

Technical Assessment Report

Waste Discharge Application

Upland Landfill

Campbell River, British Columbia

Upland Excavating Ltd.



10271 Shellbridge Way Suite 165 Richmond British Columbia V6X 2W8

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- Appendix A Letter from MOE to Upland, dated November 4, 2013
- Appendix B Upland Excavating Mission Statement and Corporate and Community Philosophie
- Appendix C Upland Property – Land Title Record

Supporting Reports

- 1 Hydrogeology and Hydrology Characterization Report (GHD 2016, Report 2)
- 2 Design, Operations, and Closure Plan (GHD 2016, Report 1)
- 3 Geotechnical Investigation Report (GHD 2016, Report 6)
- 4 Stakeholder Consultation Summary Report (GHD 2016, Report 5)

1. Introduction

1.1 Introduction

Upland Excavating Ltd. (Upland) has retained GHD Limited (GHD) as a qualified professional to assist with the development of the Waste Discharge Application (Application) to obtain an Operational Certificate for the Upland Landfill (Landfill). The Operational Certificate will replace Permit PR-10807, dated June 01, 1992 issued under the Waste Management Act.

The Technical Assessment Report (TAR) herein was developed by GHD and Upland in support of the Application. The contents of the TAR were determined at a pre-application meeting held on June 16, 2015 in Nanaimo, British Columbia (BC) between the BC Ministry of Environment (MOE), Upland, and GHD. The TAR is supported by the following attached technical reports that are discussed further in subsequent sections of this report:

- Hydrogeology and Hydrology Characterization Report (HHCR)
- Design, Operations, and Closure Plan (DOCP)
- Geotechnical and Seismic Analysis

1.2 Application Documents

The following documents are being submitted to the MOE as part of the Application

- Application Form
- TAR and supporting technical reports
- Consultation Summary Report

1.3 Background

The Upland Landfill is one of four private Demolition, Land Clearing and Construction (DLC) Waste Disposal Facilities included in the Comox Strathcona Waste Management (CSWM) Solid Waste Management Plan (SWMP). The SWMP was legally approved under the Environmental Management Act on May 23, 2013 by the MOE. The SWMP states the following:

The private DLC waste disposal facilities are expected to satisfy the same standards as publicly-owned facilities in the CSWM. It is expected that each private DLC waste disposal facility will prepare a proposed action plan and schedule to upgrade the facility to satisfy MOE standards or to phase-out and close the facility, and that the MOE will replace/update/amend the existing authorizations with updated permits or operational certificates that reflect the action plans and requirements.

On November 4, 2013, A. Leuschen, Senior Environmental Protection Officer – MOE, issued a letter to Upland requesting a proposed action plan and schedule to upgrade the waste disposal facility in accordance with the SWMP or a proposed schedule to cease operations.

- Upland's action plan included the following components: Make application for a new operational certificate to replace the existing permit
- Completion of a technical assessment report certified by a "qualified professional"

1.4 Pre-Application

1.4.1 Pre-Application Submission

In accordance with the Waste Discharge Regulation process flow sheet, Upland submitted a pre-application to the MOE on February 5, 2015. The pre-application documents included the following:

- Application Form (First three pages completed)
- Draft Terms of Reference for the Technical Assessment Report
- Draft Public, Agency, and First Nation Consultation Plan
- Draft Environmental Protection Notice

1.4.2 Pre-Application Meeting

A pre-application meeting was held on June 16, 2015 in Nanaimo, BC. The pre-application meeting was intended to review the pre-application documents and finalize the components of the Application. The attendees included:

- Al Leuschen, MOE
- Terry Stuart, Upland
- Greg Ferraro, GHD
- Matt Douglas, GHD

The outcomes of the pre-application meeting included the following key points:

- Director will issue notice of issuance of operational certificate (OC) 30 days prior to finalizing the OC to provide comment from public
- Application process for an OC is not covered under the Public Notification Regulation (PNR); however, a voluntary consultation program is recommended
- Prepare landfill reports in accordance with Section 10 of the most current version of the Draft Second Edition Landfill Criteria for Municipal Solid Waste (MSW)
- The application must include a TAR with the following information: waste types, effluent, discharge rates, land title record, site plan, footprint, buffer zone, main works, leachate pond, surface water pond
- Provide progress updates to MOE including submission of draft reports for comment prior to the final Application

2. Company Overview

2.1 Company Introduction

Upland is part of the Upland Group, which is one of the largest and most diversified construction companies on Vancouver Island, British Columbia. Upland is based out of Campbell River, and the head office is located at the entrance of the subject Site. Upland has been owned and operated by the same family since it was founded in 1969. Currently, Upland employs over 100 people in full-

time permanent positions; and at certain times, the number of employees can increase to approximately 200.

Upland believes in being a part of the local community and investing in the future of the community by contributing to local organizations. Some beneficiaries include the Salmon Enhancement Foundations, Campbell River Water Park, Rotary Club, and the Campbell River Motor Cross Track.

2.2 Mission Statement

Upland's Mission is to provide stable employment opportunities to the people of the community by growing with them over time. The Mission Statement and Corporate and Community Philosophy are provided in Appendix B.

2.3 Safety and Environmental Policies

Upland is committed to providing its employees with a safe, diverse and supportive working environment. Upland has a comprehensive occupational health and safety program in place to ensure the safety of the work force is the top priority. All workers are required to take part in the project specific safety plan.

Upland is also committed to the preservation and protection of the environment. Upland employs a rigorous Environmental Management Policy. All Upland work sites employ a site specific environmental management plan, and all workers must take part in a pre-job environmental management plan awareness training.

2.4 Services

Upland Group provides the following services:

- Aggregate Services
 - Drilling and blasting
 - Primary and secondary screening and wash plant
 - Custom crushing
 - Aggregate supply
- Trucking Services
 - 70 ton off highway rock trucks
 - 30 and 40 ton off highway trucks
 - Tractor haul rock box end dumps
 - Tandem truck and pup combinations
- Civil Contracting
 - Subdivision construction
 - Highway construction

- Logging road construction
- Spawning channel restoration
- Run of river hydroelectric construction
- Pipeline Construction
- Land Reclamation
- Open Pit Mining
- Concrete Production
- Utility Construction
- Waste Management
 - Asphalt and concrete recycling
 - Burning of clean wood waste
 - Landfilling of stumps, trees, land clearing waste, select building demolition debris, debris and residue of clean wood waste burning

3. Site Description

3.1 Site Location

The Upland Landfill (Landfill) is located at 7295 Gold River Highway (Site) within the city limits of the City of Campbell River (City), British Columbia (BC). The Site is located approximately 7 kilometres (km) west of the center of the City. The Site's southern property coincides with the boundary between the City and the Strathcona Regional District (SRD). The Gold River Highway and McIvor Lake are located to the north and west of the Site. The legal description is Lot A, District Lot 85, Plan 30709, Sayward District. The total area of the Site is approximately 48.2 hectares (ha). The Site Property Identifier is 001-223-321. A land title record for the Site is provided in Appendix C.

3.2 Property Description

The Upland Property is an active sand and gravel pit (Pit) that operates under Mines Act Permit G-8-114 issued December 1989 last amended in February 2014. The Upland property is serviced only by electrical, and is accessed from Gold River Highway from the North. The entrance of the property houses the company head office, shop, weigh scale and parking lot. The Pit is located in the centre of the property and is approximately 67,000 square metres (6.7 hectares). Upland has created a series of material stockpiles in the area east of the Site, as well as within the Pit. A mechanic shop is located in the northeast corner of the property. The perimeter burn area is located in the south east portion of the property. South of the Pit is buffer area and some overburden stockpiles. The south west area of the Site is comprised of bedrock outcrops. East of the Pit is the current 2016 gravel extraction operations. The northwest portion of the Site is used for storage of equipment and material. At the center of the base of the Pit is a wash plant. The current recycling operations are located on the northwest corner of the base of the Pit.

3.3 Site Area Zoning and Land Use

The Site is zoned as I-3 as defined by the City of Campbell River Zoning Bylaw No. 3250 dated 2006; last amended June 9, 2015. The adjacent land uses, and those within 500 metres of the landfill footprint, include industrial, rural, and residential under the same bylaw as discussed below:

- North - the Site is bound by Gold River Highway
- North and across Gold River Highway - LR-1 or lakeshore residential
- Northeast and cutting into Site - I-3 or industrial zoned parcel identified as crown land containing a telecommunication tower
- East - RU-1 rural zoned containing a large forested parcel of land that extends east as far as the Quinsam River approximately 3.5 kilometres to the east
- East - several I-3 properties used for gravel extraction and forestry operations, as well as one of the other private DLC Landfills as listed in the SWMP.
- Northeast and across Argonaut Road
 - I-3 – several lots including concrete redi-mix, mill, and the other DLC landfills listed in the SWMP
 - I-4 – Comox Valley Regional District Municipal Landfill
- West and same side of Gold River Highway:
 - I-3 – two properties also owned and operated by Upland group of companies
 - PA-2 or Public Area Two – Rico Lake
 - LS-R – a lake shore residential parcel

The areas to the south of the Site and outside of the City limits are zoned Upland Resource with minimum parcel size of 400 hectares, as defined by the Strathcona Regional District Zoning Bylaw No. 1404, Campbell River Area Zoning Bylaw, 1991.

4. Project Description and Objectives

4.1 Project Description

The project is intended to upgrade the facility as required by the MOE in the letter dated, November 4, 2013 addressed to Upland excavating, and as required by the CSWM SWMP for the continued use of the Upland Site for waste discharge. In accordance with these documents, the facility will be updated to meet the MOE Draft Second Edition Landfill Criteria for Municipal Solid Waste Landfills, dated September 2015 (Landfill Criteria). The facility upgrade will include the design and construction of a lined Landfill and leachate treatment system constructed in accordance with the Landfill Criteria. The Landfill will be operated for the discharge of MSW as defined by the Environmental Management Act, Part 3, Section 23. The Landfill will accept waste from commercial and industrial haulers only, and not be designed or constructed to accommodate residential drop-off. An environmental monitoring program will be implemented. The waste discharged under the existing Permit will be relocated to the proposed engineered landfill.

4.2 Commercial Objectives

Upland believes there is a continuing need for a DLC landfill in the region. Upland has elected to upgrade the waste disposal facility to meet the current MOE standards for the design, operation and construction of the Upland Landfill. Upland is committed to meeting and exceeding the standards set forth by the MOE. In order to finance the upgrades, Upland has developed commercial objectives that are in line with the waste management and economic needs of the community. The continuation and diversification of the waste management portion of their business will allow for the sustainable revenue required to facilitate the upgrades and associated operations, maintenance and monitoring, both during the operations and post-closure.

Upland is applying to receive the following municipal solid wastes at the upgraded facility, which are similar to the waste authorized under the existing Permit:

- Land clearing debris
- Inert Construction and Demolition waste
- Non-hazardous contaminated soil

Upland proposed to receive an average of 32,890 tonnes of waste per year. The tipping fees will be developed to ensure the commercial success of the proposed operations. A Permit Fee will be paid annually in accordance with the Permit Fee Regulation using the average annual tonnage.

4.3 Operational Objectives

The landfill operations will be conducted in accordance with the following documents:

- Operational Certificate (OC)
- DOCP developed as part of the WDA and to be updated every 5 years throughout the life of the landfill
- Municipal Development Permit

An overview of the key operational objectives is provided below:

- Receive and landfill only waste stipulated in the OC and via a comprehensive waste characterization plan
- Segregate and divert incoming materials for recycling, where possible, including concrete, asphalt, clean wood, and non-asbestos containing gypsum drywall
- Segregate and burn clean wood and brush clearing waste that is not suitable for recycling
- Construct the landfill in a staged approach as outlined in the DOCP
- Fill the landfill in accordance with the fill plan outlined in the DOCP in order to minimize leachate generation and prevent exposure to humans and wildlife
- Minimize leachate generation by promoting clean surface water diversion and preventing surface water run-on onto the landfill from adjacent land
- Ensure all surface water that comes in contact with the waste or daily cover is treated as leachate
- Collect all leachate within the lined landfill cell and associated leachate collection system

- Treat all leachate in batch leachate treatment cycles to MOE standards prior to discharge to infiltration pond
- Quarterly monitoring of groundwater, surface water, leachate
- Prevent nuisance impact to adjacent property owners
- Provide a complaint procedure in accordance with landfill criteria
- Maintain active Site specific health and safety, emergency response and fire safety plans
- Maintain records in accordance with the Landfill Criteria requirements

5. Waste Discharge

5.1 Discharge Quantity

5.1.1 Waste Quantity

The landfill is designed with a capacity of approximately 506,000 cubic metres to be consumed over a Landfill life of 20 years. The Landfill will receive an average of 25,300 cubic metres of waste per year. It is assumed that the Landfill will be filled to an apparent average density of 1.3 tonnes per cubic metres, resulting in an average annual fill rate of 32,890 tonnes of waste.

5.1.2 Leachate Quantity

The Landfill is estimated to generate a maximum annual average of 23,643 cubic metres of leachate, or 65 cubic metres per day, during the peak leachate generation stage discussed in the DOCP. The post-closure estimate leachate generation rate is estimated to be 580 cubic metres per year.

5.2 Discharge Quality

5.2.1 Waste Quality

The quality of the waste is distinguished by the types of waste to be accepted at the Landfill. The accepted, prohibited, and diverted wastes are outlined below.

5.2.1.1 Accepted Wastes:

- Land clearing debris
- Construction and demolition waste
- Asbestos containing material (ACM)
- Non-hazardous contaminated soil, as defined by the Hazardous Waste Regulation (HWR)
- Burn ash (from previous operations) and future burning if authorized

5.2.1.2 Prohibited Wastes:

- Putrescible waste
- Household waste from private residences unless disposed of by commercial hauler

- Hazardous waste as defined by the HWR
- Medical waste
- Liquid waste and sludge
- Gypsum drywall (except asbestos containing drywall)
- Recyclable materials
- Radioactive waste
- Waste under stewardship program

5.2.1.3 Wastes that may be segregated and diverted on-Site:

- Clean wood – chip some and burned some
- Concrete - crushing
- Asphalt
- Gypsum drywall

The acceptance of ACM will be completed in accordance with Section 40 of the HWR, including the appropriate MOE approval for the disposal in a landfill included in a SWMP. The handling, storage, and transportation of ACM will be completed in accordance with the HWR and WorkSafeBC requirements.

The land clearing debris may include the disposal of invasive species. Landfilling is the recommended method for the disposal of invasive plant species according to the Invasive Species Council of British Columbia.

5.2.2 Leachate Quality

All leachate will be collected from the Landfill and pumped to a lined aeration pond where it will be treated in a batch treatment cycle. The leachate will be treated to the applicable Contaminated Site Regulation (CSR) water quality standards prior to decanting to the on-Site infiltration pond. The specific forecasted leachate quality and leachate treatment quality objectives are outlined in Section 9 of the DOCP.

The acceptance of ACM and invasive plant species will not affect the leachate quality forecasted for the Landfill.

6. Applicable Environmental Criteria

6.1.1 Water Quality Criteria

The on-Site water quality criteria will be the Contaminated Site Regulation (CSR) applicable criteria for drinking water, as the downgradient off-Site aquifer has the capacity to support a drinking water supply well.

The nearest freshwater aquatic receptor, where the groundwater may potentially discharge to, is greater than 500 metres from the on-Site infiltration pond. As such, the water quality criteria for CSR

fresh water aquatic life would not apply at the Site boundary. The water quality passing the Site boundary will meet the British Columbia Water Quality Guidelines (WQG) for drinking water.

6.1.2 Landfill Gas Management Criteria

The Landfill gas will be managed in accordance with the Landfill Gas (LFG) Regulation. A Landfill gas generation estimate has been conducted, and is outlined in Section 11 of the DOCP. The current forecast estimates the maximum landfill gas generation rate to be approximately 560 tonnes of methane per year, which is under the regulatory threshold of 1000 tonnes of methane per year. As a result the landfill gas will be managed with a passive LFG system.

The generation estimate will be updated every 5 years in accordance with the LFG Regulation.

6.1.3 Soil Vapour Criteria

The soil vapour concentrations at the Site boundary and on-Site structures near the Landfill will be monitored. The soil vapour concentrations will meet the criteria stipulated in the Landfill Criteria.

7. Design Overview

The Landfill will be designed to meet the Landfill Criteria. The total footprint will be approximately 200 meters by 180 metres and will be constructed on the floor of the base of the Pit. The Landfill will be divided into 9 stages. The staging will progress from north to south and bottom to top. The landfill will 'piggy-back' on the southern slope Pit, which will be excavated to a slope of two horizontal to one vertical.

The base of the Landfill will be comprised of an engineered double liner system and leachate collection system. The double liner system will consist of a 1.5 mm HDPE geomembrane liner overlying a geosynthetic clay liner. The Landfill perimeter will include perimeter containment berms and clean water surface water ditches. The Landfill base will be sloped at a minimum of 1 percent toward a leachate sump. The sump will be connected via a forcemain to an adjacent leachate treatment system. The leachate treatment system will include a double lined aeration and settling pond that will decant to an adjacent infiltration pond.

The Landfill will be filled to a slope of three horizontal to one vertical. The final contours will extend to the same height as the surrounding topography to minimize nuisances to adjacent land owners. The final cover will be applied to areas that have reached final contours. The final cover will meet or exceed the performance of the minimum cover requirements stipulated in the Landfill Criteria.

The details of the Landfill design are found in the DOCP. The stability analysis of the landfill design is outlined in the GHD's 2016 Geotechnical Investigation Report

8. Receiving Environment Description

8.1 On-site

The Landfill will be located in the base of the approximately 6.7 hectare Pit that has been excavated approximately 20 metres below the original ground surface. Gravel extraction continues around the perimeter of the Pit. The material underlying the Pit is characterized as sand and gravel overlying

igneous bedrock. The bedrock dips significantly to the east. Bedrock is observed at the surface above the Pit wall in the southwestern portion of the Site, and is observed at depths greater than 45 metres below ground surface in the southeast portion of the Site. A bedrock ridge exists between the lakes (Rico and Mclvor Lake, discussed in Section 8.2) and the Site and provides a hydraulic (watershed) divide. The bedrock ridge is part of a mountainous divide and forms the western boundary of the Quinsam River watershed, also discussed in Section 8.2. The primary groundwater unit at the Site is an overburden aquifer is within the sand and gravel. Groundwater flow within this aquifer is to the southeast. The aquifer occurs at a depth of approximately 10 metres below the eastern half of the Pit.

A localized perched aquifer is also present in the southwestern portion of the Site above the Pit wall but is not present throughout the Site. The perched aquifer is not present below or downgradient of the proposed Landfill footprint.

Surface water from within the Pit infiltrates into the sand and gravel. There is no surface water flow from the base of the Pit. Surface water flow above the Pit walls is divided. There is flow to the west along the western side of the Site and flow to the east and south-east along the eastern and southern portions of the Site. The hydrological, hydrogeological, and geological conditions of the Site are further detailed in the HHCR submitted as part of the Application.

The Pit and the area of the Site surrounding the Pit is generally free of vegetation. The Site boundaries above the Pit walls support vegetation including treed buffer areas.

The Site experiences an average annual precipitation rate of 1,489 millimetres, according to Canadian Climate Normals measured between 1980 and 2010 at the Campbell River Airport (Climate ID: 1021261) (Government of Canada, 2016).

The baseline (existing) water quality has been characterized and is summarized in the Hydrogeology and Hydrology Characterization Report.

8.2 Off-site

The area surrounding the Site is low density land use including private lakeshore residences, and industrial uses including gravel extraction, forestry, concrete production, contractor yards and municipal solid waste management. The Site is bound to the north by the Gold River Highway, and to the north east by Argonaut Road. The nearest dwelling is located approximately 485 metres upgradient from the infiltration pond. The nearest water well is a private well located approximately 963 metres upgradient of the infiltration pond.

The Site is located within the Campbell River watershed. A bedrock ridge is located along the western boundary of the Site between the Pit and Rico and Mclvor Lake to the west, as discussed in Section 8.1. The Ridge extends from a mountainous area southwest of the Site to the area south of Mclvor Lake and northwest of the Site. East of the ridge the Site is part of the Quinsam Watershed, which is a sub-watershed of the Campbell River Watershed.

The general topography slopes towards the east and south east toward the Quinsam River approximately 4 kilometres away and continues to slope toward the Georgia Strait. The regional groundwater flow follows this general flow path toward the Quinsam River.

Mclvor Lake is contiguous with Campbell Lake and is located approximately 540 metres upgradient from the infiltration pond. Mclvor and Campbell Lakes drain into John Hart Lake located north of the Ladore Falls Dam. Mclvor Lake is the nearest reservoir.

9. Project Risk Assessment

9.1 Defining Project Risk

The design and proposed operations of the Landfill have been developed to meet the Landfill Criteria and using best management practices in the landfilling industry. The Landfill Criteria has been designed to ensure landfills are designed and operated in a manner to protect human health and the environment. The OC and the DOCP will outline the best management practices incorporated in the design and operations that will allow the Landfill to meet the Landfill Criteria and protect human health and the environment.

The project risks are associated with the failure of the design features or non-conformance with the stipulated performance criteria. Project risks have been identified and assessed based on GHD's Site specific knowledge, professional experience, and based on recommendations from the Landfill Criteria. The project risks identified for the Landfill include the following:

- Nuisances
- Landfill fires
- Emergencies including spills, explosions and accidents
- Earthquake related damage
- Slope stability
- Landfill gas migration
- Inclement weather including large snow accumulation, cold weather or increased precipitation
- Changes in leachate volume and quality
- Vector for invasive species
- Impacts on groundwater quality

Upland has included best management practices and project risk mitigation measures in the DOCP for the prevention of failures of design features. Best management practices and contingency measures have been identified in the TAR that may be implemented in the event that performance criteria of the Landfill is not achieved or a trend toward non-compliance is observed. Project risk and hazard mitigation measures in the DOCP are based on best management practices, and the implementation of contingency measures can be implemented on an as needed basis.

9.2 Potential Project Risks and Mitigation Strategies

9.2.1 Nuisances

The waste that will be placed within the Landfill cell has the potential to cause nuisances via dust and waste migration. This potential migration may also pose hazard to employees on-Site and residents in surrounding areas.

Best Management Practice: This risk of dust and waste migration will be mitigated through the application of daily cover which will keep the waste contained.

Contingency Measures: If additional measures are required to mitigate the nuisances and hazards of waste, the following measures will be considered: installation of litter fencing, use alternative daily cover, and wetting of the waste and access roads.

9.2.2 Landfill Fires

Landfill fires can develop when there is sufficient fuel and oxygen in a Landfill in addition to an ignition source. Fuel can be part of the waste or methane developed in the Landfill. Oxygen can be present in the voids of uncompacted waste. An ignition source may come from such sources as friction energy when moving equipment.

Best Management Practices: The Landfill will be operated in a manner that minimizes the risk of landfill fires. This includes compaction of waste to minimize voids, placement of daily and intermediate cover to minimize oxygen intrusion, minimum distances for hot work and welding, maintaining adequate soil stockpiles and water supply to control small fires. Burning operations will be completed in accordance with the DOCP and Landfill Criteria to minimize the risk uncontrolled fires.

Contingency Measures: A fire safety and emergency contingency plan has been developed to address the Site specific fire protection procedures. The fire safety and emergency contingency plan is provided in an Appendix of the DOCP.

9.2.3 Emergencies

Emergencies can include spills, explosions, and accidents. A wide variety of events may occur that would result in one of these emergencies.

Best Management Practices: The handling of waste and leachate will be conducted in a safe and careful manner in accordance with the DOCP and all applicable guidelines and regulations discussed within the DOCP, Landfill Criteria, and Environmental Management Act.

Contingency Measure: A fire safety and emergency response plan has been developed to address the procedures for responding to emergencies and spills, and is provided in an Appendix of the DOCP. The nearest hospital, which is 14 kilometers from the Site, is identified in this document.

9.2.4 Earthquake Related Damage

The Site can be classified as Class 'C' for seismic load calculations in accordance with the National Building Code of Canada 2011, as such there is a risk of earthquake related damage to the Landfill

Best Management Practices: A seismic evaluation of the proposed Landfill design has been conducted. The landfill is designed to withstand a seismic event with a 5% probability exceedance in 50 years (return period of 1000 years) with a peak ground acceleration of 0.20 g.

Contingency Measures: In the event of a low probability earthquake loading greater than modelled in the seismic evaluation, the Site may experience liquefaction or instability. This could result in the spreading of waste to the Pit floor adjacent to the Landfill footprint. The fire safety and emergency contingency plan discussed in Section 9.2.3 would apply.

9.2.5 Slope Stability

Slope failure is a risk at any landfill or surface features that is constructed or naturally formed with varying grades and slopes.

Best Management Practice: A slope stability assessment was conducted as part of the design process to verify an appropriate Factor of Safety was existed with the Landfill design. The slope stability assessment is detailed in the GHD's 2016 Geotechnical Investigation Report submitted as part of the Application. The Landfill design has a static long term slope stability safety factor of 1.5 with low to moderate consequences. A monitoring program will be prepared and implemented to monitor the slopes conditions and leachate conditions within the Landfill throughout the life of the Landfill.

Contingency Measures: If instability is observed during the monitoring program, or if a sudden build-up of pore pressure is observed in the Landfill the contingency measures will be implemented. The contingency measures will include a heightened monitoring program, release of pore pressure and removal of loading causing instability. Repairs and preventative measures will be conducted as required.

9.2.6 Landfill Gas Migration

Landfill gas (LFG) migration can occur when LFG intrudes into the highly permeable overburden soil allowing on-Site LFG migration.

Best Management Practices: The Landfill design includes a base liner system, and lined perimeters berms to contain LFG within the Landfill footprint. In addition, the LFG concentrations at sensitive receptors will be monitored as part of the environmental monitoring program outlined in the DOCP.

Contingency Measure: In the event LFG is detected near the on-Site buildings or property boundary a trigger level assessment approach will be implemented. The contingency measures implemented will include increased monitoring, venting system installations, landfill gas barrier systems, or other means to mitigate landfill gas migration and to protect human health and environment.

9.2.7 Large Snow Accumulation and Cold Weather

The climate variability in the Campbell River area may result in large snow accumulation or cold weather that could affect the operation of the Landfill.

Best Management Practice: The DOCP includes an allowance for snowfall events including operational requirements and capacity requirements to deal with the snow fall, snow melt, and cold weather. The surface water and leachate management plans include allowance for additional volume due to snow melt. The Site operator will make provisions at the Landfill if large snow falls are anticipated to ensure the Site is adequately prepared.

Contingency Measures: In the event a larger than anticipated snowfall event or significantly lower temperatures the following contingency measures will be implemented:

- Additional snow clearing measures

- Snow and snowmelt that comes in contact with the waste will be treated as leachate, the increased volumes will be addressed as discussed in Section 9.3.1
- Clearing of the above ground leachate pipes
- Continuous operation of the aeration system to prevent freezing of the aeration pond

9.2.8 Increased Precipitation

The Landfill features have been designed for the Campbell River climate. Climate data was obtained from historical records and statistical analysis compiled by Environment Canada to provide a quantitative description of the climate in terms of precipitation, humidity, and temperatures. It is possible, for reasons such as climate change, that the future climate parameters may differ from those used in the Landfill design. The most critical climate parameter in the design of the Landfill is the quantity and distribution of precipitation.

Best Management Practices: Surface water management, leachate management, and landfill gas management, have incorporated one of the following best management practices into the design:

1. Model inputs include increase in precipitation rates compared to historical (surface water management)
2. Model inputs are based on historical precipitation rates, however a factor of safety is applied to the model outputs. (leachate management)
3. A sensitivity analysis was conducted to determine if model results would change with increased precipitation rates, such as in the case of the climate change. (landfill gas management)

Contingency Measure: If annual precipitation rates increase beyond what is tolerable in the current design, the facility will require expansion to accommodate increase precipitation rates. The expansion works could include the following measures:

- Increased ditch sizes constructed at closure of the Landfill
- Increased pond sizes constructed at closure of the Landfill
- Increased leachate treatment capacity, as discussed in Section 9.2.9
- Updating of the landfill gas generation assessment with updated model inputs (updates required every 5 years)

9.2.9 Increased Leachate Volumes

The leachate treatment system will be designed for a forecasted leachate volume as discussed in the DOCP. It is possible that leachate volumes will increase in comparison to the forecasted leachate volumes.

Best Management Practices: The leachate volumes have been determined using the HELP model, which is a MOE approved method for modelling leachate generation rates and the active areas of the Landfill throughout the various phases of Landfill development. The leachate treatment system has been designed to accommodate the double the forecasted maximum annual average leachate generation volumes plus a freeboard. The maximum leachate generation anticipated throughout the life of the Landfill is not expected to surpass two times the forecasted maximum annual average leachate volume.

Contingency Measure: If the leachate volumes are observed to be greater than the current forecasts and the tolerable increases, the contingency measure will be to expand the capacity of the leachate treatment system ponds. This may include the construction of a settling pond, the expansion of the aeration pond, or the construction of a leachate holding tank.

9.2.10 Leachate Quality Variances

Leachate quality was forecasted based on a comparison of similar types of landfills in similar and varying climactic zones. The proposed leachate treatment system has been conceptually designed to accommodate the anticipated leachate quality based on the study of similar landfills. The actual leachate quality may differ from the current forecasts due to varying waste characteristics accepted throughout the life of the Landfill

Best Management Practices: GHD used similar landfills to forecast the leachate that is expected. During the first year of operation of the Landfill, additional leachate monitoring will be conducted to confirm and further characterize the actual leachate from the Landfill. The treatment system will be adjusted to treat the actual leachate quality observed. The duration of aeration, duration of settling, phosphorous addition, and other treatment components will be adjusted to effectively treat the leachate quality observed.

Contingency Measure: If the concentrations of contaminants in the leachate differ from those forecasted the following contingency measures will be implements:

- Adjust treatment schedule (i.e. extended aeration)
- Adjust treatment methods (i.e. pH adjustment, phosphorous addition)
- Modify the size and capacity of the treatment system (i.e. construct settling pond, etc.)

9.2.11 Leachate Treatment Objectives Not Obtained

The current leachate treatment objectives include treating the leachate such that the concentrations of the contaminants meet the applicable Contaminated Sites Regulation Schedule 6 criteria for drinking water prior to the discharge to the infiltration pond.

Best Management Practices: As discussed above, the leachate will be further characterized to ensure the leachate treatment system will be effective for the actual leachate observed. The forecasted leachate treatment process has proven effective at similar sites in British Columbia. If the treatment effectiveness is shown to be insufficient such that these leachate treatment objectives are not met during the batch treatment, the leachate will not be discharged to the infiltration pond. Furthermore, the leachate will be further treated until the leachate meets the treatment objectives.

Contingency Measure: If the treatment objectives are not being met, contingency measures will be implemented which may include increasing the level of treatment through extended treatment times and/or adding to the treatment process. While leachate treatment systems alterations are being carried out leachate may be trucked off-site for disposal at an appropriate licensed facility as an interim measure.

9.2.12 Invasive Species

Upland will ensure invasive plant species are controlled on the Site.

Best Management Practices: Invasive species will be discharge with the waste in the landfill in accordance with the Weed Control Act.

Contingency Measures: If invasive species or noxious weeds are identified as a problem, extermination measures will be employed to control the spread.

9.2.13 Increasing Groundwater Impacts

The on-Site groundwater will be monitored quarterly for landfill derived impacts. The groundwater is expected to comply with the applicable criteria downgradient of the Landfill at the on-Site downgradient compliance well.

Best Management Practices: The leachate will be treated to applicable criteria prior to discharge to the infiltration pond. The DOCP discusses the further refinement of the leachate as it attenuates within the on-Site groundwater. The Landfill derived impacts at the Site boundary are expected to be negligible.

Contingency Measures: The on-Site groundwater provides may provide contingent further reduction of leachate parameters, if required. If landfill derived impacts are detectable, and concentrations of leachate indicator parameters are observed to be increasing toward the compliance concentrations, a trigger level assessment program will be developed. The trigger level assessment will include increased monitoring, development of suitable contingency measures, establishments of trigger levels for implementation, and finally the implementation of contingencies to ensure the compliance concentrations are not exceeded.

10. Greenhouse Gas Emissions

As previously discussed, the Upland Landfill will benefit the Campbell River community and area by providing a local solution to local waste. Stemming from this is the potential for a reduction in greenhouse gas (GHG) emissions associated with waste transport by offering a waste management facility closer to the community than is otherwise available.

All waste generated in the Campbell River area during the proposed Landfill operating life will require appropriate management at an approved facility. The Upland Landfill will accept an average of 32,890 tonnes of waste per year, which would otherwise be shipped to various waste management facilities within British Columbia or United States. The nearest waste management facility that is currently identified to accept similar C&D waste streams is the Comox Valley Waste Management Centre (CVWMC) in Cumberland, British Columbia. The nearest waste management facility that is currently identified to accept contaminated soil waste streams is a private soil treatment facility (referred to as Duncan) located in Duncan, British Columbia.

GHD calculated potential GHG emission reductions for waste transport to the Upland Landfill as compared to the CVWMC and Duncan. For the purposes of the discussion it was assumed all waste soil would either be transported to Upland Landfill or Duncan and all C&D waste soil would either be transported to Upland Landfill or to the CVWMC. Although it may not be possible for all 32,890 tonnes of waste to be directed to these two alternative waste management facilities, no other facilities will be included in to GHG assessment to simplify the calculations and provide a conservative estimate of the GHG reductions associated with waste transport to the Upland Landfill.

10.1 Calculation Inputs

GHD estimated the GHG emissions associated with the transportation of 32,890 tonnes of waste per year to the Upland Landfill and to the alternate waste management facilities with the difference representing the anticipated GHG emission reductions for the Upland Landfill. GHG emissions from anaerobic degradation of waste to methane once placed in the landfill were assumed to be equivalent for both alternatives, as they share similar climates and would have identical methane generation profiles. The application of the existing alternative facilities as the baseline site is considered conservative, as any site further from Campbell River would have higher transportation GHG emissions, and would thus increase the reductions associated with the Uplands Landfill.

The GHG emissions assessment was conducted using the following information and assumptions, which were assumed to be identical for both sites, apart from transportation distances:

- Round trip distances from Campbell River city centre to the Upland Landfill, the CVWMC, and Duncan of 17.6 kilometres, 108.2 kilometres, 404 kilometres, respectfully.
- A waste amount of 32,890 tonnes per year, consisting of 50% soil and 50% construction and demolition (C&D) waste.
- Truck capacities of 20 tonnes of soil and 5 tonnes of C&D waste per load.
- Transportation emissions consist of the mobile combustion of diesel fuel.

10.2 Calculation Methodology

The number of return trips required for both sites was calculated according to Equation 1.

Equation 1: Number of Return Trips Required

$$N_{RT} = M_w \cdot \left(\frac{\%_{soil}}{Cap_{soil}} + \frac{\%_{C\&D}}{Cap_{C\&D}} \right)$$

Where:

- N_{RT} = number of return trips to be made per year
- M_w = waste amount per year (32,890 tonnes)
- $\%_{soil}$ = soil fraction of waste (50%)
- $\%_{C\&D}$ = C&D fraction of waste (50%)
- Cap_{soil} = capacity of truck for soil per trip (20 tonnes)
- $Cap_{C\&D}$ = capacity of truck for C&D waste per trip (5 tonnes)

Emission rates vary by fuel type and fuel consumption varies by vehicle type. GHD utilized emission factor and fuel consumption data from the GHG Protocol, a project of the World Resources Institute. An emission factor, per kilometre of distance travelled, for non-articulating heavy duty diesel vehicles (1960-present) was utilized. GHG emissions associated with waste transportation under the two scenarios were calculated according to Equation 2.

Equation 2: Waste Transportation GHG Emissions

$$GHG\ Emissions_i = D_i \cdot N_{RT} \cdot EF_{CO_2e}$$

Where:

- D_i = round trip distance for Site i (kilometre)
- N_{RT} = number of round trips required to transport waste amount
- EF_{CO_2e} = emission factor (0.718 tonnes of carbon dioxide equivalent (tCO_{2e}) per 1,000 kilometre travelled)

10.3 Results

The above calculations are detailed in Table 1. The results show that the transportation of 32,890 tonnes of waste to the Uplands Landfill would provide GHG emission reductions of 442 tonnes of carbon dioxide equivalent (tCO_{2e}) per year, when compared with transportation to the CVWMC.

Based on an emission rate of 0.221 tCO_{2e}/year for a typical passenger vehicle in North America, the annual emission reductions would represent the equivalent of 93 passenger vehicles being taken off of the road for a year (US EPA)

11. Proposed Monitoring Program

11.1 Quarterly Monitoring

The proposed environmental monitoring program (EMP) was developed in accordance with the Guidelines for Environmental Monitoring at Municipal Solid Waste Landfills. The proposed EMP will include quarterly monitoring of the following:

- Leachate quality (influent to the leachate treatment system)
- Leachate treatment effluent quality
- On-Site monitoring wells (upgradient, downgradient, cross-gradient, compliance)
- Off-Site upgradient private water wells
- Off-Site upgradient surface water
- On-Site surface water discharge locations (infiltration ponds)
- Soil vapour near on-site buildings and property boundary

11.2 Annual Reporting

The EMP results will be reported to the MOE annually. The Annual Report will include the components listed below in accordance with the requirements outlined in Section 10.6 of the Landfill Criteria. The details of the proposed EMP are provided in Section 14 of the supporting DOCP.

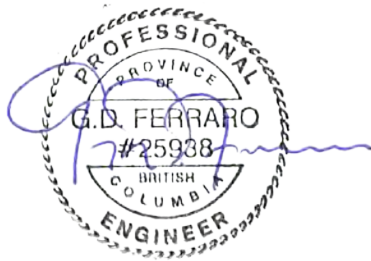
- Results of the environmental monitoring program

- Data tabulation, comparison to the performance criteria, interpretation, trend analysis, graphs, etc.
- Identification of any current or predicted future non-compliance with performance criteria
- Conclusions, recommendations and proposed changes to the environmental monitoring program
- Total quantity of waste discharged into Landfill
- Total quantity of waste diverted from the Landfill
- Leachate quantities collected, treated, and discharged
- Operational plan for the next 12 months
- Remaining Landfill site life
- Closure works completed, if applicable
- Results of regular inspections
- Changes from approved reports, plans, specifications
- Any complaints received and the action taken as a result of the complaint
- Identification of any non-compliance with the SWMP and OC

All of which is Respectfully Submitted,
GHD

A handwritten signature in black ink, appearing to read 'Shauna Sturgeon'.

Shauna Sturgeon, B.Sc.Eng.



Gregory D. Ferraro, P. Eng

12. References

Invasive Species Council of British Columbia, 2014. <http://bcinvasives.ca/> (accessed May 5, 2016)

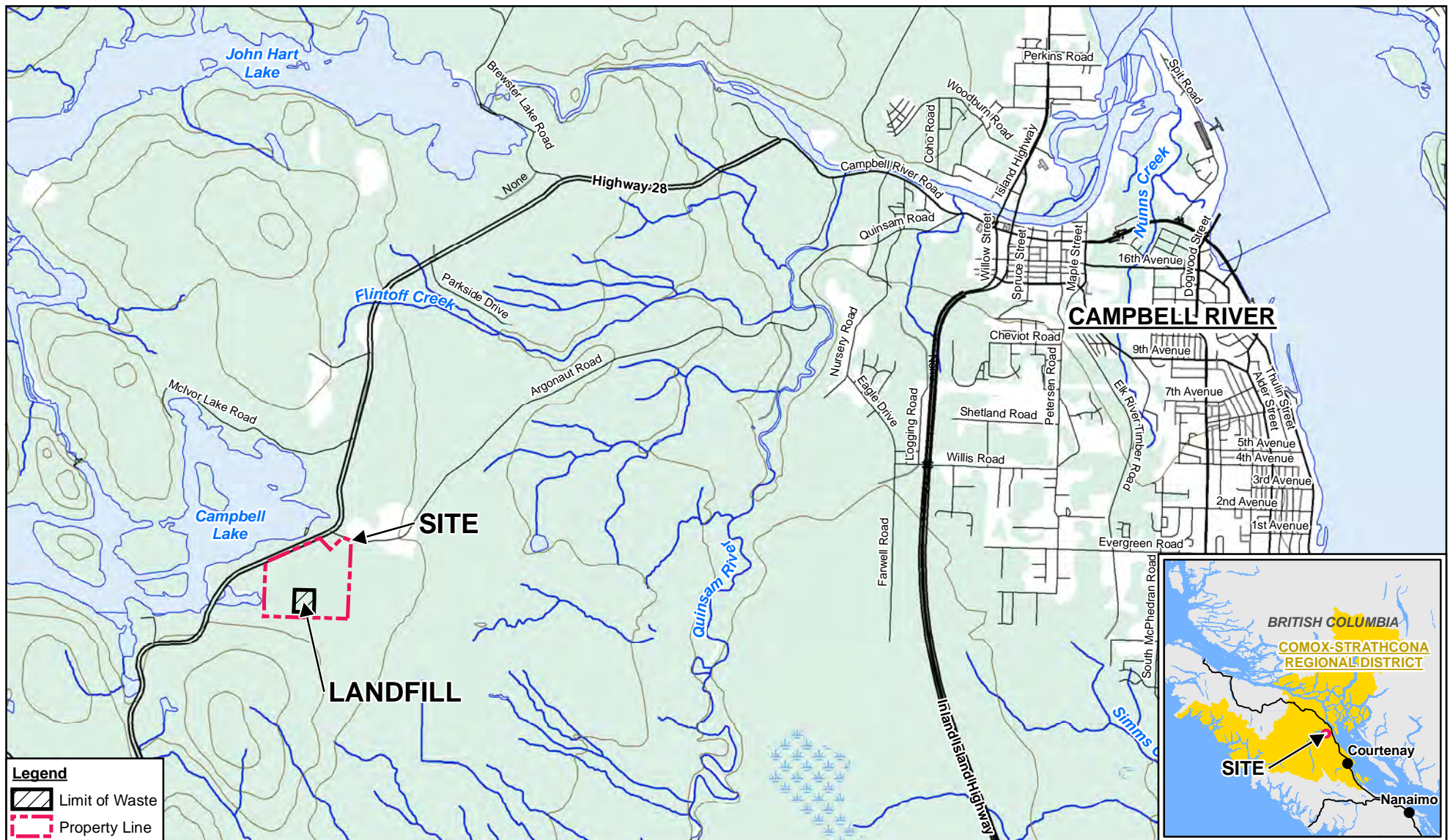
Government of Canada – Environment and Natural Resources, 2016, Canadian Climate Normals 1981-2010 Station Data – Campbell River A, Climate ID 1021261.

US EPA, 2014. *Greenhouse Gas Equivalencies Calculator*.

<https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator> (accessed May 7, 2016).

World Resources Institute. 2012. *GHG Emissions from Transport or Mobile Sources*.

<http://www.ghgprotocol.org/calculation-tools/all-tools> (accessed May 7, 2016).



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

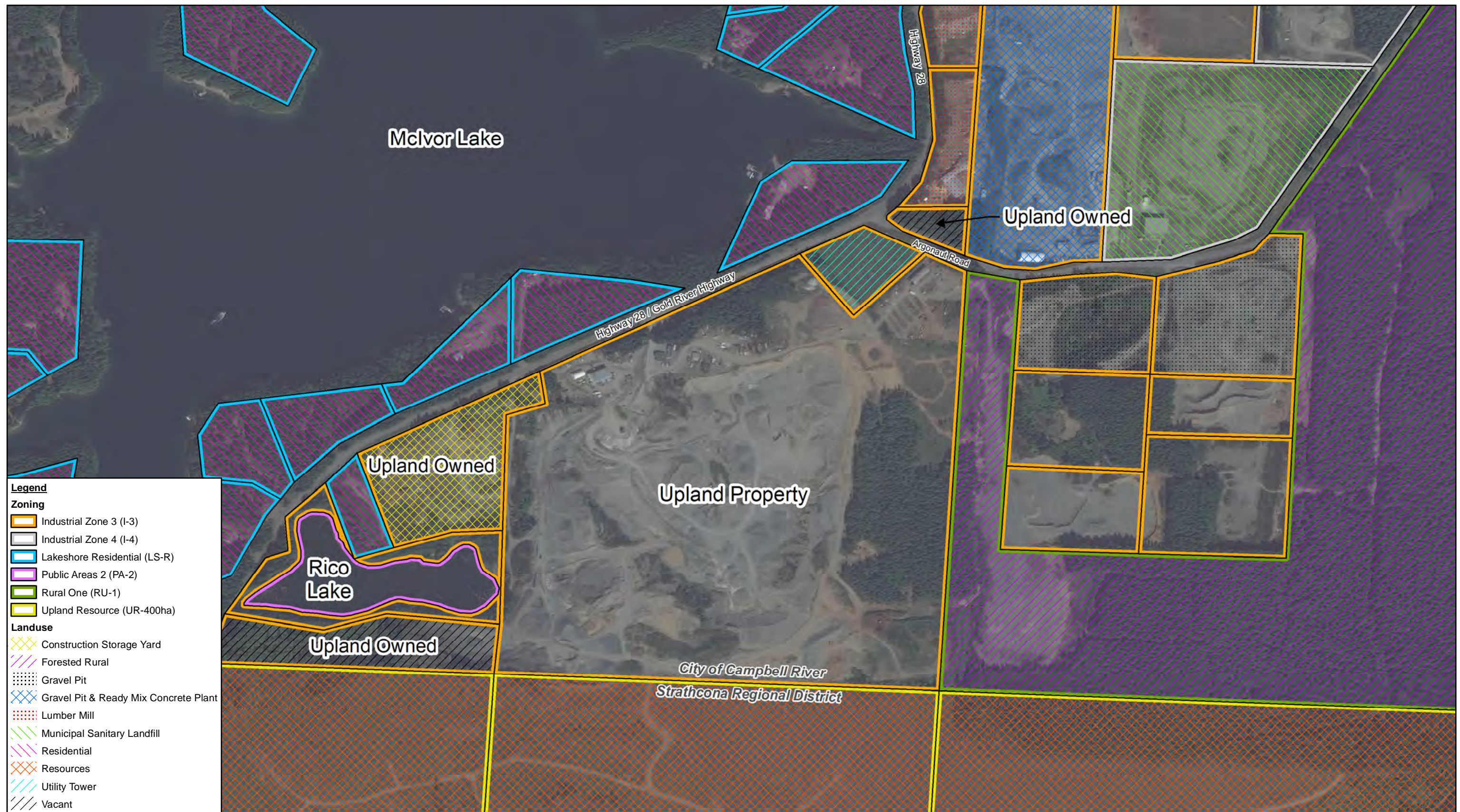


UPLAND EXCAVATING LTD.
UPLAND LANDFILL, CAMPBELL RIVER, BRITISH COLUMBIA
TECHNICAL ASSESSMENT REPORT

SITE LOCATION MAP

88877-02
May 27, 2016

FIGURE 1.1



Sources: CanVec Edition 1.1 © Department of Natural Resources Canada, all rights reserved; National Road Network 2.0 GeoBase; Property Parcels - City of Campbell River; Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation.

0 60 120 180
Meters
Coordinate System:
NAD 1983 UTM Zone 10N



UPLAND EXCAVATING LTD.
UPLAND LANDFILL, CAMPBELL RIVER, BRITISH COLUMBIA
TECHNICAL ASSESSMENT REPORT

088877-02
May 17, 2016

ADJACENT LAND USES AND ZONING

FIGURE 3.3

Table 1

**Greenhouse Gas Emission Estimates
Technical Assessment Report
Upland Landfill
Upland Excavating Ltd., Campbell River, British Columbia**

Parameter	Upland Landfill (C&D)	Upland Landfill (Soil)	CVWMC ¹ (C&D)	Duncan ² (Soil)	Units
Approximate Distance from Campbell River City Centre					
1 way	8.8	8.8	54.1	202	km/0.5 trip
Round trip	17.6	17.6	108.2	404	km/trip
Material Amounts					
Total amount (32,980 * 50% Soil/C&D)	16,445	16,445	16,445	16,445	tonnes/year
Truck Capacity	5	20	5	20	tonnes/trip
Number of trips	3289	822.25	3289	822.25	trips/year
Number of km per year	57,886.4	14,471.6	355,869.8	332,189.0	km/year
Emission Factor ³	0.718	0.718	0.718	0.718	tonne CO2e/1000 km
Total emissions per year	42	10	256	239	tonnes CO2e/year
Total emissions per trip	0.013	0.013	0.078	0.290	tonnes CO2e/trip
Potential GHG Savings from Using Upland Landfill versus CVWMC and Duncan Soil Facility	442				tonnes CO2e/year
	0.342				tonnes CO2e/trip
Equivalent number of passenger vehicles eliminated from roads annually ⁴					
		93	cars/year		

¹ Comox Valley Waste Management Centre, Cumberland, BC

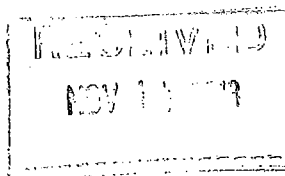
² Private Soil Treatment Facility in Duncan, BC

³ Heavy duty vehicle, diesel, 1960-Present. Greenhouse Gas Protocol - <http://www.ghgprotocol.org/calculation-tools/all-tools>

⁴ Environmental Protection Agency - <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator> -0.211 cars per tonne of CO₂e for the year

Appendices

Appendix A
Letter from MOE to Upland, dated
November **4**, 201**3**



Date: November 4, 2013

File: 10807

Upland Excavating Ltd
101-990 Cedar Street
Campbell River BC V9W 7Z8

Dear Permittee:

Re: Permit 10807 - Demolition, Construction and Land Clearing Waste Disposal Facility – Open Burn and Landfill Facility located near the Campbell River Waste Management Centre

Regional districts are mainly responsible for the management of municipal solid waste and recyclable material. Each regional district must have a solid waste management plan (SWMP) that describes its strategies for the management of municipal solid waste and recyclable material, including demolition, construction and land clearing waste, at public and private waste management facilities. A SWMP is legally approved under the *Environmental Management Act*.

The Comox Valley Regional District SWMP was approved by the ministry on May 23, 2013, and is available on the website: <http://www.cswm.ca/plan.html>. The approved SWMP (sections 12 and 15) encourages diversion, recycling and energy recovery of demolition, construction and land clearing waste, and addresses Private Demolition, Land Clearing and Construction (DLC) Waste Disposal Facilities including the subject waste disposal facility (section 18.9):

There are four active private DLC waste disposal facilities authorized by the MoE in the CSWM area:

- *Gleese Holdings (MoE Authorization 9081), a DLC waste landfill and open burn site near Campbell River;*
- *Upland Excavating (MoE Authorization 10807), a DLC waste landfill and open burn site near Campbell River;*
- *Surgenor Landfill (MoE Authorization 8834), a DLC waste landfill near Courtenay; and*

.../2

- *West Shore Aggregates Ltd. (MoE Authorization Permit PR-07730), a DLC waste landfill located across the road from the entrance to the Campbell River Waste Management Centre.*

The private DLC waste disposal facilities are expected to satisfy the same standards as publicly-owned facilities in the CSWM. It is expected that each private DLC waste disposal facility will prepare a proposed action plan and schedule to upgrade the facility to satisfy MoE standards or to phase-out and close the facility, and that the MoE will replace / update / amend the existing authorizations with updated permits or operational certificates that reflect the action plans and requirements.

Current MoE (Ministry of Environment) standards for landfills include the ministry Landfill Criteria for Municipal Solid Waste and the Guidelines for Environmental Monitoring at Municipal Solid Waste Landfills, and are available at the ministry website <http://www.env.gov.bc.ca/epd/mun-waste/waste-solid/landfills/>.

In accordance with the approved SWMP, a proposed action plan and schedule to upgrade the waste disposal facility to satisfy MoE standards **OR** to phase-out and close the waste disposal facility, is requested. Please send the proposed action plan and schedule to the Director, Environmental Protection Division, West Coast Region, 2080A Labieux Road, Nanaimo BC V9T 6J9, **by March 31, 2014.**

A proposed action plan and schedule to upgrade the waste disposal facility to satisfy MoE standards should include:

- An application for a new operational certificate to replace the existing permit. Complete and submit the application form available at:
http://www.env.gov.bc.ca/epd/waste_discharge_auth/app_forms/index.htm.
- A technical assessment report certified by a "qualified professional"¹ that includes comparison of the existing and proposed waste disposal facility with MoE standards, environmental impacts, action plan and schedule to upgrade the facility to satisfy MoE standards, design, operating, and closure plans, and a monitoring program.

A proposed action plan and schedule to phase-out and close the waste disposal facility should include:

-

¹ "qualified professional" means a person who:

(a) is registered in British Columbia with his or her appropriate professional association, acts under that professional association's code of ethics, and is subject to disciplinary action by that professional association, and

(b) through suitable education, experience, accreditation and knowledge may be reasonably relied on to provide advice within his or her area of expertise as it relates to this waste disposal facility.

- An action plan and schedule to cease open burning and landfilling by a specified date, and to close the landfill.
- A letter from the permit holder advising that they have elected to abandon Permit 10807 pursuant to section 20 of the *Environmental Management Act*, effective on the specified date the facility will cease open burning and landfilling.
- A landfill closure plan certified by a "qualified professional". The landfill closure plan should satisfy the ministry Landfill Criteria for Municipal Solid Waste (section 8 Closure and Post-Closure Criteria).

Before preparing and submitting the information, it is recommended that the "qualified professional" contact me to discuss the process, information requirements, and the scope and contents of the information, to help ensure the information will be adequate.

Thank you for your cooperation. We look forward to receiving the requested information **by March 31, 2014**. If you have any questions or concerns, please contact me at telephone 250 751 3199, email allan.leuschen@gov.bc.ca.

Yours truly,



A. Leuschen
Senior Environmental Protection Officer
Government & Compliance Section

cc: Upland Excavating Ltd., 7295 Gold River Highway, Campbell River BC V9H 1P1;
Fax: 250 286 3546; email mark.stuart@uplandgroup.ca
Thomas Boatman, Manager of Solid Waste, Comox Valley Regional District,
600 Comox Road, Courtenay BC V9N 3P6 tboatman@comoxvalleyrd.ca

Appendix B

Upland Excavating Mission Statement and Corporate and Community Philosophie



Mission Statement:

To provide stable opportunities to the people of the community by growing with them over time:

Corporate and Community Philosophie:

Upland Excavating Ltd. was founded in 1969 and has grown over time in pace with the local community. By working closely with the Community, Business Leaders and First Nation Groups, Upland Excavating Ltd. has remained a Community Leader in Construction Innovation and Employment. Upland Excavating Ltd. prides itself by providing families with permanent long term employment opportunities. We believe that with community engagement and our continual commitment to the preservation of the environment we will have a strong community presence for another 45 years.

Appendix C

Upland Property – Land Title Record

TITLE SEARCH PRINT

File Reference:

2016-04-18, 11:30:01

Requestor: Brian Fagan

****CURRENT INFORMATION ONLY - NO CANCELLED INFORMATION SHOWN****

Title Issued Under	SECTION 189 LAND TITLE ACT
Land Title District Land Title Office	VICTORIA VICTORIA
Title Number From Title Number	FB434174 S57100
Application Received	2011-10-24
Application Entered	2011-11-02
Registered Owner in Fee Simple Registered Owner/Mailing Address:	UPLAND EXCAVATING LTD., INC.NO. 326,339 1920 ANTONELLI ROAD CAMPBELL RIVER, BC V9W 4R6
Taxation Authority	CITY OF CAMPBELL RIVER
Description of Land Parcel Identifier: Legal Description:	001-223-321 LOT A, DISTRICT LOT 85, SAYWARD DISTRICT, PLAN 30709 EXCEPT PART IN PLAN EPP15087
Legal Notations	NONE
Charges, Liens and Interests Nature: Registration Number: Registration Date and Time: Registered Owner: Remarks:	MORTGAGE EC66769 1989-07-11 14:28 GEORGE WILLIAM STUART INTER ALIA
Nature: Registration Number: Registration Date and Time: Registered Owner:	MORTGAGE EK26583 1996-03-14 10:12 ROYAL BANK OF CANADA

TITLE SEARCH PRINT

2016-04-18, 11:30:01

File Reference:

Requestor: Brian Fagan

Nature:	PRIORITY AGREEMENT
Registration Number:	EK26584
Registration Date and Time:	1996-03-14 10:13
Remarks:	GRANTING EK26583 PRIORITY OVER EC66769.

Duplicate Indefeasible Title	NONE OUTSTANDING
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Transfers	NONE
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Pending Applications	NONE
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