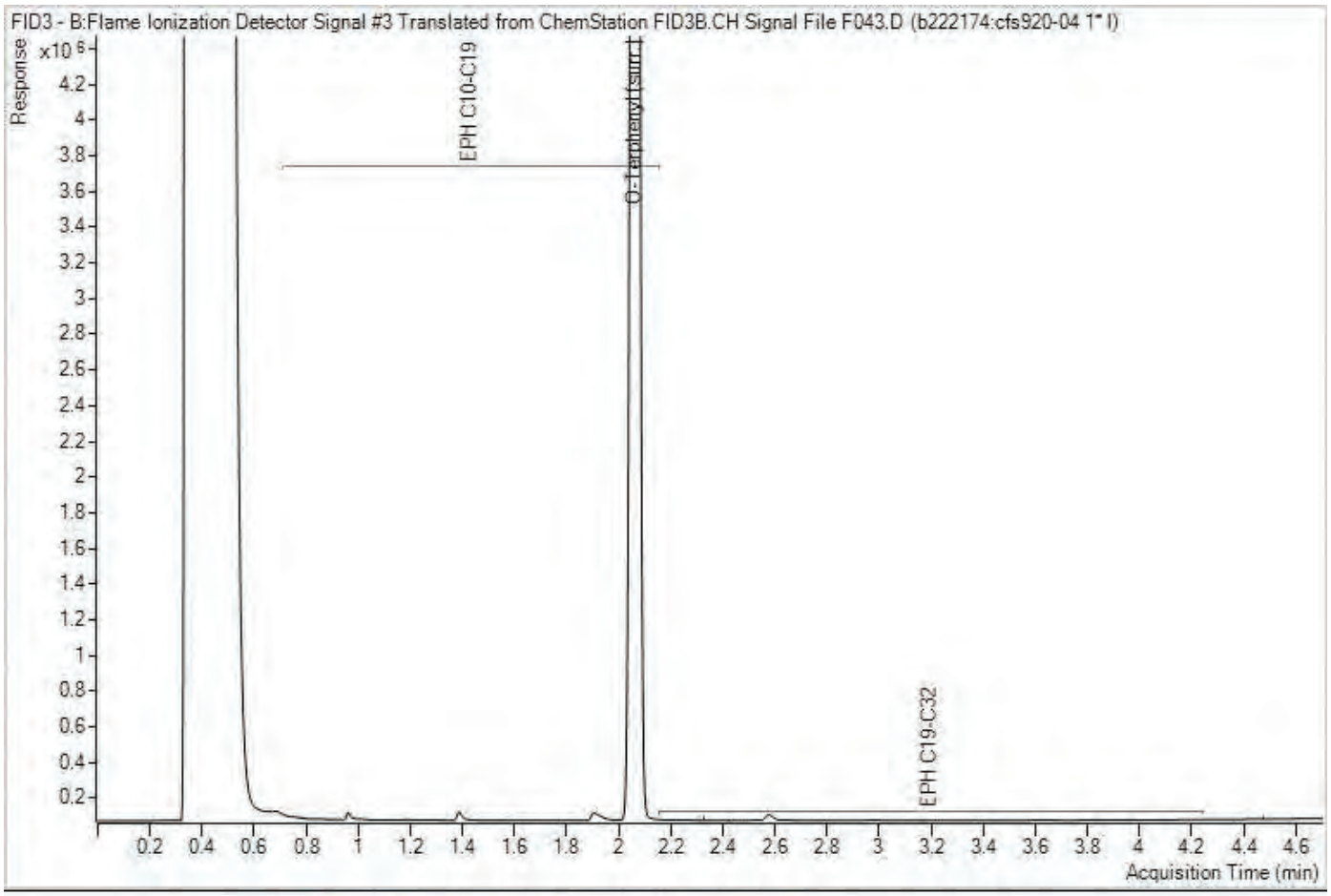
* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

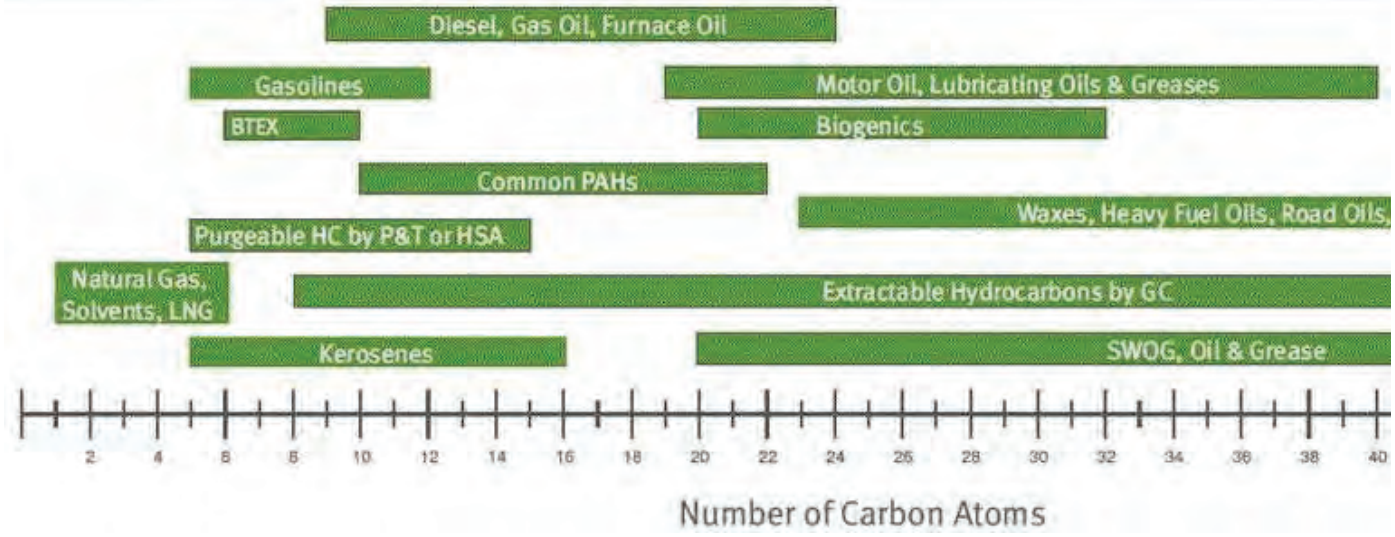
White: Bureau Veritas Yellow: Client

ice packs: yes

Bureau Veritas Canada (2019) Inc.

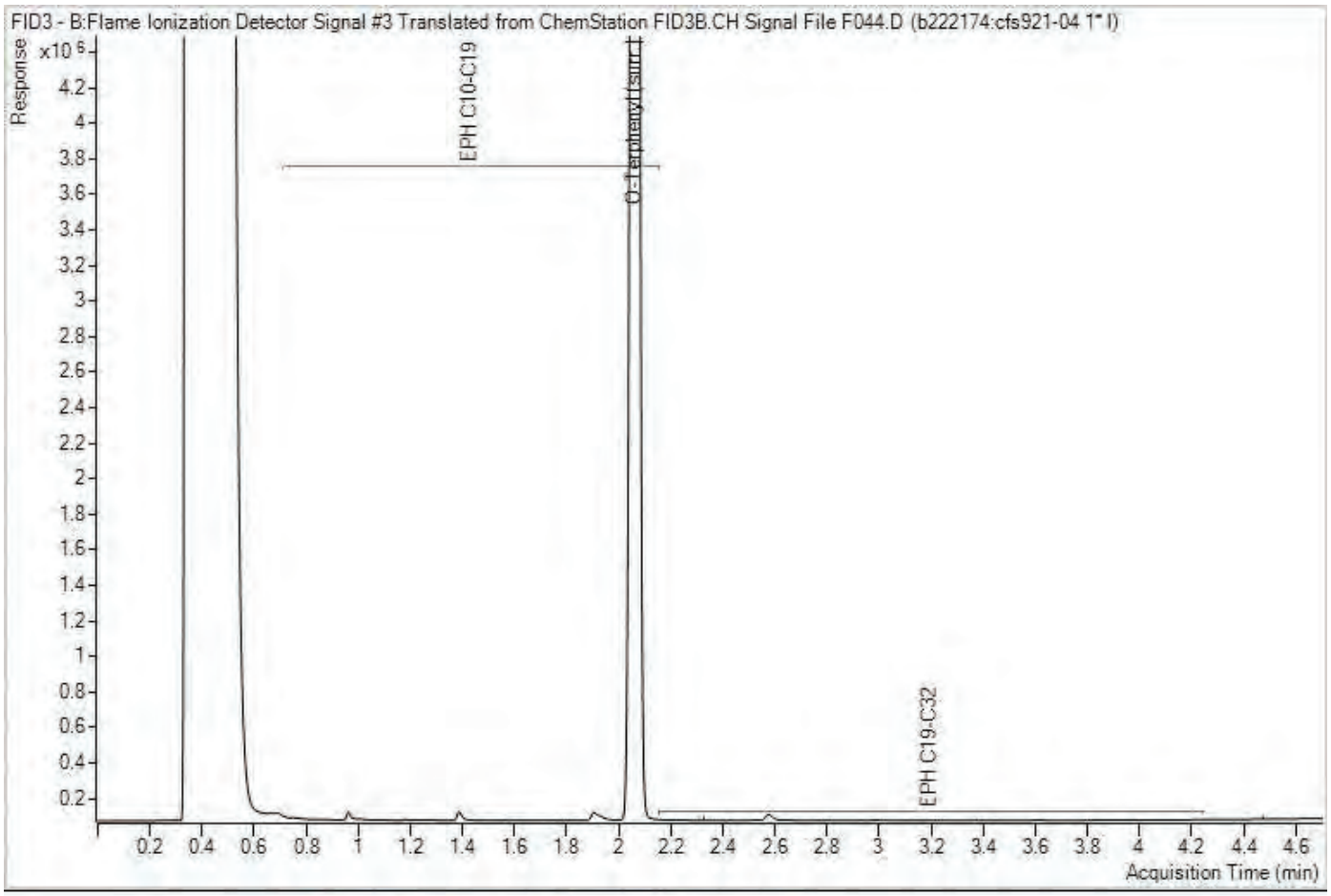
**EPH in Water when PAH required Chromatogram**

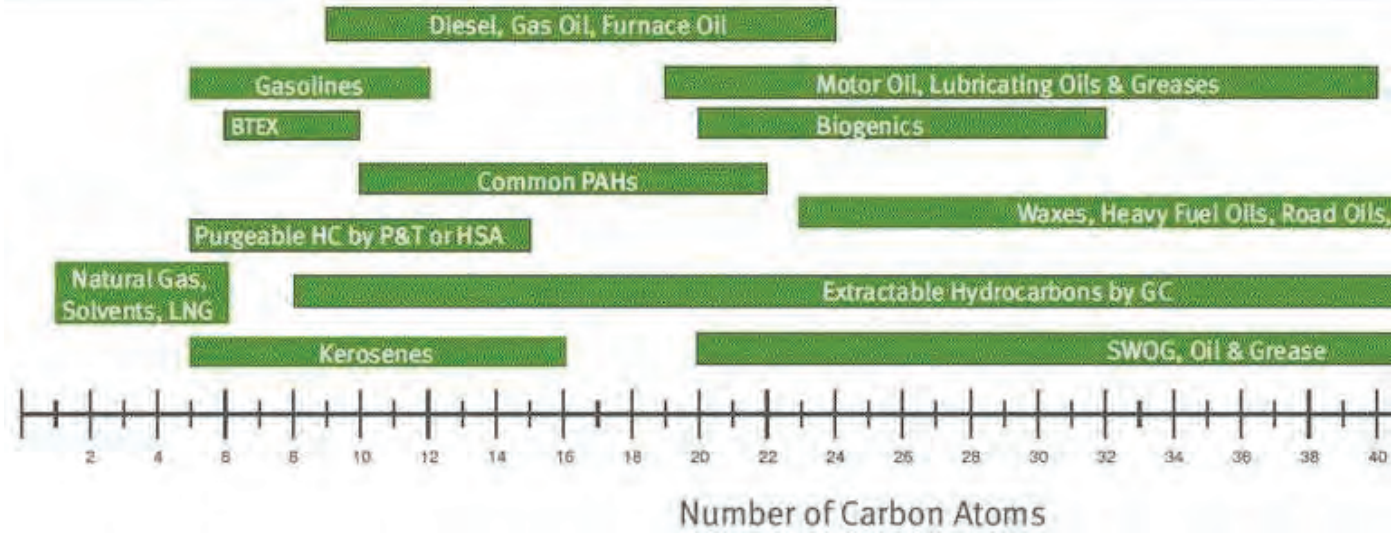



**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

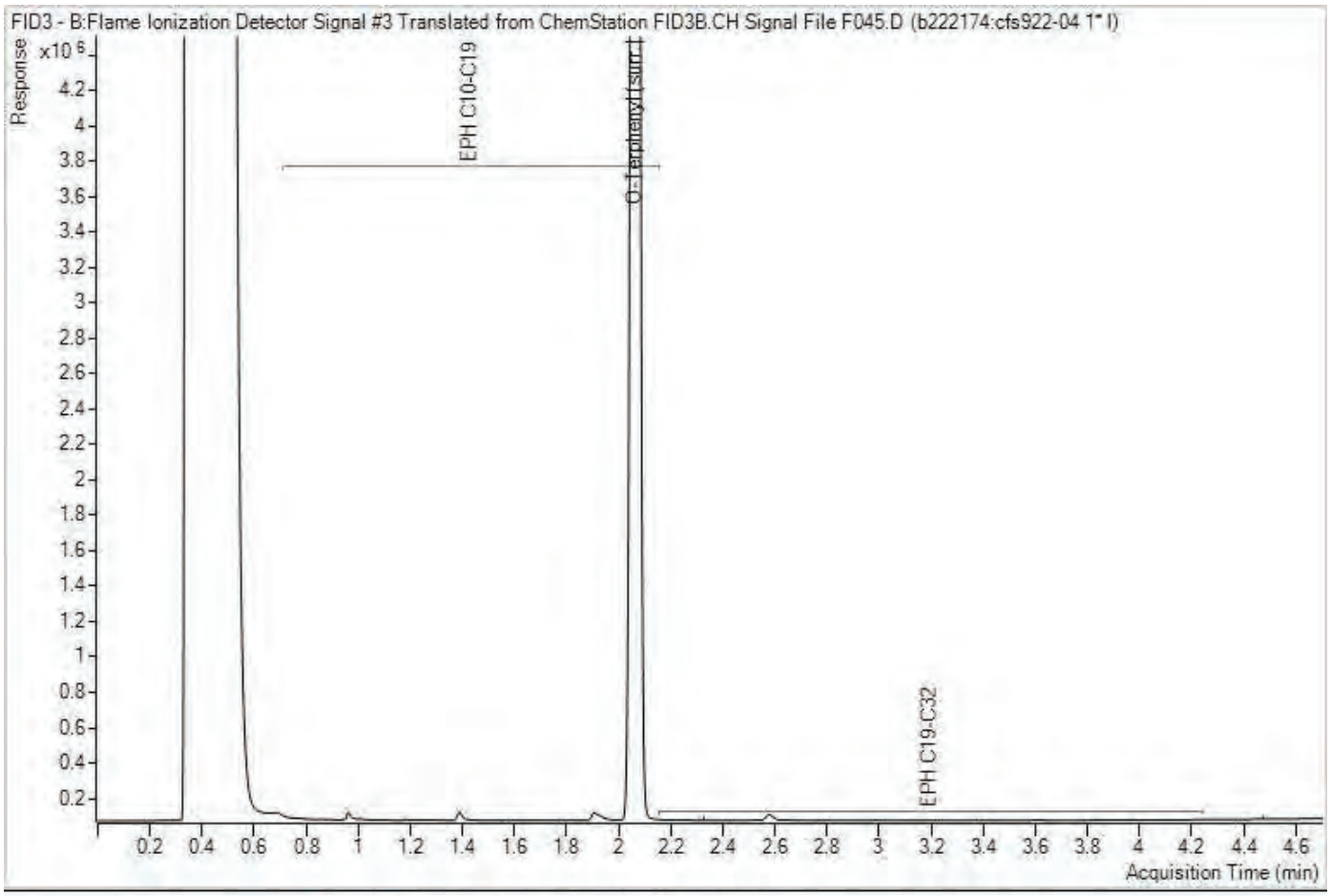
**EPH in Water when PAH required Chromatogram**

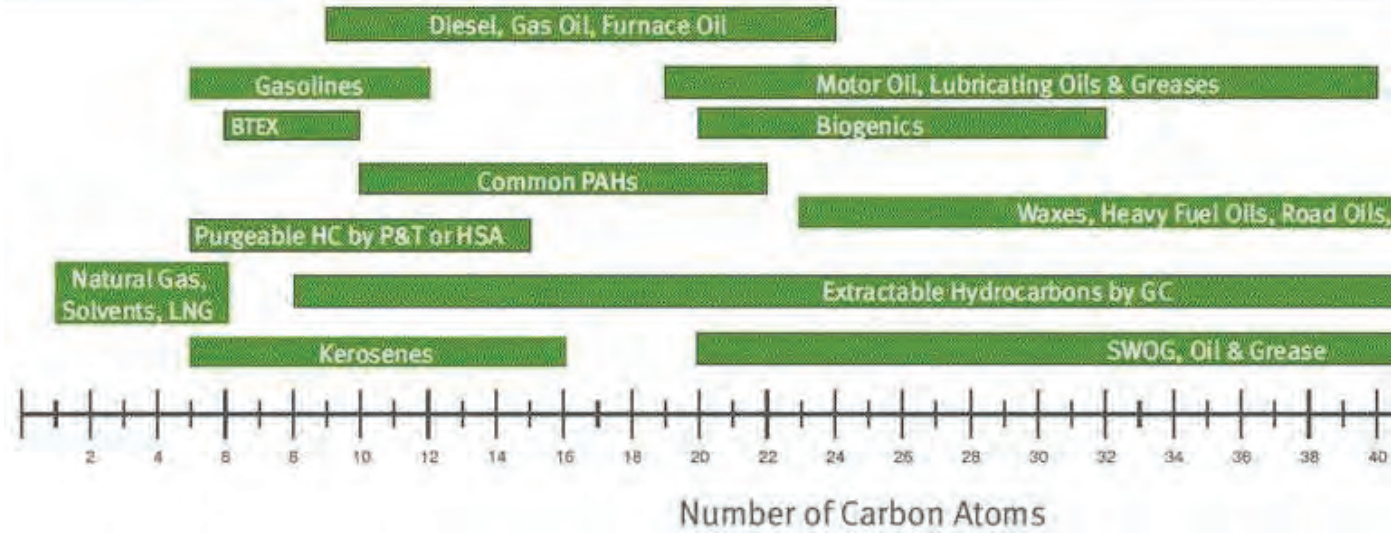



**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

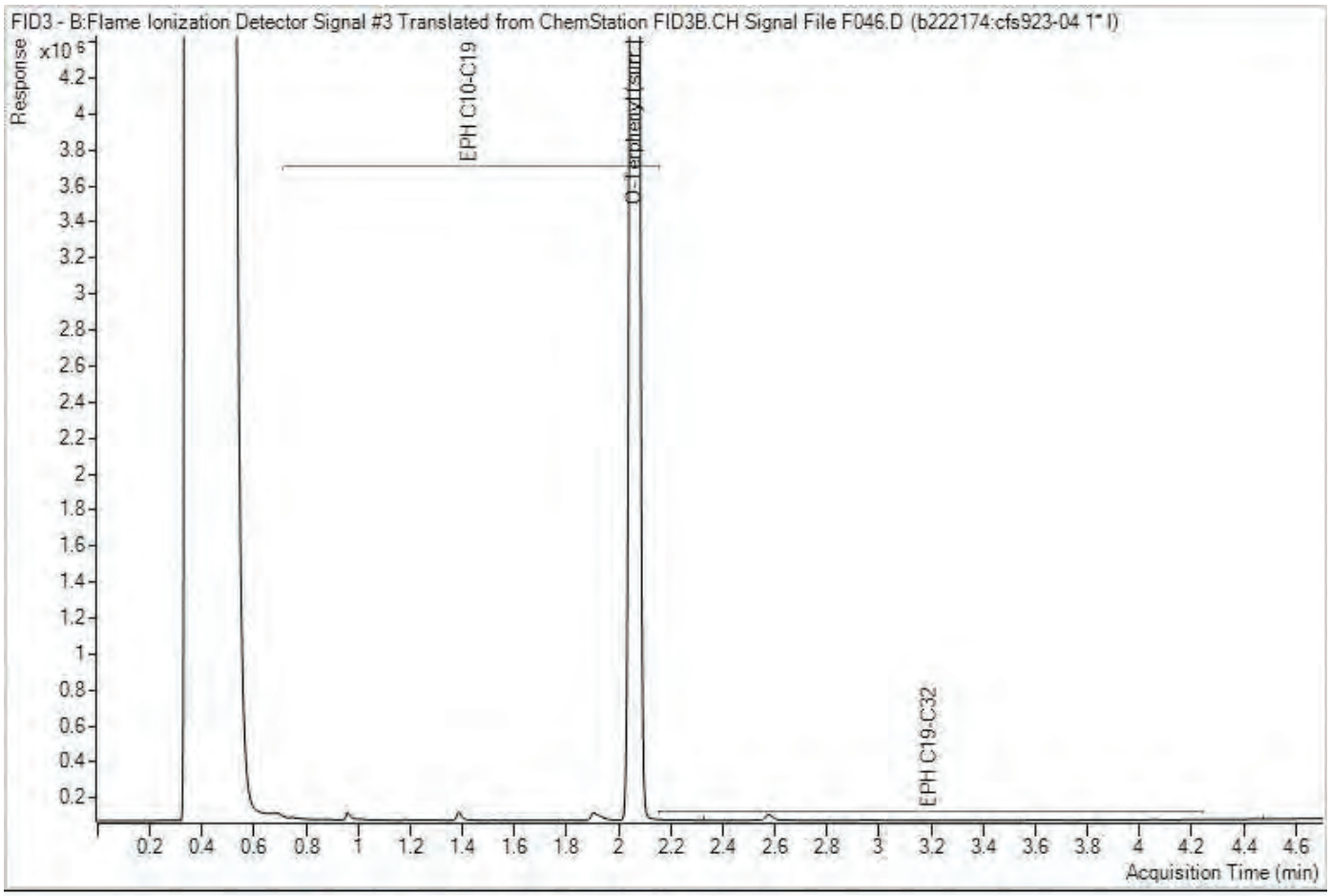
**EPH in Water when PAH required Chromatogram**

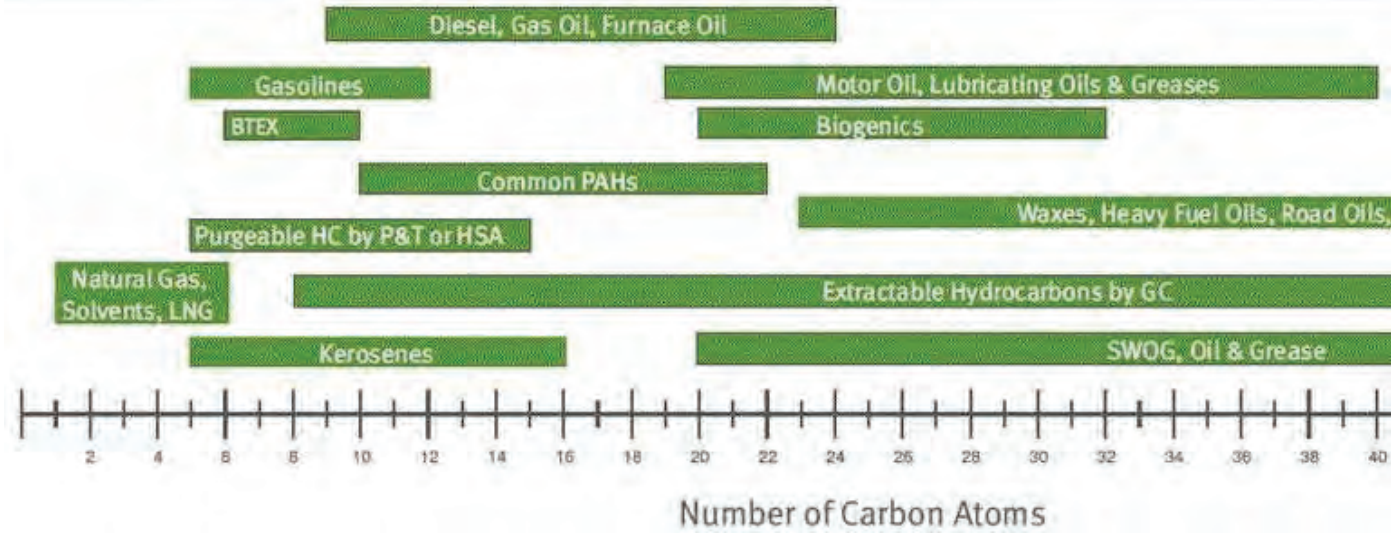



**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

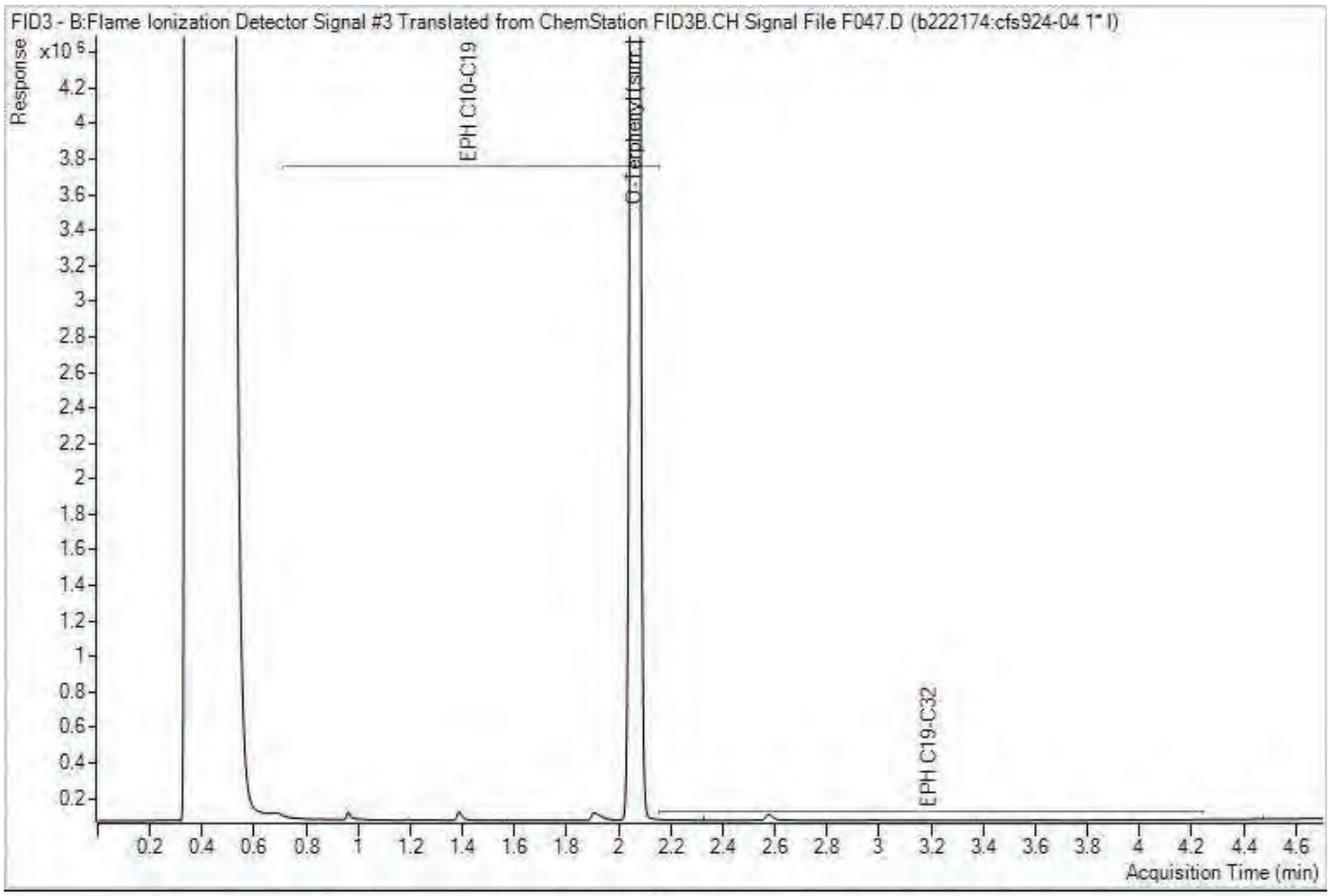
**EPH in Water when PAH required Chromatogram**

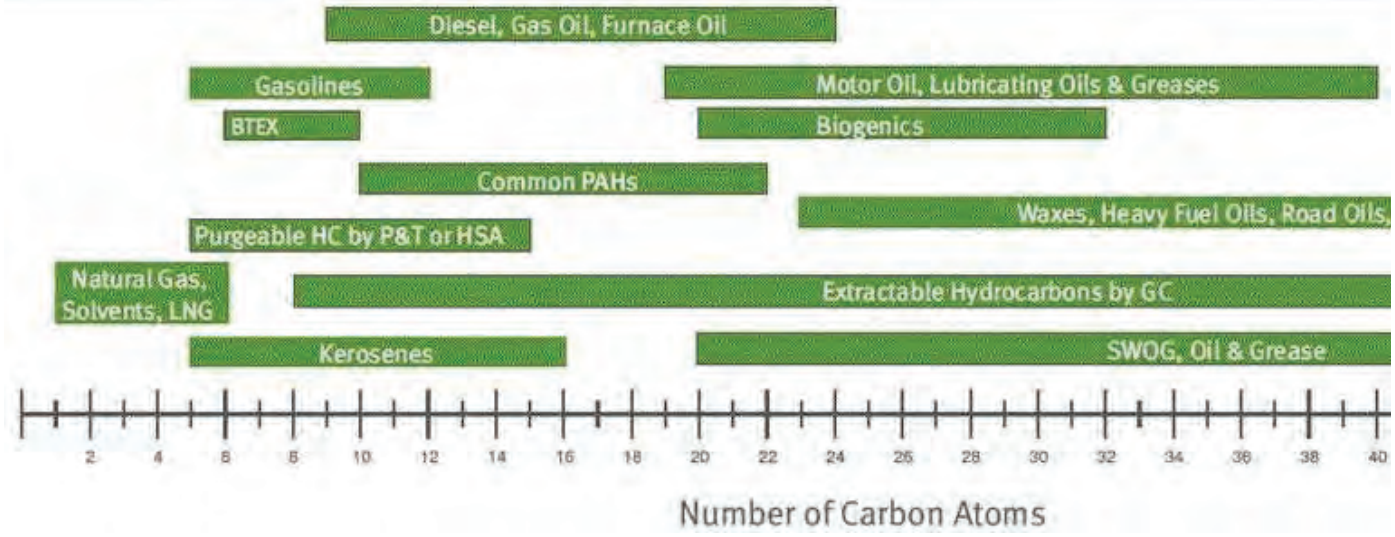



**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

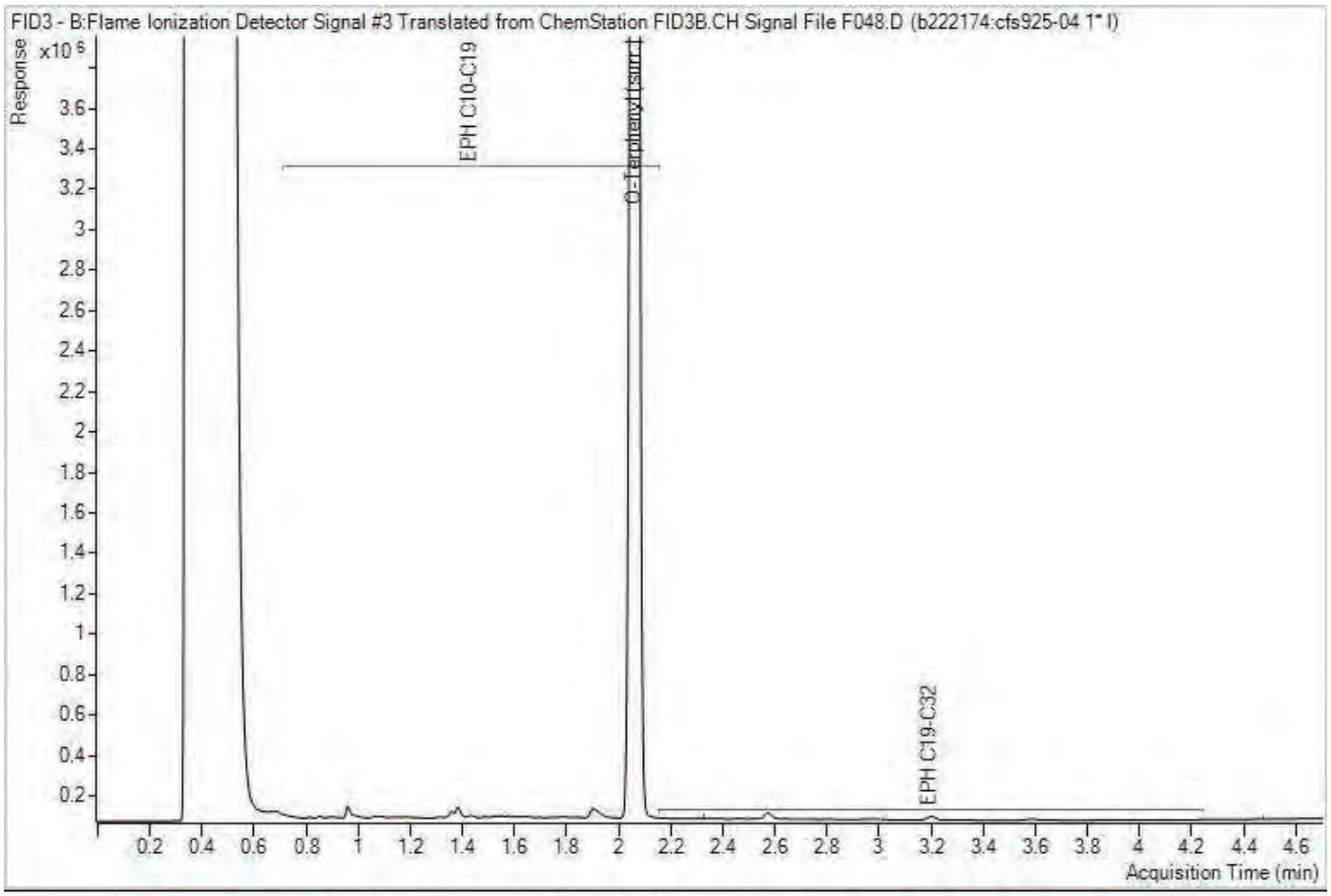
**EPH in Water when PAH required Chromatogram**

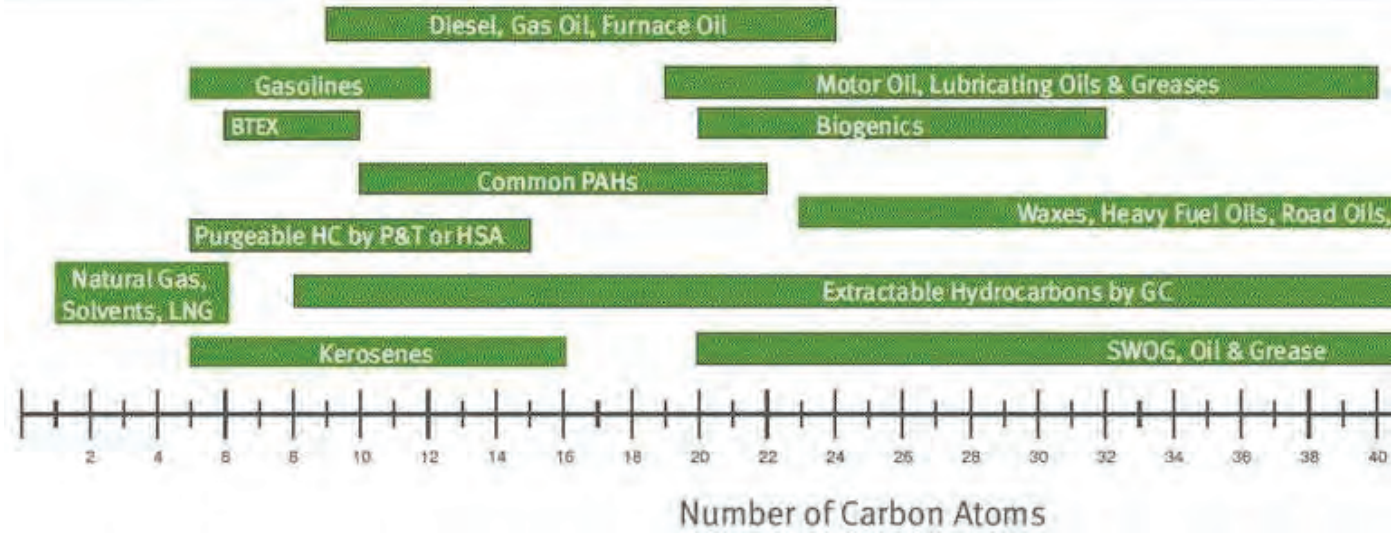



**Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.**

**EPH in Water when PAH required Chromatogram**




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

# Appendix H

## Data Quality Assessment and Verification Report

# Data Verification Report

**22 February 2024**

| | | | |
|---|---|---|---|
| **To** | Rose Marie Rocca, Kathleen Hasler, Melissa Jenkins, David R Barton, Carny Wong, Bailey Bjarnason | **Project No.** | 11222680 |
| **Copy to** | | **DVR No.** | 01 |
| **From** | Stephanie Berton | **Contact No.** | 1-519-884-0510 |
| **Project Name** | 088877 Upland Landfill | **Email** | Stephanie.Berton@ghd.com |
| **Subject** | Data Quality Assessment and Verification<br>Groundwater Surface Water and Leachate Events<br>Campbell River, BC<br>Northwin Environmental | | |

*The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.*

| | |
|---|---|
| **Laboratory:** | Bureau Veritas Canada (2019) Inc. |
| **Lab Job No.:** | C322057, C322498, C354929, C354963, C354973, C371107, C397191, C397797 |
| **Date(s) Sampled:** | March – November 2023 |
| **Media Sampled:** | Groundwater, Surface Water, and Leachate Water |

| QA/QC | Criteria | Pass | Qualifiers | Fail | N/A |
|---|---|---|---|---|---|
| **Holding Times** | Analyte specific | ☐ | ☒ | ☐ | ☐ |
| **Temperature** | <10ºC at receipt | ☒ | ☐ | ☐ | ☐ |
| **Sample Preservation** | Required container/preservatives | ☒ | ☐ | ☐ | ☐ |
| **Field Duplicate (blind)** | Within 20%/<1xRL | ☐ | ☒ | ☐ | ☐ |
| **Field Blank (blind)** | Non detect | ☐ | ☒ | ☐ | ☐ |
| **Trip Blank** | Non detect | ☒ | ☐ | ☐ | ☐ |
| **Lab QA/QC** | Within standard recoveries | ☐ | ☒ | ☐ | ☐ |

The following results are qualified due to holding time exceedance:

| Lab Report # | Sample Date (mm/dd/yyyy) | Sample ID | Analyte | Result | Qualifier | Units |
|---|---|---|---|---|---|---|
| C354963 | 07/18/2023 | WL-11222680-180723-KH-01 | pH | 5.82 | J | s.u. |
| C354963 | 07/18/2023 | WL-11222680-180723-KH-02 | pH | 5.96 | J | s.u. |
| | | | | | | |
| C354973 | 07/18/2023 | WG-11222680-180723-KH-05 | pH | 7.76 | J | s.u. |
| C354973 | 07/18/2023 | WG-11222680-180723-KH-06 | pH | 7.15 | J | s.u. |

| Lab Report # | Sample Date (mm/dd/yyyy) | Sample ID | Analyte | Result | Qualifier | Units |
|---|---|---|---|---|---|---|
| C354973 | 07/18/2023 | WG-11222680-180723-KH-07 | pH | 7.54 | J | s.u. |
| C354973 | 07/18/2023 | WG-11222680-180723-KH-08 | pH | 7.61 | J | s.u. |
| C354973 | 07/18/2023 | WG-11222680-180723-KH-09 | pH | 7.14 | J | s.u. |
| C354973 | 07/19/2023 | WG-11222680-180723-KH-10 | pH | 7.49 | J | s.u. |
| | | | | | | |
| C397797 | 11/28/2023 | WG-11222680-281123-KH-06 | pH | 7.40 | J | s.u. |
| C397797 | 11/28/2023 | WG-11222680-281123-KH-07 | pH | 7.32 | J | s.u. |
| C397797 | 11/28/2023 | WG-11222680-281123-KH-08 | pH | 7.25 | J | s.u. |
| C397797 | 11/28/2023 | WG-11222680-281123-KH-09 | pH | 7.12 | J | s.u. |
| C397797 | 11/29/2023 | WG-11222680-291123-KH-10 | pH | 6.91 | J | s.u. |
| C397797 | 11/28/2023 | WL-11222680-281123-KH-01 | pH | 7.35 | J | s.u. |
| C397797 | 11/28/2023 | WS-11222680-281123-KH-01 | pH | 6.85 | J | s.u. |
| C397797 | 11/28/2023 | WS-11222680-281123-KH-02 | pH | 6.47 | J | s.u. |
| | | | | | | |
| C354973 | 07/18/2023 | WG-11222680-180723-KH-06 | Nitrate (as N) | 0.190 | J | mg/L |
| C354973 | 07/18/2023 | WG-11222680-180723-KH-06 | Nitrite (as N) | 0.0055 | J | mg/L |
| C354973 | 07/18/2023 | WG-11222680-180723-KH-06 | Nitrite/Nitrate | 0.195 | J | mg/L |
| | | | | | | |
| C354973 | 07/18/2023 | WG-11222680-180723-KH-06 | Orthophosphate | 0.0040 | J | mg/L |

The following results are qualified based on matrix spike recovery outlier:

| Lab Report # | Sample Date (mm/dd/yyyy) | Sample ID | Analyte | Result | Qualifier | Units |
|---|---|---|---|---|---|---|
| C354973 | 07/18/2023 | WG-11222680-180723-KH-05 | Sulfide | 0.0018 | UJ | mg/L |
| C354973 | 07/18/2023 | WG-11222680-180723-KH-06 | Sulfide | 0.0018 | UJ | mg/L |
| C354973 | 07/18/2023 | WG-11222680-180723-KH-07 | Sulfide | 0.0018 | UJ | mg/L |
| C354973 | 07/18/2023 | WG-11222680-180723-KH-08 | Sulfide | 0.0018 | UJ | mg/L |
| C354973 | 07/18/2023 | WG-11222680-180723-KH-09 | Sulfide | 0.0018 | UJ | mg/L |
| C354973 | 07/19/2023 | WG-11222680-180723-KH-10 | Sulfide | 0.0018 | UJ | mg/L |

The following results are qualified due to a tentatively identified result and may be potentially high due to matrix interference:

| Lab Report # | Sample Date (mm/dd/yyyy) | Sample ID | Analyte | Result | Qualifier | Units |
|---|---|---|---|---|---|---|
| C354973 | 07/19/2023 | WG-11222680-180723-KH-10 | Benzo(a)pyrene | 0.013 | J+ | µg/L |

The following results are qualified due to incomplete preservation (Sample pH <9). Due to volatility of analyte, a low bias in the results is likely:

| Lab Report # | Sample Date (mm/dd/yyyy) | Sample ID | Analyte | Result | Qualifier | Units |
|---|---|---|---|---|---|---|
| C354963 | 07/18/2023 | WL-11222680-180723-KH-01 | Sulfide | 0.35 | J- | mg/L |

| Lab Report # | Sample Date (mm/dd/yyyy) | Sample ID | Analyte | Result | Qualifier | Units |
|---|---|---|---|---|---|---|
| C354963 | 07/18/2023 | WL-11222680-180723-KH-02 | Sulfide | 0.32 | J- | mg/L |

The following results are qualified due to field duplicate variability:

| Lab Report # | Sample Date (mm/dd/yyyy) | Sample ID | Analyte | Result | Qualifier | Units |
|---|---|---|---|---|---|---|
| C322498 | 03/29/2023 | WG-11222680-290323-KH-05 | Aluminum (dissolved) | 11.4 | J | µg/L |
| C322498 | 03/29/2023 | WG-11222680-290323-KH-06 | Aluminum (dissolved) | 3.0 | UJ | µg/L |
| | | | | | | |
| C354929 | 07/17/2023 | WG-11222680-170723-KH-03 | Aluminum (dissolved) | 8.8 | J | µg/L |
| C354929 | 07/17/2023 | WG-11222680-170723-KH-04 | Aluminum (dissolved) | 3.0 | UJ | µg/L |
| | | | | | | |
| C322498 | 03/29/2023 | WG-11222680-290323-KH-05 | Arsenic (dissolved) | 0.24 | J | µg/L |
| C322498 | 03/29/2023 | WG-11222680-290323-KH-06 | Arsenic (dissolved) | 0.10 | UJ | µg/L |
| | | | | | | |
| C322498 | 03/29/2023 | WG-11222680-290323-KH-05 | Cadmium (dissolved) | 0.167 | J | µg/L |
| C322498 | 03/29/2023 | WG-11222680-290323-KH-06 | Cadmium (dissolved) | 0.010 | UJ | µg/L |
| | | | | | | |
| C322498 | 03/29/2023 | WG-11222680-290323-KH-05 | Copper (dissolved) | 2.17 | J | µg/L |
| C322498 | 03/29/2023 | WG-11222680-290323-KH-06 | Copper (dissolved) | 0.20 | UJ | µg/L |
| | | | | | | |
| C322498 | 03/29/2023 | WG-11222680-290323-KH-05 | Phosphorus (dissolved) | 31 | J | µg/L |
| C322498 | 03/29/2023 | WG-11222680-290323-KH-06 | Phosphorus (dissolved) | 10 | UJ | µg/L |
| | | | | | | |
| C322498 | 03/29/2023 | WG-11222680-290323-KH-05 | Thallium (dissolved) | 0.032 | J | µg/L |
| C322498 | 03/29/2023 | WG-11222680-290323-KH-06 | Thallium (dissolved) | 0.010 | UJ | µg/L |
| | | | | | | |
| C354963 | 07/18/2023 | WL-11222680-180723-KH-01 | Total suspended solids (TSS) | 140 | J | mg/L |
| C354963 | 07/18/2023 | WL-11222680-180723-KH-02 | Total suspended solids (TSS) | 180 | J | mg/L |

The following results are qualified based on field blank detections:

| Lab Report # | Sample Date (mm/dd/yyyy) | Sample ID | Analyte | Result | Qualifier | Units |
|---|---|---|---|---|---|---|
| C322498 | 03/29/2023 | WG-11222680-290323-KH-09 | Cadmium (dissolved) | 0.034 | U | µg/L |
| C322498 | 03/29/2023 | WG-11222680-290323-KH-10 | Cadmium (dissolved) | 0.077 | J+ | µg/L |
| | | | | | | |
| C322498 | 03/29/2023 | WG-11222680-290323-KH-05 | Iron (dissolved) | 24.1 | U | µg/L |
| C322498 | 03/29/2023 | WG-11222680-290323-KH-06 | Iron (dissolved) | 11.5 | U | µg/L |
| C322498 | 03/29/2023 | WG-11222680-290323-KH-09 | Iron (dissolved) | 11.9 | U | µg/L |
| C322498 | 03/29/2023 | WG-11222680-290323-KH-10 | Iron (dissolved) | 16.5 | U | µg/L |

| Lab Report # | Sample Date (mm/dd/yyyy) | Sample ID | Analyte | Result | Qualifier | Units |
|---|---|---|---|---|---|---|
| | | | | | | |
| C322498 | 03/29/2023 | WG-11222680-290323-KH-05 | Selenium (dissolved) | 0.28 | U | µg/L |
| C322498 | 03/29/2023 | WG-11222680-290323-KH-06 | Selenium (dissolved) | 0.18 | U | µg/L |
| C322498 | 03/29/2023 | WG-11222680-290323-KH-07 | Selenium (dissolved) | 0.20 | U | µg/L |
| C322498 | 03/29/2023 | WG-11222680-290323-KH-09 | Selenium (dissolved) | 0.23 | U | µg/L |

Conclusion:

Based on the assessment detailed in the foregoing, the data summarized are acceptable with the specific qualifications noted above.

Notes:

N/A - Not Applicable

QA/QC - Quality Assurance/Quality Control

RL - Reporting Limit

N - Nitrogen

s.u. - Standard pH Units

U - The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.

UJ - The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

J - The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

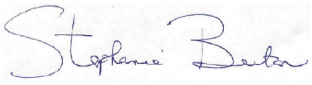
J+ - The result is an estimated quantity, but the result may be biased high.

J- - The result is an estimated quantity, but the result may be biased low.

Data verification reference documents:


1. "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", United States Environmental Protection Agency (USEPA) 540/R-99-008, September 2016.
2. "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review", USEPA 540/R-94-013, September 2016.
3. "British Columbia Environmental Laboratory Manual", Analysis, Reporting & Knowledge Services Knowledge Management Branch Ministry of Environment and Climate Change Strategy Province of British Columbia, April 2020.

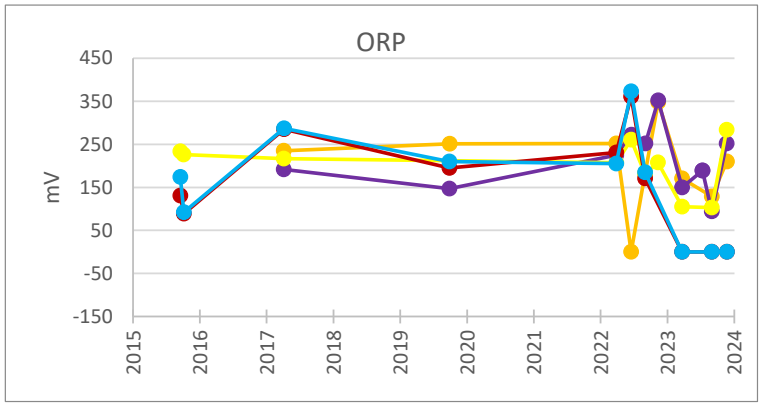

Regards

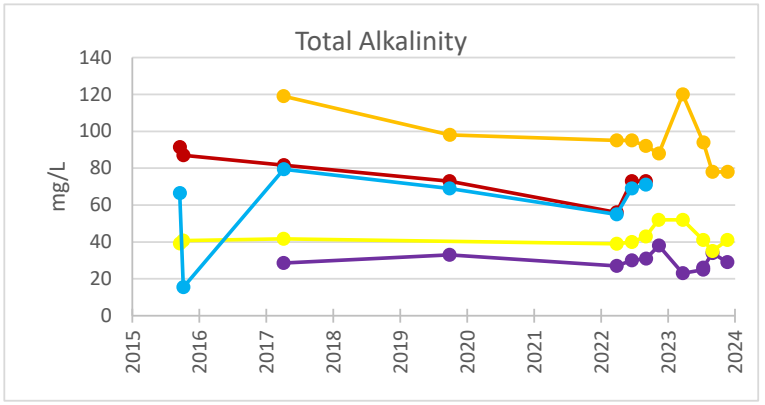


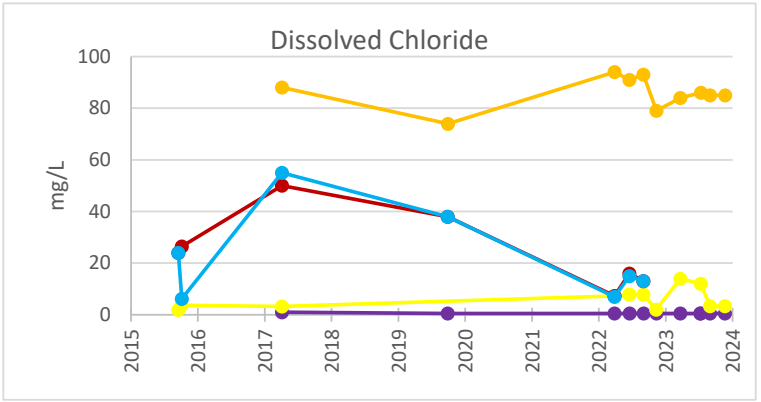
**Stephanie Berton**
Data Management – Data Validator

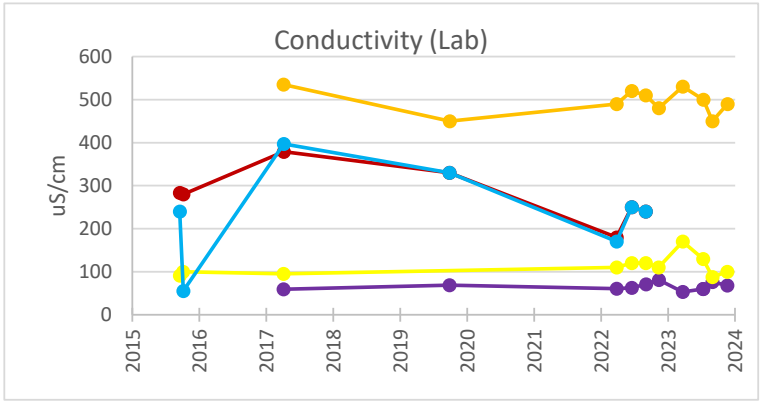
# Appendix I

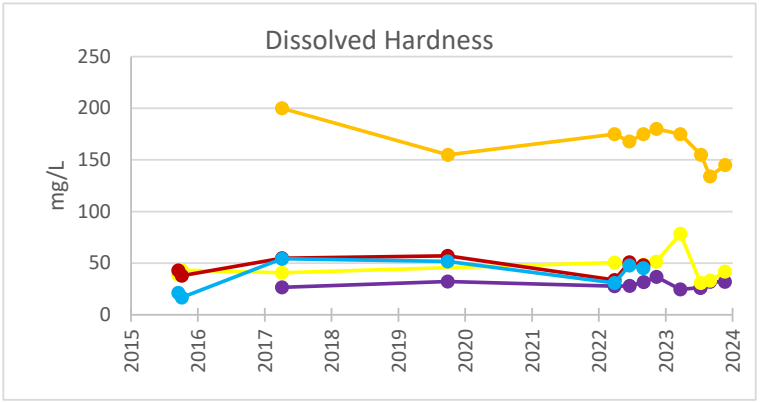
## Concentration Versus Time Plots

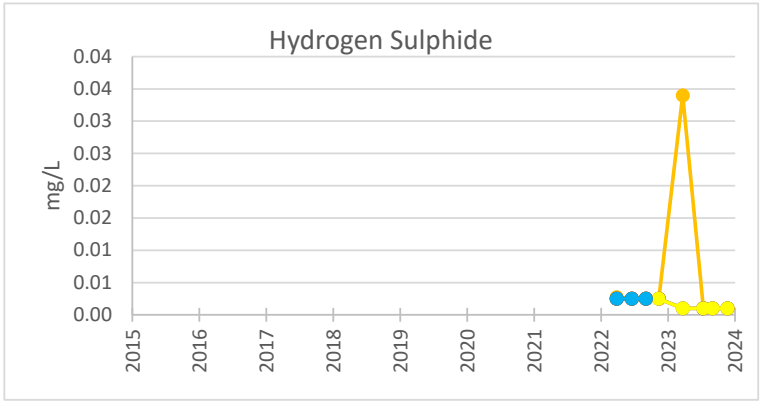


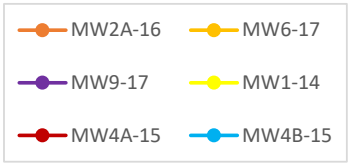



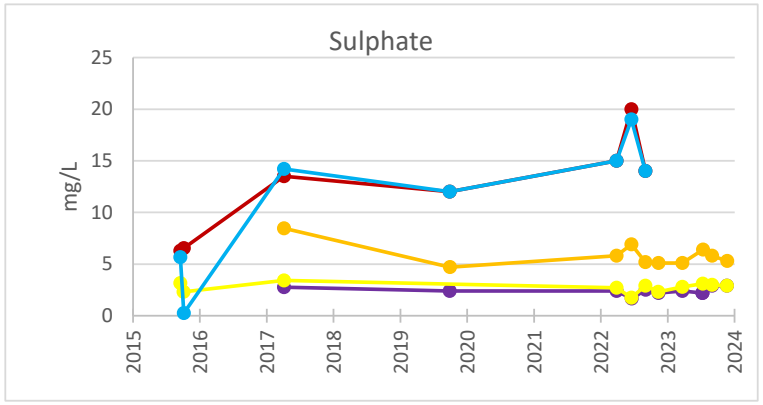



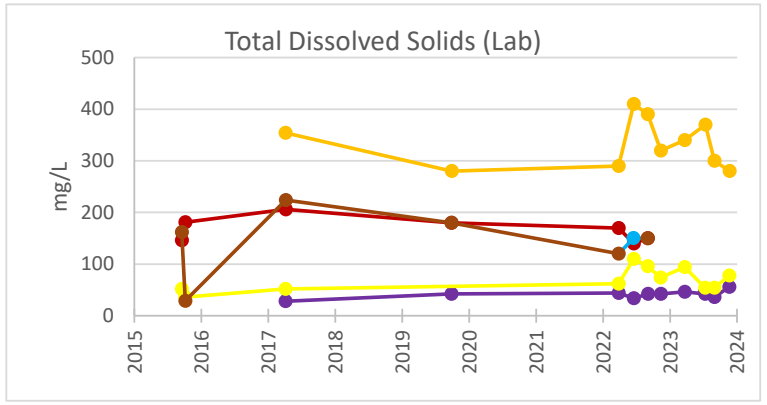



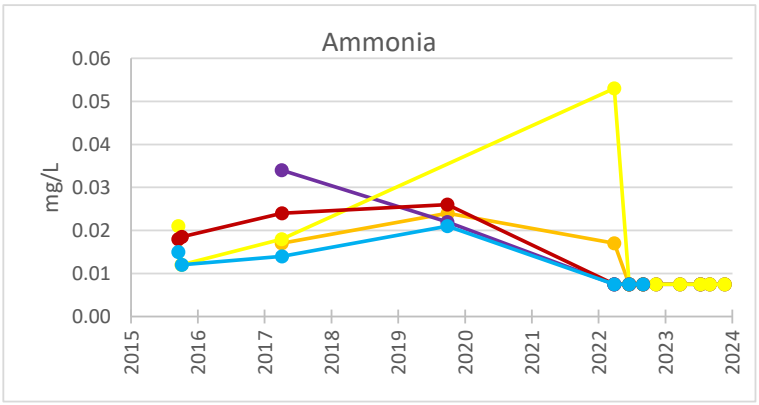



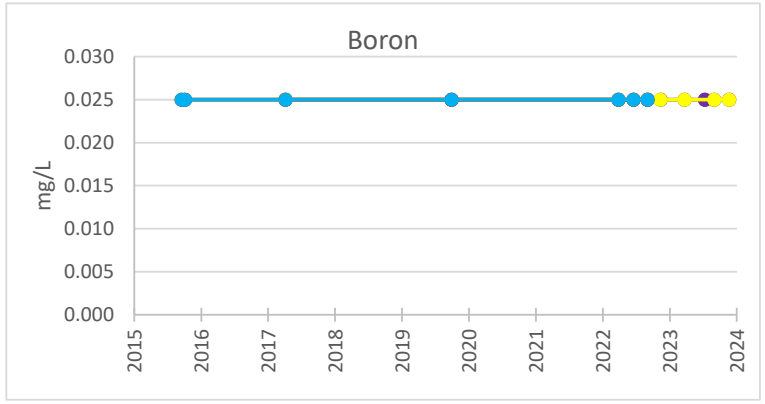


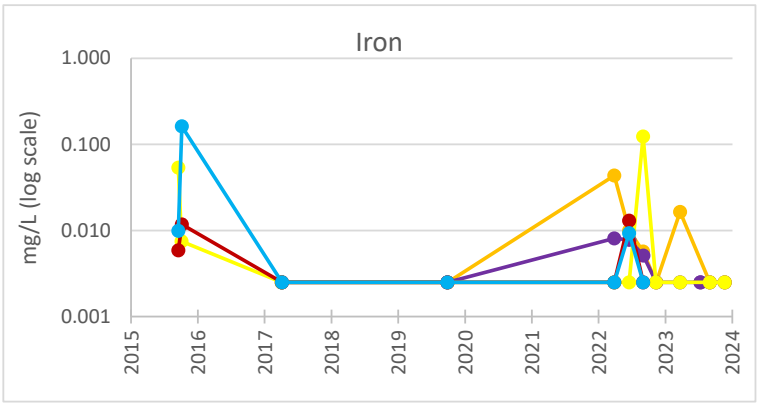

APPENDIX I
CONCENTRATION VERSUS TIME - UPGRADIENT
2023 ANNUAL OPERATIONS AND MONITORING REPORT
UPLAND NEW LANDFILL

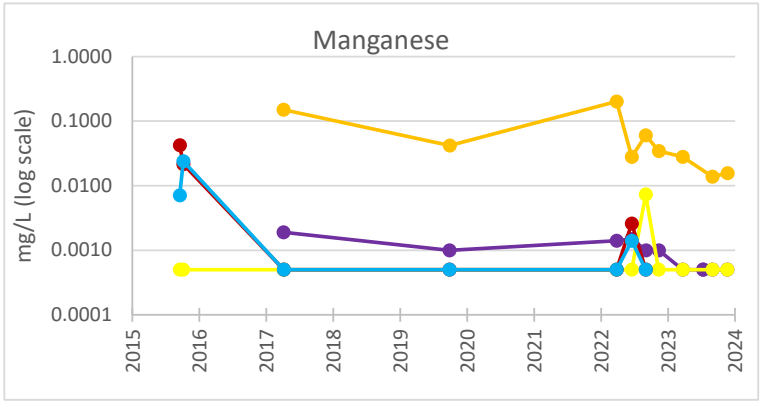


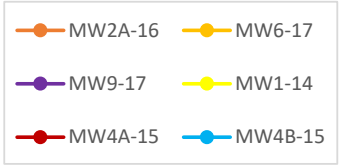



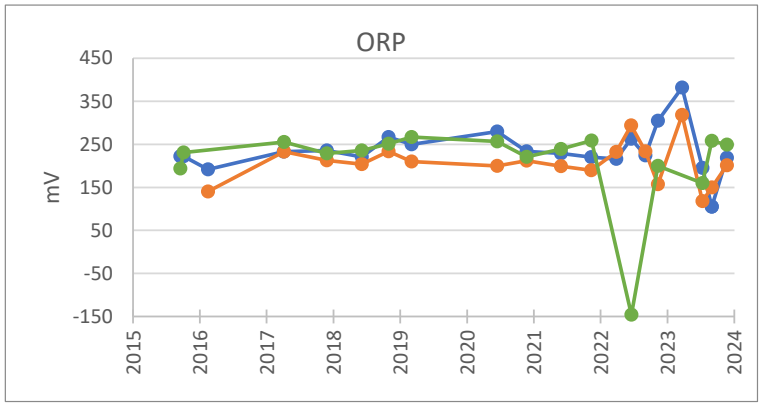



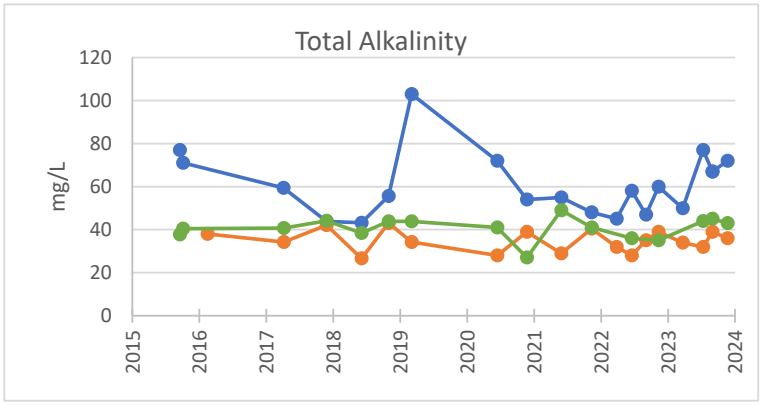



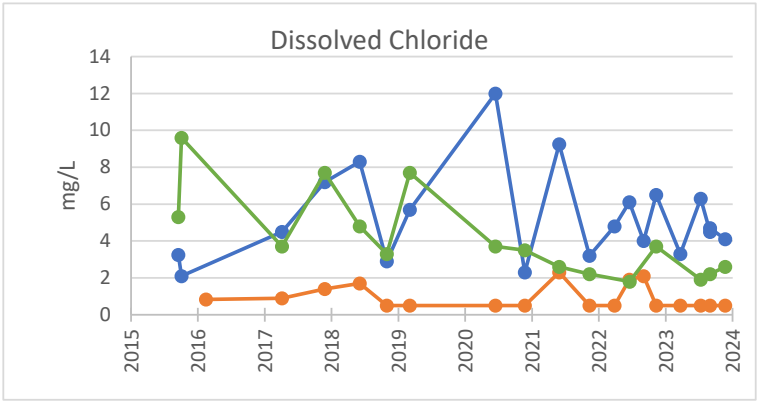



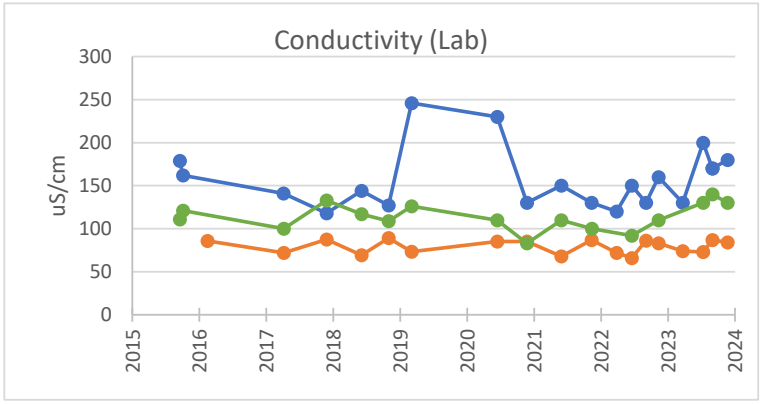


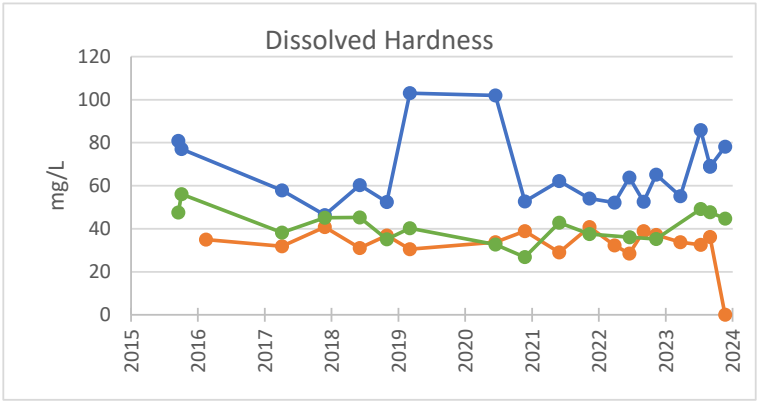

APPENDIX I
CONCENTRATION VERSUS TIME - UPGRADIENT
2023 ANNUAL OPERATIONS AND MONITORING REPORT
UPLAND NEW LANDFILL

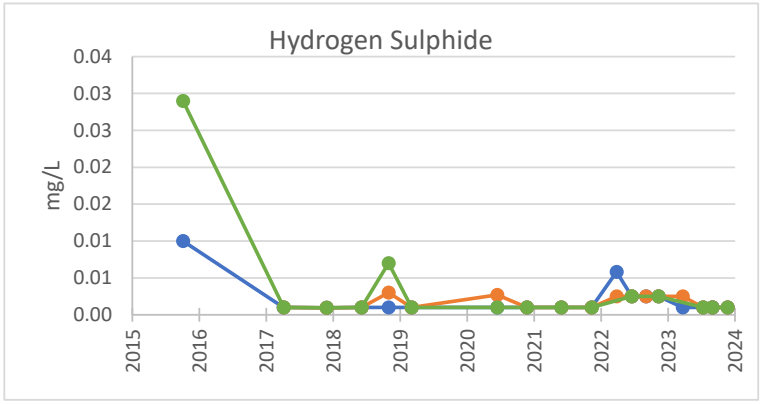


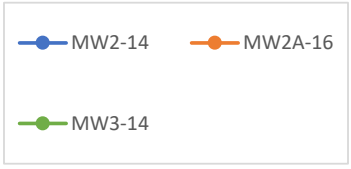



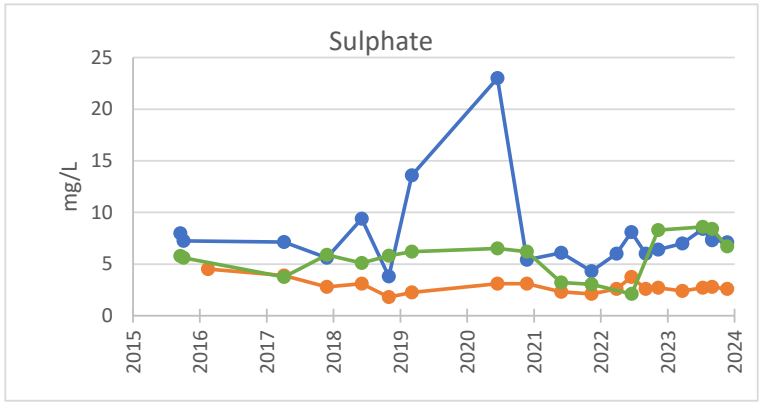



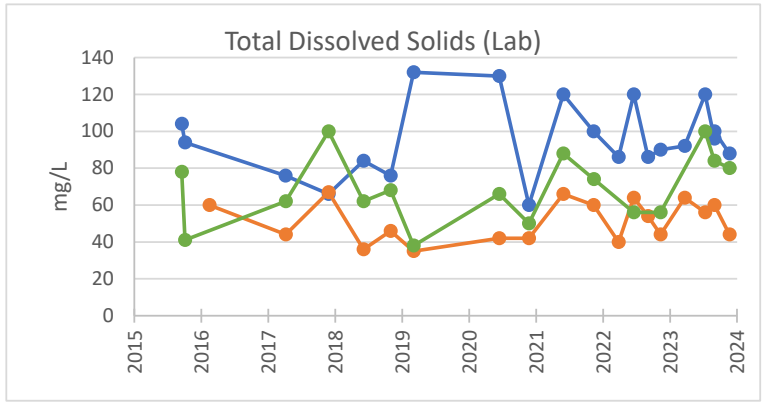



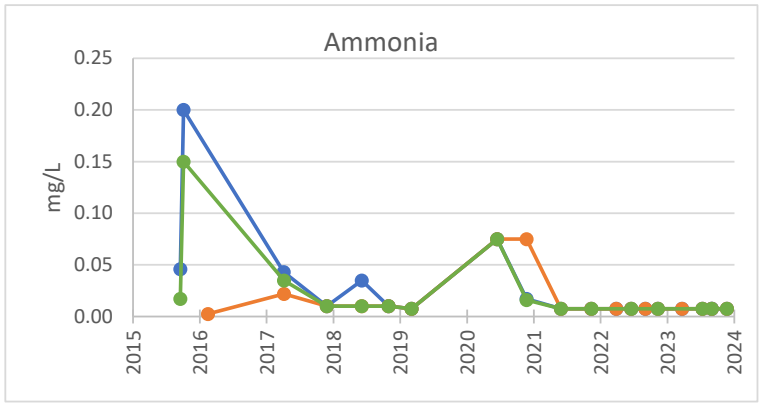



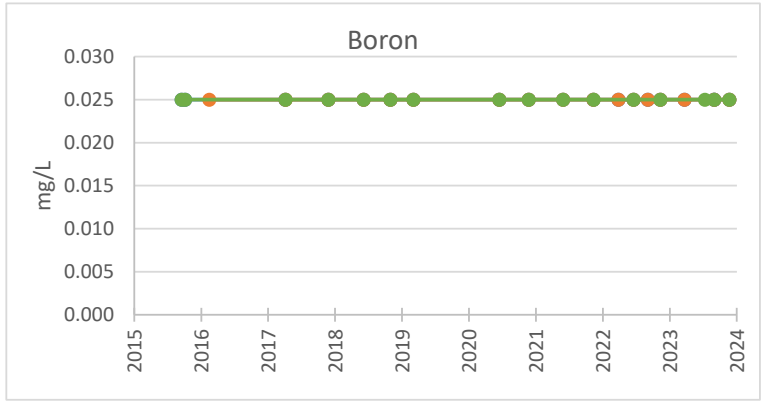


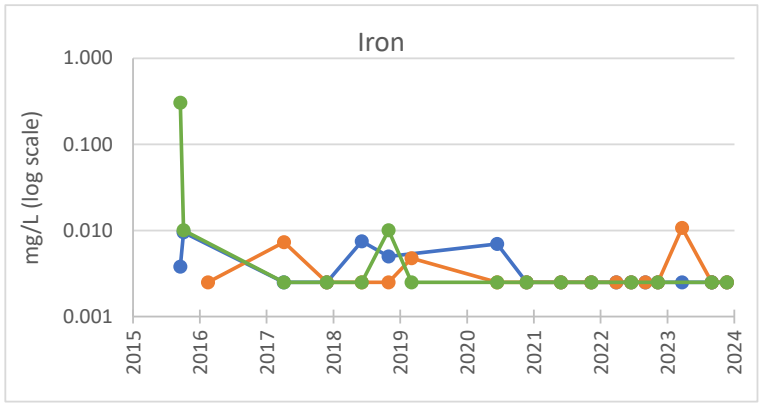

APPENDIX I
CONCENTRATION VERSUS TIME - CROSSGRADIENT
2023 ANNUAL OPERATIONS AND MONITORING REPORT
UPLAND NEW LANDFILL

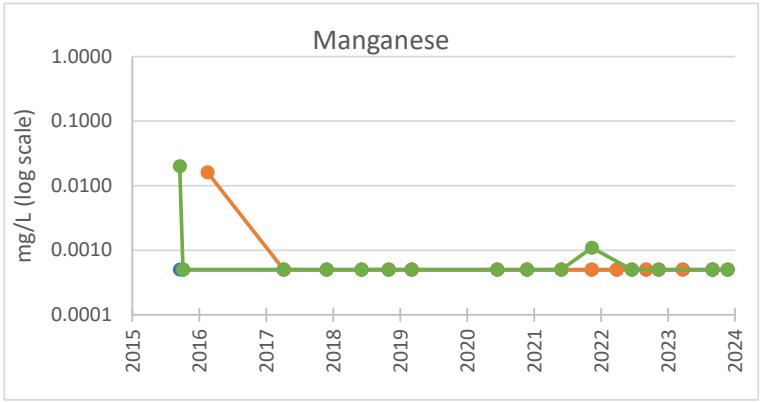


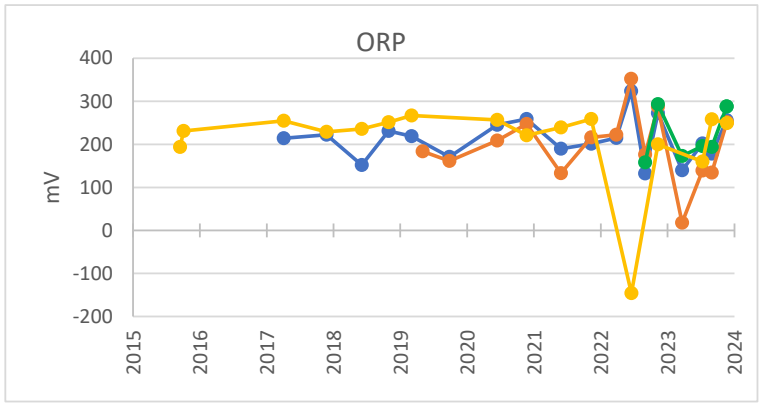



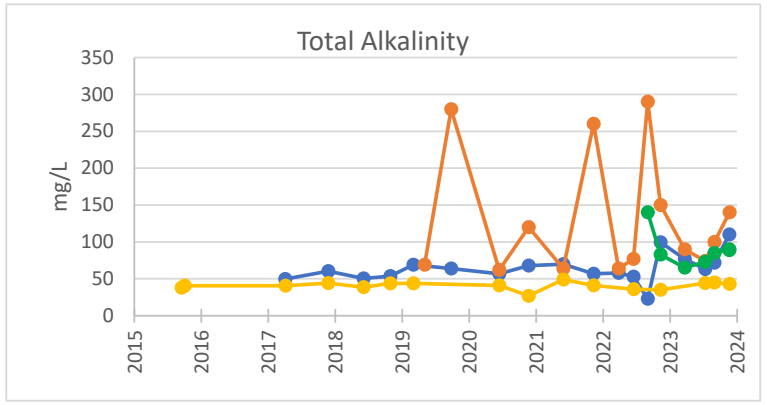



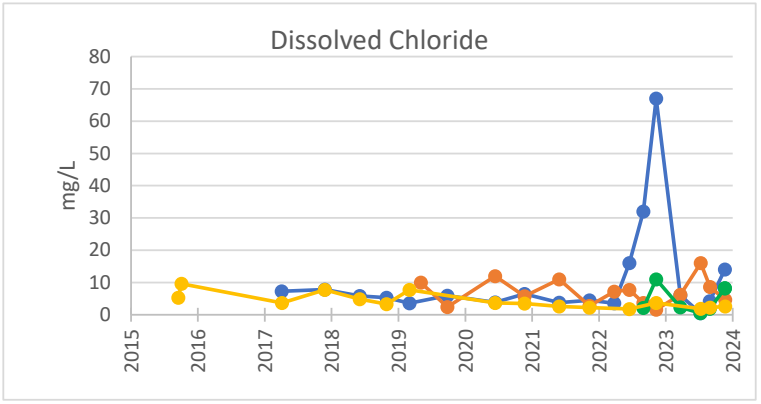



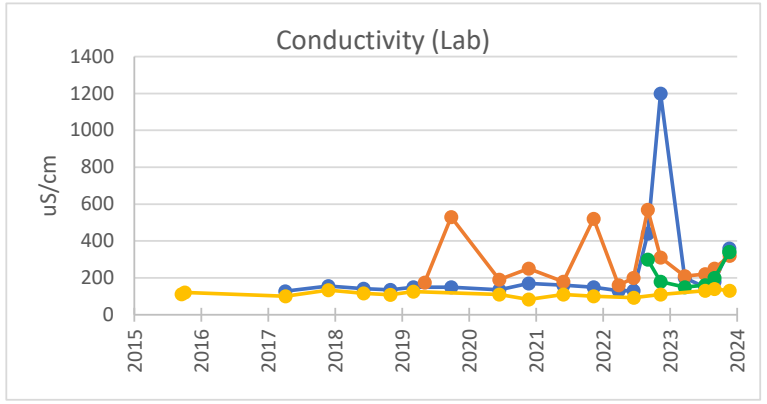



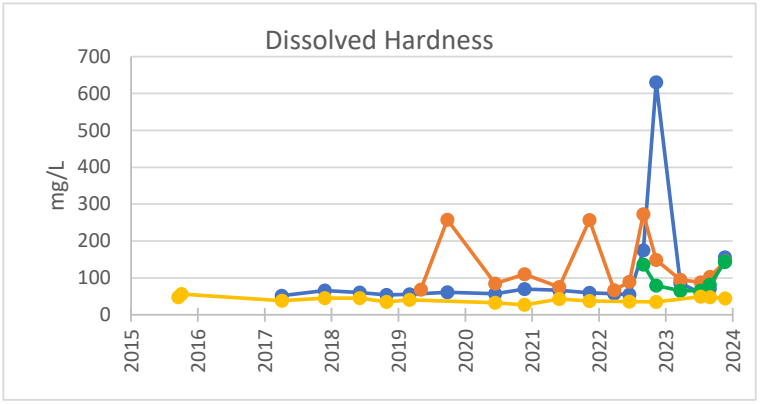
APPENDIX I
CONCENTRATION VERSUS TIME - CROSSGRADIENT
2023 ANNUAL OPERATIONS AND MONITORING REPORT
UPLAND NEW LANDFILL

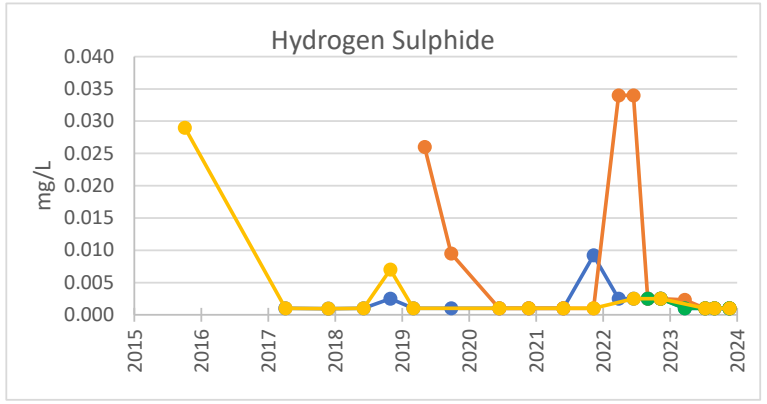


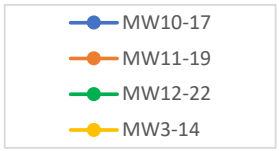



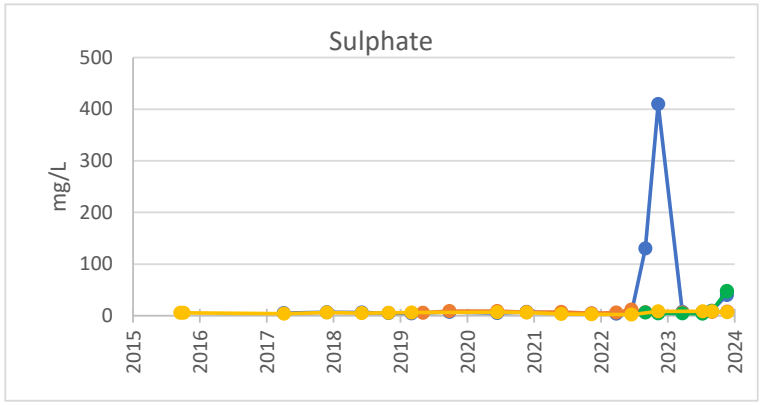



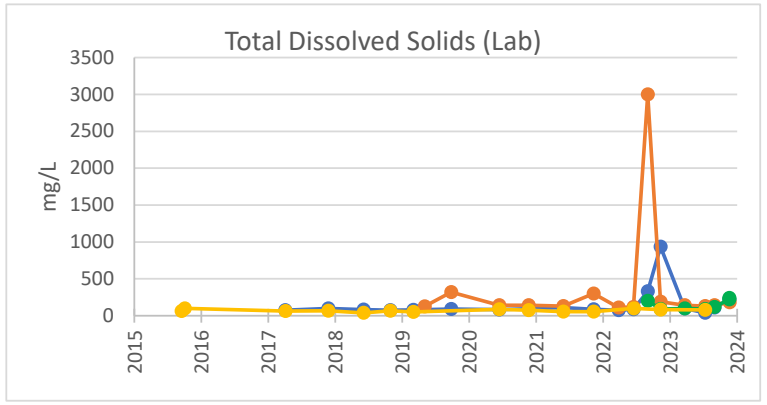



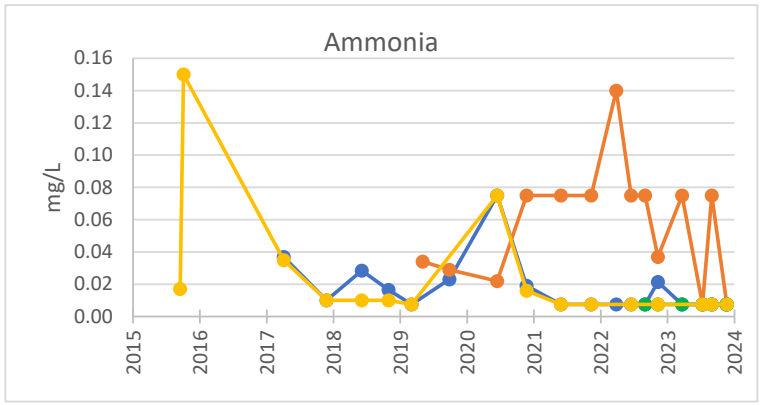



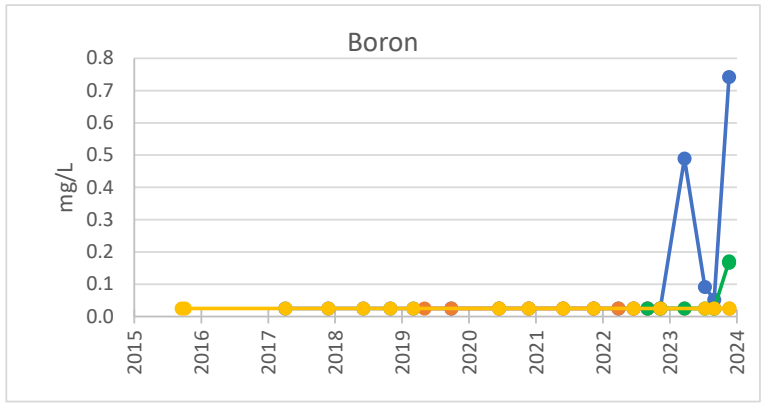



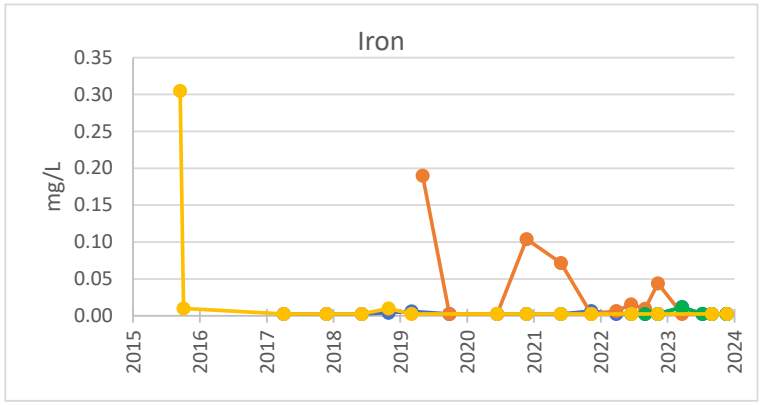

APPENDIX I
CONCENTRATION VERSUS TIME - DOWNGRADIENT
2023 ANNUAL OPERATIONS AND MONITORING REPORT
UPLAND NEW LANDFILL

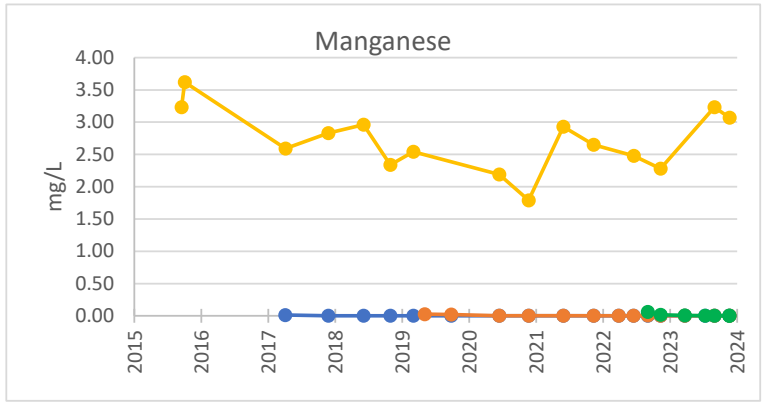


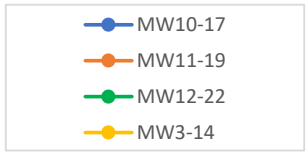




APPENDIX I
CONCENTRATION VERSUS TIME - DOWNGRADIENT
2023 ANNUAL OPERATIONS AND MONITORING REPORT
UPLAND NEW LANDFILL

# Appendix J

## 2024 Environmental Monitoring Program Specification

**Environmental Monitoring Program Specification - 2024**

**PROJECT:** New Landfill EMP

**CLIENT:** Northwin Environmental

**PROJECT NO.:** 11222680.15

**PROJECT MANAGER:** Diana Nowak

| **MONITORING STAFF:** | **RESPONSIBILITY** |
|---|---|
| Kathleen Hasler | Field Lead |
| Debra Tong | Field Secondary |
| Airesse MacPhee | Project Chemist |
| Tristan Habdas | Database Analyst |

**LABORATORIES USED:** ALS Environmental, Burnaby, British Columbia

**AUTHORIZATION:** **MONITORING EVENT(S)** Mar/Apr, Jun, Aug/Sep, Nov **PC/PM SIGNATURE** _____

| Revision # | Date | Revision | GHD |
|---|---|---|---|
| 1 | January 2022 | Specification was developed based on the DOCP, dated July 8, 2021 | RMR |
| 2 | April 2022 | Typo in 2022 EMP Spec was corrected, from MW12-17 to MW11-19. | RMR |
| 3 | August 2022 | MW3-14 was added to the groundwater monitoring program as a downgradient compliance well, to be sampled quarterly. | RMR |
| 4 | August 2022 | MW12-22 was added to the groundwater monitoring program as a downgradient compliance well following its installation, to be sampled quarterly.<br><br>Renamed LS1 to LDMP-1 and renamed LS2 to LDMP-2. Added LDS, LDMP-3, and LDMP-4. These changes were made to the leak detection monitoring program to account for as built conditions.<br><br>Added phenols to the leachate analytical parameter list, to be analyzed annually due to presence of wood waste. | RMR |
| 5 | September 2022 | Updated QA/QC samples. Added LW-PFAS to field blank's analytical list in Q4. | KH |
| 6 | March 2023 | Added semi-annual water level monitoring to the full groundwater well network.<br>Removed East and West surface water ditch from the EMP until final cover is placed on the New Landfill.<br>Added Cell 1 West leachate sump to the quarterly leachate monitoring program. Samples will be collected following the discharge of waste to the cell. | RMR |

| Revision # | Date | Revision | GHD |
|---|---|---|---|
| 7 | May 2023 | Perfluorinated compounds has been discontinued from the leachate analytical list since standards only apply to sites set out in Schedule 2 as item A4, C3, E10 or G1.<br>For monitoring location TLIP, the sampler has been changed from GHD to Upland to reflect current field practices. | RMR |
| 8 | March 2024 | Update project staffing, included S07-24 to the leachate monitoring program. | |


Monitoring Schedule: Table 1
Groundwater Analytical Parameters: Table 2
Surface Water Analytical Parameters: Table 3
Leachate Analytical Parameters: Table 4
Notes: Page 7


**Note for Staff – Labelling error on casing:**

LFG1-22 labelled as “SVP1-22” on casing.
LFG2-22 labelled as “SVP2-22” on casing.

McIvor Lake Sampling Location Reference Photo:

**Environmental Monitoring Program Specification - 2024**
**Monitoring Schedule**
**New Landfill**
**Northwin Environmental, Campbell River, BC**

| Monitoring Location | Purpose | Sample Matrix | Quarterly Hydraulic Monitoring | March/ April | June | August/ September | November |
|---|---|---|---|---|---|---|---|
| **Groundwater Monitoring (19 WL Locations, 12 Sampling Locations)** | | | | | | | |
| ***Upgradient Monitoring Wells (5 Locations)*** | | | | | | | |
| MW6-17 | To monitor upgradient groundwater quality. | WG | Q | √ | √ | √ | √ |
| MW9-17 | To monitor upgradient groundwater quality. | WG | Q | √ | √ | √ | √ |
| MW1-14 | To monitor upgradient groundwater quality. | WG | Q | √ | √ | √ | √ |
| MW4A-15 | To monitor upgradient groundwater quality. | WG | Q | √ | √ | √ | √ |
| MW4B-15 | To monitor upgradient groundwater quality. | WG | Q | √ | √ | √ | √ |
| ***Cross-Gradient Monitoring Wells (2 Locations)*** | | | | | | | |
| MW2-14 | To monitor cross-gradient groundwater quality. | WG | Q | √ | √ | √ | √ |
| MW2A-16 | To monitor cross-gradient groundwater quality. | WG | Q | √ | √ | √ | √ |
| ***Downgradient Compliance Monitoring Wells (4 Locations, 1 Proposed Location)*** | | | | | | | |
| MW10-17 | To monitor downgradient groundwater quality near the east property boundary. | WG | Q | √ | √ | √ | √ |
| MW12-22 | To monitor downgradient groundwater quality at the south property boundary. | WG | Q | √ | √ | √ | √ |
| MW11-19 | To monitor downgradient groundwater quality at the south east corner of the site. | WG | Q | √ | √ | √ | √ |
| MW3-14 | To monitor groundwater quality immediately downgradient of Phase 1 East Landfill Cell. | WG | Q | √ | √ | √ | √ |
| MW13 (proposed) | To monitor groundwater quality immediately downgradient of the landfill. **Sample once installed.** | WG | Q | √ | √ | √ | √ |
| MW5A-15, MW5B-15, MW7-17, MW8-17, MW15A-18, MW15B-18, PZ1-19 | | WG | Q | - | - | - | - |
| **Surface Water Monitoring (4 Monitoring Locations, 2 Sampling Locations)** | | | | | | | |
| Rico Gauge | To **monitor** the water level in Rico Lake via surface water gauge. | N/A | Q | - | - | - | - |
| SW15-02 | To monitor surface water quality in Rico Lake | WS | N/A | - | - | - | √ |
| McIvor Lake | To monitor the water level in McIvor Lake via BC Hydro Data Records - use link in notes below. **Look up and record on day of monitoring event** - data is only available for a limited period on BC Hydro website[1] | N/A | Q | - | - | - | - |
| SW15-01 | To monitor surface water quality in McIvor Lake | WS | N/A | - | - | - | √ |
| **Leachate Monitoring (3 Locations)** | | | | | | | |
| S06-21 | To characteize leachate quality collected from the Leachate Sump at northeast end of Cell 1 West. Sampling location is from the leachate collection system sump riser pipe. | WL | N/A | √ | √ | √ | √ |
| TLIP | To assess leachate treatment performance and determine if changes to the treatment process are required. Upland to collect samples prior to discharge to the treated leachate infiltration pond (TLIP) to assess if quality meets the CSR DW Standards. | WL | N/A | - | - | - | - |
| S07-24 | To characteize leachate quality collected from the Leachate Sump in Cell 1 West. | WL | N/A | √ | √ | √ | √ |
| **Leak Detection Monitoring Program (5 Locations)** | | | | | | | |
| LDS | To monitor leakage at the primary liner of the landfill as part of the Trigger Level Response Plan. If water is present, collect a sample. Acess to the leak detection sump is on the north side of the landfill. | W | Q | √ | √ | √ | √ |
| LDMP-1 | To monitor leakage at the primary liner of the landfill, as part of the Trigger Level Response Plan. Access to the Leak Detection Monitoring Pipe is on the north side of the landfill. **If water is present call PM** | W | Q | - | - | - | - |
| LDMP-2 | To monitor leakage at the primary liner of the landfill, as part of the Trigger Level Response Plan. Access to the Leak Detection Monitoring Pipe is on the north side of the landfill. **If water is present call PM** | W | Q | - | - | - | - |
| LDMP-3 | To monitor leakage at the primary liner of the landfill, as part of the Trigger Level Response Plan. Access to the Leak Detection Monitoring Pipe is on the east side of the landfill. **If water is present call PM** | W | Q | - | - | - | - |
| LDMP-4 | To monitor leakage at the primary liner of the landfill, as part of the Trigger Level Response Plan. Access to the Leak Detection Monitoring Pipe is on the ease side of the landfill. **If water is present call PM** | W | Q | - | - | - | - |
| **Landfill Gas in Soil Monitoring (2 Locations)** | | | | | | | |
| LFG1-22 | To monitor landfill gas migration. | n/a | Q[2] | - | - | - | √ |
| LFG2-22 | To monitor landfill gas migration. | n/a | Q[2] | - | - | - | √ |
| **Field Quality Assurance/Quality Control (QA/QC)[3]** | | | | | | | |
| Field Blank | | WG | - | √ | √ | √ | - |
| Trip Blank - BTEX/VPH Only | | WL/W | - | - | - | - | √ |
| Groundwater Duplicate | | WG | - | √ | √ | √ | √ |
| Leachate Duplicate | | WL | - | √ | √ | √ | - |

**Notes:**

[1] - McIvor Lake water level. Look up current water level at the Ladore Dam: https://www.bchydro.com/energy-in-bc/operations/transmission-reservoir-data/previous-reservoir-elevations/vancouver_island/ladore_ldr.html

[2]- Collect water level only if screen is blocked and a landfill gas in soil cannot be measured.

[3] - The number of QC samples should be 20% of all samples collected within 48 hours of each other;
and include duplicate, field blank, and trip blank samples for each parameter. Add QA/QC samples to the November event if 20% has not been reached.

**Table 2**

**Environmental Monitoring Program Specification - 2024**
**Groundwater Analytical Parameters**
**New Landfill**
**Northwin Environmental, Campbell River, BC**

| Groundwater (WG) | Quarterly | | | |
|---|---|---|---|---|
| | Mar/Apr | Jun | Aug/Sep | Nov |
| **Water Level Monitoring** | | | | |
| Depth to Water | √ | √ | √ | √ |
| Depth to Bottom | √ | √ | √ | √ |
| **Field Parameters** | | | | |
| Conductivity (uS/cm) | √ | √ | √ | √ |
| Oxidation reduction potential (mV) | √ | √ | √ | √ |
| pH (s.u.) | √ | √ | √ | √ |
| Temperature (deg C) | √ | √ | √ | √ |
| Total dissolved solids (mg/L) | √ | √ | √ | √ |
| Turbidity (ntu) | √ | √ | √ | √ |
| **General Chemistry** | | | | |
| Alkalinity (Speciated) | √ | √ | √ | √ |
| Conductivity | √ | √ | √ | √ |
| Chloride | √ | √ | √ | √ |
| Sulphate | √ | √ | √ | √ |
| Total Sulphide (Low Level) + $H_2S$ Calc | √ | √ | √ | √ |
| Total Sulphide, Un-ionized (as $H_2S$) (Calc) | √ | √ | √ | √ |
| Nitrate (as N) | √ | √ | √ | √ |
| Nitrite (as N) | √ | √ | √ | √ |
| Nitrite/Nitrate (N+N) | √ | √ | √ | √ |
| Orthophosphate | √ | √ | √ | √ |
| Total Dissolved Solids (TDS) | √ | √ | √ | √ |
| **Nutrients** | | | | |
| Ammonia Nitrogen | √ | √ | √ | √ |
| **Metals** | | | | |
| Dissolved CSR Metals (Incl. Hg) | √ | √ | √ | √ |
| Dissolved Hardness (as $CaCO_3$) | √ | √ | √ | √ |
| **Other** | | | | |
| LEPH/HEPH (Incl. PAH/EPH) | √ | √ | √ | √ |

**Table 3**

**Environmental Monitoring Program Specification - 2024**
**Surface Water Analytical Parameters**
**New Landfill**
**Northwin Environmental, Campbell River, BC**

| Surface Water (WS) | Quarterly | | | |
|---|---|---|---|---|
| | Mar/Apr | Jun | Aug/Sep | Nov |
| **Water Level Monitoring** | | | | |
| Water level at Rico Gauge | √ | √ | √ | √ |
| Record water level using BC Hydro Data Records - use link in Table 1. | √ | √ | √ | √ |
| **Field Parameters** | | | | |
| Conductivity (uS/cm) | √ | √ | √ | √ |
| Oxidation reduction potential (mV) | √ | √ | √ | √ |
| pH (s.u.) | √ | √ | √ | √ |
| Temperature (deg C) | √ | √ | √ | √ |
| Total dissolved solids (mg/L) | √ | √ | √ | √ |
| Turbidity (ntu) | √ | √ | √ | √ |
| **General Chemistry** | | | | |
| Alkalinity (Speciated) | √ | √ | √ | √ |
| Conductivity | √ | √ | √ | √ |
| Chloride | √ | √ | √ | √ |
| Sulphate | √ | √ | √ | √ |
| Total Sulphide (Low Level) + $H_2S$ Calc | √ | √ | √ | √ |
| Total Sulphide, Un-ionized (as $H_2S$) (Calc) | √ | √ | √ | √ |
| Nitrate (as N) | √ | √ | √ | √ |
| Nitrite (as N) | √ | √ | √ | √ |
| Nitrite/Nitrate (N+N) | √ | √ | √ | √ |
| Orthophosphate | √ | √ | √ | √ |
| Total Suspended Solids (TSS) | √ | √ | √ | √ |
| **Nutrients** | | | | |
| Ammonia Nitrogen | √ | √ | √ | √ |
| **Metals** | | | | |
| Total CSR Metals (Incl. Hg) | √ | √ | √ | √ |
| Dissolved Hardness (as $CaCO_3$) | √ | √ | √ | √ |
| **Other** | | | | |
| LEPH/HEPH (Incl. PAH/EPH)[1] | - | - | - | - |

1 - If leachate concentrations for LEPH/HEPH are 80% within CSR 3.2 Aquatic Life Criteria, include LEPH/HEPH analysis in surface water during the next event

**Table 4**

**Environmental Monitoring Program Specification - 2024**
**Leachate Analytical Parameters**
**New Landfill**
**Northwin Environmental, Campbell River, BC**

| Leachate (WL) | Quarterly | | | |
|---|---|---|---|---|
| | Mar/Apr | Jun | Aug/Sep | Nov |
| **Water Level Monitoring** | | | | |
| Depth to Water | √ | √ | √ | √ |
| Depth to Bottom | √ | √ | √ | √ |
| **Field Parameters** | | | | |
| Conductivity (uS/cm) | √ | √ | √ | √ |
| Oxidation reduction potential (mV) | √ | √ | √ | √ |
| pH (s.u.) | √ | √ | √ | √ |
| Temperature (deg C) | √ | √ | √ | √ |
| Total dissolved solids (mg/L) | √ | √ | √ | √ |
| Turbidity (ntu) | √ | √ | √ | √ |
| **General Chemistry** | | | | |
| Alkalinity (Speciated) | √ | √ | √ | √ |
| Conductivity | √ | √ | √ | √ |
| Chloride | √ | √ | √ | √ |
| Sulphate | √ | √ | √ | √ |
| Total Sulphide (Low Level) + $H_2S$ Calc | √ | √ | √ | √ |
| Total Sulphide, Un-ionized (as $H_2S$) (Calc) | √ | √ | √ | √ |
| Nitrate (as N) | √ | √ | √ | √ |
| Nitrite (as N) | √ | √ | √ | √ |
| Nitrite/Nitrate (N+N) | √ | √ | √ | √ |
| Orthophosphate | √ | √ | √ | √ |
| Biological Oxygen Demand (Total) (BOD5) | √ | √ | √ | √ |
| Chemical Oxygen Demand (COD) | √ | √ | √ | √ |
| Total Dissolved Solids (TDS) | √ | √ | √ | √ |
| Total Suspended Solids (TSS) | √ | √ | √ | √ |
| **Nutrients** | | | | |
| Ammonia Nitrogen | √ | √ | √ | √ |
| **Metals** | | | | |
| Total CSR Metals (Incl. Hg) | √ | √ | √ | √ |
| Dissolved Hardness (as $CaCO_3$) | √ | √ | √ | √ |
| **Other** | | | | |
| LEPH/HEPH (Incl. PAH/EPH) | √ | √ | √ | √ |
| BTEX/VPH | - | - | - | √ |
| Chlorinated phenols + Non-chlorinated Phenols + Nitrophenols + Hydroxy Phenols | - | - | - | √ |

**Table 5**

**Environmental Monitoring Program Specification - 2024**
**Leak Detection Water Analytical Parameters**
**New Landfill**
**Northwin Environmental, Campbell River, BC**

| Leak Detection Water (W) | Quarterly | | | |
|---|---|---|---|---|
| | Mar/Apr | Jun | Aug/Sep | Nov |
| **Water Level Monitoring** | | | | |
| Depth to Water | √ | √ | √ | √ |
| Depth to Bottom | √ | √ | √ | √ |
| **Field Parameters** | | | | |
| Conductivity (uS/cm) | √ | √ | √ | √ |
| Oxidation reduction potential (mV) | √ | √ | √ | √ |
| pH (s.u.) | √ | √ | √ | √ |
| Temperature (deg C) | √ | √ | √ | √ |
| Total dissolved solids (mg/L) | √ | √ | √ | √ |
| Turbidity (ntu) | √ | √ | √ | √ |
| **General Chemistry** | | | | |
| Alkalinity (Speciated) | √ | √ | √ | √ |
| Conductivity | √ | √ | √ | √ |
| Chloride | √ | √ | √ | √ |
| Sulphate | √ | √ | √ | √ |
| Total Sulphide (Low Level) + $H_2S$ Calc | √ | √ | √ | √ |
| Total Sulphide, Un-ionized (as $H_2S$) (Calc) | √ | √ | √ | √ |
| Nitrate (as N) | √ | √ | √ | √ |
| Nitrite (as N) | √ | √ | √ | √ |
| Nitrite/Nitrate (N+N) | √ | √ | √ | √ |
| Orthophosphate | √ | √ | √ | √ |
| Biological Oxygen Demand (BOD) | √ | √ | √ | √ |
| Chemical Oxygen Demand (COD) | √ | √ | √ | √ |
| Total Dissolved Solids (TDS) | √ | √ | √ | √ |
| Total Suspended Solids (TSS) | √ | √ | √ | √ |
| **Nutrients** | | | | |
| Ammonia Nitrogen | √ | √ | √ | √ |
| **Metals** | | | | |
| Total CSR Metals (Incl. Hg) | √ | √ | √ | √ |
| Dissolved Hardness (as $CaCO_3$) | √ | √ | √ | √ |
| **Other** | | | | |
| LEPH/HEPH (Incl. PAH/EPH) | √ | √ | √ | √ |
| BTEX/VPH | - | - | - | √ |
| Phenols | - | - | - | √ |

ghd.com

The Power of Commitment