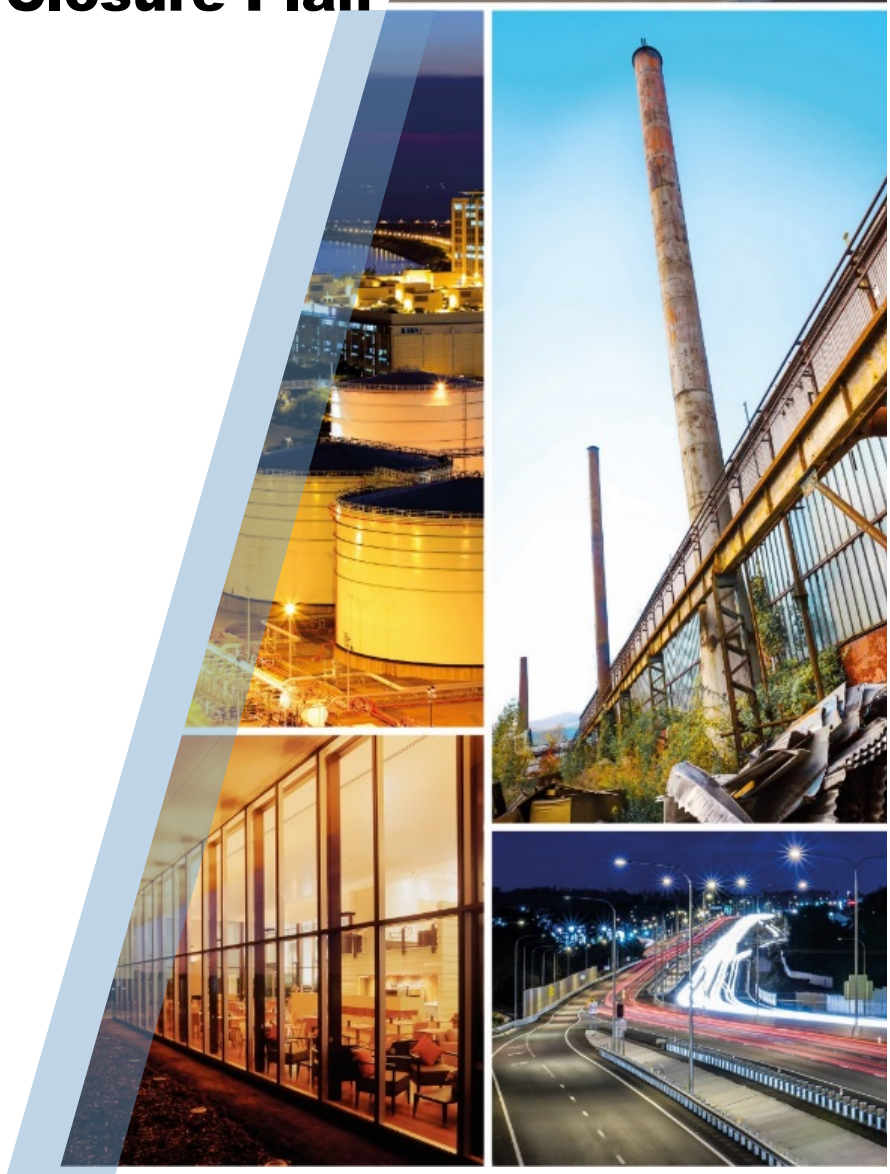
Original Landfill Operations and Closure Plan

Revision 1



Upland Excavating

Record of Revision

Revision No.	Date (mm-dd-yr)	Revision Description
1	10-04-19	This Report is an update to the May 22, 2019 Operations and Closure Plan for the Original Landfill.

Table of Contents

1. Introduction 1
   - 1.1 Site Location 1
   - 1.2 Site Layout 1
   - 1.3 Regulatory Setting 2
     - 1.3.1 Permit PR-10807 2
     - 1.3.2 Operational Certificate 2
2. Existing Conditions 2
   - 2.1 Un-lined Waste Discharge Area 2
   - 2.2 Lined Cell 2
   - 2.3 Existing Waste Types 4
     - 2.3.1 Un-lined Discharge Area Waste Types 4
     - 2.3.2 Lined Cell Waste Types 4
3. Lifespan Analysis 4
   - 3.1 Waste Acceptance 5
   - 3.2 Landfill Layout 5
4. Filling Plan 5
5. Stormwater Management Plan 6
   - 5.1 Objectives 6
   - 5.2 Stormwater Management Overview 6
6. Leachate Management Plan 6
   - 6.1 Objectives 6
   - 6.2 Leachate Quantity 7
     - 6.2.1 Conceptual Leachate Generation Model 7
   - 6.3 Leachate Quality 8
     - 6.3.1 Original Landfill Leachate Quality 9
   - 6.4 Leachate Management Overview 10
7. Environmental Monitoring Program 11
   - 7.1 Compliance Criteria 11
     - 7.1.1 Leachate Indicator Parameters 11
   - 7.2 Monitoring Activities 12
   - 7.3 Proposed Amendments to the Environmental Monitoring Program 13
   - 7.4 LFG Monitoring 13
8. Original Landfill Operations 13
   - 8.1 Authorized Wastes 13

8.2 C&D Waste Acceptance Policy 14
8.3 Soil Acceptance Plan 14
8.4 Director Approved Waste 15
8.5 Landfilling of Waste 15
8.6 Cover Placement 15
8.6.1 Daily Cover 15
8.6.2 Intermediate Cover 16
8.6.3 Final Cover 16
8.7 Leachate Removal 16
8.8 Hours of Operations 16
8.9 Nuisance Controls 17
8.9.1 Dust Control 17
8.9.2 Odour Control 17
8.9.3 Litter Control 17
8.9.4 Noise Control 18
8.10 Vector and Wildlife Management 18
8.11 Scavenging 18
8.12 Site Health and Safety Plan 18
8.13 Site Security and Signage 18
8.14 Weigh Scale 19
8.15 Traffic Volumes 19
8.16 Operational Personnel 19
8.17 Operator Training 20
8.18 Equipment Requirements 20
8.19 Winter and Wet Weather Operation 20
8.20 Reporting Requirements 21
8.20.1 Inspection and Record Keeping 21
8.20.2 Annual Operations and Monitoring Report 21
9. Closure Plan 22
9.1 Total Capacity of the Original Landfill 22
9.2 Final Closure Design 22
10. Contaminating Lifespan 23
11. Financial Security Plan 23
11.1 Closure Costs 23
11.2 Post-Closure Operations, Monitoring and Maintenance 24
11.3 Contingency Costs 24
11.4 Financial Contingency 24
11.5 Discount and Inflation Rates 24

11.6 Cost Estimation 25
12. Contingency Plan 25
13. References 26

Figure Index

Figure 1.1 Site Location Map
Figure 1.2 Site Layout Plan
Figure 2.1 Existing Conditions
Figure 3.1 Final Contours
Figure 4.1 Perimeter Berm Height Extension
Figure 7.1 Environmental Monitoring Locations
Figure 7.2 Leak Detection Monitoring Pipe Extension
Figure 7.3 Leachate Monitoring Riser Pipe

Figure Index (In-Text)

Figure 6.1 Schematic of Leachate Management Plan 11

Table Index

Table 6.1 Climate Data
Table 6.2 Monthly Leachate Generation Estimates
Table 6.3 Leachate Analytical Results
Table 11.1 Closure, Post-Closure and Contingency Cost Estimate
Table 11.2 Rates Used in Financial Security Calculation
Table 11.3 Financial Security Calculation

Table Index (In-Text)

Table 2.1 Lined Cell Waste Type Volumes 4
Table 3.1 Original Landfill Lifespan Analysis 5
Table 6.1 Estimated Monthly Leachate Volume 8
Table 8.1 Applicable Exposure Pathway 14
Table 9.1 Total Capacity 22
Table 11.1 Financial Security Summary 25

Appendix Index

Appendix A	Operational Certificate
Appendix B	Environmental Monitoring Program
Appendix C	Exposure Pathway Assessment for Soil Acceptance at the Lined Cell of the Original Landfill
Appendix D	Soil Acceptance Agreement
Appendix E	Soil Screening Process

1. Introduction

GHD was retained by Upland Excavating Ltd. (Upland) to prepare an Operations and Closure Plan (OCP) for the Original Landfill on the Upland property (Site). The OCP has been prepared to satisfy the requirements of the Operational Certificate (OC) Section 2.3 and includes information identified in the relevant items listed in the British Columbia (BC) Landfill Criteria for Municipal Solid Waste, Second Edition, dated June 2016 (Landfill Criteria). As specified in the OC, the following items listed in Landfill Criteria Section 10.3 Design, Operations and Closure Plan (DOCP) apply to this OCP:

- Site layout plan
- Filling plan
- Lifespan analysis table
- Storm water management plan
- Leachate management plan
- Environmental monitoring plan
- Operations plan
- Closure plan

Additionally, the OC specifies that the following information to be provided in the OCP:

- Contaminated soil acceptance plan.
- Financial security plan prepared in accordance with Section 8 of the Landfill Criteria.

1.1 Site Location

The Site is located at 7295 Gold River Highway, approximately 7 kilometres (km) southwest of Campbell River, BC. 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 parcels use in the forestry industry. The legal description is Lot A, District Lot 85, Plan 30709, Sayward District. A Site location map is presented in Figure 1.1.

1.2 Site Layout

The Site is approximately 48 hectares in size and is accessed from the north via an entrance from Gold River Highway. The Site encompasses a sand and gravel pit (Pit) that has been in operation since 1969 under Mines Act Permit G-8-114 issued December 1989 (Last amended February 2014). The Pit is approximately 20 metres (m) deep. The main access road is a gravel perimeter road that runs from the Site office and Site entrance around the Pit.

The Original Landfill waste management area is located outside the Pit near the southeast corner of the Site, as shown in the Site Layout Plan on Figure 1.2. The Original Landfill waste management area is accessed via two smaller access roads that connect the main access road.

1.3 Regulatory Setting

1.3.1 Permit PR-10807

Permit PR-10807 was issued for the Original Landfill on June 1, 1992 (Permit). In accordance with the approved Comox Valley Regional District Solid Waste Management Plan (SWMP), Upland has submitted an application in June 2015 to replace Permit PR-10807 with a new Operational Certificate. The Ministry of Environment & Climate Change Strategy (ENV) issued the OC on August 1, 2019 (Appendix A).

1.3.2 Operational Certificate

The OC authorizes a New Landfill on-Site as well as continued discharge to the existing original lined cell prior to the construction of the New Landfill. Under the OC, the maximum rate of waste discharged to the original lined cell is 45,000 tonnes per calendar year. Wastes authorized for discharge by the OC include demolition waste, construction waste, land clearing debris, soil meeting applicable Contaminated Sites Regulation (CSR) industrial land use standards, sludge from the leachate management works and any other waste authorized by the Director.

Ultimately all waste from the Original Landfill, including waste discharge before the date of issuance of the OC, and any waste authorized pursuant of the OC, will to be exhumed and discharged to the New Landfill.

2. Existing Conditions

The Original Landfill is located within the existing waste management area of the Site. The existing original waste management area includes an approximate 0.7 hectare (ha) un-lined cell and an existing 0.72 ha (85 m x 85 m) lined cell, material sorting area, leachate treatment equipment, and related appurtenances, as shown on Figure 2.1.

2.1 Un-lined Waste Discharge Area

The un-lined waste discharge area has received waste since the early 1990s. The waste deposited in this area includes wood waste, ash and burning residue, construction and demolition (C&D) waste. Landfilling in the un-lined area was discontinued once the Original Landfill lined cell was constructed. Pursuant the OC, no further discharge is authorized to occur to the un-lined area.

2.2 Lined Cell

The lined cell was constructed in April 2015 to contain solid waste imported to the Site. The cell is equipped with two 20 mil Coated Woven Polyethylene (CWPE) liners with the dimensions 85 by 85 m and a leak detection layer between the two liners.

The leak detection layer consists of a 0.3 m granular material and a 100 millimetre (mm) polyvinyl chloride (PVC) riser pipe that extends from within the granular layer at the toe of the slope of the north and east perimeter berms to the top of the berms. The riser pipe may be used to determine, if water is present in the leak detection layer and take water level measurements, if applicable.

The lined cell, from the bottom to top, is constructed as follows:

- Levelled subgrade
- A 0.3 m thick compacted and smooth sand grading layer
- Lower CWPE 20 mil liner
- Minimum 0.3 m thick granular leak detection layer
- Upper CWPE 20 mil liner
- 0.3 m thick granular protection layer
- Waste intermediate cover soil

The cell base is constructed to provide a slight slope to the northeast for the lower leak detection later and a slight slope to the northwest for the drainage on the upper liner layer.

Leachate Management

The lined cell is equipped with a leachate sump and leachate extraction chamber located within the lined cell near the west side of the cell. Three 2,500 US gallon (9.46 cubic metres) tanks are installed partially buried, adjacent to the northeast corner of the cell. The leachate sump allows leachate to enter the chamber through the granular drain rock at the base of the sump. Leachate levels may be observed in the leachate sump and leachate may also be extracted via the sump. The leachate extraction chamber consists of a 0.6 m diameter corrugated high-density polyethylene (HDPE) pipe installed on end into drain rock. A PVC pipe is located along the northern berm and is available to pump leachate from the sump to the leachate storage tanks available for temporary leachate storage, as required.

Water Management

The lined cell is bound by perimeter containment berms. The interior slopes of the perimeter containment berms are approximately 1.5H:1V to 2H:1V. The perimeter containment berms on the north, east and south sides of the cell are approximately four to five metres tall. The perimeter containment berm on the west is approximately two to three metres tall. The west berm is lower to allow operational access to the cell, and to allow for clean stormwater run off to leave the cell when intermediate soil is applied.

Cover Soil

The existing intermediate cover soil consists of imported fill. The approximate 10,700 tonnes of soil used for cover were imported from the Salmon River Dam Decommissioning Project. The soil quality meets the CSR Residential Standards, as of September 2017. The intermediate cover soil thickness ranges in depth across the Original Landfill, with a minimum of 0.3 m. The waste and cover soil is graded from east to west to allow for stormwater runoff. The slope of the cover soil as of December 2017 is approximately one to two percent (%).

Access Road

The waste management area access roads are gravel topped and relatively flat, except for a ramp into the lined cell. The roads provide all weather access roads to haul trucks, maintenance trucks, and equipment.

2.3 Existing Waste Types

2.3.1 Un-lined Discharge Area Waste Types

As shown on Figure 1.2, the existing un-lined area is located adjacent to the lined cell within the boundaries Original Landfill waste management area, however, the exact limit of waste is currently unknown. The location of the limit of waste will be determined upon final closure.

The waste in the un-lined area has an estimated thickness of up to 5 m. The estimated volume of waste is estimated as 35,000 cubic metres (m^3), as reported in the Location and Volume of Existing Waste letter addressed to the ENV, dated May 12, 2017. The waste consists of the following types:

- Land clearing waste – approximately 25,000 m^3.
- Combustion residue – approximately 10,000 m^3.

2.3.2 Lined Cell Waste Types

The estimated volume of waste in the lined cell is 4,446 m^3 of the following types:

Table 2.1 Lined Cell Waste Type Volumes

Waste Type	Source Location	Approximate Tonnes	Approximate Volume (m^3)	Year Discharged to Lined Cell
Contaminated Soil	Squamish, BC	3,784	2,100	2015
Contaminated Soil	Campbell River, BC	724	480	July 2015
Contaminated Soil	Campbell River, BC	496	330	September 2015
Demolition Debris	Courtenay, BC	114	114	2017
Treated Wood/Demolition Debris	Campbell River, BC	1,275	1,275	August to October 2017
Wood waste	Campbell River, BC	147	147	2018
Total		**6,540**	**4,446**	

The above table is current to the end of 2018.

3. Lifespan Analysis

Under the draft OC, the original lined cell is permitted to receive 45,000 tonnes of waste per calendar year. Authorization to discharge waste to the original lined cell ceases on the earlier of:

- Original lined cell is filled to capacity with side slope grades no steeper than 3H:1V (33%).
- Commencement of waste discharge to the New Landfill.

3.1 Waste Acceptance

Waste is accepted at the Original Landfill by appointment only.

The wastes authorized for discharge into the original lined cell are listed in Section 1.1.2 of the OC.

A Soil Acceptance Plan is provided in Section 8.3.

3.2 Landfill Layout

The final conditions of the lined cell include 3H:1V side slopes on all sides and a landfill plateau approximately 7.7 m by 16.4 m. The final contours are shown on Figure 3.1. The total volume of the landfill is approximately 38,000 m^3, with 35,300 m^3 available for waste.

The lined cell has a lifespan of just over one year, as shown in Table 3.1 below. The lifespan has been calculated based on the maximum allowable annual fill rate, the geometry of the original lined cell and the apparent density of the anticipated wastes. Existing contours are based on survey data from December 2018. The estimated apparent density of the anticipated waste is approximately 1.3 tonnes per m^3, based on average typical density of C&D waste, land clearing waste and soil.

Table 3.1 Original Landfill Lifespan Analysis

Year	Annual Waste Disposal Rate – tonnes	Annual Airspace Consumption[1] – m^3	Cumulative Waste -In Place – tonnes	Cumulative Airspace Consumption[2] – m^3
Existing	-	-	6,540	4,446
Year 1	45,000	34,615	41,155	39,061
Year 2	890	685	41,840	39,746
Total	**45,890**	**35,300**	**89,535**	**83,253**

[1] Apparent density of 1.3 tonnes/m^3 obtained from the average of the following waste streams:
1. Waste soil – 1.6 tonnes/m^3
2. Construction and Demolition waste – 1.0 -1.2 tonnes/m^3

[2] From Table 2.1

4. Filling Plan

The Original lined cell will be filled as a single cell, generally from east to west. The major activities during filling include:

- Extension of berm height around the perimeter of the lined cell. Figure 4.1 shows the perimeter berm height extension details, including an extension of the 20 mil liner up the side slopes of the berm.
- Removal of intermediate cover from area to be landfilled.
- Construction of containment berms around the active portion of the cell.
- Application of intermediate cover at the earliest opportunity, and no larger than 30 days after landfilling in an area.
- Grading of intermediate cover to promote drainage of clean stormwater away from active areas.

5. Stormwater Management Plan

Stormwater runoff at the Site is directed towards the Pit where aggregate extraction and production activities are carried out. The Stormwater Management Plan (SWMP) provided herein has been developed for the Original Landfill objectives.

5.1 Objectives

The objectives of the Original Landfill SWMP are as follows:

- The runoff from the lined cell is conveyed away from the Original Landfill in a manner that does not cause erosion or possible damage to the Landfill cell.
- The runoff from the watershed around the lined cell is conveyed and directed away from the lined cell to minimize stormwater contact with waste, and minimize leachate generation.
- Minimize potential for on-site erosion and sediment loading to the base of the Pit (there are no downstream water courses that will be impacted by sediment loading).

This SWMP has been developed for the Original Landfill only.

5.2 Stormwater Management Overview

The SWMP includes the following elements:

- Operational berms will be constructed of clean soil to contain areas receiving waste.
- Operational berms will promote infiltration of stormwater coming in contact with waste (from precipitation) into the cell's leachate collection system.
- Perimeter berms will be maintained to ensure that water coming into contact with daily cover or exposed waste remains within the lined cell and is separate from the clean stormwater runoff.
- Stormwater runoff from areas with intermediate cover consisting of minimum 300 mm of clean soil or from areas with final cover, is considered clean water and will be managed with the overall Site stormwater management system.
- Intermediate cover will be sloped to promote clean stormwater run-off and reduce stormwater infiltration through the cover soil.
- As there are no natural surface water outlets on-Site, clean stormwater will infiltrate into the groundwater aquifer below the Site.

6. Leachate Management Plan

6.1 Objectives

The objective of the leachate management plan is to collect and dispose of leachate generated in the lined cell to ensure protection of groundwater. The un-lined cell of the Original Landfill will remain closed and will continue to act as a natural attenuation landfill.

The leachate generation in the lined cell will be minimized by:

- Maintaining a small active face.
- Applying appropriate intermediate cover at the earliest opportunity.
- Promoting clean stormwater diversion away from the Original Landfill.
- Minimizing clean stormwater infiltration through intermediate cover soil.

6.2 Leachate Quantity

The principal factors governing the quantity of leachate generated at a landfill include:

- Moisture addition, either through precipitation through the landfill surface or water present in the waste mass.
- Thickness of refuse layer.
- Compaction and permeability of refuse mass.
- Slope, thickness and permeability of cover soils.

Leachate quantities were estimated using the Water Balance Method (WBM), which is based on the principle of conservation of mass and accounts for the total amount of precipitation falling onto a landfill. The WBM was initially developed by Thornthwaite and Mather (1957) for quantifying evapotranspiration and adapted Landfill applications, as described by McBean et al., (1995). The method uses the following equation to estimate the total amount of water infiltrating the landfill:

Infiltrate = Precipitation – Surface Runoff – Soil Moisture Storage – Evapotranspiration

The basic assumptions of the water balance model are:

- The only source of percolation is direct precipitation on the landfill surface. All stormwater run-off from adjacent areas is diverted away from the landfill.
- Groundwater does not enter the landfill.
- Landfill water movement is only vertically downward.
- The Landfill is at field capacity at the start of the calculations.
- Leachate is not recycled nor is other liquid co-disposed.

6.2.1 Conceptual Leachate Generation Model

A conceptual leachate generation model for the lined cell was developed based on an intermediate condition of partial filling of the lined cell, wherein 50% of the landfill footprint is open/active and 50% of landfill footprint is covered with 300 mm of intermediate cover soils. In areas of active filling, stormwater run-off will be contained and infiltrated into the landfill as leachate, and therefore will be added back into the WBM equation.

Input parameters to the WBM equation were estimated as follows:

- Monthly precipitation data were obtained from the Campbell River Airport (Station 1021262) 1981 to 2010 Climate Normals (Table 6.1).

- Stormwater run-off was calculated using a run-off coefficient of 0.15, based on a surface conditions with sandy soil and average slope (2 to 7% grade) as provided by McBean et al. (1995).
- Soil moisture storage capacity of the soil was based on soil thickness and soil type and vegetation root depth. The intermediate cover soil will consist of sand and be either un- vegetated or be seeded with shallow-rooted vegetation. The corresponding available soil moisture of 2 inches (50.8 mm) was used in the equation (McBean et al., 1995).
- Monthly evapotranspiration values were determined based on monthly temperatures at Campbell River Airport (Table 6.1) and the yearly heat index, adjusted for monthly sunlight duration based on the Site latitude. Values were obtained using tables provided in McBean et al. (1995).

The monthly leachate generation estimates are provided in Table 6.2 following the text. Based on the results of the WBM and the conceptual model, an estimated 7,139 m^3 of leachate will generated annually. As summarized in Table 6.1 below, the majority will be generated between the months of October and April.

Table 6.1 Estimated Monthly Leachate Volume

Month	Estimated Monthly Leachate Volume (m^3)
January	1,413
February	913
March	711
April	299
May	37
June	34
July	21
August	24
September	30
October	762
November	1,424
December	1,470
Total	**7,139**

6.3 Leachate Quality

Typical construction and demolition (C&D), land clearing, and contaminated soil waste leachate is a mixture of organic and inorganic compounds produced from refuse materials by a combination of physical, chemical and biochemical processes. Physical processes, related to leachate generation, involve the flushing and dissolution of pollutants as water percolates through the refuse material. Chemical processes, including ion exchange, sorption/desorption, and change in pH, contribute to leachate production by enhancing the mobilization of various pollutants (leachate constituents). Biological processes contribute to leachate production via the degradation of organic constituents into simpler and more mobile compounds.

Leachate produced from typical Demolition, Land Clearing and Construction (DLC) waste landfills is generally considered to be less threatening to human health and the environment compared to leachate from other types of disposal facilities, such as municipal solid waste (MSW) landfills that contain large quantities of putrescible waste.

Leachate treatment systems are designed and operated on a site specific basis to address the site specific leachate. Common leachate constituents found in C&D landfill leachate are sulphate, arsenic, iron, manganese, Total Dissolved Solids (TDS) and polyaromatoic hydrocarbons (PAHs) which are all readily treatable.

The presence of sulphate in leachate can be attributed to the presence of gypsum drywall in C&D landfills. Gypsum drywall has widely been used as interior walls in construction due to its high fire resistance (Townsend, 2000). When gypsum drywall is landfilled and comes in contact with infiltrating water, calcium and sulphate are released into solution.

In the 1970s to 1980s, wood was preserved with chromated copper arsenate (CCA-treated wood) and used in the construction of decks, patios, gazebos, and other wooden structures. CCA-treated wood in C&D waste landfills contributes to arsenic, chromium, and copper levels in typical C&D waste leachate.

Manganese is found in alloys, paints, and naturally occurs in plant tissue.

High TDS concentrations in C&D leachate are mostly likely attributed to calcium, sulphate and alkalinity ions from the dissolution of gypsum drywall and the leaching of calcium carbonate and calcium hydroxide from concrete.

Creosote is a widely used wood preservative for railway ties, bridge timbers, pilings, utility poles and other large sized timbers. Landfilling of creosote treated timbers may increase the concentration of PAHs in the leachate, however biological activity within the landfill will tend to reduce PAH levels.

Asbestos containing material (ACM) does not affect the quality of the leachate in terms of impacts from the asbestos material, as asbestos does not have the leachability characteristic that distinguished hazardous chemicals, identified in the HWR. ACM is only hazardous, when the potential for asbestos fibres to become airborne prior to and during landfilling. Once landfilled, ACM is an inert material and does not impact leachate quality.

6.3.1 Original Landfill Leachate Quality

Characterization of the Original Landfill leachate was completed through collection and laboratory analysis of leachate samples. Leachate samples were analyzed for general chemistry, nutrients, sulphides, metals (total and dissolved), sulphate, PAHs, VOCs and EPHs. The analytical leachate results collected from the original lined cell are provided in Table 6.3.

Based on analytical results from the leachate samples collected from the original lined cell, the following conclusions were made:

- Leachate is characterized as a weak leachate. The parameters present are indicative of the waste contained within the lined cell.
- The occurrence of PAHs in the leachate is likely derived from the presence of the creosote treated wood waste in the lined cell.

The quality of leachate is not expected to change significantly over the course of Original Landfill operation and development and is forecasted to contain similar parameters to those listed in Table 6.1.

6.4 Leachate Management Overview

The leachate management plan includes the following elements:

- Minimize leachate generation through the use of intermediate cover and tarping of active waste discharge areas.
- Leachate collection/containment within the lined cell.
- Observation of leachate levels in the leachate sump and leachate riser pipes.
- Extraction of leachate from the sump. A PVC pipe located along the northern berm and is available to pump leachate.
- Treatment of leachate preparatory to either infiltration on-Site or transport to an off-Site licensed treatment facility. Treatment of leachate will occur using a flow-through batch treatment system, including aeration, settling and carbon filtration. Treated effluent will be sampled and tested to ensure compliance with the stipulated criteria for infiltrating on-Site or for the off-Site receiving facility acceptance criteria.

As shown on Table 6.1, the vast majority (approximately 98%) of leachate is generated between the months of October and April. As a result, the majority of leachate management activities will be undertaken during the seven wettest months. From October 1 to April 30, leachate levels in the sump and leachate riser pipes will be monitored weekly. It is targeted that leachate levels will remain 0.3 m or less above the base of the sump. Observed leachate elevations of 0.225 m or above (75% of the targeted maximum elevation) will trigger leachate removal from the landfill.

Leachate will be treated on Site using a batch flow through treatment system. Tanks will be set up adjacent to the Original Landfill to provide for aeration, oil-water separation, settling, carbon filtration and storage. Leachate will be pumped through the system at a rate of 6 US GPM (22.7 liters per minute) to allow for sufficient retention time. Effluent will be sampled to determine the discharge quality. Dependent on the quality, the treated leachate will either be transported off-Site to a licensed treatment and disposal facility or discharged to an on-Site infiltration basin. Effluent that meets Contaminated Sites Regulation (CSR) Schedule 3.2 Standards for drinking water protection (DW) standards may be infiltrated on-Site. The design of the infiltration pond is presented in the 2017 DOCP (GHD, May 2017). Effluent that does not meet DW standards will be accepted by Tervita Corporation (Newalta) located in Nanaimo, BC. A schematic of the leachate management plan is provided in Figure 6.1 below.

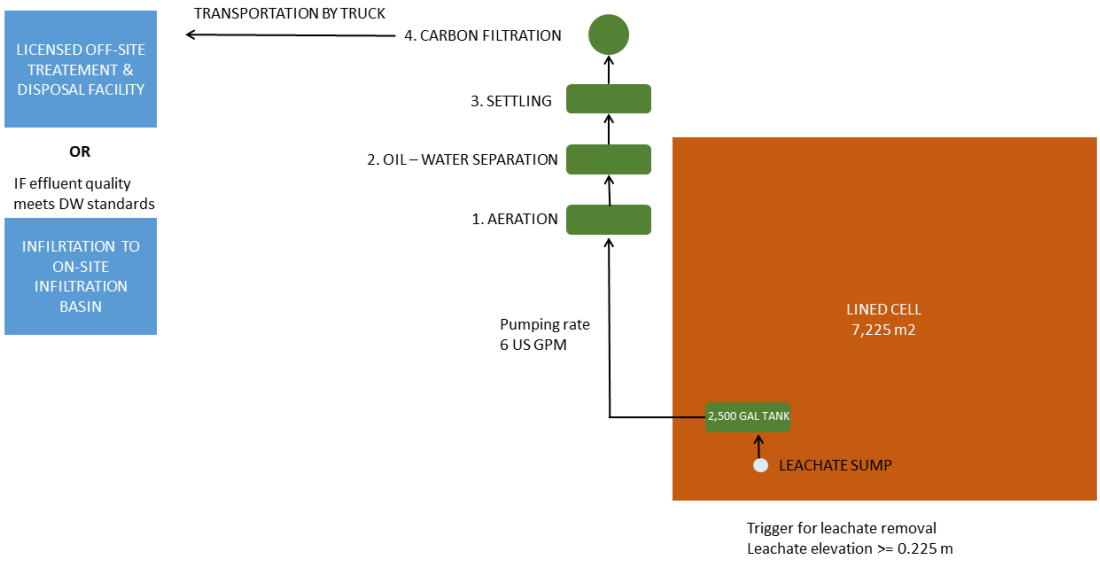


Figure 6.1 Schematic of Leachate Management Plan

7. Environmental Monitoring Program

The Environmental Monitoring Program (EMP) for the Original Landfill was developed to monitor the performance of the landfill in its environmental setting. As provided in the Hydrogeology and Hydrology Characterization Report (HHCR) (GHD, May 31, 2017), the geology underlying the Original Landfill is sand and gravel overburden at least 45 m in thickness. Groundwater within the sand and gravel aquifer flows southeast and generally occurs approximately 35 to 44 m below the Original Landfill area.

The EMP was developed to assess:

- Leachate quality
- Potential Landfill derived impacts to the receiving environment
- Landfill slope stability

7.1 Compliance Criteria

The compliance criteria for the water quality comparison for the on-Site groundwater are the CSR Schedule 3.2 DW standards.

7.1.1 Leachate Indicator Parameters

A number of leachate parameters can be used as indicators of leachate derived impacts within the receiving environment. As chemicals are transported in landfill leachate, concentrations of chemicals can be reduced or attenuated by a variety of processes including dilution, dispersion, sorption, ion exchange and biological degradation. An indicator parameter of landfill derived impacts should be a

chemical which is subject to minimal attenuation so that it can provide an early signal of the presence of leachate in groundwater.

The key leachate indicator parameters selected for the Site are as follows:

- Oxidation reduction potential
- Dissolved hardness
- TDS (lab)
- Conductivity (lab)
- Chloride
- Bicarbonate and total alkalinity
- Sulphur

These parameters are typically elevated in construction and demolition landfill leachate and are therefore used as leachate indicator parameters for the EMP.

7.2 Monitoring Activities

The EMP consists of bi-annual water quality and leachate monitoring and includes the following activities:

- Water level monitoring, field parameter measurement, sample collection and analytical testing of groundwater at five monitoring wells MW2-14, MW2A-16, MW3-14, MW10-17, and MW11-19.
- Water level monitoring at an additional 11 monitoring wells and one piezometer MW1-14, MW4A-15, MW4B-15, MW5A-15, MW5B-15, MW6-17, MW7-17, MW8-17, MW9-17, MW15A-18, MW15B-18, and PZ1-19.
- Surface water level monitoring at Rico Lake and McIvor Lake.
- Field parameter measurement, sample collection and analytical testing at the leak detection system access pipe S01-17.
- Water level monitoring, field parameter measurement, sample collection and analytical testing of leachate from the lined cell at leachate sump S03-19. S02-17 was decommissioned and replaced by S03-19 in March 2019.
- Collection of two field duplicates, one trip blank and one field blank as part of the quality assurance/quality control program.
- Field sample key (FSK) preparation and environmental database updates.

The water quality results are assessed for evidence of leachate derived alterations and compared to the water quality standards for the Site. Groundwater and leak detection water samples are analyzed for general chemistry parameters, nutrients, and dissolved metals. Leak detection water samples are also analyzed for PAHs and VOCs. The environmental monitoring locations are shown on Figure 7.1.

7.3 Proposed Amendments to the Environmental Monitoring Program

The proposed amendments to the environmental monitoring program include:

- Extend the leak detection system access pipe and continue field parameter measurement, sample collection and analytical testing at S01-17.
- Install two leachate access pipe/sampling locations S04 and S05 on the north and south sides of the Landfill (Figure 7.1). Conduct field parameter measurement, sample collection and analytical testing of the leachate bi-annually.

Figure 7.2 presents the details the leak detection system access pipe extension for sample location S01-17, and Figure 7.3 shows the typical installation of a leachate access pipe at S04 and S05.

The EMP specification is provided in Appendix B.

7.4 LFG Monitoring

Landfill gas (LFG) monitoring is not included in the EMP, as there are no receptors for LFG in proximity to the Landfill. In addition, the non-putrescible nature and overall small volume of the waste in the Landfill result in low LFG generation potential. The highly permeable overburden unit at the Site may allow LFG to migrate vertically and to dissipate rapidly, prior to reaching any receptors.

8. Original Landfill Operations

8.1 Authorized Wastes

The following wastes are accepted for discharge to the original lined cell:

- Demolition waste
- Construction waste
- Land clearing waste
- Soil meeting applicable CSR industrial land use standards
- Other waste as authorized in writing by the Director

The following wastes are not authorized:

- Hazardous waste except as authorized pursuant to the HWR
- Controlled waste
- Attractants, and
- Waste and/or recyclable material prohibited in writing by the Director

8.2 C&D Waste Acceptance Policy

Prior to the acceptance of C&D waste, the C&D waste will be subject to a waste screening process. Material from deconstructed houses or renovations, where asbestos is suspected, must be accompanied with a Hazard Assessment, as recommended by WorkSafeBC to assess the presence of asbestos or other hazardous materials. Additional testing to confirm the C&D waste is non-hazardous may be required as per the requirements of the HWR and ENV Technical Guidance. The submitted data will be compared by Upland to the Site acceptance criteria to ensure compliance with the OC. Construction debris from construction completed in 1991 or newer will not require a hazard assessment.

8.3 Soil Acceptance Plan

The Soil Acceptance Plan provides the procedure that will be carried out before soil is accepted for discharge at the lined cell of the Original Landfill including screening, receipt of a signed soil acceptance agreement, and review of documents, if necessary.

Upland is authorized by the ENV under Section 1.1.2(d) of the OC to receive clean soil within the lined cell of the Original Landfill. The OC states that soil discharge must be “soil in which the concentrations of all substances that are less than the lowest applicable industrial land use standard specified for those substances in (i) the generic numerical soil standards and (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.”

Per the OC Section 2.7 (b)(iii), a Qualified Professional is to certify that characterization of fill and soil from sites that may be contaminated is carried out in accordance with ministry procedures and applicable CSR Guidance, Protocols and Procedures prior to acceptance for discharge in the lined cell.

The industrial land use standards applicable to soil accepted for discharge at the lined cell was determined by completing an Exposure Pathway Assessment (Appendix C). The assessment was completed using Protocol 13 as a guide to determine applicable risk based standards. A complete exposure pathway must have a source, a mechanism for transport from the source to one or more human health or ecological receptor, and an exposure route. One complete exposure pathway was determined applicable for the Original Landfill lined cell:

Table 8.1 Applicable Exposure Pathway

Source	Pathway	Receptor	Exposure Pathway Assessment
Soil	Intake of contaminated soil (i.e. ingestion, dermal, dust inhalation, vapour inhalation)	Human (Site Worker and Generator)	Upon acceptance of the contaminated soil, Site workers and the Generator may come in contact with the contaminated soil during handling and landfilling of waste.

Prior to the acceptance of soil, Upland will require a completed Soil Acceptance Agreement (Agreement) and the completion of a soil screening process by Upland staff. The Agreement as presented in Appendix D may be amended from time to time.

The Agreement must be executed before any soil can be accepted. Once accepted, the soil screening process, which is a two phased approach, will be completed. First, Upland staff will visually inspect the soil for presence of waste materials or non-compliance with the soil acceptance plan prior to acceptance at the Site. Suspect loads will be rejected. Next, Upland staff will complete an additional visual inspection of the soil following receipt at the Original Landfill area to confirm that the accepted soil does not contain waste material and is compliant with the soil acceptance plan. Suspect loads will be isolated and tested or removed by Upland staff at the cost of the generating company. All rejected or non-compliant loads will be recorded and included in the annual report. The soil screening process is outlined in Appendix E.

8.4 Director Approved Waste

On a case-by-case basis, under the approval of the Director, Upland is authorized, pursuant to Section 52 of the HWR, to accept hazardous waste from accidental spills or abandonment to the lined cell of the Original Landfill. Approval provided by the Director to accept Hazardous Waste from accidental spills or abandonment must be kept on file.

8.5 Landfilling of Waste

Waste will be placed within the Landfill footprint in accordance with the recommended fill methods described in the Landfill Criteria. Based on the Landfill capacity and the allowable fill rate, at maximum the Landfill will receive approximately 45,000 tonnes of waste within a year. For a landfill receiving 20,000 to 50,000 tonnes of waste per year the recommendations include the following:

- The active face will be kept to a minimum, while maintaining sufficient area for safe unloading of waste and traffic operations. The Landfill Criteria recommended maximum area of 243 square metres will be maintained when possible. As waste will be received sporadically (by appointment) the active face may be larger at times.
- The lift height will be kept to the Landfill Criteria recommended maximum of 2.5 m.
- The waste will be compacted to achieve the most efficient compaction density.

8.6 Cover Placement

Cover is required to control vectors, wildlife, fire, litter, odour, infiltration, landfill gas, scavenging, etc.

8.6.1 Daily Cover

Daily cover will be placed on the active face at the end of each operating day. Daily cover will consist of either 150 mm of non-hazardous level soil, as defined by the HWR or approved alternative cover. Polyethylene tarps may be used. Soil used for daily cover may be removed from the active face immediately prior to landfilling in the same area. Soil used for daily cover will have minimal fines to prevent perched leachate layers within the waste and to prevent dust migration from the Landfill.

Stormwater contact with the daily cover will be contained within the Original Landfill footprint and managed as leachate, as discussed in Section 6.

8.6.2 Intermediate Cover

Intermediate Cover will be placed on areas of the Landfill that are not scheduled to receive the placement of additional waste for 30 days or more. Intermediate cover will consist of 300 mm of soil and will meet Industrial soil quality standards as defined by the CSR or approved alternative cover. The thickness may include daily cover if daily cover is present in the area and the daily cover meets the Industrial soil quality standards. Soil used for intermediate cover may be removed from the active face immediately prior to landfilling in the same area.

The stormwater runoff from the intermediate cover will be managed as clean stormwater and will be conveyed through the stormwater management system, as discussed in Section 5.

8.6.3 Final Cover

According to the Landfill Criteria, final cover must be placed within 365 days on any part of the Landfill footprint within that has reached final contours and is large enough to warrant final cover application.

It is planned that once the Original Landfill has reached final contours and/or the New Landfill has been constructed and commissioned to receive waste, the waste discharged to the Original Landfill will be relocated to the New Landfill. The Waste Relocation Plan will be submitted with the DOCP for the New Landfill. Until the submission of the DOCP, it is assumed that the Original Landfill will be closed in-place with final cover. The final cover design is described in Section 9.2. Waste in the un-lined cell will be re-contoured to promote positive stormwater drainage prior to installation of final cover.

8.7 Leachate Removal

As discussed in Section 6.4, leachate will be removed from the landfill to ensure leachate levels remain below 0.3 m (measured at the sump) to control hydraulic pressure on the base liner system.

During the wetter winter months (October to April) leachate levels will be monitored weekly, and leachate will be pumped and removed on a regular basis. The trigger for leachate removal has been established at 0.225 m measured at the sump, which is equivalent to 75% of the targeted maximum elevation. During drier months, the frequency of leachate pumping will be reduced as much less leachate is generated. Leachate will be pumped at a rate of 6 U.S. GPM through a batch treatment system. The effluent will be removed by truck either a licensed off-Site facility or to the on-Site infiltration basin.

8.8 Hours of Operations

The hours of operations of the overall Site are Monday to Friday 7:30 a.m. to 4:00 p.m. The Landfill hours will generally be restricted to the hours of operation for the Site. Special arrangements may be made to receive waste outside of these hours from time to time. The Landfill will not be open for receiving waste unless otherwise scheduled in advance, and waste characterization procedures have been completed to ensure the waste is suitable for disposal at the original lined cell. When required, the Landfill will be open on Saturday and Sunday to receive incoming waste from approved sources.

8.9 Nuisance Controls

8.9.1 Dust Control

Dust generation occurs at landfill sites due to the handling of soils, dry waste such as demolition waste, plaster, and concrete, as well as the movement of vehicles along gravel and dirt access roads. Dust mitigation measure will be employed at the Site on an as-needed basis and may include the following:

- Use of granular daily cover daily with minimal fines content (i.e. silts and clays).
- Reduction of allowable vehicular speeds.
- Use of water to control dust.
- Proper placement of stockpiles and covers to minimize dispersion.

8.9.2 Odour Control

The waste streams that will be discharged at the Landfill are generally not a source of odour due to low organic content. The Landfill operations will, however, be carried out in a manner that prevents generation of nuisance odours. The following measures will be used at the Site to control and minimize nuisance odours:

- Daily and intermediate cover will be applied.
- Leachate management will include adequate odour controls such as periodic removal of leachate accumulated in the leachate storage tanks.
- Odour control systems must be in place when odorous waste is anticipated.

8.9.3 Litter Control

Preventative litter control measures are steps taken to minimize the blowing of litter from the active area of the Landfill and from incoming waste loads. Litter must not migrate beyond the Landfill property boundary. The following measures will be used at the Site to control and minimize windblown litter:

- All loads must be tarped to prevent litter from blowing out of the vehicle. Upland reserves the right to not accept loads that are not tarped.
- The active face will be selected based on the direction and intensity of the wind to provide maximum shelter for the active area. The aerial extend of the working face will be kept to a minimum on windy days.
- Litter will be collected within the Site and along the Site boundaries when necessary.
- Appropriate use of cover soil.
- Installation of litter fences and use of operational berms within the Landfill, as necessary.

8.9.4 Noise Control

Potential noise impacts from the Site may result from the operation of the landfill equipment. The operation of this equipment will comply with the noise emission standards as outlined in the Society of Automotive Engineers (SAE) J88 – Latest Edition "Sound Measurement – Earth Moving Machinery". Noise mitigation will also be provided by the following Site features:

- Vegetative buffer zones.
- Distance of Landfill operations from Site boundary and neighbouring properties.

8.10 Vector and Wildlife Management

The Landfill is not expected to attract vectors or wildlife due to the lack of municipal solid waste, such as curbside garbage or other organic matter to be disposed of in the Landfill. Furthermore, the Landfill will comply with the daily, intermediate, and final cover requirements stated in Section 8.5. If vector and wildlife become problematic at the Site, these measures will be revised to ensure the protection of the wildlife and the environment.

8.11 Scavenging

Scavenging is defined in the Landfill Criteria as the informal and unauthorized recovery and removal of waste. Scavenging of waste from the active face and within the Site is will be prohibited due to health and safety concerns. Recovery of items from the incoming waste that has potential re-use value may occur.

8.12 Site Health and Safety Plan

A Site Health and Safety Plan (HASP) will be prepared and kept on Site at all times. The Site operations will meet the requirements of WorkSafeBC.

8.13 Site Security and Signage

Access to the Site will continue to be via the existing Site entrance off Gold River Highway, which enters the Site from the north, as shown on Figure 1.1. The Site entrance gate is locked outside of normal operating hours to prohibit vehicle entrance and uncontrolled disposal when the Site is closed. A chain link fence is present along the northern property boundaries along Gold River Highway and Argonaut Road.

Signage will be erected and maintained at the Site entrance and will include the following information:

- Name of owner and contact information
- Hours of operation
- Emergency contact information
- Accepted and restricted wastes

The existing signage will be maintained for continued operation of the Site. The signs will be reviewed from time to time by Landfill staff for adequacy and additional signs implemented as required.

8.14 Weigh Scale

A weigh scale is currently located at the Site entrance. This weigh scale will continue to be used for the Landfill operations. The weigh scale will be maintained in proper working order and meet the requirements of the federal Weights and Measures Act.

8.15 Traffic Volumes

Traffic volumes will be dependent on the amount of waste and non-hazardous soils destined for the Site during any given time period. The waste may be received at specific times of the year and be distributed unequally throughout the year. In general, the traffic flow volume is expected to see a marginal increase from the existing traffic volumes to the Site.

All relevant records will be maintained by the Site owner for the entire operating life of the Landfill and for the duration of the contaminating lifespan, as estimated in Section 10. Relevant records will be maintained on-site for a minimum of seven years, and all records will be submitted to the Director within 14 days of a request from the ENV. Records will include the following:

- The Permit or the Operations Certificate.
- All plans and reports prepared in support of the development for the Site.
- Inspection records conducted by regulatory agencies.
- A complaint log system providing source of complaint, nature of complaint, time received and actions taken.
- Waste tonnages and volumes disposed of in the Landfill for each category of waste received.
- Waste sources, characterization and approvals.

8.16 Operational Personnel

The Landfill will employ a Site Manager/Operator who oversees all daily Landfill operations.

The Site Manager or Operator will be present when the facility is open for business and will inspect loads of incoming waste to ensure the material matches the waste characterization, and complies with the requirements of the OC.

The Site Manager, Operator, or other staff members are responsible for accepting and recording waste loads, as discussed above, and also for collecting tipping fees, stockpiling, placement of waste, and placement of daily cover, as required. An equipment operator is responsible for the operation of the front-end loader, bulldozer, and hydraulic excavator.

Additional staff will be utilized at the Site as the work load demands to meet environmental control requirements including dust, litter, and odour control measures.

8.17 Operator Training

At least one supervisor shall successfully complete the Solid Waste Association of North America's (SWANA) Manager of Landfill Operations (MOLO) course. At least one of the operations staff working regularly at the Landfill active face will successfully complete SWANA BC's Qualified Landfill Operator's course. These certifications will be kept current as per by SWANA's requirements.

8.18 Equipment Requirements

Adequate equipment will be maintained at the Site to ensure that operational requirements will be met. The equipment to be used on-Site will include:

- Front-end loader
- Dozer
- Excavator

8.19 Winter and Wet Weather Operation

Winter operations require advanced planning for Site preparation, snow removal, and the stockpiling and storage of cover material. Winter operations for the Landfill will be coordinated with the active aggregate extraction activities.

During the winter months the active disposal area will be located in such a manner so as to be free draining, sheltered from the prevailing winds and if possible located with a southern exposure. Up to twice the estimated required area for disposal through the winter months, will be prepared to minimize problems due to heavy snow and equipment failure. During winter conditions, flatter grades may be required at the daily working face to facilitate equipment travel.

Snow plowing and a snow storage area will be considered in advance of winter conditions. A snow storage area will be created adjacent to the active disposal area to permit storage of snow removed from the tipping face, such that it does not interfere with daily Landfill operations. The snow storage area will be located such that during snow melt events, the runoff will be treated as storm water and not flow into the active disposal area.

Snow which has contacted waste will be managed as leachate. In the event of extreme weather conditions, or at the discretion of the operator, the Site may stop receiving waste material.

Snow maintenance and wet weather operation will be conducted in such a manner as to minimize infiltration and operate the Landfill in a dewatered condition.

During wet weather operations stormwater will be directed away from the active disposal area by means of temporary soil berms constructed upgradient of the active area, as required.

On-Site equipment used for continued Landfill operations during rainfall events, will be provided with closed cabs.

Should washouts of the Site roadways occur due to rainfall events, the roadways will be reconstructed in a timely fashion.

8.20 Reporting Requirements

The following sub sections summarize the reporting requirements, as outlined in Section 5.0 of the draft OC.

8.20.1 Inspection and Record Keeping

All relevant records will be maintained by the Site owner for the entire operating life of the Landfill and for the duration of the contaminating lifespan, as estimated in Section 10. Relevant records will be maintained on-Site for a minimum of seven years, and all records will be submitted to the Director within 14 days of a request from the ENV. Records will include the following:

- The Permit or OC
- All plans and reports prepared in support of the development for the Site.
- Inspection records conducted by regulatory agencies.
- A complaint log system providing source of complaint, nature of complaint, time received and actions taken.
- Waste tonnages and volumes disposed of in the Landfill for each category of waste received.
- Waste sources, characterization and approvals

8.20.2 Annual Operations and Monitoring Report

An annual operations and monitoring report will be submitted to the Director by March 31 of each year. The annual report will include the following information as per Section 5.2 of the draft OC:

- Review of the preceding year of operation and OCP implementation
- Summary of construction report(s)
- Annual and cumulative tonnages and categories of waste including contaminated soil tonnages(s) and soil quality class(es) discharged to the Original Landfill
- Remaining volume and lifespan of the Original Landfill
- Summary of complaints and nuisances
- Summary of non-compliance notification and non-compliance reporting
- Planned OCP implementation and construction of Significant Works for the next calendar year
- Environmental Monitoring Reporting including:
  - Updated groundwater contours based on groundwater elevation monitoring.
  - Data including laboratory analysis and quality assurance and quality control results.
  - Comparison of the monitoring data with the performance criteria discussed in Section 7.1, interpretation of the monitoring data, identification and interpretation of irregularities and trends, recommendations, and any proposed changes to the monitoring program.

9. Closure Plan

The Original Landfill will be considered at final elevation the earlier of:

- Original Landfill Lined Cell is filled to capacity with side slope grades no steeper than 3H:1V (33%)
- Commencement of waste discharge to the New Landfill

Within 365 days of final elevations being reached, one of the following will take place:

- Relocation of existing waste to the New Landfill, or
- Application of final cover

The Original Landfill Waste Relocation Plan will be presented with the New Landfill DOCP. Until the Original Landfill Waste Relocation Plan has been submitted, for the purpose of this OCP, the assumed method of closure will be application of final cover over waste in-place.

9.1 Total Capacity of the Original Landfill

The total capacity of the Original Landfill is shown in the table below:

Table 9.1 Total Capacity

	Un-lined Cell (m^3)	Lined Cell (m^3)	Total Original Landfill (m^3)
Existing	35,000	4,446	39,446
Future	0	35,300	35,300
Total	35,000	39,746	**74,746**

9.2 Final Closure Design

Final cover will be constructed over top the final waste grades of the original lined cell, as presented in Detail 1 of Figure 3.1. The final cover will consist of, from top to bottom:

- 150 mm of topsoil with suitable vegetation
- 450 mm of sand layer
- Non-woven geotextile
- Textured linear low density polyethylene (LLDPE) geomembrane (40 mil)
- Non-woven geotextile

The final cover slopes for the lined cell will be a maximum of 3H:1V (33%) on all side slopes and a minimum of 10H:1V (10%) on the top slopes of the Site.

The waste in the un-lined area will be re-contoured to allow for positive drainage off the final cover. The exact limit of waste will be confirmed upon final closure and final cover construction. A 50 m buffer between the limit of waste and the property boundary will be maintained.

10. Contaminating Lifespan

The Contaminating Lifespan (CLS) is the period after the final closure of the Landfill until which the Landfill leachate no longer poses a risk to the environment because the concentrations of leachate contaminants have decayed sufficiently that the leachate constituent concentrations meet the applicable CSR standards for regulatory compliance.

During the CLS, the Landfill will require monitoring, and maintenance of the leachate management system to manage the post-closure Landfill conditions. These measures can be terminated at the end of the CLS. The CLS is used to calculate the Financial Security required for the Landfill, as discussed in Section 11. The Landfill Criteria stipulates that at minimum, the CLS shall not be assumed to be less than 30 years.

Landfill leachate strength at any given time depends primarily on waste composition. The nature of leachate generated from waste such as C&D, land clearing, and contaminated soil is generally much weaker in comparison to leachate from municipal landfills and also tends to have a lower organic content. Based on the quality of leachate and the small size of the Landfill, the CLS of the Landfill is expected to less than 30 years, however per the Landfill Criteria, the CLS is assumed to be 30 years.

11. Financial Security Plan

Financial security is required for privately owned landfills in accordance with Section 8.0 - Financial Security of the Landfill Criteria. The amount of the financial security provided in each year must be adequate to fund the closure of the landfill in that year and fund post-closure operations, monitoring, and maintenance for the estimated contaminated lifespan. The amount of financial security shall be calculated as the sum of the following costs:

- Cost of emergency closure or planned closure of both the lined and un-lined portions of the Original Landfill, whichever cost is greater.
- Cost of post-closure operation, maintenance, monitoring and reporting for the contaminating lifespan.
- Cost of implementing contingency measures.

Cost estimates for the above are provided in Table 11.1 and described in Section 11.1 through 11.4.

11.1 Closure Costs

The closure costs consist of the estimated capital and engineering cost to install final cover on the Original Landfill in accordance with the OCP. The final cover design includes a LLDPE geomembrane liner, 0.45 m sand cover and a 0.15 m topsoil layer.

The activities considered in the closure costs to estimate the security fund are:

- Compaction and grading of the landfill surface
- Final cover placement

- Hydroseeding
- Construction of swales and erosion control

Closure cost estimates are based on information supplied by Upland and engineer's estimates. Due to the small size of the Original Landfill, the entire footprint will be closed at one time.

11.2 Post-Closure Operations, Monitoring and Maintenance

The post-closure costs consist of the Site monitoring, operation, and maintenance cost during the post-closure stage in accordance with the OCP. Activities considered in the post-closure cost estimation include:

- Administration
- Site maintenance
- Water quality monitoring
- Consultation and reporting

Post-closure costs are estimated based on implementing the EMP semi-annually at current per event cost as well as Site maintenance and administration costs provided by Upland.

Leachate management has not been considered since the post-closure leachate generation rate will be effectively zero. Additionally, due to the small size of the Original Landfill, annual allowance for erosion and stormwater repairs has not been given, instead a contingency budget for slope repairs has been included, as discussed in Section 11.3 below.

11.3 Contingency Costs

The contingency costs are the costs associated with implementing and maintaining the contingency measure to address potential failure or non-compliance with the landfill performance criteria. In the event of failure of the landfill side slope(s), the affected area will be remediated and a geomembrane clay liner (GCL) final cover will be deployed. The advantage of GCL over LLDPE is the relatively installation that does not require a specialized contractor.

11.4 Financial Contingency

In accordance with Section 8.2 – *Calculating Financial Security of the Landfill Criteria*, the amount of financial security shall include a contingency of 20% of the sum of the closure costs, post-closure costs and the contingency measures cost.

11.5 Discount and Inflation Rates

All cost estimates for the financial security are presented in net present values (2018) and adjusted for inflation and discount rates. The discount and inflation rates used for the cost projection were selected based on Section 8.4 – Cost to be Presented in Current Dollars of the Landfill Criteria, which states the following:

"All cost estimates should be presented in net present values and adjusted for inflation and discount rates. Inflation rates shall be based on the British Columbia Consumer Price Index averaged over

the preceding 10 year period or as recommended by a qualified professional. Discount rates shall be based on the current Government of Canada Long Term Bond Yield or as recommended by a qualified professional."

Due to fluctuations in Canadian bond yields in recent years, the discount rate was selected to be the 10-year average Government of Canada benchmark bond yields: long term, as published in the Bank of Canada website: http://www.bankofcanada.ca/rates/interest-rates/lookup-bond-yields/. The Government of Canada 10-year average benchmark bond yields: long term, for the period between 2009 and 2018, is 2.76% as presented in Table 11.2.

The inflation rate has been selected from the average of the past 10 years of the Non-Residential Building Construction Index (NRBCI) for the Vancouver Census Metropolitan Area from the Statistics Canada Table 18-10-0135-01, last accessed March 1, 2019. The 10-year average inflation rate for the period between Q3 2009 and Q3 2018 is 2.93%.

11.6 Cost Estimation

The calculated amount of financial security required for each year is shown in Table 11.3 and the amounts required in the next five years are summarized in the table below:

Table 11.1 Financial Security Summary

Year	Stage	Amount of FS Required
2019	Planning & Filling	$1,099,899
2020	Filling	$1,116,762
2021	Filling & Closure	$1,118,561
2022	Planned Post-Closure Period Begins – Year 1	$820,640
2023	Post-Closure Period – Year 2	$785,187

The amount of financial security required will decrease once the Landfill is closed, as the closure costs will no longer contribute to the liability. After closure, the cost of implementing slope repairs (contingency measure) is included. It should be noted that Financial Security has been calculated under the assumption that the Original Landfill will be closed in-place. If waste is relocated to the New Landfill and the Original Landfill is remediated, the financial liability for the Original Landfill will end and the waste will be accounted for under the Financial Security provided for the New Landfill.

12. Contingency Plan

The Contingency Plan was developed to present practical and implementable solutions to address possible failure and/or non-compliance scenarios for the Landfill.

As part of the EMP presented in Section 7, groundwater, surface water and leachate quality will be monitored on a regular basis. The general condition of the landfill side slopes will also be monitored.

The following are possible contingency measures, in order of implementation sequence, which may be implemented in response to a non-compliance condition.

- Downgradient ground water quality impacts detected above standards:
  - Additional monitoring to verify results.
  - Early closure of the Landfill either by relocating waste or deploying final cover.
- Partial slope failure of the 3:1 landfill slope post-closure:
  - Re-contouring of damaged portion of slope and installation of new final cover over affected area using GCL.

13. References

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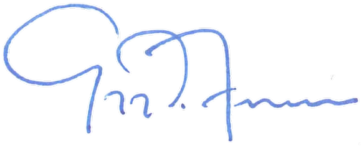
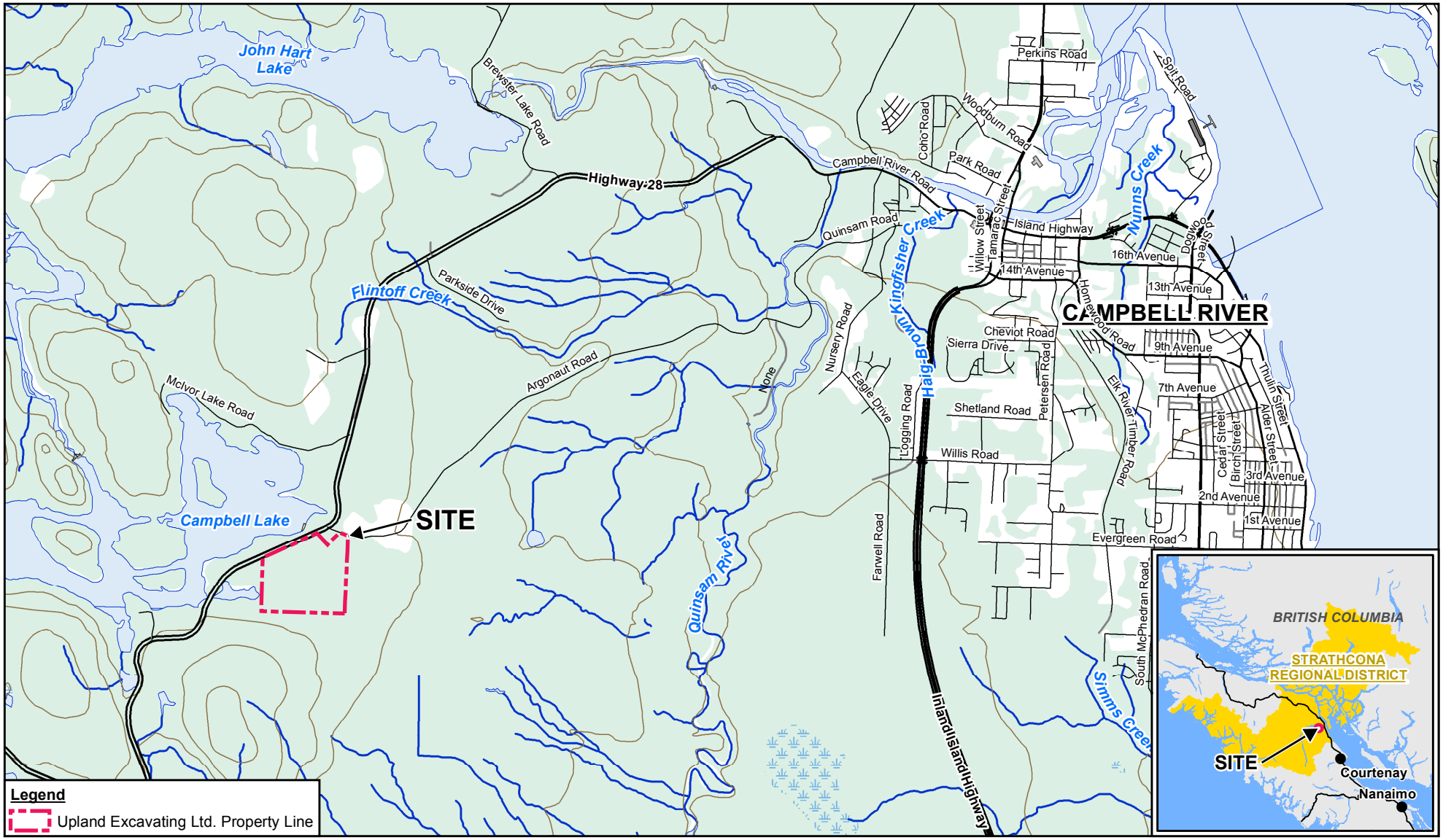
All of Which is Respectfully Submitted,

GHD

Roxanne Hasior, EIT



Gregory D. Ferraro, P.Eng.



Source: CanVec Edition 1.1 © Department of Natural Resources Canada, all rights reserved. National Road Network 2.0 GeoBase. ESRI Base Data, 2008.

0 500 1,000 1,500
Meters

Coordinate System:
NAD 1983 UTM Zone 10N

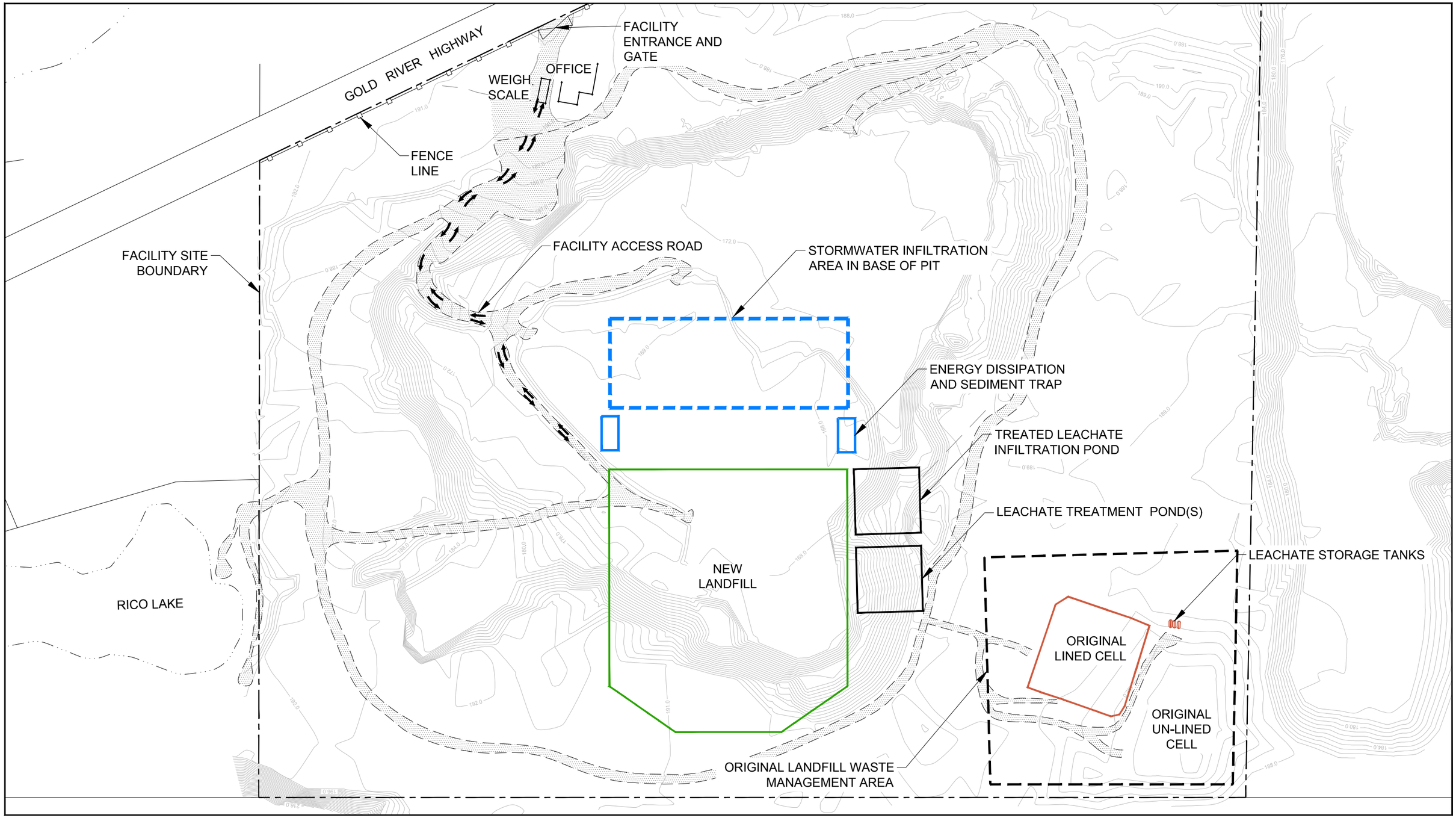
UPLAND EXCAVATING PROPERTY
ORIGINAL LANDFILL OPERATIONS AND CLOSURE PLAN

088877-07
Mar 27, 2019

SITE LOCATION MAP

FIGURE 1.1

GIS File: Q:\GIS\PROJECTS\88000s\88877\Layouts\012\88877-07(012)GIS-OT001.mxd



0 27.5 55 82.5m

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UPLAND EXCAVATING PROPORTY
ORIGINAL LANDFILL OPERATIONS AND CLOSURE PLAN
SITE LAYOUT PLAN

088877-07

FIGURE 1.2

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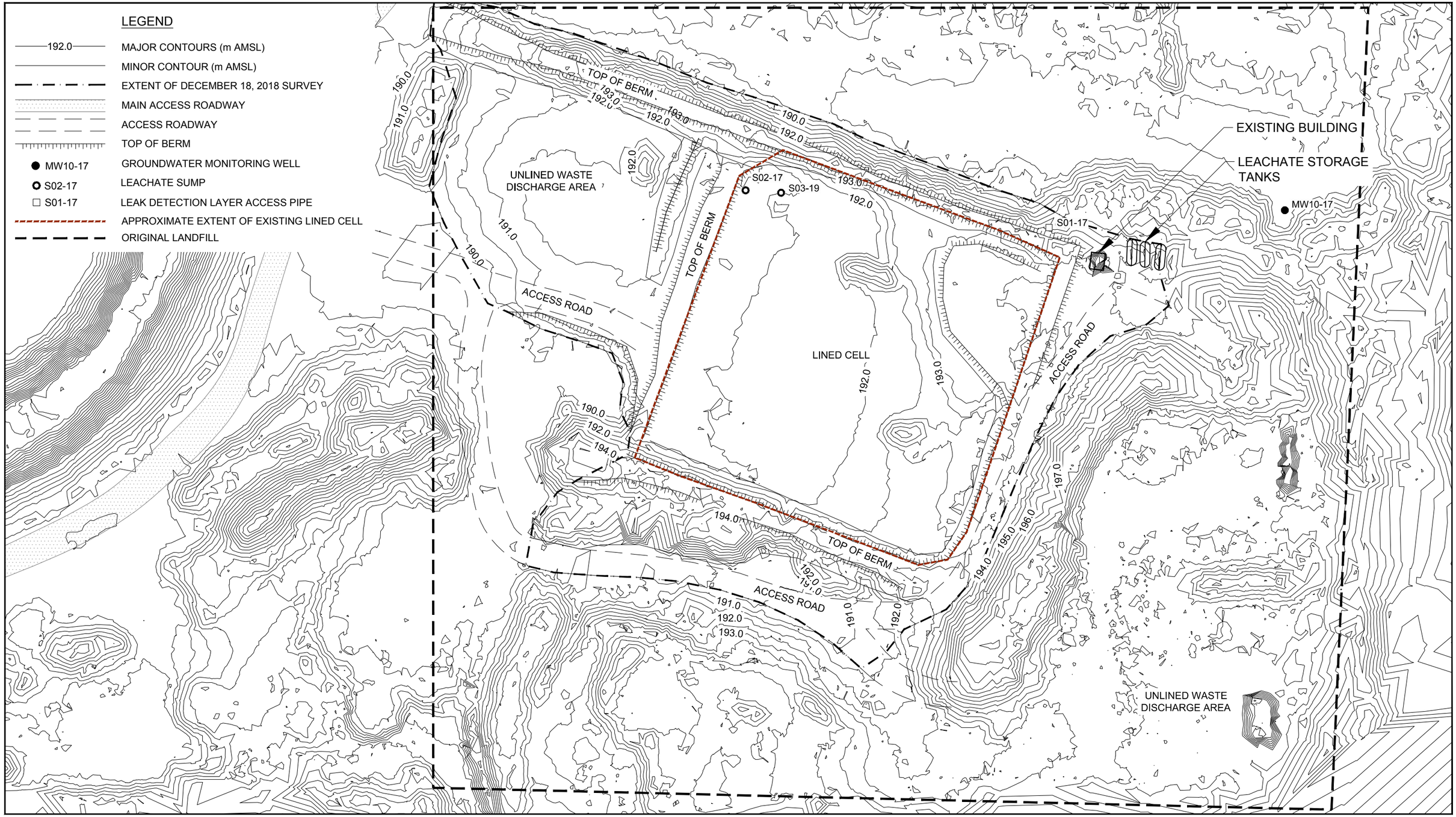


SOURCE: TOPOGRAPHICAL SURVEY CONDUCTED DEC-18-2018 RECEIVED FROM UPLAND GROUP 2019-03-04

0 8 16 24m

SCALE 1:800

GHD

UPLAND EXCAVATING PROPERTY
ORIGINAL LANDFILL OPERATIONS AND CLOSURE PLAN
EIXSTING CONDITIONS

88877-07

Oct 1, 2019

FIGURE 2.1

CAD File: 88877-07(012)GN-WA002.dwg

LEGEND

- 192.0 — MAJOR CONTOURS (m AMSL)
- MINOR CONTOUR (m AMSL)
- EXTENT OF DECEMBER 18, 2018 SURVEY
- MAIN ACCESS ROADWAY
- ACCESS ROADWAY
- TOP OF BERM
- MW10-17 — GROUNDWATER MONITORING WELL
- S02-17 — LEACHATE SUMP
- S01-17 — LEAK DETECTION LAYER ACCESS PIPE
- APPROXIMATE EXTENT OF EXISTING LINED CELL

TOTAL AIRSPACE:
~ 38,000 m³

2 / FIG. 4.1 PERIMETER BERM EXTENSION

LEACHATE MONITORING PIPE — 4 / FIG. 7.3

LEAK DETECTION MONITORING PIPE EXTENSION — 3 / FIG. 7.2

EXISTING BUILDING

LEACHATE STORAGE TANKS

MW3-14

MW10-17

S02-17

S03-19

S04-19

S01-17

S05-19

MW11-19

TOP OF BERM

ACCESS ROAD

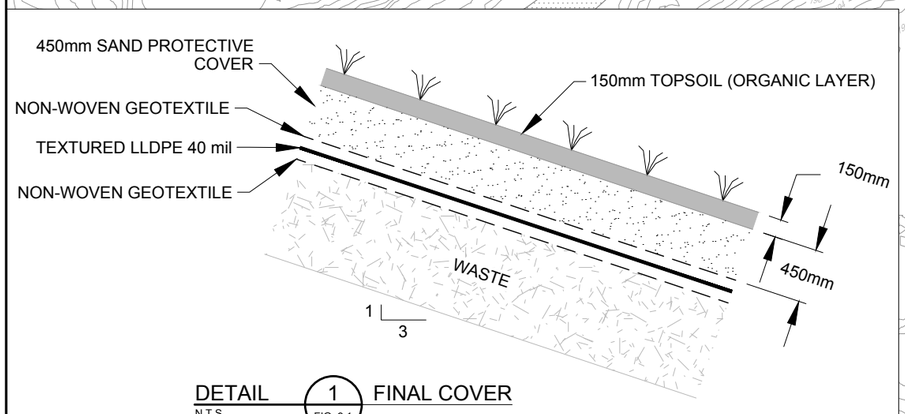
3:1

193 194 195 196 197 198 199 200 201 202 203 204 205 206

206 205 204 203 202 201 200 199 198 197 196 195

FINAL COVER — 1 / FIG. 3.1

LEACHATE ACCESS PIPE



DETAIL 1 FINAL COVER (FIG. 3.1) N.T.S.

SOURCE: TOPOGRAPHICAL SURVEY CONDUCTED DEC-18-2018 RECEIVED FROM UPLAND GROUP 2019-03-04

0 10 20 30m

SCALE 1:1000

N

GHD

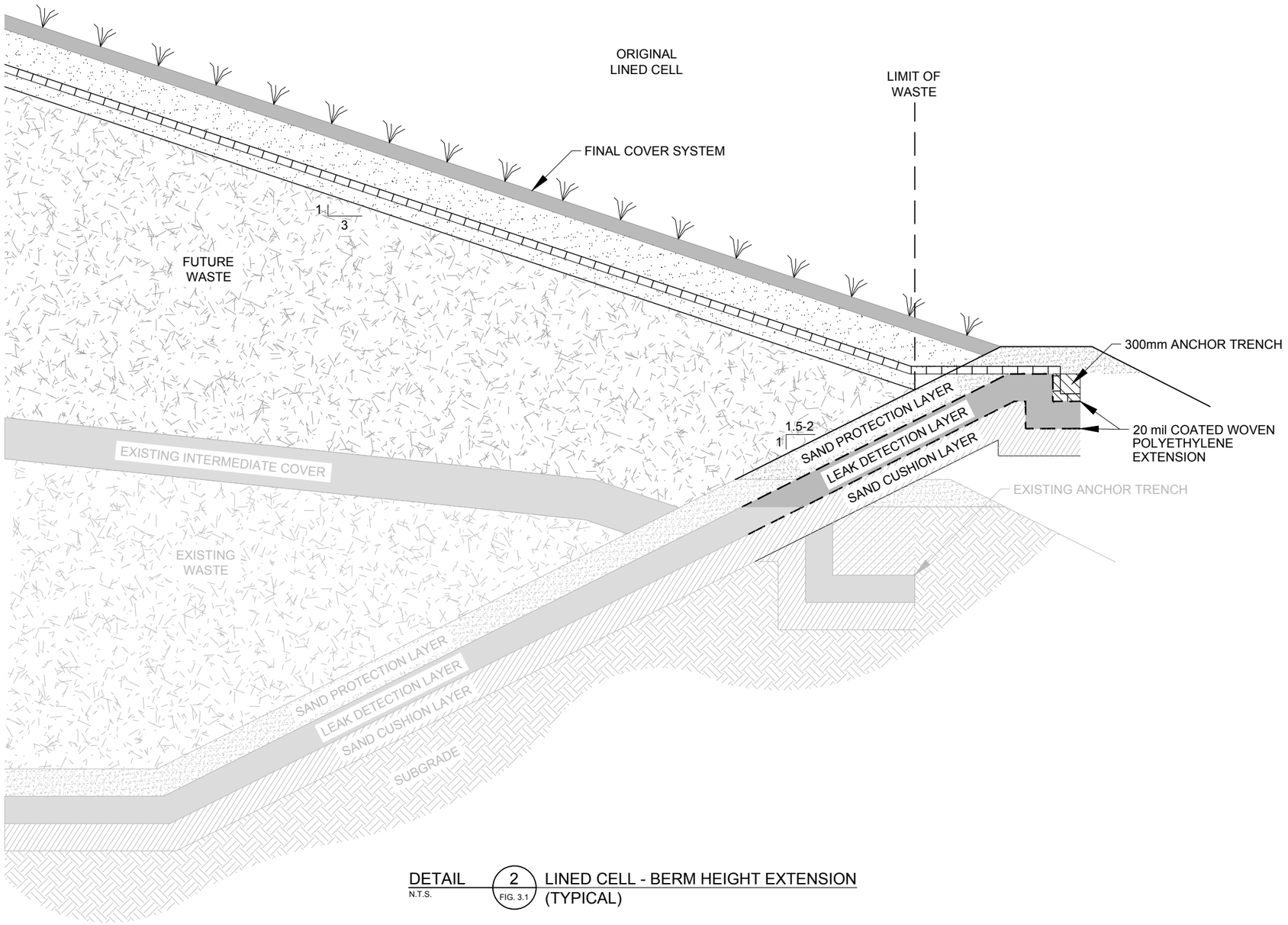
UPLAND EXCAVATING PROPERTY
ORIGINAL LANDFILL OPERATIONS AND CLOSURE PLAN
FINAL CONTOURS

88877-07

M□□9, 2019

FIGURE 3.1

CAD File: 88877-07(012)GN-WA003.dwg



DETAIL 2 LINED CELL - BERM HEIGHT EXTENSION
N.T.S. FIG. 3.1 (TYPICAL)

ALL MEASUREMENTS ARE APPROXIMATE AND
AS REPORTED BY UPLAND EXCAVATING LTD.

GHD

UPLAND EXCAVATING PROPERTY
ORIGINAL LANDFILL OPERATIONS AND CLOSURE PLAN
PERIMETER BERM HEIGHT EXTENSION

88877-07
Apr 29, 2019

FIGURE 4.1

CAD File: 88877-07(012)GN-WA004.dwg

LEGEND

- 165.00 — EXISTING MAJOR CONTOURS (m AMSL)
- EXISTING MINOR CONTOUR (m AMSL)
- UPLAND EXCAVATING LTD. PROPERTY LINE
- EXTENT OF DECEMBER 18, 2018 SURVEY
- LAKE
- EXISTING ACCESS ROADWAY
- MW7-17 — GROUNDWATER MONITORING WELL
- MW5B-15 — GROUNDWATER SAMPLE LOCATION
- S03-17 — LEACHATE SUMP SAMPLE LOCATION
- S01-17 — LEAK DETECTION LAYER ACCESS PIPE
- SW15-01 — SURFACE WATER SAMPLE LOCATION
- S04 — PROPOSED LEACHATE SUMP SAMPLE LOCATION
- APPROXIMATE EXTENT OF EXISTING LINED CELL
- ORIGINAL LANDFILL

McIVOR LAKE

SW15-01 (APPROXIMATELY 1 KM NORTH-EAST)

LOT 6 PLAN 31913

ARGONAUT ROAD

2047-R

112 OIP

137m 136-50-24

GOLD RIVER HIGHWAY

301.764m 65-58-15

LOT 6 PLAN 31913

MW9-17

LOT A PLAN 30709

104 OIP

236.236m 65-58-15

WEIGH SCALE

OFFICE

SHED

SHOP

MW8-17

LOT A PLAN 42515

MW1-14

MW6-17

LOT A PLAN 42515

STRATA LOT 1 PLAN VIS6756

MW7-17

244.553m 2-22-42

K&D CONTRACTING LTD.

LOT C PLAN 42515

WASH PLANT

MW15B-18

MW15A-18

STRATA LOT 2 PLAN VIS6756

MW4A-15

MW4B-15

MW2-14

MW2A-16

632m 2-35-48

110 OIP

ORIGINAL LANDFILL

SW15-01 (APPROXIMATELY 1 KM NORTH-EAST)

EXISTING STORAGE BUILDING

LEACHATE STORAGE TANKS

S03-19

S02-17

S04

MW10-17

S01-17

SW15-02

RICO LAKE

243.443m 2-22-42

MW3-14

S05

MW5A-15

MW5B-15

MW11-19

231.223m 271-28-27

105 OPP BCLS724

524.777m 271-28-27

113 OPP

NE 1/4 SEC.32 TP.2

W 1/2 OF NW 1/4 SEC. 33 TP. 2

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

0 40 80 120m

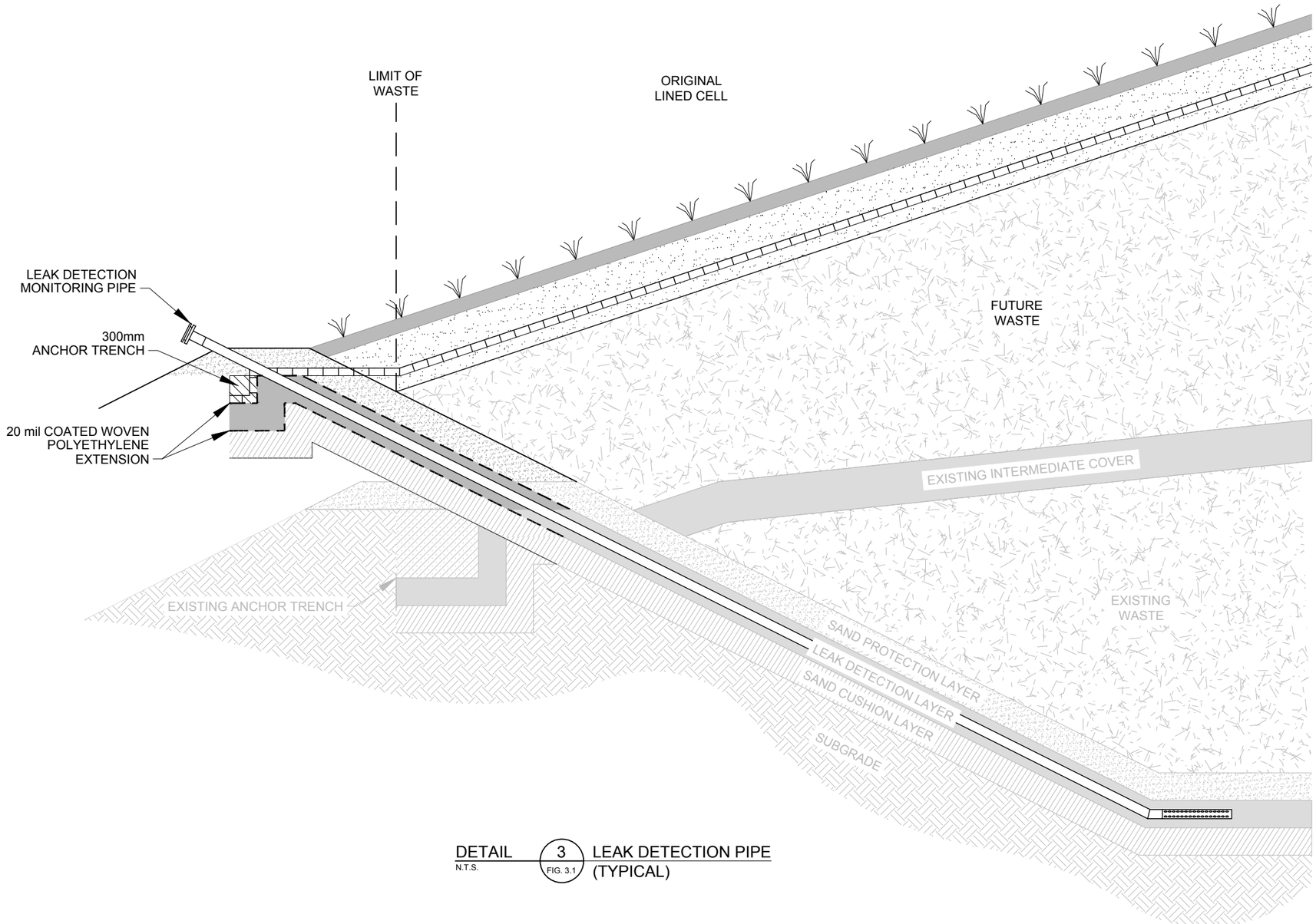
GHD

UPLAND EXCAVATION PROPERTY
ORIGINAL LANDFILL OPERATIONS AND CLOSURE PLAN
ENVIRONMENTAL MONITORING LOCATIONS

88877-07
Oct 1, 2019

FIGURE 7.1

CAD File: 88877-07(012)GN-WA005.dwg



DETAIL 3 LEAK DETECTION PIPE (TYPICAL)
N.T.S. FIG. 3.1

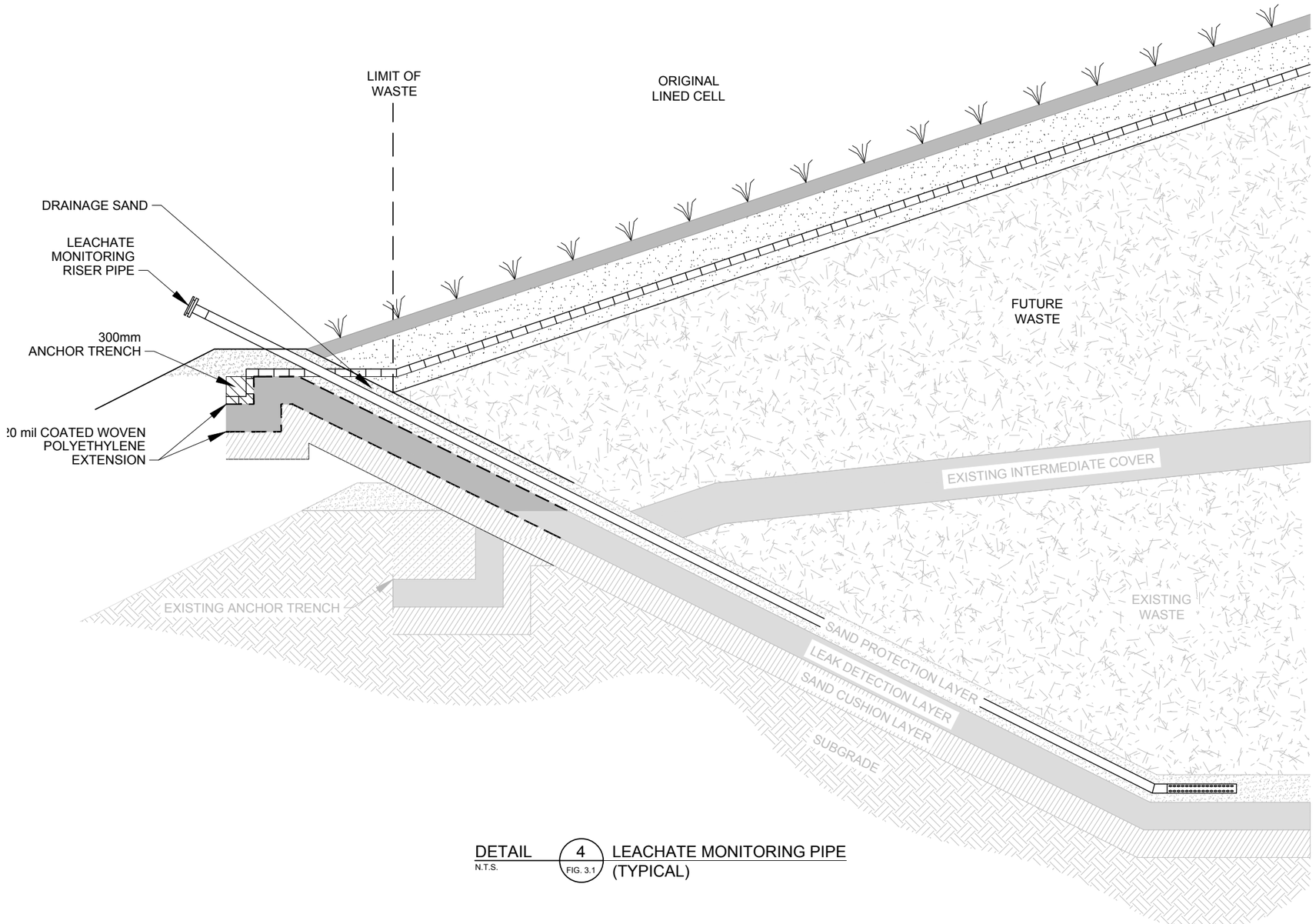
ALL MEASUREMENTS ARE APPROXIMATE AND
AS REPORTED BY UPLAND EXCAVATING LTD.

UPLAND EXCAVATING PROPERTY
ORIGINAL LANDFILL OPERATIONS AND CLOSURE PLAN
LEAK DETECTION MONITORING PIPE EXTENSION

88877-07
Apr 29, 2019

FIGURE 7.2

CAD File: 88877-07(012)GN-WA004.dwg



DETAIL 4 LEACHATE MONITORING PIPE (TYPICAL)
N.T.S. FIG. 3.1

ALL MEASUREMENTS ARE APPROXIMATE AND
AS REPORTED BY UPLAND EXCAVATING LTD.

GHD

UPLAND EXCAVATING PROPERTY
ORIGINAL LANDFILL OPERATIONS AND CLOSURE PLAN
LEACHATE MONITORING RISER PIPE

88877-07
Apr 29, 2019

FIGURE 7.3

CAD File: 88877-07(012)GN-WA004.dwg

Climate Data
Upland Excavating Property
Original Landfill Operations and Closure Plan

Month	Daily Average Temperature (Celcius)	Daily Maximum Temperature (Celcius)	Daily Minimum Temperature (Celcius)	Rainfall (mm)	Snowfall (cm) [1]	Precipation (mm) [1]	Average Relative Humidity (0600LST) (%)	Average Relative Humidity (1500LST) (%)
January	2.4	5.5	-0.8	194.6	23.3	217.5	93	84.9
February	3.2	7.2	-0.7	135.5	14.4	149.5	92.4	75.1
March	5.2	9.7	0.7	128.4	11.7	140	91.4	67.8
April	8	13.2	2.8	91.6	0.5	92.1	90.2	59.6
May	11.6	17	6.2	68.4	0	68.4	86.5	57.2
June	14.7	20.1	9.3	62.9	0	62.9	83.7	57.6
July	17.3	23	11.5	39.4	0	39.4	83.8	54.4
August	17.2	23.3	11.1	44.6	0	44.6	87.8	55.1
September	13.7	19.8	7.6	55.2	0	55.2	91.5	59.1
October	8.6	13.1	4.0	161	1.2	162.2	93.3	74
November	4.4	7.7	1.0	222.1	10.5	231.9	93	83.3
December	2.1	4.9	-0.8	204.2	22.6	225.7	92.6	86.3
Annual	**9.0**	**13.7**	**4.3**	**1407.9**	**84.2**	**1489.4**	**89.9**	**67.9**

Notes:
Source: Environment Canada: Climate Normals - Campbell River Airport (Station No. - 1021261), 1981 - 2010 Station Data
[1] 1 cm of snowfall corresponds to 1 mm of precipation

Table 6.2

Monthly Leachate Generation Estimates
Upland Excavating Property
Original Landfill Operations and Closure Plan

	Monthly Leachate Generation Intermediate Cover[1] (mm)	Monthly Leachate Generation Active Area[2] (mm)
January	179.2	211.9
February	115.2	137.6
March	87.9	108.9
April	34.5	48.3
May	0.0	10.3
June	0.0	9.4
July	0.0	5.9
August	0.0	6.7
September	0.0	8.3
October	93.3	117.6
November	179.7	214.5
December	186.5	220.4
Total	**876.4**	**1099.8**

[1]Infiltrate = Precipitation – Surface Runoff – Change in Soil Moisture Storage – Evapotranspiration
[2]Infiltrate = Precipitation – Change in Soil Moisture Storage – Evapotranspiration

Table 6.3

Leachate Anaytical Results
Upland Excavating Property
Original Landfill Operations and Closure Plan

Sample Location:		**S02-17**	**Lined Cell**
Sample ID:		**WL-88877-271117-CR-01**	**WL-88877-070319-RMR-07**
Sample Date:		**11/27/2017**	**3/7/2019**
Parameters	**Units**		
Field Parameters			
Conductivity, field	uS/cm	526	618
Dissolved oxygen (DO), field	mg/L	3.30	-
Oxidation reduction potential (ORP), field	millivolts	34	7
pH, field	s.u.	6.04	7.06
Temperature, field	Deg C	7.77	5.8
Total dissolved solids, field (TDS)	g/L	0.34	0.396
Turbidity, field	NTU	4.47	78.2
General Chemistry			
Alkalinity (as CaCO3 pH=8.3)	mg/L	ND (1.0)	ND (1.0)
Alkalinity, total (as CaCO3)	mg/L	150	406
Biochemical oxygen demand (BOD)	mg/L	67.6	41.0
Chemical oxygen demand (COD)	mg/L	219	144
Chloride (dissolved)	mg/L	8.0	16
Conductivity	uS/cm	429	790
Hardness	mg/L	202	323
Hardness (dissolved)	mg/L	192	349
Hydrogen sulfide	mg/L	0.12	0.032 J
Hydroxide (as CaCO3)	mg/L	ND (1.0)	ND (1.0)
pH	s.u.	7.86 J	7.77 J
Sulfide	mg/L	0.11	0.030 J
Sulphate (Dissolved)	mg/L	51.5	6.6
Total dissolved solids (TDS)	mg/L	306	504
Total suspended solids (TSS)	mg/L	20.5	55.2
Nutrients			
Ammonia-N	mg/L	ND (0.020)	0.57
Bicarbonate (as CaCO3)	mg/L	182	496
Carbonate (as CaCO3)	mg/L	ND (1.0)	ND (1.0)
Nitrate (as N)	mg/L	ND (0.10)	ND (0.10)
Nitrite (as N)	mg/L	ND (0.10)	ND (0.10)
Nitrite/Nitrate	mg/L	ND (0.10)	ND (0.10)
Dissolved Metals			
Aluminum (dissolved)	ug/L	75.7	17.4
Antimony (dissolved)	ug/L	ND (0.50)	ND (0.50)
Arsenic (dissolved)	ug/L	2.49	1.82
Barium (dissolved)	ug/L	12.4	16.1
Beryllium (dissolved)	ug/L	ND (0.10)	ND (0.10)
Bismuth (dissolved)	ug/L	ND (1.0)	ND (1.0)
Boron (dissolved)	ug/L	ND (50)	57
Cadmium (dissolved)	ug/L	0.093	0.015
Calcium (dissolved)	ug/L	60900	113000
Chromium (dissolved)	ug/L	1.1	1.2
Cobalt (dissolved)	ug/L	3.35	2.35
Copper (dissolved)	ug/L	3.47	0.86
Iron (dissolved)	ug/L	1910	6970
Lead (dissolved)	ug/L	0.37	ND (0.20)
Lithium (dissolved)	ug/L	ND (2.0)	ND (2.0)
Magnesium (dissolved)	ug/L	9630	16100
Manganese (dissolved)	ug/L	1480	3860
Mercury (dissolved)	ug/L	ND (0.010)	ND (0.0020)

Table 6.3

Leachate Anaytical Results
Upland Excavating Property
Original Landfill Operations and Closure Plan

Sample Location:		**S02-17**	**Lined Cell**
Sample ID:		**WL-88877-271117-CR-01**	**WL-88877-070319-RMR-07**
Sample Date:		**11/27/2017**	**3/7/2019**
Parameters	**Units**		
Molybdenum (dissolved)	ug/L	1.7	ND (1.0)
Nickel (dissolved)	ug/L	3.7	1.2
Potassium (dissolved)	ug/L	2200	2480
Selenium (dissolved)	ug/L	0.24	0.22
Silicon (dissolved)	ug/L	6240	9410
Silver (dissolved)	ug/L	ND (0.020)	ND (0.020)
Sodium (dissolved)	ug/L	13300	27200
Strontium (dissolved)	ug/L	174	313
Sulphur (Dissolved)	ug/L	20300	ND (3000)
Thallium (dissolved)	ug/L	ND (0.010)	ND (0.010)
Tin (dissolved)	ug/L	ND (5.0)	ND (5.0)
Titanium (dissolved)	ug/L	ND (5.0)	ND (5.0)
Uranium (dissolved)	ug/L	0.30	0.30
Vanadium (dissolved)	ug/L	ND (5.0)	ND (5.0)
Zinc (dissolved)	ug/L	58.9	10.7
Zirconium (dissolved)	ug/L	0.37	0.55
Total Metals			
Aluminum	ug/L	1740	1650
Antimony	ug/L	ND (0.50)	ND (0.50)
Arsenic	ug/L	4.78	3.01
Barium	ug/L	17.9	21.8
Beryllium	ug/L	ND (0.10)	ND (0.10)
Bismuth	ug/L	ND (1.0)	ND (1.0)
Boron	ug/L	ND (50)	63
Cadmium	ug/L	1.31	0.095
Calcium	ug/L	63800	103000
Chromium	ug/L	3.2	3.0
Cobalt	ug/L	4.39	3.24
Copper	ug/L	22.8	14.4
Iron	ug/L	5430	10300
Lead	ug/L	1.36	0.46
Lithium	ug/L	ND (2.0)	ND (2.0)
Magnesium	ug/L	10300	15800
Manganese	ug/L	1460	3680
Mercury	ug/L	ND (0.010)	ND (0.0020)
Molybdenum	ug/L	1.9	ND (1.0)
Nickel	ug/L	5.4	2.6
Potassium	ug/L	2360	2460
Selenium	ug/L	0.35	0.22
Silicon	ug/L	8370	11000
Silver	ug/L	0.035	ND (0.020)
Sodium	ug/L	13500	25100
Strontium	ug/L	183	324
Sulphur	ug/L	22100	ND (3000)
Thallium	ug/L	0.030	ND (0.010)
Tin	ug/L	ND (5.0)	ND (5.0)
Titanium	ug/L	110	109
Uranium	ug/L	0.33	0.31
Vanadium	ug/L	9.6	9.2
Zinc	ug/L	262	62.2
Zirconium	ug/L	0.55	0.89

Table 6.3

Leachate Anaytical Results
Upland Excavating Property
Original Landfill Operations and Closure Plan

Sample Location:		**S02-17**	**Lined Cell**
Sample ID:		**WL-88877-271117-CR-01**	**WL-88877-070319-RMR-07**
Sample Date:		**11/27/2017**	**3/7/2019**
Parameters	**Units**		
Petroleum Products			
Total Petroleum Hydrocarbons VPH (C6-C10)LessBTEX	ug/L	ND (300)	ND (300)
Total Petroleum Hydrocarbons VH (C6-C10)	ug/L	ND (300)	ND (300)
Volatile Organic Compounds			
Benzene	ug/L	ND (0.40)	1.1
Ethylbenzene	ug/L	0.42	2.3
m&p-Xylenes	ug/L	0.79	2.5
Methyl tert butyl ether (MTBE)	ug/L	ND (4.0)	ND (4.0)
o-Xylene	ug/L	0.69	2.0
Styrene	ug/L	ND (0.40)	ND (0.40)
Toluene	ug/L	0.65	21
Xylenes (total)	ug/L	1.5	4.6
PAHs			
1-Methylnaphthalene	ug/L	86	74
2-Methylnaphthalene	ug/L	110	100
Acenaphthene	ug/L	76	70
Acenaphthylene	ug/L	1.4	1.3
Acridine	ug/L	3.8	4.7
Anthracene	ug/L	7.4	6.1
Benzo(a)anthracene	ug/L	2.1	2.1
Benzo(a)pyrene	ug/L	0.78	1.2
Benzo(b)fluoranthene/Benzo(j)fluoranthene	ug/L	1.2	1.6
Benzo(b)pyridine (Quinoline)	ug/L	63	1.2
Benzo(g,h,i)perylene	ug/L	0.12	0.36
Benzo(k)fluoranthene	ug/L	0.46	0.63
Chrysene	ug/L	2.9	2.7
Dibenz(a,h)anthracene	ug/L	0.041	0.11
Fluoranthene	ug/L	16	11
Fluorene	ug/L	37	28
Indeno(1,2,3-cd)pyrene	ug/L	0.12	0.32
Naphthalene	ug/L	320	900
PAH high molecular weight	ug/L	38	28
PAH low molecular weight	ug/L	670	1200
Phenanthrene	ug/L	58	40
Pyrene	ug/L	15	8.8
Total PAH	ug/L	710	1300

Notes:
ND - Not detected at the associated reporting limit.
J - Estimated concentration.

Table 11.1

Closure, Post-Closure and Contingency Cost Estimate
Upland Excavating Property
Original Landfill Operations and Closure Plan

Closure Cost Estimate			
Item	**Unit**	**$ Per Unit**	**$ Per m^2 landfill**
Sand (Available on-site)	m^3	$3.00	$1.35
Geomembrane + 2 layers of geotextiles	m^2	$15.50	$15.50
Topsoil	m^3	$12.60	$1.89
Hydroseeding	m^2	$0.90	$0.90
Construction of swale and erosion control	lump sum	$30,020.80	$2.11
Contingency (20%)			$4.35
Total			$26.10
Post-Closure Cost Estimate	**Annual cost in the years post-closure**		
Item	**1 to 5**	**6 to 15**	**16 to 30**
Vegetation Maintenance	$ 2,500.00	$ 2,500.00	$ 2,500.00
Erosion & Surface Water Repairs	$ -	$ -	$ -
Leachate Management	$ -	$ -	$ -
Environmental Monitoring	$ 22,000.00	$ 15,000.00	$ 10,000.00
Consultant Reporting	$ 5,000.00	$ 4,000.00	$ 3,000.00
Contingency (20%)	$ 5,900.00	$ 4,300.00	$ 3,100.00
Total	$ 35,400.00	$ 25,800.00	$ 18,600.00
Cost of Implementing Contingency Measures			
Localized slope failure of lined cell			$ 73,000.00

Notes:

Environmental Monitoring Annual Costs for:

-1 to 5 years includes semi-annual monitoring at current per event cost

- 6 to 15 years includes annual monitoring, reduced analytical parameters, and annual reporting at current per event cost

-16 to 30 years includes annual monitoring, reduced anlaytical parameters, and reporting once every three years at current per event cost

Table 11.2

Rates Used in Financial Secuirty Calculation
Upland Excavating Property
Original Landfill Operations and Closure Plan

Non-Residential Building Construction Price Index Vancouver Census Metropolitan Area [1] 2017 Q1 = 100		Government of Canada Benchmark Bond Yields - LONG TERM [2]	
Year	**Index (Q3)**	**Year**	**% (as of Jan)**
2009	79.8	2009	3.90%
2010	80.3	2010	3.73%
2011	83.4	2011	3.29%
2012	86	2012	2.43%
2013	88.6	2013	2.84%
2014	90	2014	2.73%
2015	91.2	2015	2.17%
2016	95.4	2016	1.92%
2017	100.4	2017	2.28%
2018	106.5	2018	2.35%
10 year average inflation rate	**2.93%**	**10 year average long-term bond yield**	**2.76%**

Notes:
(1) Statistics Canada, https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1810013501, last accessed March 1, 2019
(2) Bank of Canada, http://www.bankofcanada.ca/rates/interest-rates/lookup-bond-yields/, last accessed March 1, 2019

Table 11.3

Financial Security Calculation
Upland Excavating Property
Original Landfill Operations and Closure Plan

Year	Stage	Original Landfill - Unlined Cell		Original Landfill - Lined Cell		A	B	C	D	Amount of FS Required (PV)
		Open Area (m^2)	Planned Closure Area (m^2)	Open Area (m^2)	Planned Closure Area (m^2)	Cost of Planned Closure (PV) *	Cost of Emergency Closure (PV)*	Sum of 30 Years Post-Closure O&M Costs (PV)*	Cost of Implementing Contigency Measures (PV)*	= (MAX A or B) + C + D
2019	Planning & Filling	7,000		7,225		$ -	$ 371,279.76	$ 728,618.78	$ -	**$ 1,099,899**
2020	Filling	7,000		7,225		$ -	$ 371,878.08	$ 744,883.66	$ -	**$ 1,116,762**
2021	Filling & Closure		7,000		7,225	$ 372,477.37	$ -	$ 746,084.04	$ -	**$ 1,118,561**
2022	Planned Post-Closure Period Begins					$ -	$ -	$ 747,286.36	$ 73,353	**$ 820,640**
2023						$ -	$ -	$ 711,714.94	$ 73,472	**$ 785,187**
2024						$ -	$ -	$ 676,028.79	$ 73,590	**$ 749,619**
2025						$ -	$ -	$ 640,227.52	$ 73,709	**$ 713,936**
2026						$ -	$ -	$ 604,310.77	$ 73,827	**$ 678,138**
2027						$ -	$ -	$ 568,278.17	$ 73,946	**$ 642,225**
2028						$ -	$ -	$ 541,932.41	$ 74,066	**$ 615,998**
2029						$ -	$ -	$ 515,501.67	$ 74,185	**$ 589,687**
2030						$ -	$ -	$ 488,985.68	$ 74,305	**$ 563,290**
2031						$ -	$ -	$ 462,384.15	$ 74,424	**$ 536,808**
2032						$ -	$ -	$ 435,696.82	$ 74,544	**$ 510,241**
2033						$ -	$ -	$ 408,923.41	$ 74,664	**$ 483,588**
2034						$ -	$ -	$ 382,063.64	$ 74,785	**$ 456,848**
2035						$ -	$ -	$ 355,117.22	$ 74,905	**$ 430,022**
2036						$ -	$ -	$ 328,083.89	$ 75,026	**$ 403,110**
2037						$ -	$ -	$ 300,963.36	$ 75,147	**$ 376,110**
2038						$ -	$ -	$ 281,348.28	$ 75,268	**$ 356,616**
2039						$ -	$ -	$ 261,669.93	$ 75,389	**$ 337,059**
2040						$ -	$ -	$ 241,928.11	$ 75,511	**$ 317,439**
2041						$ -	$ -	$ 222,122.61	$ 75,632	**$ 297,755**
2042						$ -	$ -	$ 202,253.22	$ 75,754	**$ 278,007**
2043						$ -	$ -	$ 182,319.74	$ 75,876	**$ 258,196**
2044						$ -	$ -	$ 162,321.96	$ 75,999	**$ 238,321**
2045						$ -	$ -	$ 142,259.68	$ 76,121	**$ 218,381**
2046						$ -	$ -	$ 122,132.68	$ 76,244	**$ 198,376**
2047						$ -	$ -	$ 101,940.77	$ 76,367	**$ 178,307**
2048						$ -	$ -	$ 81,683.72	$ 76,490	**$ 158,173**
2049						$ -	$ -	$ 61,361.33	$ 76,613	**$ 137,974**
2050						$ -	$ -	$ 40,973.39	$ 76,736	**$ 117,710**
2051	Planned Post-Closure Period Ends					$ -	$ -	$ 20,519.68	$ 76,860	**$ 97,380**

Appendices

Appendix A
Operational Certificate

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.

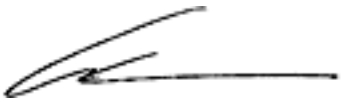
Requirements may also be specified by the *Environmental Management Act* and regulations including, but not limited to, the Contaminated Sites Regulation, Environmental Data Quality Assurance Regulation, Hazardous Waste Regulation, Landfill Gas Management Regulation, Organic Matter Recycling Regulation, 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 1×10^{-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 1×10^{-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.

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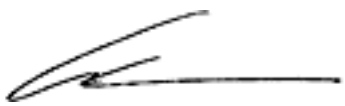

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3.2 Maintenance of the Facility

(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.

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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

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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.

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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,

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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,

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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.

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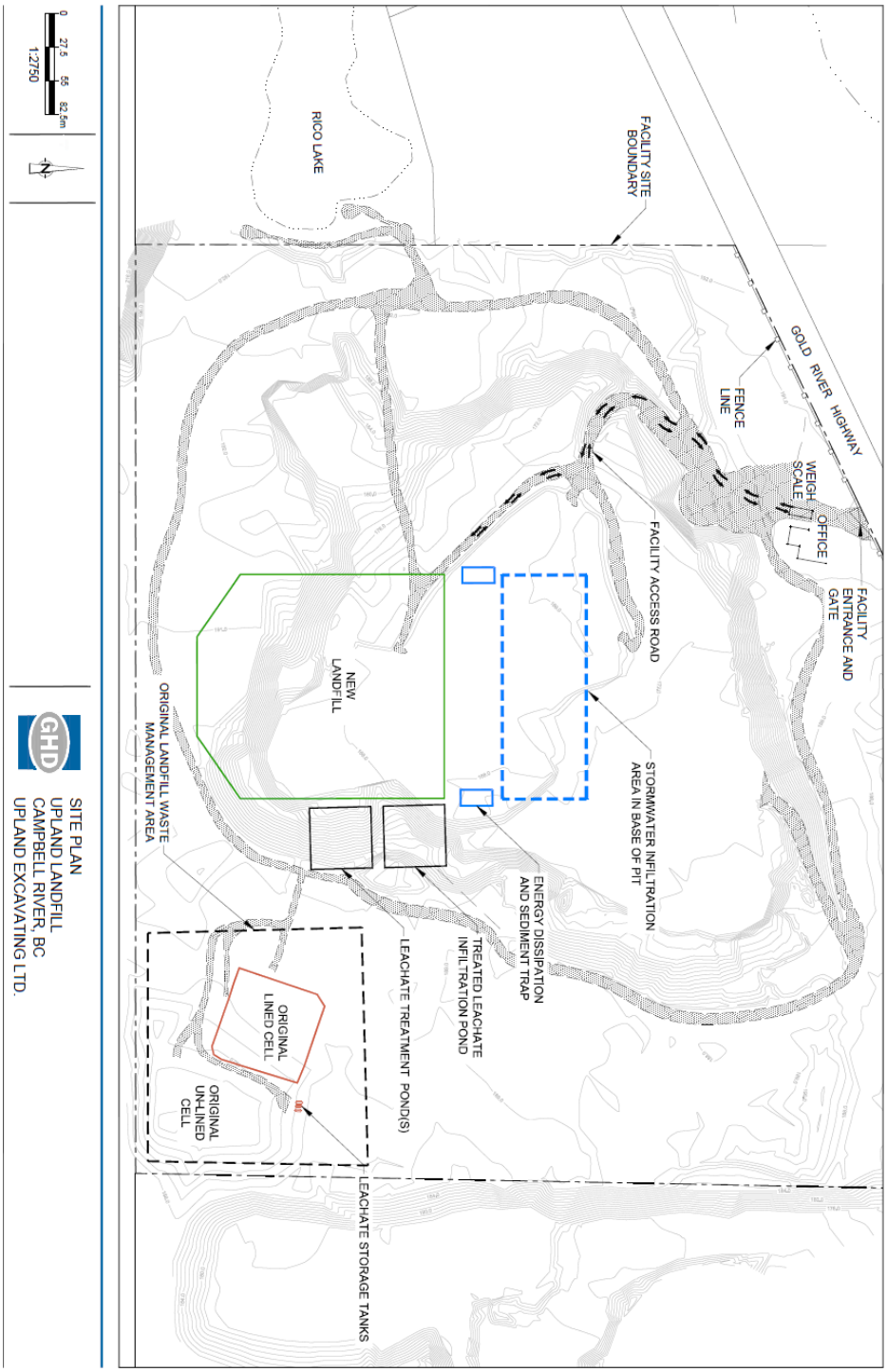
Authorizations - South Region

Site Plan A



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Appendix B
Environmental Monitoring Program

Table 1

Schedule
Environmental Monitoring Program Specification
Original Landfill, Campbell River, BC
Upland Excavating

Sampling Location	Sampling Location Purpose	Sample Matrix	Hydraulic Monitoring	Q1/Q2	Q3/Q4
Groundwater Monitoring Program (18 locations)					
MW2-14	To characterize groundwater quality upgradient of the Original Landfill	WG	√	Schedule A	Schedule A
MW2A-16	To characterize groundwater quality upgradient of the Original Landfill	WG	√	Schedule A	Schedule A
MW3-14	To characterize groundwater quality upgradient of the Original Landfill	WG	√	Schedule A	Schedule A
MW10-17	To characterize groundwater quality cross-gradient of the Original Landfill and monitor for potential Landfill derived impacts to the underlying aquifer	WG	√	Schedule A	Schedule A
MW11-19	To characterize groundwater quality downgradient of the Original Landfill and monitor complaince with respect to water quality	WG	√	Schedule B	Schedule B
MW1-14, MW4A-15, MW4B-15, MW5A-15, MW5B-15, MW6-17, MW7-17, MW8-17, MW9-17, MW15A-18, MW15B-18, PZ1-19			√	-	-
Surface Water Monitoring Program (2 locations)					
Rico Gauge	To monitor the water level in Rico Lake via surface water gauge	-	√	-	-
McIvor Lake	To monitor the water level in McIvor Lake via BC Hydro Data Records - use link below	-	√	-	-
https://www.bchydro.com/energy-in-bc/operations/transmission-reservoir-data/previous-reservoir-					
Leak Detection Layer Monitoring Program (1 location)					
S01-17	Leak Detection Layer	W	√	Schedule B	Schedule B
Leachate Monitoring Program (1 existing location; 2 proposed locations)					
S02-17	Leachate Sump	WL	√	Schedule B	Schedule B
S04	Proposed Leachate Access Pipe	WL	-	-	-
S05	Proposed Leachate Access Pipe	WL	-	-	-
Field Quality Assurance/Quality Control					
Field Blank		WG	-	Schedule A	-
Trip Blank		W	-	-	Schedule B
Groundwater Duplicate		WG	-	Schedule A	-
Leachate Duplicate		WL	-		Schedule B
Extra Bottles					
--		WG	-	Schedule A	Schedule A
--		WL	-	Schedule B	Schedule B

Notes:

WG - Groundwater
W - Water
LW - Leachate
√ - Every monitoring event

Table 2

Analytical Parameters
Environmental Monitoring Program Specification
Original Landfill, Campbell River, BC
Upland Excavating

Groundwater (WG)	Q1/Q2	Q3/Q4
Schedule A		
Water Level Monitoring		
Top of Water	√	√
Depth to Bottom	√	-
Field Parameters		
Conductivity (field)	√	√
Oxidation reduction potential (ORP)	√	√
pH (field)	√	√
Temperature	√	√
Total dissolved solids (TDS)	√	√
Turbidity	√	√
General Chemistry		
Alkalinity (speciated)	√	√
Chloride	√	√
Conductivity	√	√
Hardness (dissolved)	√	√
Hydrogen sulfide	√	√
pH	√	√
Sulfate (dissolved)	√	√
Sulfide	√	√
Total dissolved solids (TDS)	√	√
Nutrients		
Ammonia-N	√	√
Nitrate (as N)	√	√
Nitrite (as N)	√	√
Nitrite/Nitrate	√	√
Orthophosphate	√	√
Dissolved CSR Metals (incl. sulphur, mercury, hardness)	√	√

Leak Detection Layer Water (W) & Leachate (WL)	Q1/Q2	Q3/Q4
Schedule B		
Water Level Monitoring		
Depth to Water	√	√
Depth to Bottom	√	-
Field Parameters		
Conductivity (field)	√	√
Oxidation reduction potential (ORP)	√	√
pH (field)	√	√
Temperature	√	√
Total dissolved solids (TDS)	√	√
Turbidity	√	√
General Chemistry		
Alkalinity (speciated)	√	√
Biochemical oxygen demand (BOD)	√	√
Chemical oxygen demand (COD)	√	√
Chloride (dissolved)	√	√
Conductivity	√	√
Hardness (dissolved)	√	√
Hydrogen sulfide	√	√
pH	√	√
Sulfate (dissolved)	√	√
Sulfide	√	√
Total dissolved solids (TDS)	√	√
Total suspended solids (TSS)	√	√
Nutrients		
Ammonia-N	√	√
Nitrate (as N)	√	√
Nitrite (as N)	√	√
Nitrite/Nitrate	√	√
Orthophosphate	√	√
Dissolved CSR Metals (incl. Hg, phosphorus, sulphur, hardness)	√	√
Total CSR Metals (incl. Hg, phosphorus, sulphur, hardness)	√	√
Polycyclic Aromatic Hydrocarbons	√	√
BTEX/Volatile Petroleum Hydrocarbons	√	√

Appendix C
Exposure Pathway Assessment for Soil Acceptance at the Lined Cell of the Original Landfill

Technical Memorandum

September 30, 2019

To:	Upland Excavating Ltd.	Ref. No.:	088877
From:	Michelle Uyeda, P.Eng., CSAP	Tel:	604-214-0510
	Rose Marie Rocca, B.Sc., GIT /vk/10		
cc:			

Subject: **Exposure Pathway Assessment for Soil Acceptance at the Lined Cell of the Original Landfill**

1. Introduction

Upland Excavating Ltd. (Upland) is authorized by the BC Ministry of Environment Climate Change and Strategy (ENV) under Operational Certificate 107689 (OC) to receive soil within the lined cell of the Original Landfill as defined in Section 1.1.2(d) of the OC. The OC states that soil discharge must be "soil in which the concentrations of all substances that are less than the lowest applicable industrial land use standard specified for those substances in (i) the generic numerical soil standards and (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.

Per the OC Section 2.7 (b)(iii), a Qualified Professional is to certify that characterization of fill and soil from sites that may be contaminated is carried out in accordance with ENV procedures and applicable Contaminated Sites Regulation (CSR) (ENV 2019a) Guidance, Protocols and Procedures prior to acceptance for discharge in the lined cell.

For permitted engineered landfills, the assessment of the industrial land use (IL) standards that apply to the waste discharged to the engineered landfill cells becomes dependent on the potential exposure to receptors within and in the vicinity of a landfill.

This technical memo provides the conceptual site model and exposure pathway assessment to determine the applicable IL standards for the acceptance of soil at the lined cell of the Original Landfill.

GHD
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2. Conceptual Site Model

The conceptual site model is summarized below and presents the sources, fate and transport and exposure pathways and receptors applicable to soil acceptance at the lined cell.

The engineered landfill consists of a leachate collection system, a double geomembrane liner system and a leak detection system, combined to create a barrier between the waste and the underlying sand and gravel aquifer. Receptors at the landfill are limited to: site worker, operator, contaminated soil generator/transporter and trespasser (public). The exposure pathway assessment in support of the conceptual site model is provided below.

3. Exposure Pathway Assessment

The exposure pathway assessment presented below supports determination of the applicable CSR IL standards and whether soil for discharge poses acceptable or unacceptable risks to human health and the environment. Per Protocol 13, Screening Level Risk Assessment (SLRA), if a contaminated site is deemed to have no unacceptable risks (i.e., pass the SLRA), then the site is considered to satisfy the risk-based matrix standards of the CSR. Using Protocol 13 as a guide, and the known engineered, environmental and physical characteristics of the Site, GHD provided rationale as to whether exposure pathways are present for soil discharge into the lined cell.

Table 3.1 lists each of the potential exposure pathways, as defined by both Protocol 13 and the CSR Section 3.1 matrix standards site-specific factors. Both human and ecological exposure scenarios were evaluated. Environmental protection for livestock, major microbial functional impairment and groundwater used for irrigation were not assessed since these site-specific factors are not applicable for industrial land use.

Table 3.1 Exposure Pathway Assessment for IL Soil Being Accepted at the Lined Cell

Pathway	Receptor	Exposure Pathway Assessment
Human Exposure Scenarios		
Exposure to Contaminated Soils - Intake of contaminated soil (i.e. ingestion, dermal, dust inhalation, vapour inhalation)	Human – Public and Trespasser	The Site is private property and relatively secluded. Public exposure is limited by: • Site security including signage, controlled public access through a main gate, Site staff monitoring. • Daily, interim and final, low permeability cover material is placed to eliminate the exposure pathway. • Final engineered cover will be placed upon closure to eliminate the exposure pathway for ground surface to be uncovered and contaminated soils to be exposed at surface. The liner will provide a barrier, to prevent contact with contaminated soil. **Based on the above, the human health exposure pathway by ingestion is incomplete for the public when the landfill is active and during closure/post-closure but would be complete for the trespasser.**
	Human - Site Worker, Operator and Contaminated Soil Generator/Transporter	The site worker, operator and generator/transporter may be exposed to the contaminated soil during screening, acceptance and placement of the contaminated soil within the active landfill lined cell and management of the cell materials. Once the landfill is closed and a final cover is placed, the exposure pathway for the site worker and operator will be eliminated. **Based on the above, the human health (worker) exposure pathway by ingestion is complete only while the landfill is active.**
Exposure to Contaminated Groundwater - Groundwater used for drinking water	Human	The following engineered measures are in place to eliminate exposure to groundwater used for drinking water becoming contaminated by IL soil: • No active drinking water wells on the Site or within 500 m of the Site. Self-imposed restriction on having a drinking water well at the Site.

Pathway	Receptor	Exposure Pathway Assessment
		• Landfill is lined at its base, precluding discharge of leachate to the environment; leachate is collected, treated and disposed of off-Site as described in the landfill Operations and Closure Plan (OCP) Section 6. • The base liner system hydraulically disconnects the landfill from the underlying aquifers, and removes the potential for soil leachate to migrate to groundwater and flow to a future water well used for drinking water beyond the site boundary. • Landfill has been designed with a lined leak detection system. The leak detection system provides a means to monitor the performance of the liner system. • Regular groundwater, surface water and water from the leak detection system is monitored for comparison to performance criteria stipulated in OCP Section 7. **Based on the above, the human health (drinking water) exposure pathway is incomplete.**
Ecological Exposure Scenarios		
Terrestrial Exposure to Contaminated Soil – Toxicity to Soil invertebrates and plants	Terrestrial	Terrestrial exposure to contaminated soil is limited by: • The Site does not accept putrescible waste. • There have been no occurrences of vectors or wildlife within the active waste discharge area. • There is no potential terrestrial habitat present within the landfill area nor any suitable habitat for specific local species. • Upon closure of the landfill, final cover of the landfill will be constructed to eliminate any contact between the contaminated soil and ground surface. • The liner system will mitigate the potential for burrowing animals and potential terrestrial habitat. **Based on the above, the terrestrial exposure pathway is incomplete.**

Pathway	Receptor	Exposure Pathway Assessment
	Invertebrates and plants	Invertebrates and plants exposure is limited by: • There is no potential habitat for invertebrates and naturalization of vegetation at the active lined cell. • Upon closure of the landfill, specific non-deep rooting plants will be part of the reclamation plan. Ongoing monitoring of vegetation and clearing as needed will be completed. • Upon closure of the landfill, final cover of the landfill will be constructed to eliminate any contact between the contaminated soil and ground surface and provide a barrier for the potential for invertebrates to come into contact with the contaminated soil beneath the liner. **Based on the above, the invertebrates and plants exposure pathway is incomplete.**
Exposure of aquatic biota to contaminated groundwater - Groundwater flow to surface water used by aquatic life	Aquatic Biota	Aquatic biota exposure is limited by: • Aquatic life standards do not apply at the Site (Leushen, 2018). • The active landfill footprint is constructed with a liner, leak detection system, and leachate collection system. • Stormwater runoff from daily cover or waste is contained and managed as leachate as stipulated in the OCP Section 6. • These engineered works provide a barrier to hydraulic connection between the contaminated soil within the landfill and the underlying aquifer or nearby aquatic receptors, eliminating the potential for soil leachate to migrate to a receiving environment. • Surface water level monitoring outlined in OCP Section 7 verifies the hydraulic disconnection between the landfill, groundwater, and surface water. **Based on the above, the aquatic biota (surface water) exposure pathway is incomplete.**

Based on the information presented in Table 3.1, only the exposure to contaminated soils for the Site worker, operator, contaminated soil generator/transporter and the trespasser was identified.

All other human and ecological exposures did not have a complete operable pathway. This exposure pathway for the Site worker, operator, soil generator/transporter, and trespasser would only be valid during operation of the lined cell. Once closure of the lined cell with final cover is completed, the pathway would be removed.

4. Summary

Per GHD's assessment of exposure pathways using the ENV Protocol 13 SLRA, the applicable CSR IL standards for soil acceptance at the lined cell of the Original Landfill would include the following:

- CSR Schedule 3.1 Part 1 Human Health Protection – Intake of Contaminated Soil Matrix Standard or
- CSR Schedule 3.1 Part 2 Generic Numerical Soil Standards to Protect Human Health, whichever is most stringent.

Per the evaluation of the ecological exposure pathways and confirming that none are present within the lined cell, GHD opines that the CSR Schedule 3.1 Part 3 – Generic Numerical Soil Standards to Protect Ecological Health would not be applicable as a standard for soil acceptance.

5. References

Letter to Mr. Allan Leuschen, March 23, 2018 – Technical Response to ENV Review (Auth. No.:Pr-10807), Upland Landfill, Upland Excavating, Campbell River, British Columbia

Ministry of Environment, Climate Change and Strategy, Protocol 13, Screening Level Risk Assessment, v. 3.1, January 9, 2019

Ministry of Environment, Climate Change and Strategy, Contaminated Sites Regulation, B.C. Reg. 375/96, O.C. 1480/96 [includes amendments up to B.C. Reg. 13/2019, January 24, 2019a]

Appendix D
Soil Acceptance Agreement

Original Landfill
#210-909 Island Highway
Campbell River, BC
V9W 2C2
Phone (250) 286-1148 Fax (250) 286-3546

Soil Acceptance Agreement

This Agreement must be executed before any soil can be accepted by Upland Excavating Ltd. at the Upland Original Landfill located at 7295 Gold River Highway (Upland Landfill). The Upland Landfill requires this agreement to be executed by an authorized signatory of your firm (the "Company").

By signing this agreement, the Company represents and warrants to Upland Landfill that none of the soil delivered to Upland Landfill by the Company contains any waste material(s) or soil constituents at concentrations exceeding the applicable Industrial land use standard as defined by the Qualified Professional for the Upland Landfill (the "Criteria") or any other criteria stipulated by Upland Landfill and which may be amended from time to time at its sole discretion upon notice to the Company.

Upland Landfill further serves the right to inspect and sample and/or may require the Company to sample any and all soil before accepting the soil. The right of Upland Landfill to inspect or sample the soil does not reduce, restrict or otherwise affect the Company's liability in relation to soil that that contains any waste material or does not meet the Criteria. Any soil that contains waste material or does not meet the Criteria may be rejected by Upland Landfill acting in its discretion and Upland Landfill may request the Company to remove and dispose of such soil/material, such removal and disposal being the sole cost, risk and responsibility of the Company. If after acceptance by Upland Landfill, the soil is discovered to include waste material or not meet the Criteria, Upland Landfill will notify the Company. If requested the Company shall remove the soil/material within 24 hours of notification and dispose of the same in accordance with all applicable laws.

The Company agrees to defend, indemnify and hold Upland Landfill harmless from and against any and all claims, demands, orders, causes of action, damages, liabilities, losses, expenses, penalties and all costs of defense relative thereto, including legal fees, caused by or resulting from the Company's breach of this agreement, including without limitation, any breach of the Company's obligation to deliver only soil and meets the Criteria.

This Agreement does not confer a right on the Company to deliver soil to the Upland Landfill. Upland Landfill reserves the right to reject for any reason, any and all deliveries of soil made by or desired to be made by the Company.

This Agreement commences effective as of the first day on which the Company delivers soil to the Upland Landfill.

Any waiver of any provisions of this Agreement must be in writing signed by the Upland Landfill.

Name:	Title:
Company:	Company Address:
Site Name:	Site Address:
Signature:	Date:

Appendix E
Soil Screening Process

Original Landfill
#210-909 Island Highway
Campbell River, BC
V9W 2C2
Phone (250) 286-1148
Fax (250) 286-3546

Soil Screening Process

Upland staff will complete the following steps prior to the acceptance of soil and during discharge at the Original Landfill lined cell.

Phase 1 – Prior to Discharge

Ask the Company the following questions and confirm their responses by visual inspection.

1. Is the soil generated from a site that may be contaminated? Y/N

2. Does the soil contain or is intermixed with waste including but not limited to plastic, metal debris, PVC pipe, or insulation? Y/N

3. Does the soil have any visible stains? Y/N

4. Is the soil odorous? Y/N

5. Does the soil comply with the OCP Soil Acceptance Plan? Y/N

The generating company must sign the Soil Acceptance Agreement, answered No to Questions 1 to 4, and answered Yes to Question 5, before proceeding with soil discharge to the Original Landfill lined cell.

If the answer to Question 1 is yes, the soil characterization must be certified by Qualified Professional.

Phase 2 – During/Following Discharge

During discharge (i.e., dumping) at the lined cell, confirm that the soil does not contain any waste material including but not limited to:

1. Plastic

2. Metal debris

3. PVC pipe

4. Insulation

5. Other waste material

6. Staining

7. Odorous soil (i.e., gasoline, chemical, paint; etc. odour)

If the soil contains one or more waste materials, isolate the soil for testing or removal. Record non-compliant or rejected loads on the corresponding Soil Acceptance Agreement and contact your supervisor for further direction.

about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

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