Jager, Brenda CSNR:EX

From: Kear Porttris <Kear@sirm.ca>
Sent: Thursday, March 31, 2016 1:29 PM
To: s.22 Todd Mizuik; Downie, AJ ENV:EX
Cc: Tom Good; Hunse, Laura A ENV:EX; Leuschen, Allan ENV:EX; Raymond Lam
Subject: Updated EPM/OMS - 460 Stebbings Road Site
Attachments: 20160331_460Stebbings_EPMOMS_(Signed by Todd Mizuik).pdf; 20160331 EPMOMS Appendices.pdf

Hi,

Please find the updated Environmental Procedures Manual/Operation, Maintenance and Surveillance Manual (EPM/OMS) for the Mine and Reclamation Site located at 460 Stebbings Road, Shawnigan Lake, BC (MOE Waste Discharge Permit PR-105809 and MEM Quarry Permit Q-8-094).

Please remember this document is proprietary information and shall not be distributed without written consent from South Island Resource Management. It is our position this document is not subject to Freedom of Information requests.

Thank you,

Kear Porttris
SOUTH ISLAND
RESOURCE MANAGEMENT
460 Stebbings Road
Shawnigan Lake, BC V0R 2W3
Mobile: 250.580.7087
Office: 250.743.0811
Email: kear@sirm.ca
Web: http://www.sirm.ca/

SOUTH ISLAND
RESOURCE MANAGEMENT

460 Stebbings Road
Shawnigan Lake, BC V0R 2W3
250.743.0811
info@SIRM.ca

Environmental Procedures Manual/ Operation, Maintenance and Surveillance Manual [EPM/OMS]

Waste Discharge Permit PR-105809
Quarry Permit Q-8-094

Rev. 1.1
March 31, 2016

SIRM Document Revision History

Revision No.	Date	Revisions	Authorized (SIRM)
1.0	July 29, 2015	Conversion of SIA EPM v. 1.3 to reflect SIRM assumption of operations; merger with MEM OMS to create a new document	RPC
1.1	Mar 31, 2016	Name changes; text edits throughout the document; Section 7: Water Management Plan	

Notes:
(1) Review/revise to keep current and at least annually on or before March 31.
(2) Revisions are not effective until review/approval by technical reviewers and sign-off by SIRM Mines Manager.
(3) At time of issue, revisions must be submitted concurrently to both BC Ministry of Environment and BC Ministry of Energy, Mines and Petroleum Resources.

Approvals

Revision	Approval	Name	Signature	Date
1.1	SIRM Director	Todd Mizuik		March 31, 2016

Distribution

This is a controlled document.

When approved, this document must be kept accessible on Site in both original (signed) paper and (searchable) electronic forms. Electronic copies of the document are for information only; electronic files are subject to manipulation or alteration and only signed original hard-copies can be relied upon.

The document is the intellectual property of SIRM Ltd., which retains all rights and privileges. Unauthorized alteration or manipulation is strictly prohibited.

Other than the Province of British Columbia and its properly designated agents, no third party may rely on this document in part or in full, without the written permission of SIRM. SIRM is in no way liable for any damages of any kind resulting from third-party use, reference or citation.

EXECUTIVE SUMMARY AND COMPLIANCE POINT OVERVIEW

This document comprises the integrated site operations manual, the *Environmental Procedures Manual/ Operation, Maintenance and Surveillance Manual* (EPM/OMS), for the mine and reclamation site (the "Site") located at 460 Stebbings Road, Shawnigan Lake, BC (Lot 23, Blocks 156, 201 and 323, Malahat District, Plan VIP78459).

The operation of the mine includes the commercial production of rock products and the reclamation of the mine with encapsulated non-hazardous waste classification contaminated soils. As such, the mine operates under the following permits:

- BC Ministry of Environment (MOE) Permit PR-105809 (issued August 21, 2013; confirmed by the Environmental Appeal Board March 20, 2015; last amended June 4, 2015); and,
- BC Ministry of Energy, Mines and Petroleum Resources (MEM) Permit Q-8-94 (issued October 4, 2006; last amended Oct 28, 2015).

This EPM/OMS has been developed as a single operating guide for the Site meeting the related requirements of both Ministry of Environment ("MOE") and Ministry of Energy and Mines ("MEM") permits. Though based on a pre-existing Environmental Procedures Manual (v. 1.3, dated June 8, 2015), it represents an extensive revision and expansion of Site guidance.

South Island Resource Management Ltd. (SIRM) became the operator of record for the Site on June 11, 2015. Cobble Hill Holdings Ltd. (BC0754588, "CHH") is the landlord and permit holder for the Site. SIRM operates under a renewable long-term operating agreement with CHH. SIRM is not connected by ownership or management to CHH.

The SIRM EPM/OMS is a living document, routinely updated, with all updates submitted concurrently to MOE and MEM. A current version of the EPM/OMS is maintained on Site, available to staff and Ministry representatives at all times.

The EPM/OMS is a guide to Site operations, procedures, maintenance, surveillance/monitoring and compliance. It, with its appendices, present a detailed program for maintaining and improving the environmental performance of the Site.

For convenience, major compliance points are summarized briefly below in this executive summary, followed by synopses of effluent water and receiving environment water monitoring.

EXECUTIVE SUMMARY - GENERAL COMPLIANCE POINTS

Compliance Point/Item	General Overview
Quarry Production	• Max. 240,000 tonne/year
Contaminated Soil Import for Reclamation	• Max. 100,000 tonne/year
Hours of Operation	• Quarry and Landfilling/Reclamation: 7 am to 5 pm (normal business days) • Drilling: Restricted to 8 am to 4 pm (normal business days) • Light maintenance permitted in Quarry: 9 am to 4 pm Saturday
Authorized Works	• As described in permits. • No bypasses or changes that adversely affect quality or quantity of discharges
Authorized Discharge - Landfill	• No hazardous waste • No liquids, slurries, putrescible (rotting) material • Multicomponent (compacted clay till and landfill geomembrane liners on low permeability bedrock) encapsulation system • Importation, handling and record keeping as per Section 6 (Soil Acceptance Plan) of the EPM/OMS • Soils must be classified by qualified professional prior to arrival, and have supporting analytical data from an approved laboratory • Incoming soils re-sampled at prescribed frequency for quality assurance • All trucks from contaminated soil areas must go through wheel wash and be inspected before exiting Site.
Authorized Discharge – Water Treatment System	• Annual avg. rate 12.1 m^3/day; maximum instantaneous rate 274 m^3/day • Treat all contact water (runoff from areas with contaminated soil) • Comply with most stringent of BCAWQG and BCWWQG for Freshwater Aquatic Life (AL) protection and Drinking Water (DW) uses for parameters of concern
Authorized Discharge – Settling Pond	• 42,500 m^3/day for up to a 1 in 10 year flood event of 24 hrs duration • Maintain minimum water depth below decant and minimum freeboard during storm events. • Comply with most stringent of BCAWQG and BCWWQG for AL. • Total Suspended Solids (TSS) shall not exceed 25 mg/L for up to a 1:10 year storm event; nitrate shall not exceed standards applicable to DW.
Air/Odour/Dust	• No objectionable hydrocarbon odour evident at property boundary • No exceedance of Residential Land Use Standards (BC Contaminated Sites Regulation) at property boundary • No exceedance of 1.7 mg/dm2/day over 2 week averaging period at property boundary • Cover contaminated soils (including in active encapsulation cells) to protect from rain and wind
Notifications	• See Section 13 of the EPM/OMS - Notification is required for most significant upset Conditions, 24 hours in advance of blasting, and before placing soils in a new encapsulation cell.
Reporting	• See Section 13 of the EPM/OMS - Reports include: (a) regular quarterly and annual reports, including public posting and advisory committee review; and (b) certified as-built records for major work, including cell liner and cap construction.

SYNOPSIS: EFFLUENT WATER MONITORING

Monitoring Location	Minimum Monitoring Frequency	Minimum Sampling Frequency
Catch Basins and Leak/Leachate Detection Inspection Ports (soil management and encapsulation areas)	Visually inspected on at least a weekly basis. Cleaned out as needed.	N/A
Water Treatment System Holding Tanks (When Applicable) and/or Containment Pond	Weekly	Monthly (or as generated)
Water Treatment System Outlet (WTS)	Weekly	Monthly and every 2,000m^3 of effluent treated effluent
Settling Pond Outlet (SW-1)	Weekly	Monthly and every 2,000m^3 of effluent treated effluent
		Turbidity assessed bi-weekly from November to April and after greater than 1:10 year storm events*

*1:10 Year Return Event estimated based on 122mm of precipitation over a 24 hour period as measured at the on-site rain gauge.

SYNOPSIS: RECEIVING ENVIRONMENT MONITORING – GROUNDWATER AND SURFACE WATER

Receptor	Monitoring Locations			Monitoring Schedule
Ground-water	Up-gradient	MW-6	On-site, near southeast corner	Quarterly
	Down-gradient	MW-1 (S/D)	On-site, near centre	
		MW-2	On-site, near west property boundary	
		MW-3 (S/D)	On-site, near west property boundary	
		MW-5 (S/D)	On-site, north	
Surface Water	Up-stream	SW-4	Shawnigan Creek	5 in 30* (2 times/year, conducted during fall first flush event and during spring freshet); and after a 1:200 year storm event** at SW-2 and SW-3
		SW-2	Ephemeral Creek	
	Down-stream	SW-5	Shawnigan Creek	
		SW-3	Ephemeral Creek	

*5 in 30 refers to at least 5 weekly samples taken in a period of 30 days. Due to the ephemeral nature of some of the creeks, the first 5 in 30 samples should be collected when the ground has first been saturated.
** 156 mm of rain over 24 hours

TABLE OF CONTENTS

FIGURES

APPENDICES

1 INTRODUCTION

This document is the integrated site operations manual for the mine and reclamation site (the "Site") located at 460 Stebbings Road, Shawnigan Lake, BC (Lot 23, Blocks 156, 201 and 323, Malahat District, Plan VIP78459).

South Island Resource Management Ltd. (SIRM) became the operator of record for the Site on June 11, 2015. Cobble Hill Holdings Ltd. (BC0754588, "CHH") is the landlord and permit holder for the Site. SIRM operates under a renewable long-term operating agreement with CHH. SIRM is not connected by ownership or management to CHH.

The operation of the mine includes the commercial production of rock products and the reclamation of the mine with encapsulated non-hazardous waste classification contaminated soils. As such, the mine operates under the following permits:

- BC Ministry of Environment (MOE) Permit PR-105809 (issued August 21, 2013; confirmed by the Environmental Appeal Board March 20, 2015; last amended June 4, 2015); and
- BC Ministry of Energy, Mines and Petroleum Resources (MEM) Permit Q-8-94 (issued October 4, 2006; last amended Oct 28, 2015).

Current versions of both permits are attached in Appendix A and B, respectively.

As per Section 2.13 of MOE Permit PR-1058089, the Site must operate under an Environmental Procedures Manual (EPM), which is to be kept current; as per Section 2(a) of MEM Permit Q-8-94, the Site must also operate under an Operation, Maintenance and Surveillance (OMS) manual, also to be kept current.

This integrated site operations manual, the *Environmental Procedures Manual/ Operation, Maintenance and Surveillance Manual* (EPM/OMS), is a single operating guide for the Site, meeting the related requirements of both MOE and MEM permits.

The EPM/OMS is a living document, routinely updated, with all updates submitted concurrently to MOE and MEM. A current version of the EPM/OMS is maintained on Site, available to staff and Ministry representatives at all times.

1.1 Health, Safety, Security and Environment (HSSE) Policy Statement

SIRM's policy on health, safety, security and environment, as reflected in this EPM/OMS and in its separate Occupational Health and Safety Program manual, is an integral part of all operations and procedures. All employees are expected to embody our core values, to be "Reliable, Responsible and Accountable".

SIRM recognizes the importance of protecting the safety and health of employees, contractors and the communities in which they live, work and play. SIRM is committed to consulting with its employees and communities to promote and improve healthy, safe, environmentally responsible operations.

Management is accountable for ensuring the health and safety of employees and for the effectiveness of health, safety, security and environmental programs. Employees are responsible for following the procedures, protocols, reporting requirements and other responsibilities laid out in the EPM/OMS and the SIRM Occupational Health and Safety Program (maintained under separate cover).

Occupational health and safety, areas outside the mine boundary are under the jurisdiction of Work Safe BC and the BC Occupational Health and Safety Regulation (the "OHS reg", B.C. Regulation 296/97, as amended). Areas within the mine are under the jurisdiction of the Inspector of Mines, and the Health, Safety and Reclamation Code for Mines in British Columbia (the "Code").

1.2 Summary Description of the Site and Works

The Site is a shallow bedrock quarry approximately 5 km south of Shawnigan Lake in a rural, historically logged, industrial portion of the Cowichan Valley Regional District (CVRD) on Vancouver Island, British Columbia. The quarry has an estimated remaining productive life of 40 to 50 years. The pit cuts into an extensive mass of relatively impermeable rock, the Wark Gneiss (West Coast Crystalline Complex). The rock is hard, dense (about 2.85 g/mL) and resistant to cracking, spalling or degradation from mechanical, wet/dry or freeze/thaw action, making it highly desirable as, e.g., armour stone and wall rock.

Seepage through the rock mass is estimated, through historical studies, to be less than 0.3 m^3/day over the entire quarry footprint of nearly 20 acres. This includes conservative allowances for potentially weathered horizons. Where groundwater is encountered in rock fractures below the pit, it occurs with an upward hydraulic gradient (i.e., water in fractured bedrock deep beneath the pit is confined by overlying bedrock; if a flow path were available, water would flow upwards, into the pit).

Given the extremely low probability of contaminant transport out of pit fill under these conditions, the reclamation plan includes the use of fully encapsulated non-hazardous waste class contaminated soil and ash for bulk fill, with a final (future) revegetation cover of uncontaminated soil. To date, only soil has been received at the Site, and soils comprise the bulk of intended future acceptance. "Soil" is therefore used in this document in the context of soil acceptance and soil encapsulation to mean "soil and/or ash".

To provide additional assurance of permanent isolation, cells of soil are encapsulated in a composite liner and cover system using both natural clay material and commercial landfill geomembranes.

The Site accepts contaminated soils that exceed residential, commercial and industrial land use standards as defined by the BC Contaminated Sites Regulation (CSR) Schedules 4, 5 and 10. However, it does not accept soil exceeding the BC Hazardous Waste Regulation (HWR) standards, including standards based on leachability or toxicity.

Under permit terms, organic/treatable contaminants could be treated prior to encapsulating on Site, or prior to shipping off Site for appropriate re-use. In deference to CVRD's current interpretation of zoning terminology, **no contaminant treatment is currently conducted on Site**.

The Site is an active quarry, with contract drill/blast operations and rock processing. Rock products are exported and the pit is (aside from incident precipitation) dry. While the Site is classified as a mine, there is no permanent explosives magazine, mine tailings storage, dams or waste rock storage.

Current Site operations include:

(a) Rock product production under MEM Permit Q-8-094, to a maximum of 240,000 tonnes annually (Mine 1610355).

(b) Discharge of relocated contaminated soil and ash to engineered landfill cells under MOE Permit PR-105809, to a maximum of 100,000 tonnes per year (site reference E292889.)

(c) Discharge of treated water from a water treatment system to a general settling pond, under PR-105809, to an average annual daily rate of 12.1 cubic metres per day, with a maximum rate of 274 cubic metres per day (site reference E292170).

(d) Discharge of stormwater and water treatment system effluent from a settling pond to a seasonal (ephemeral) creek bed on the western boundary of the Site (site reference E292898).

Site features include:

- An active quarry pit
- A visual and noise screening berm along Stebbings Road
- Site fencing
- A buffer zone between the property line and the mine area
- Designated, controlled access ways to the permitted mine area (as required by the Mines Act)
- A deep (approximately 100 m) water supply well east of Shawnigan Creek from the pit (Well tag 86152)
- Incoming and outgoing scales
- Offices, storage buildings and laydown areas
- A conservation easement along Shawnigan Creek, which runs between the scale area/parking lot and the quarry area
- A covered Soil Management Area (SMA), to stage soil, and/or re-test them before discharge to landfill cells in the quarry
- Landfill (encapsulation cells) in the quarry to receive and permanently isolate compacted contaminated soil from the environment in composite clay till and geomembrane cells on low permeability bedrock

- A collection/containment system for water that may come into contact with contaminated soil ("contact water")
- A Water Treatment System to treat contact water
- A collection/management system for runoff water within the active Site area which has not come into contact with contaminated soil ("non-contact water")
- A settling pond and combined final discharge for combined collected non-contact water and treated contact water

Figure 1, attached, shows the Site layout.

The positions of the overall landfill area boundaries (the mine limits), the overall soil management area, the settling pond discharge, the water treatment system discharge, surface water sampling locations and down- and up- gradient groundwater monitoring wells are fixed under PR-105809 (Figures A and B of the permit).

Mining operations and reclamation activities are undertaken concurrently (referred to in mining as "progressive reclamation"). Within the specifications of the relevant permits, individual components of individual systems, such as the active quarry face, the location of individual pieces of water treatment system equipment, on-site monitoring locations, stockpiles and support structures, are moved to adapt as mining progresses.

1.3 EPM/OMS Objectives

As per Section 2.13 of MOE Permit PR-1058089, an EPM must cover all typical aspects of an Environmental Management System relevant to soil treatment, water treatment and landfill facilities (including operation, maintenance and inspection of works, as well as an emergency response plan). Minimum contents of the EPM are outlined in the permit.

As per Section 2(a) of MEM Permit Q-8-94, an OMS must outline procedures for successful operation, maintenance and surveillance of the Site (and of emergency preparedness and response procedures).

Specifically, with respect to the Health Safety and Reclamation Code for Mines in British Columbia (the Code), Section 10.5.2,

> *An Operation, Maintenance and Surveillance (OMS) manual shall be prepared and provided to an inspector and to all employees involved in the operation of a major dam or major impoundment, prior to commissioning. The manual shall be revised regularly during operations, decommissioning and closure of the structure.*

As per the Code, Part 10, Reclamation and Closure, "Definitions":

> *"major dam" means a dam that is used to store and control water, slurry or solids and has a maximum height at any point that exceeds 15 metres or is between 10 and 15 metres in height and has either a crest length that exceeds 500 metres, a flood discharge rate that exceeds 2000 cubic metres per second, a reservoir capacity that exceeds one million cubic metres, or any other dam so declared by the chief inspector.*

and

> *"major impoundment" means an impoundment that has a maximum depth of material greater than 10 metres at any point, or a maximum height of retaining dam or dike at any point that exceeds 15 metres, or is a storage facility designed to contain more than one million cubic metres of material or is constructed with dams or dikes that contain more than 50000 cubic metres of fill, or any other impoundment or water management facility so declared by the chief inspector*

Current OMS content has been developed with regard to the water management facilities of the Site, including the stormwater system, containment pond, water treatment system and settling pond.

The overall objectives of the amalgamated EPM/OMS are: (a) compliance with the above permit requirements; and (b) continuous improvement in environmental performance, health, safety and security.

These objectives are attained through:

1. Identifying compliance requirements
2. Procedures to facilitate permit requirements
3. Defining the overall management system and supporting operational procedures
4. Describing the process of change management and continuous improvement

1.4 EPM/OMS Scope and Function

The EPM/OMS includes, but is not limited to the following:

- Site and works description
- Risk identification and prioritization
- Administrative and engineering controls
- Roles and responsibilities
- Training requirements and competency demonstration
- A Soil Acceptance Plan

- A Water Management Plan, including operations, maintenance and system monitoring (surveillance)
- An Environmental Monitoring Plan including surveillance parameters, surveillance procedures, on- and off-site monitoring locations and the sampling procedures for soil and ash, water, groundwater and air quality, as required
- An Emergency Response Plan/Mine Emergency Response Plan, including contingency measures
- Site preparation for the construction of landfill cells
- Internal and external EMS audits
- Notification, reporting, corrective and preventive measures
- Change management
- References

The EPM/OMS focuses on operations and maintenance of a site constructed to approved designs. It has been developed in reference to Site permits, applicable legislation, regulations, standards, guidelines and codes of practice.

Design and design criteria is included only to the extent necessary for conveying intended capacity and operating ranges, enabling the comparison of performance to design intent, and guide evaluation of whether design modification is necessary. For more information on detailed design, refer to the "Technical Assessment for Authorization to Discharge Waste" (TAR), the current mine plan, and the on-site file of as-built records.

1.5 EPM/OMS Updates and Change Management

The EPM/OMS is prepared to the best of the author's, reviewer's and approver's knowledge at the time of writing. Except as noted, the EPM/OMS is a "living" document that is modified as required to reflect advancement of design and refinement of operation methods, as well as changing regulatory requirements and environmental conditions.

As a condition of the permit, the EPM/OMS is reviewed at least annually to reflect such changes. Annual reviews and submission of revisions are due to Province on March 31st of each year.

Additional review, revision and submission to the Province may be taken at any time on the direction of the SIRM Operations Manager.

Revision history and approvals for the current revision are presented before the Table of Contents.

2 RISK IDENTIFICATION AND PRIORITIZATION

Site risks are broadly categorized into two groups: (A) risks specific to the handling and encapsulation of contaminated soil and ash; and (B) risks normally associated with operation of a quarry. Both are discussed below.

2.1 Risks Related to Contaminated Soil and Ash

The potential for contaminated soil or ash to impact human and/or ecological receptors requires a pathway for contaminants to reach receptors. The Site was designed to eliminate potential pathways, which eliminates risk. Monitoring and inspection programs are required to confirm that the Site design and operations are effective at eliminating exposure pathways and quality assurance. Maintenance programs are required to ensure that works are as designed and approved, and function as intended.

The prioritization of risks, if pathways were somehow activated and contingency measures not taken, is subjective. It requires comparing speculative low-probability scenarios; for example, where design and monitoring simultaneously fail, where deliberate vandalism occurs, or where improbable natural disasters impinge.

Based on factors such as rate of contaminant migration, remedial alternatives, response time available, toxicity to receptors and attenuation along the pathway before contact with a receptor, prioritization is considered to be as follows:

1. Surface water impacts (transport of particulate and dissolved-phase contaminants in surface water)
2. Groundwater impacts (transport of dissolved-phase contaminants in groundwater)
3. Air quality impacts (transport of particulate/dust and volatile contaminants in air, including odours).

The potential for surface water impacts is considered to be the highest priority as a result of the potential for direct contact of precipitation with contaminated soil (“contact water”) and the potential for sedimentation associated with diverted overland runoff (“non-contact water”).

The volume of water requiring management and treatment, and the anticipated rate of migration will vary seasonally and in relation to storm events. The Site design considered a 1:200 year storm event and anticipated a worst-case scenario whereby such an event also results in a near-instantaneous snow melt. However, Site procedures include cover requirements for trucks, piles and active cell faces.

Potential groundwater impacts are considered to be the second highest priority. The risk to groundwater is mitigated by natural geological and hydrogeological conditions at the Site in addition to engineered controls.

Impacts to groundwater require simultaneous failure of multiple levels of physical and procedural control. For significant groundwater impacts related to an encapsulation cell to impact off-site receptors, the following safeguards must be breached:

- The final (graded) revegetated cap
- The geomembrane cap
- Quality assurance procedures to prevent introduction of leachable materials
- The leachate collection layer
- The geomembrane bottom liner
- The leak detection layer under the geomembrane
- The compacted clay layer
- A significant layer of low permeability bedrock
- An upwards hydraulic gradient
- Natural attenuation along the flowpath to the receptor

The potential for air quality impacts is considered the lowest priority, based on the temporal (temporary) nature, ease of management (slowing/limiting soil disturbance, tarps, mists, sprays and foams), rapid attenuation with distance from the point of release, and the lack of nearby receptors. Air risks are similar to but lower (because of distances to receptors such as residences) than other air risks routinely managed at contaminated soil excavations throughout the province.

2.2 Risks Related to Quarry Operations

Risks related to routine quarry operations fall into two general categories: risks to workers in the quarry, and risks to human and ecological health outside the quarry. The Site is managed under SIRM's health and safety program (maintained under separate cover), which seeks to exceed the requirements of both the BC Occupational Health and Safety Regulation (the "OHS reg") and the Health, Safety and Reclamation Code for Mines in British Columbia (the "HSRC" or simply "Code"). The Site has established a management-worker Occupational Health & Safety Committee (OHSC), dedicated to continuously improving worker health and safety. Worker health and safety is not considered further herein.

Risks to human and ecological health outside the quarry are conceptualized as follows, based on experience and on the "Aggregate Operators Best Management Practices Handbook for British Columbia" (Ministry of Energy, Mines and Petroleum Resources, 2002):

Item	Issue(s)	Existing Mitigation	Existing Relative Risk
Noise	Noise from equipment operations, loading and transportation.	• Berm • Buffer Zones • Hours of operation (generally 7am to 5pm weekdays; drilling restricted to 8am to 4pm weekdays)	Low
Dust	Dust from exposed soils, traffic and stabilization	• Distance to receptors • Sprinklers • Tarps and Covers • Wheel wash • Paving • Only carried out in the SMA with appropriate equipment	Low
Traffic	Heavy truck traffic into/from the facility	• Hours of operation • Limited production tonnage • Facility terms of service restrictions on trucker conduct • Trucker orientations	Low
Viewscapes	Changes to landscape	• Berm • Buffer areas • Revegetation • Housekeeping and maintenance	Moderate
Stormwater	Increased erosion and siltation; pollution	• Buffer zones and Conservation Easement • Housekeeping and maintenance • Ditches, bioswales, checkdams, gravel filters and retention/stilling basins • Designated (controlled) equipment maintenance areas • Paved areas around wheel wash sloping to wheel wash catch basin • Spill (emergency) response plan and spill kits • Settling Pond • Revegetation of disturbed areas • Gravelled parking lot • Facility terms of service restrictions on truck condition/trucker conduct	High
Groundwater	Reduced filtering capacity; altered recharge rates; lowering of groundwater table; contamination	• Massive, low permeability bedrock • No pit groundwater dewatering necessary (dry pit) • Designated (controlled) equipment maintenance areas • Spill (emergency) response plan and spill kits	Low
Acid Rock Drainage	Increased acidity	• Test results show rock is not acid generating.	Low

Based on the above risk identification, risk prioritization and management is as follows:

Item	Relative Prioritization & Related Action(s)
Noise	Low – no specific additional measures in the absence of triggering event.
Dust	Low – no specific additional measures in the absence of triggering event.
Traffic	Low – no specific additional measures in the absence of triggering event.
Viewscapes	Low – no specific additional measures in the absence of triggering event.
Stormwater	High – integrate general quarry stormwater management with contaminated soil/ash surface water monitoring program.
Groundwater	Low – no specific additional measures in the absence of triggering event
Acid Rock Drainage	Low – no specific additional measures in the absence of triggering event

3 ADMINISTRATIVE AND ENGINEERING CONTROLS

In order to frame the EPM/OMS within the context of an Environmental Management System (EMS), the following table presents the prioritized risks from the preceding section, their associated controls or monitoring/surveillance, and related audit mechanisms.

Summary of EMS Framework within EPM/OMS

Prioritized Risk	Controls	Audits
Surface Water Impacts	**Soil Acceptance Plan**: Only non-leachable, non-hazardous waste soils accepted to Site, confirmed via laboratory data, soil sampling in accordance with MOE Guidelines and signed-off by the generator's QEP.	Quarterly and Annual Reporting, Internal and External EMS Audits, Advisory Committee Recommendations
	Water Management Plan: Collection, treatment and monitoring of contact water; collection and monitoring (with ability to treat) of non-contact water from adjacent areas (active site). Combined discharge from active site only occurs at one location, allowing for simplified control/intervention.	
	Environmental Monitoring Plan: Routine inspection and monitoring of surface water quality to confirm no impacts are occurring.	
Groundwater Impacts	**Bedrock Integrity Inspections**: Bedrock underlying proposed cells is inspected prior to construction. Identified fractures are subject to risk mitigation prior to construction.	Inspection/reporting required prior to the construction of each new cell
	Soil Acceptance Plan: Only non-leachable soils accepted to Site, confirmed via laboratory data review and soil sampling in accordance with MOE Guidelines.	Quarterly and Annual Reporting, Internal and External EMS Audits, Advisory Committee Recommendations, Inspection/reporting required prior to the construction of each new cell
	Environmental Monitoring Plan: Routine inspection and monitoring of groundwater quality to confirm no impacts are occurring.	
	Site Design and Natural Setting: Both compacted natural clay till and synthetic liners/landfill geomembranes are utilized for contaminated soil isolation; bedrock comprises a very low-permeability aquitard; bedrock inspection and risk assessment is conducted prior to cell construction; construction includes QA/QC with qualified professional oversight and reporting to the Province.	
Air Quality Impacts	**Environmental Monitoring Plan:** Routine monitoring of air quality during soil treatment or as triggered by Site observations.	Quarterly and Annual Reporting, Internal and External EMS Audits, Advisory Committee Recommendations
	Site Operational Procedures: Soil covered when not actively being worked/relocated, soil worked only during suitable climatic conditions, routine monitoring of climatic conditions including wind and precipitation.	

The above table links the risks associated with the Site to the “Controls” that are detailed within the EPM/OMS. The related plans forming subsections with the EPM/OMS are as follows:

- Soil Acceptance Plan (Section 6);
- Water Management Plan (Section 7);
- Sediment and Erosion Control Measures (Section 7);
- Environmental Monitoring Plan (Section 8); and,
- Emergency Response Plan (Section 9).

In addition to the above plans, the EPM/OMS details all other procedural aspects of the Site including:

- Roles and Responsibilities of Site Personnel (Section 4);
- Training Requirements for Site Personnel (Section 5);
- Site Construction, Construction QA/QC and As-Builts (Section 10);
- Site Operation, Inspection and Maintenance Procedures (Section 11).
-

4 ROLES AND RESPONSIBILITIES

Staff includes both core staff and personnel who come to the Site on an as-needed basis for oversight and specialty work (technical specialists). The roles and responsibilities for both core staff and technical specialists are described below.

4.1 Core Staff

Core Staff include the following key roles:

- Mine Manager
- Operations Manager
- Environmental Technician
- Scale Operator
- Shiftboss
- General Staff

Key responsibilities associated with each position are as follows:

- Mine Manager
  - Carry out designated responsibilities under the Mines Act and Code
  - Retain a current roster of Site personnel, clearly identifying the staff carrying out each role identified in the EPM/OMS
  - Carry out designated responsibilities under the Site Mine Permit, including but not limited to:
    - Maintain copies of Blast Logs, Electronic Monitoring Reports, blast videos and geotechnical/compaction quality assurance/quality control testing results and inspection logs for waste material in encapsulation cells
    - Notify the Inspector of Mines, and residents within 1 km from the centre of the quarry[1], 24 hours before to create a scheduled window, not more than 1.5 hours long, for any blasting.
    - Forward, to the Inspector of Mines, certified as-built records, including records for encapsulation cell liner construction prior to waste soil/ash placement, and compaction records for each subsequent 1 meter lift of waste soil/ash fill in

[1] 48°33'06.2"N,123°36'23.4"W

  - Forward, to the Inspector of Mines, a construction QA/QC report within 30 days of completing encapsulation cell construction
  - Forward to the Inspector of Mines an updated mine plan on a quarterly basis.
  - Provide the Inspector of Mines an annual report identifying the volume of water through the Water Treatment System, including all operating costs associated with the operation and maintenance of the treatment plant
  - Forward, to the Inspector of Mines, a copy of the report submitted to the Ministry of Finance in relation to the annual Health and Safety Assessment and the related data on annual production
  - Direct and verify compliance with mining procedures and plans beyond the scope of the EPM/OMS, including specific procedures for blasting within 3 m of the buffer zone and the approved plan to comply with Part 8 Section 8.7.1 to 8.7.4 of the Code
  - Schedule truck traffic such that trucks do not conflict with school bus pick-up and drop-off
  - Maintain an Occupational Health and Safety Committee
  - Forward copies of licensed land survey of any row of holes blasted within 10 metres of the boundary with CVRD property to the Inspector of Mines within one week of the subject blast

- Operations Manager
  - Verify Environmental Technician and Scale Operator completion of routine duties
  - Schedule routine flow-triggered, event-triggered, daily, weekly, monthly, quarterly and bi-annual monitoring events
  - Ensure that required environmental logs and records are maintained on-site for Provincial inspection
  - Confirm appropriate Waste Approval Applications have been submitted to, reviewed by and approved by a Qualified Environmental Professional
  - Complete monthly, quarterly and annual reports related to soil quantity and quality tracking for Qualified Environmental Professional input and review
  - Review permitted capacity and approve any quotes/offers to accept suitable waste soils

- Document and report instances of non-compliance in accordance with permit requirements and as outlined in the Emergency Response Plan/Mine Emergency Response Plan
- Routinely assess Site works and procedures, promptly bringing potential improvements in health, safety, security and/or environmental performance to the attention of the Mine Manager
- Liaise with the Advisory Committee established under MOE Permit PR-105809

- Environmental Technician
    - Conduct and document Site orientations for visitors, contractors and staff
    - Receive completed Soil Arrival Forms, verifying valid Waste Approval numbers
    - Assess incoming trucks for consistency with the relevant Waste Approval
    - Direct and observe unloading and consolidation at the SMA or encapsulation cell
    - Collect soil samples at SMA or encapsulation cell according to the Soil Acceptance Plan
    - Collect air samples according to the Environmental Monitoring Plan
    - Collect water samples according to the Environmental Monitoring Plan
    - Direct and inspect the covering of soil as required based on operations and precipitation
    - Conduct visual and olfactory monitoring for visible dust emissions and/or objectionable odours at the property boundary
    - Reconcile Waste Approval numbers, Soil Arrival Form numbers, and scale ticket numbers under unique tracking IDs (as per the Soil Acceptance Plan)
    - Track weights received from weigh scale operator and provide daily totals to Operations Manager
    - Document and demarcate soil in the Soil Management Area on a daily basis
    - Document soil placed in encapsulation cells on a daily basis
    - Complete daily log documenting soil source(s), locations and status
    - Conduct and document routine inspections of infrastructure including the SMA, Containment Pond, Water Treatment System, Water Treatment System Discharge, Settling Pond, Settling Pond Discharge, Leachate Detection Ports; Leak Detection Ports, ancillary equipment, catch basins, clean-outs and appurtenances.

  - Routinely assess Site works and procedures, promptly bringing potential improvements in health, safety, security and/or environmental performance to the attention of the Mine Manager.
- Scale Operator
  - Receive incoming trucks and monitor outgoing trucks, including:
    - Conducting driver orientations
    - Verifying truck information and compliance with Site terms of service
    - Taking truck weights, tare weight and vehicle information
    - Monitoring truck arrival and departure, keeping track of all haul trucks within Site boundaries
    - Verifying that incoming trucks are clean and have secured loads
    - Verifying that outbound trucks from the SMA have passed through the wheel wash and self-inspected to ensure that loose soil has been removed
    - Verifying that all outbound trucks are clean and have secured loads (if applicable)
    - Liaising with generating and receiving sites to schedule truck arrival/departure;
    - Printing truck and Site copies of scale tickets
    - Collecting Soil Arrival Forms and verifying that such are filled out fully and completely, including designation of a valid Waste Approval number
  - Maintain the Site sign-in/sign out sheet (mine tally)
  - Routinely assess Site works and procedures, promptly bringing potential improvements in health, safety, security and/or environmental performance to the attention of the Mine Manager.
- Shiftboss
  - Carry out all duties associated with an Open Pit Shift Boss as per the *Mines Act* and Code
  - Supervise workers in the pit
  - Monitor works, traffic, water and other pertinent Site features, promptly alerting the Environmental Technician of any unusual observations, high risk conditions, near misses, conditions that might lead to contravention permit or EPM/OMS requirements, or any known or suspected non-compliances with respect to permits, law or regulation

- Routinely assess Site works and procedures, promptly bringing potential improvements in health, safety, security and/or environmental performance to the attention of the Mine Manager.

General staff are utilized to operate equipment such as excavators, rock trucks, graders, rollers, street sweepers, and front end loaders in order to move, consolidate and manage soil and rock. Additional staff will be employed as needed. General staff work under the direct supervision of the Environmental Technician for activities related to waste soil receipt, management and encapsulation, and under the direct supervision of the shiftboss when in the pit.

4.2 Technical Specialists

A variety of specialists are employed on an as-needed basis by the Mine Manager and the Operations Manager. They attend Site on an as-needed basis.

These specialists include contract blasters, electricians, liner installation experts and water treatment experts.

Registered Qualified Professionals are retained to oversee, check, audit, and certify Site work within their specific fields of expertise and accreditation.

All permit works, plans, bedrock integrity and risk assessment, assessments, sampling, monitoring, investigations and reports, surveys, programs and reports must be conducted and certified by Qualified Professionals.

Two such Qualified Persons have substantial, continuing roles:

- The Site Qualified Environmental Professional (QEP) oversees operations related to contaminated materials operations under MOE Permit PR-105809; and
- The Site Qualified Professional Engineer (QPE) oversees operations related to ground engineering work as specified in MEM Permit Q-8-094, and related to bedrock integrity inspection and risk assessment under MOE Permit PR-105809.

4.2.1 Qualified Environmental Professional

The Site Qualified Environmental Professional's responsibilities include the following:

- Prepare/approve any changes to the approved Soil Acceptance Plan (a subsection of this EPM/OMS), and verify that MOE's approval is obtained prior to implementing any substantive changes
- Determine contaminants of concern for chemical analysis of environmental media
- Oversee sample collection and analysis
- Supervise/approve the re-characterization of any soils suspected as being unacceptable

- Designate/verify off-site disposal of any unacceptable soils at an appropriate off-site disposal site within 30 days of delivery
- Review soil quality data from proposed receiving sites (Generator Sites) in relation to the permit requirements
- Review Quality Assurance sample results
- Review data collected specific to the Environmental Monitoring Plan (groundwater, surface water, and, as applicable, air)
- Oversee the preparation of, and review/approve, Quarterly and Annual Reports in accordance with Permit requirements including requirements for data, interpretations, conclusions and recommendations

4.2.2 Qualified Professional Engineer

The Site Qualified Professional Engineer's responsibilities include the following:

- Undertake bedrock integrity inspection and risk assessments, and submit a report to MOE and MEM, prior to construction of any encapsulation cell
- Prior to receiving fill in any encapsulation cell, provide a signed as-built of work completed to date to both the Inspector of Mines and MOE, including a statement that the construction meets the standards of both MOE Permit PR-105809 and MEM Permit Q-8-094
- Undertake an annual inspection of waste storage and submit a report to the Inspector of Mines by March 31 of the year following the inspection
- Oversee and inspect Site construction
- Review rock cuts and slope design, evaluating the need for scaling and/or stabilization for worker safety
- Review Site conditions and monitoring results regularly and recommend, as necessary, additional instrumentation, monitoring frequencies, thresholds and response procedures related to stability

5 TRAINING AND COMPETENCY REQUIREMENTS

All personnel are required to complete a Site orientation, refreshed at least annually, which includes a Site health and safety orientation, an overview of permits, hours of operation, the meanings of property line and buffer markings and an overview of emergency response procedures. They must comply with SIRM's health and safety program, which includes minimum training standards with respect to conventional quarry activities.

Competency in emergency response is demonstrated as a team, in periodic exercises. Additional training requirements and required demonstrations of competence are role-dependent, as described in the following sub-sections. Copies of training records are retained on Site.

5.1 Core Staff

Core Staff have specific training and competency requirements related to their designations under law and regulation. For example, shiftbosses are evaluated and tested by MEM.

Supplemental training and competencies related to the EPM/OMS depend on role. Training guidelines are presented below:

- OFA1+T - Transportation Endorsement for Level 1 First Aid
- ERP - Emergency Response Plan/Mine Emergency Response Plan
- TDG - Transportation of Dangerous Goods
- PACWEIGH – Scale Software, Weighing, Taring and Scale Ticket Generation
- ICS - Incident Command Systems Level 100
- ENVIRO - Environmental Sample Collection and Analysis as per the EPM/OMS, BC MOE Technical Guidance for Contaminated Sites, as well as the British Columbia Field Sampling Manual (2013)
- HAZWOP - 24 Hour HAZWOPER (Hazardous Waste Operations and Emergency Response Standard)
- EQUIP - Equipment-specific procedures for the maintenance, calibration, use, decontamination and record keeping related to field instrumentation, such as water quality and air monitoring instruments.
- EPM/OMS - An overview of the EPM/OMS, and requirements of the EPM/OMS specific to relevant roles
- PERMIT/REG - The EPM/OMS in detail, Site permits, the Technical Assessment Report, the Contaminated Sites Regulation, the Hazardous Waste Regulation, the Mines Act and Code, the and related law and regulation.

Role	OFA1+T	ERP	TDG	PACWEIGH	ICS	ENVIRO	HAZWOP	EQUIP	EPM/OMS Overview	PERMIT/REG
Environmental Technician		•	•	•		•	•	•	•	•
Scale Operator		•	•	•					•	
Shiftboss	•	•	•		•		•		•	
Operations Manager		•	•	•	•	•	•	•	•	•
Mine Manager	•	•	•	•	•		•		•	•

The Mine Manager may designate staff into roles on a provisional basis, under enhanced supervision, as they complete additional training.

Competency is demonstrated by fulfilling the training course requirements, and by performance under the supervision of the Operations Manager or Mine Manager.

5.2 Technical Specialists

A wide range of specialists are involved with the Site operations and attend Site on an as-needed basis. These specialists will include engineers, geologists and liner installation experts.

These personnel will be required to demonstrate competency as appropriate for the specific discipline/expertise including both technical and regulatory competencies. Outlining training requirements for the Technical Specialists is beyond the scope of this document.

6 SOIL ACCEPTANCE PLAN

The following sub-sections outline the process for receiving and tracking imported soils.

These sub-sections relate directly to Section 2.2 (Screening and Acceptance of Soil) in MOE Permit PR-105809; no changes may be made to the substantive requirements of this Soil Acceptance Plan without the prior approval of MOE.

Modifications of "example" procedures or forms, general references and matters of format or diction are submitted to MOE in the form of a revised EPM/OMS as soon as practicable (and not less often than annually).

6.1 Waste Approval Application

Prior to receipt of any contaminated soils, a Waste Approval Application (WAA) will be completed by the Generator (or the QEP representative of the Generator). The Waste Approval Application will include generator site details including land use, land use history, and waste characterization information. An example of a "WAA" with examples of supporting documents is included as Appendix C.

Waste characterization details will include: nature of contamination, physical soil descriptions, soil moisture content, list of Potential Contaminants of Concern (PCOCs), maximum identified contaminant concentrations, and estimated soil quantity.

The Waste Approval Application must be accompanied by analytical results from a CALA (Canadian Association for Laboratory Accreditation) accredited laboratory. To ensure that no soil is received with contaminant concentrations in excess of the standards outlined in the Permit, the Site will require the following analytical information (see the example "Terms of Service" accompanying the WAA in Appendix C):

- For soils containing concentrations of LEPH and/or HEPH in excess of the CSR IL standards, the Site requires analysis of PAHs to ensure the PAH Toxicity Equivalent (TEQ) does not exceed that outlined in Schedule 1.1 of the HWR.
- For soils containing concentrations of metals with the potential to produce leachate as determined by the "rule of 20", the Site requires Toxicity Characteristic Leaching Procedure (TCLP) analysis.
- For soils containing any substances potentially classified as Hazardous Waste, appropriate laboratory analytical data is required by the Site to confirm no concentrations exceed the HRW standards.
- For soils where the PCOCs are dioxins and/or furans, laboratory analysis must be conducted utilizing a method acceptable to the Director.

The “rule of 20” is used to determine whether it is theoretically possible to produce leachate from a contaminated soil sample, thereby providing the trigger for TCLP analyses. The “rule of 20” simply converts the concentration of an analyte in soil (mg/kg) to a theoretical maximum leachate concentration in water (mg/L) by dividing the soil concentration by 20. The theoretical maximum leachate concentration is then compared to the leachate quality standards. If the theoretical leachate concentration exceeds the standard, then TCLP analyses will be conducted to determine the actual expected leachate concentrations from the particular material. The division factor of 20 reflects the ratio of extraction fluid to solid used in the TCLP analysis. Therefore, this is a conservative screening tool as the “rule of 20” assumes that 100% of the contaminant is leached from the soil which is highly atypical.

The Waste Approval Application and analytical information will be reviewed by the Site Environmental Technician prior to acceptance of any soil.

Prior to accepting soil, the physical properties of the soil will also be considered, in terms of geotechnical suitability. For soils determined as problematic (i.e. high moisture content, compressible, entrained debris, etc.), a project-specific geotechnical plan will be prepared and implemented, in consultation with the Site geotechnical engineer. This may include establishing an acceptable range of physical properties, criteria for measuring physical properties, and a plan for ensuring the soil is rendered acceptable for placement.

6.2 Soil Receiving and Verification

Contaminated soils entering the Site will be managed according to the types and concentrations of contaminants and the level of characterization undertaken at the Generator Site. If soils have been adequately characterized and do not demonstrate a risk of containing hazardous waste, soils may be directly deposited into a permanent containment cell. Soils requiring further characterization, or suspected of containing hazardous waste, will be deposited in the SMA. The SMA may also be utilized for the temporary storage of soil as needed, conceivably to avoid exposure to inclement weather or to allow for preparation of a cell within the Permanent Encapsulation Area (PEA).

Suspect soil will be stockpiled in a designated area in the SMA.

Site staff will inspect the soils using field-screening techniques (visual/olfactory inspection, headspace vapour measurements using a portable gas meter) to determine whether there is an appreciable risk that actual soil quality differs from the information presented on the Waste Approval Application. As necessary, and in accordance with standard QA/QC protocols established below, soil samples will be collected and submitted to a CALA accredited laboratory for analysis of applicable PCOCs.

Analysis will be performed if contaminant concentrations are suspected to exceed those detailed in the Waste Approval Application and compared to submitted analytical results. For example, analyses will be performed for LEPH/HEPH/PAHs if hydrocarbon contamination is suspected to exceed concentrations detailed in the Waste Approval Application, to determine whether concentrations of individual PAHs and/or PAH TEQ exceed the applicable HWR standards. Similarly, if metals concentrations are suspected to exceed those detailed in the Waste Approval Application, total metals and TCLP analysis will be performed to determine if potential leachate concentrations risk exceeding the applicable HWR standards.

6.3 Soil Acceptance

Soils will be accepted at the Site only once a Waste Approval Application has been submitted, reviewed and approved by the Generator's QEP, as outlined above. Once approved, the Site will provide the generator (or qualified professional representative) with Soil Arrival Forms. An example Soil Arrival Form is included in Appendix D. One Soil Arrival Form will accompany each soil load from the Generator Site to the Site. Soil Arrival Forms will include three areas of information, as follows:

- **Section A – Generator Information:** This section will be completed and signed by the generator or qualified professional representative. Section A information will include generator name and contact information, source site location and site contact details, and a description of soil characteristics and classification. The soil classification will be pre-determined by the site during the Waste Approval Application review process.
- **Section B – Transporter Information:** This section will be completed and signed by the transporter (i.e. shipping company). Section B information will include transporter company name and contact details, driver name and contact details, truck number, vehicle license number, and an indication of the type of load (tandem truck, truck & pony trailer, truck & transfer trailer, etc.).
- **Section C – Site Information**: This section will be completed and signed by the Site staff upon receipt of the soil. This section will include the name and location of the receiving Site, and any additional pertinent details (i.e. condition of soil, debris observed, etc.). Upon receipt of the soil, Site staff will assign a unique code to each project (common to the Generator Site WAA), using the coding system described below.

All soil loads will be weighed and logged upon entry to the Site. At the close of each business day, a copy of the daily scale logs and Soil Arrival Forms will be provided to each generator to allow for a cross-check of load counts and total daily soil volumes. Hard copies of the daily weigh scale logs and Soil Arrival Forms will be retained on-site, and electronic backups of these documents will be stored in a secure off-site location and updated weekly.

Only soil quantities approved under a WAA will be accepted. If soil quantities above the initially approved WAA are expected, a Waste Approval Change Order (WACO or "change order") must be completed by the Generator (or the QEP representative of the Generator). An example Waste Approval Change Order Form is included in Appendix C. Each WACO must include a letter with waste characterization information from the Generator, or their QEP. The WACO will be reviewed by the Site Qualified Environmental Professional prior to acceptance of any additional soil. If soil is deemed acceptable under the original WAA, the change order will be accepted and the maximum approved quantity will be adjusted accordingly. If the soil is not deemed acceptable under the original WAA, no new soil will be accepted and the generator must submit a new WAA.

6.4 Soil Tracking

The soil deposit areas, including the SMA and PEA, will be equipped with facilities to demarcate and sign deposit zones for the truck traffic. Facilities will include delineators placed along three sides of each zone, and a movable sign-post with appropriate signage.

Prior to importing soil onto the Site, a tracking identification number (the WAA number) will be assigned to each project and noted on the Soil Arrival Form. The tracking ID will be unique to the source site and will include notations for the date, company, and project. An example tracking ID format is as follows:

"Date"_"Company"_"Project"

The corresponds to when the WAA was accepted and signed (ie: 20150421 indicates the WAA was accepted and signed on April 21st, 2015). The unique company identification code delineates who is sending the contaminated material for disposal. The unique project identification code specifies which job the contaminated material is coming under. This tracking ID will follow the soil through the remediation and disposal process.

Soils imported to either the SMA or PEA will be end-dumped into demarcated zones as directed by Site staff. Between shipments, soil will be moved and consolidated as required.

At the end of each day, soils within the SMA and PEA will be covered as appropriate, and a standardized plan will be prepared mapping soils within the Site.

6.5 QA/QC for Incoming Soils

As outlined above, soils will be inspected by Site staff, field-screened, and, where there is a risk of actual soil quality differing from the soil quality presented on the Waste Approval Application, Site staff will collect soil samples and submit these samples for analyses of the applicable PCOCs.

If analytical results indicate that contaminant concentrations exceed HWR standards, the soil will be placed in the SMA for immediate characterization and off-site disposal. Under these circumstances, no additional shipments will be accepted from the Generator Site.

If analytical results indicate that contaminant concentrations are significantly higher than indicated on the applicable Waste Approval Application, but still below HWR standards, then related soil stockpiles may be re-classified. The decision to require re-classification will be based on a review by the Site QEP and will depend on the degree and consequence of the analytical variability.

In addition, the Site will conduct routine QA/QC sampling, generally in accordance with MOE Document 1 (GD-1). Guidance Document 1 prescribes stockpile sizes for Suspect Waste Soil to be 150 m^3. This is about 250 tonnes (assuming density of 1.7 tonnes/m^3). As such, the QA/QC sampling program will include:

- Collect one sample, comprised of a minimum of three aliquots, for the first 250 tonnes of any individual shipment (for any amount up to 250 tonnes);

- Collect an additional random sample (minimum three aliquots) representing soil exceeding 250 tonnes, but less than 1,000 tonnes for any individual shipment;
- Collect an additional random sample (minimum three aliquots) representing soil exceeding 1,000 tonnes; and,
- Collect one random sample for every additional 1,000 tonnes up to the maximum amount of the shipment.

Soil QA/QC Sampling Frequency

0-250 tonnes	250-1,000 tonnes	>1,000 tonnes
1 random sample	1 random sample	1 random sample per 1,000 tonnes

For example, on a shipment of 2,500 tonnes, one sample would represent the first 250 tonnes, a second sample would represent 250-1,000 tonnes, a third sample would represent 1,000-2,000 tonnes, and a fourth sample would represent 2,000-2,500 tonnes.

Sample results would be compared to pre-shipment data and soil classification provided by the Generator. If results indicate systematic soil characterization problems, all shipments would be halted until further characterization was undertaken by the Generator.

Soil tonnage would be recorded at the Site such that accurate quantities could be established for any given Generator. Soil quality data would be recorded and tracked against representative shipments. If soil density is observed vary significantly from the anticipated range of 1.5 to 1.8 tonnes/m^3 (based on anticipated tonnage for standard haulers), then on-site density determination may be undertaken under the direction of the QEP. This may include filling ten, 5-gallon pails to capacity and determining an average weight to calculate density.

On a case-by-case basis, the QEP may consider an alternative QA/QC sampling plan. For example, smaller shipments of heterogeneous soil (such as fill) may be sampled more frequently, while larger shipments of homogeneous soil (such as dredgate) may be sampled less frequently. The frequency of sampling will also be dictated by relative correlation of the pre-and post-shipment data. Any deviation from the Permit requirements must be pre-approved by the Director.

6.6 Procedures for Removal of Unacceptable Soils

The Site will not knowingly accept any soils that exceed the standards outlined in the HWR. However, if during the soil receiving and verification process, or through random QA/QC soil sampling, it is determined that soil quality exceeds the applicable HWR standards, the generator will be contacted and the relevant soils will be transported to an appropriate licensed site.

Given that all loads will be received by Site staff, and will be observed during unloading, no soils that are physically unsuitable for permanent encapsulation (e.g. due to high debris content or moisture in accordance with an established acceptance plan) will be permitted to unload. However, in the event that physically unsuitable soils are unloaded, no further material will be accepted from the Generator Site until the issue has been discussed with the generator or qualified professional, and safeguards have been established to ensure that all further material received from the Generator Site will be physically suitable.

Unsuitable materials will require temporary storage on Site in order to confirm soil quality, identify an appropriate disposal site and arrange for the material to be transferred. During this temporary storage period, the unsuitable materials will be appropriately covered and relocated to a demarcated and dedicated zone within the SMA.

Soils classified as Hazardous Waste or physically unsuitable will be transported directly to appropriate site determined by the nature of the material.

7 WATER MANAGEMENT PLAN

The Water Management Plan for the Site includes the following components:

- Pit and active area run-off is diverted from contact with contaminated soils
- Surface water from disturbed and undisturbed/ancillary areas
- Soil Management Area run-off
- Permanent Encapsulation Area leachate collection system
- Permanent Encapsulation Area leak detection/collection system
- Permanent Encapsulation Area groundwater seepage system
- Water Treatment System
- Water Treatment System Discharge
- Contact Water Containment Pond
- Settling Pond
- Settling Pond Discharge

The above components, along with a description of the design basis, are discussed in the following sections. Inspection and maintenance of the water management infrastructure is covered in Section 11.

7.1 Design Storm Event

The "worst case scenario" that was used to design the components of the water management system, included a melting snowpack during a 1/200 year rainfall event.

The 200-year storm event from the North Cowichan Rainfall Intensity Duration Frequency (IDF) curve was used along with a conservative time of concentration of 10 minutes producing a rainfall intensity of 50 mm/hr.

Due to the small size of the catchment, a conservative water equivalent depth method was chosen over degree day or temperature index melt equations to model the effect of snowmelt. This approach linked melt directly to rainfall, therefore, the resultant peak runoff from rainfall and snowmelt occurred simultaneously in the modeled output producing flows which are considered conservative estimates.

The existing Settling Ponds and runoff detention system for the Quarry Operation have been augmented to detain the runoff volume calculated for the Site combined with the quarry activities. Runoff volumes are based on a 200-year, 24-hour storm and modeled using the unitless Type 1A SCS hyetograph with all calculations confirmed using HydroCAD stormwater modeling software.

The average maximum snow depth for the region was derived from the Natural Resources Canada atlas (0 mm - 300 mm), a snowpack depth of 300mm (new snow) was assumed to have a water equivalent depth of 25mm or approximately 8% of the snow volume. The values for additional rainfall from snowmelt were added to the 200 year rainfall depths to provide a "worst case scenario" event which conservatively models complete melting of a 300 mm snow pack concurrently with a 24 hour 200 year rainfall event (SNOWPACK + 200). The resulting rainfall/melt depth is **181.4 mm**, and the unit hyetograph places the peak instantaneous intensity approximately 8 hours into the storm event.

7.2 Non-Contact Water

Active management of surficial waters on Site begins with diversion of waters away from contaminated soil working areas in order to minimize the amount of water requiring treatment. There are three areas which will generate water requiring source specific management.

- **Disturbed Areas:**
    - **Active Mine Areas:** The active mine area is where drilling, blasting, loading and hauling crushing and screening and stockpiling of rock products take place. This area is clearly defined by a ridge, with ramp access into the lower parts of the active mine. Water that falls within this area is identified as ***non-contact water from active mine areas***.
    - **Disturbed Areas:** A disturbed area is an area where operational activities do not regularly take place but the land is not vegetated due to prior operational activities and are outside the active mine area. All water that falls within these areas is identified as ***non-contact water from disturbed areas***.
- **Undisturbed Areas**: An undisturbed area is an area where operational activities are not taking place and there is natural or restorative vegetation present. All water that falls within these areas is identified as ***non-contact water from undisturbed areas***.

All non-contact water is managed by reinforcement of existing drainage paths with stilling pools, gravel check dams, woody debris and similar features to prevent sedimentation. Non-contact water from undisturbed areas, such as the vegetated areas on the backsides of the pit crest and abutting the conservation easement, will be directed away from active mine and disturbed areas to reduce loading on sediment control infrastructure. This ensures only disturbed area runoff enters treatment systems/infrastructures.

Non-contact water from disturbed areas and active mine areas is diverted away from the SMA and active encapsulation cells. Non-contact water collected in the Settling Pond allows for sediment drop and is sampled to verify the chemical quality at discharge. All non-contact water from disturbed areas will be controlled and directed to appropriate areas, as directed by Site Professionals and in accordance with permit requirements.

Surface water management will be modified as the pit grows and encapsulation areas are constructed. The basic strategy, however, will remain the same:

- Undisturbed areas (such as the east side of Shawnigan Creek) will be protected and monitored to prevent sedimentation and minimize disturbance of natural stormwater flow and infiltration.

- Surface water will be diverted around (and isolated from) contact with contaminated soils in the SMA and encapsulation areas.
- Non-contact water will be directed and collected appropriately to remove sediment and allow observation and/or testing prior to discharge
- The most stringent of either the DFO Land Development Guidelines[3] and MEM Aggregate Operators Best Management Practices Guidelines[4] will be upheld.

7.3 Contact Water: Soil Management Area Run-off

Any water incident to the SMA is collected within a catch basin via gravity flow across the paved asphalt surface. The catch basin water is piped to a Containment Pond capable of storing up to 326.6 m^3 of water. The volume was set based on the size of the uncovered, paved surface of the Soil Management Area (1,800 m^2) and the design 1-in-200 year storm event (181.4 mm).

Water from the Containment Pond is treated (as per MOE permit PR-105809) with an on-site Water Treatment System prior to discharge.

Beneath the SMA liner is a leak detection system which includes a network of perforated pipe sloped towards a single inspection port. This inspection port is piped to the main catch basin for the SMA. It is expected that inspection port will be dry, but is in place to identify and collect any water that may pass through both the asphalt surface and the underlying synthetic liner.

7.4 Contact Water: Permanent Encapsulation Area

Encapsulated soil has a drainage layer above the base liner, allowing soil to drain (if needed). This serves as a leachate collection system.

Precipitation that falls upon an active cell before the installation of a permanent cover may generate contact water. This contact water is collected in the drainage layer. Very little water will result from soil dewatering. Once covered with a permanently fused cap-liner, this system is anticipated to be dry.

Accumulated water from encapsulated soil leachate is pumped from reservoirs to the contact pond and subsequently to the Water Treatment System. An inspection port, at the top of the contact water reservoir, allows monitoring of flow/volume and for sample collection.

7.5 Permanent Encapsulation Area Leak Detection/Collection System

Each cell constructed in the permanent encapsulation area (landfill area) includes a drainage layer under the 40 mil base liner, above the compacted clay/till layer on the bedrock surface. If there were (a) leachate

---

[3] Department of Fisheries and Oceans. 1993. Land Development Guidelines for the Protection of Aquatic Habitat. September 1993. 30-31 pp.
4 BC Ministry of Energy and Mines (Now BC Ministry of Energy Mines and Petroleum Resources). 2002. Aggregate Operators Best Management Practices Guidelines. April 2002.

in the leachate collection layer above the liner; and (b) a defect in the liner, leachate would flow into the drainage layer above the compacted clay/till layer for detection and is collected in a separate reservoir.

This system is expected to be dry. If water accumulates, it will be transferred to the Water Treatment System for treatment. An inspection port, at the top of the reservoirs, allows for monitoring of flow/volume and sample collection.

7.6 Permanent Encapsulation Area Groundwater Seepage Blanket

The seepage blanket consists of a layer of clear drain rock, to a prescribed thickness. This broken rock layer is levelled off with crush gravel to prepare a surface for the clay/till liner. The broken rock layer and crush gravel will have significant permeability, and will act as a drainage blanket for any groundwater occurring between the compacted clay till layer and the bedrock, i.e., seepage from the base of the pit and from the sidewalls.

If groundwater seepage occurs it will migrate through the subsurface to the ephemeral tributary to the west of the Site, i.e., to the area of the Settling Pond Discharge. Downgradient surface water monitoring allows determination of water quality. Shallow Interflow monitoring wells are planned to be installed and monitored near the western boundary to study the quality and behaviour of the water present in this seepage blanket.

If other Site monitoring indicated a need at any time in the future, shallow interception trenches can be installed to intercept and collect this drainage.

7.7 Water Treatment System

The Water Treatment System (WTS) is fed from the Containment Pond, and can receive inputs from any of the following:

- Soil Management Area
- Permanent Encapsulation Area Leachate Collection System
- Permanent Encapsulation Area Leak Detection System
- Any other Site water, such as WTS backwash, SMA washdown water, truckwash water, or stormwater collected using vacuum trucks or sump pumps, designated by the Operations Manager or MOE for treatment

Water may be sampled in holding areas prior to treatment for potential contaminants of concern. If laboratory analytical testing indicates that the water in the holding area is not impacted, the holding area may be discharged to the settling pond.

If the water quality is above discharge standards, the water will be processed through the treatment system and sampled post-treatment to confirm acceptable quality prior to discharge.

The authorised works in MOE Permit PR-105809 must be complete and in operation when discharging; the discharge (and point of sampling/compliance) must be as indicated on Figure A of the permit. Additional equipment, including activated alumina water treatment units, additional settling tanks, sand filters, influent batching tanks, equalization basins, effluent holding tanks and recycle lines for re-treating treated water may be used to ensure that discharges comply with permit standards and to improve effluent quality.

The WTS has backup equipment on hand to ensure water treatment is available during adverse events, such as power outages or WTS breakdowns. The WTS is equipped with automatic float switches to provide extra safeguards when the system is operating.

Contact water may be collected and sent off-site for treatment and discharge under the direction of Site operations staff.

7.8 Settling Pond

The Settling Pond is fed from non-contact water from disturbed areas, active mine areas and treated effluent from the WTS.

The authorised works in MOE Permit PR-105809 must be complete and in operation when discharging; the discharge (and point of sampling/compliance) must be as indicated on Figure A of the permit.

Settled solids, which have accumulated in the pond, will be removed as required to maintain a minimum water depth below the pond decant of 0.5 m. This material will be treated as suspect waste soil, transferred to the SMA and characterized.

8 ENVIRONMENTAL MONITORING PLAN

The following Environmental Monitoring Plan (EMP) addresses on- and off-site monitoring requirements and their evaluation in the Site EMS.

Sampling is carried out in accordance with the "British Columbia Field Sampling Manual"[5] or as authorized by MOE.

8.1 Samples for chemical analysis will be appropriately collected, filtered and preserved (as applicable), and shipped under Chain of Custody to a Canadian Association of Laboratory Accreditation (CALA) certified laboratory for analysis as per the "British Columbia Environmental Laboratory Manual"[6] or as directed by MOE. Sampling procedures are detailed Appendix E. Quality Assurance / Quality Control measures will include at least one duplicate sample for each parameter sampled for each monitoring period.Air Quality Monitoring

Air quality monitoring is required by permit during periods of mechanical soil aeration for soil treatment. However, given a difference of interpretation with CVRD in regard to activities permitted by the F1 Zoning at the Site, **soil treatment, including aeration, is not planned or carried ou**t.

The aeration process has the greatest potential to release significant vapours and cause impacts at the property boundary. As a result, real-time vapour monitoring will be conducted using a PID during soil movement activities, and soil movement will be immediately ceased if unacceptable readings are obtained. Initially, 100 ppb will be used as the threshold reading but may be subject to adjustment as Site-specific vapour monitoring data is obtained and correlations established. In general, soil turning activities will not be undertaken on warm, dry days with moderate to high winds.

The established, prevailing wind directions at the Site are from the Northeast and Southwest. A residence is located approximately 300 m from the northeast boundary of the Site, representing the most sensitive receptor. As such, a sampling point has been established near the northeast property line. The air monitoring station is shown on Figure 1.

Section 3.5 of the Permit requires that monthly ambient air samples are collected during the active season for soil treatment (if applicable) at the down-wind property line using a Summa® Canister. Event-based ambient air samples are also required if and when soils with measurable volatile contaminant concentrations exceeding established thresholds are being managed at the SMA.

The Summa® Canister is regulated to collect an ambient air sample over a 24 hour period. Prior to, and immediately following, sample collection, wind speed and direction will be measured and recorded using a hand-held anemometer or by the on-site weather station. The suite of analytes will be pre-approved by

[5] BC Ministry of Water, Land and Air Protection (Now BC Ministry of Environment). 2003. British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples. January 2003. ISBN 0-7726-2741-X. 401 pp.
[6] BC Ministry of Environment. 2009. British Columbia Environmental Laboratory Manual. 2009 Edition. July 14, 2009.

a Qualified Professional. Sample collection methods are outlined in Appendix D. Results will be used to assess potential impacts and to determine whether procedural adjustments or mitigative measures are required.

Air quality monitoring is also required as an ongoing operations measure. Section 2.9 of the Permit requires that there must be no objectionable hydrocarbon odour evident outside the property boundaries and Section 2.10 of the Permit requires that fugitive dust must be suppressed and is not to exceed the BC Ambient Air Quality Residential Objective of 1.7 mg/(dm^2-day) over a two-week averaging period at the property boundary using conventional dustfall jars. Sample collection and analysis for both parameters are event-driven, based on the day-to-day observations of the Environmental Technician.

If contaminant concentrations measured in the Summa® Canister sample collected from the down-wind property line are found to exceed the CSR Schedule 11 Column III RL standards, soils within the SMA will be covered with non-permeable polyethylene sheeting or a cap of non-hydrocarbon contaminated soils. Covering the soils will be adequate to suppress the vapour emissions from impacting down-wind receptors, which will be verified by additional sample collection and analysis. Dust exceedances will trigger a review of dust suppression methods.

8.2 Effluent Water Monitoring

Water effluent encompasses both contact water and active Site non-contact water systems as follows:

Effluent Water Monitoring Program

Monitoring Location	Minimum Monitoring Frequency	Minimum Sampling Frequency
Catch Basins and Leak Detection Inspection Ports (SMA and encapsulation areas)	- Visually inspected on at least a weekly basis. - Cleaned out as needed.	N/A
Water Treatment System Holding Tanks (When Applicable) and/or Containment Pond	Weekly	Monthly (or as generated)
WTS Outlet	Weekly	Monthly and Every 2,000m^3 of Effluent Treated Effluent
Settling Pond Outlet (SW-1)	Weekly	Monthly and Every 2,000m^3 of Effluent Treated Effluent Turbidity Assessed Bi-Weekly from November to April and After >1:10 year storm events*

*1:10 Year Return Event estimated based on 122mm of precipitation over a 24 hour period as measured at the on-site rain gauge. Turbidity will be assessed using a *Hatch 2100Q Portable Turbidimeter* (or equivalent).

Monitoring at the WTS discharge includes recording the flow meter value and pH, and making any observations about the physical properties of the discharge (colour, odour, turbidity, etc.).

Monitoring at the Settling Pond Outlet (SW-1) includes measuring turbidity and recording observations about the discharge (estimated flow, colour, odour, etc.). In addition, the Settling Pond includes regular visual inspection to ensure ongoing competency and function (rip-rap integrity, requisite freeboard, accumulated sediment, tension cracking or erosion of sidewalls, etc.).

Monitoring associated with Leak Detection and Leachate Collection Systems will occur at inline catch basins/inspection ports, noting presence/absence of liquid, estimated flow, colour, odour, etc.

Samples will be collected as outlined below. An example Effluent Monitoring and Sampling Form is included as Appendix G.

Effluent samples are analyzed for all potential contaminants of concern as determined by the Qualified Environmental Professional ("QEP") based on soil contaminants received at the facility, monitoring results to date and input from MOE.

As per MOE Permit PR-105809, section 1.4.4 the characteristics of the discharged treated effluent from the Water Treatment System must be equivalent to or better than the most stringent of those *British Columbia Approved Water Quality Guidelines* (BCAWQG) and *A Compendium of Working Water Quality Guidelines for British Columbia* (BCWWQG) *for Freshwater Aquatic Life* (AL) *protection and Drinking Water* (DW) uses for the parameters of concern.

As per MOE Permit PR-105809, section 1.5.3 the characteristics of the discharged treated effluent from the Settling Pond must be equivalent to or better than the most stringent of BCAWQG and BCWWQG for AL. Total Suspended Solids (TSS) shall not exceed 25 mg/L for up to a 1:10 year storm event. Per MEM Permit Q-8-094, nitrate shall not exceed standards applicable to DW.

Per MOE Permit PR-105809, for flood events greater than the 1 in 10 year event (122 mm of precipitation over a 24 hour period), the characteristics of the settling pond discharge must not exceed background concentrations (i.e., SW-4).

8.3 Receiving Environment Monitoring – Groundwater and Surface Water

Settling Pond water (including Water Treatment System Effluent) is discharged to a pre-existing, typically dry, drainage course along the west side of the Site. The drainage course transitions into an ephemeral tributary. The tributary flows north, eventually reporting to Shawnigan Creek. The confluence of the tributary and Shawnigan Creek is located approximately 1 km north of the Site.

Receiving environment water monitoring includes both surface water and groundwater monitoring locations. There are four long-term surface water monitoring locations within the ephemeral tributary and Shawnigan Creek (SW-2 through SW-5). These have been surveyed and permanently (though discretely) marked.

There are also five on-site monitoring wells, including three with nested completions for a total of eight piezometers; all eight locations are included in the groundwater monitoring program (a minimum of 7 are required, as per Section 3.3 of MOE Permit PR-105809).

The receiving environment monitoring program for groundwater and surface water is summarized in the following table and shown on Figure 1 (attached).

Receiving Environment Monitoring – Groundwater and Surface Water

<table>
<tr><th>Receptor</th><th colspan="3">Monitoring Locations</th><th>Monitoring Schedule</th></tr>
<tr><td rowspan="5">Groundwater</td><td>Up-gradient</td><td>MW-6</td><td>On-site, near southeast corner</td><td rowspan="5">Quarterly</td></tr>
<tr><td rowspan="4">Down-gradient</td><td>MW-1 (S/D)</td><td>On-site, near centre</td></tr>
<tr><td>MW-2</td><td>On-site, near west property boundary</td></tr>
<tr><td>MW-3 (S/D)</td><td>On-site, near west property boundary</td></tr>
<tr><td>MW-5 (S/D)</td><td>On-site, north</td></tr>
<tr><td rowspan="4">Surface Water</td><td rowspan="2">Up-stream</td><td>SW-4</td><td>Shawnigan Creek</td><td rowspan="4">5 in 30* (2 times/year, conducted during fall first flush event and during spring freshet); and after a 1:200 year storm event** at SW-2 and SW-3</td></tr>
<tr><td>SW-2</td><td>Ephemeral Creek</td></tr>
<tr><td rowspan="2">Down-stream</td><td>SW-5</td><td>Shawnigan Creek</td></tr>
<tr><td>SW-3</td><td>Ephemeral Creek</td></tr>
</table>

*5 in 30 refers to at least 5 weekly samples taken in a period of 30 days. Due to the ephemeral nature of some of the creeks, the first 5 in 30 samples should be collected when the ground has first been saturated.
** 156 mm of rain over 24 hours

This program includes event-based monitoring: immediately following a 1-in-200 year, 24-hour storm event, locations SW-2 and SW-3 are monitored. A 1:200 year storm event is defined as 156mm of rain over a 24 hour period, as determined by the on-Site rain gauge.

Samples are analyzed for all potential contaminants of concern as determined by the Qualified Environmental Professional based on soil contaminants received at the facility, monitoring results to date and input from MOE.

Flow measurements are collected from surface water sampling locations at time of sampling.

8.4 Routine Inspection and Physical Observation

The condition of systems, locations of contaminated materials, presence of flow, estimated flow, and other critical Site parameters are inspected on a regular basis. These inspections are guided and documented with specialized field forms:

- Appendix H presents an example of a SMA Daily Monitoring Form. The SMA is inspected daily when active and at least weekly overall.

- Appendix I presents an example of an Encapsulation Cell Daily Monitoring Form. Encapsulation cells are inspected daily when an encapsulation cell being actively filled and at least weekly overall, until the cell is closed.

- Appendix J presents an example of a Daily Inspection and Monitoring Log, which is completed daily when the Site is receiving or placing waste, and at least weekly overall. This type of inspection documents the condition of works and the presence/absence, characteristics and flow rate for contact and non-contact water.

9 EMERGENCY RESPONSE PLAN

The Site Emergency Response Plan (ERP)/Mine Emergency Response Plan (MERP) is attached as Appendix K. It is maintained as a single stand-alone document that applies to all on-site personnel.

The objectives of the ERP/MERP are to provide effective responses (including evacuation protocols) for both workplace/mine Site emergencies and for urgent situations involving the discharge of contaminated soil, run-off or leachate from the Site, including accident scenarios involving Shawnigan Creek (which, it is noted, is approximately 250 m to the east and at a higher elevation, than the pit).

10 SITE PREPARATION AND CONSTRUCTION OF LANDFILL CELLS

The following sections summarize Site Preparation and encapsulation cell construction within the authorized landfilling area (the mine pit, as ultimately developed).

10.1 Site Preparation

Soil encapsulation cells are engineered to provide permanent isolation of the contaminated soils. Compacted clay till and landfill geosynthetic liners are used to fully encapsulate the soil placed in each cell. Details of a typical cell design are provided in the TAR.

Cells are filled one at a time; however, cells may be prepared up to the point of receiving waste material before previous cells have been completed.

No blasts will be initiated during installation of liners (base or cover), nor will machine traffic be allowed on liners, until such liners are covered with adequate material appropriate to the type of equipment being used or activities taking place. Only new, high-quality, purpose-manufactured geosynthetic liners shall be used for construction, and their installation, quality assurance/control process, sealing and use shall be in accordance with manufacturer's guidance for materials, methods, equipment and training. In accordance with Section 2.4.1 of MOE Permit PR-105809, the reuse of geomembranes/liners in encapsulation cells is strictly prohibited.

Liner panels are pre-fabricated in controlled manufacturing conditions for a specific cell. This reduces the number of field welds that required.

Site preparation for the construction of landfill cells includes the following:

- Final blasting and removal of rock for aggregate production. The final blasting surface of the bedrock will be sharply undulating and contain shattered rock fragments up to approximately 2 m in depth.
- Bedrock inspection by a qualified professional and preparation of an assessment report
- Levelling of the surface with crushed rock and construction of a seepage blanket where appropriate
- Covering the leveled surface with a minimum of 1000 mm of compacted clay till soils.

The clay till layer is used to create the desired sloping for drainage over the bedrock surface and also serves as an additional layer of leachate protection, one constructed from natural, geologically stable materials. The specifications for the clay till are as follows:

- The clay till must contain a minimum of 10% clay, defined as a particle size of 0.002 mm or less (2 µm, as per ISO 14688).
- Alternatively, laboratory testing results may be used to verify the required hydraulic conductivity of the till.

- As of July 17, 2015, per MEM Permit Q-8-094, Section 16, the clay till will be placed in maximum 250 mm lifts, and compacted to at least 90% Standard Proctor Maximum Dry Density (SPMMDD – ASTM D698), with an objective of 95% SPMMD (95% SPMMD being the standard used for cell 1).

Depending on pit layout and the layout of pit walls, temporary side berms of till may be used to support the edges of liner panels until the neighbouring panel is installed to overlap and be sealed together. These berms are temporary construction aids, not liner components.

10.2 Bedrock Integrity Inspection Report

A bedrock integrity inspection and risk assessment report is completed and submitted to the province prior to the construction of any encapsulation cells. For any abnormalities (open fractures or seepage) identified during the inspection construction will halt, the MOE will be immediately notified and a report will be completed within 30 days following inspection.

In general, the following items will be included in a bedrock inspection report:

- Rock type
- Description of fractures
- Presence/absence and description of any seepage

The final blasting surface of the bedrock will be sharply undulating and contain shattered rock fragments up to approximately 2 m in depth. It is not feasible to expose the entire surface for visual inspection, and spot-checking via test pits is used.

The final bedrock surface is impacted by blasting, influencing the ability to visually ascertain the undisturbed condition of the rock. However, the rock type, fracturing and weathering is ascertainable, and presence/absence of seepage will provide information pertaining to potentially water-bearing fractures.

10.3 Seepage

The base of the pit bottom is below the piezometric elevation of the groundwater beneath the Site. There are two scenarios to be considered at pit bottom:

1. <u>Seepage is not observed</u>: In this scenario, the bedrock is not significantly fractured and is acting as an aquitard, preventing any substantial groundwater as seepage upwards into the pit.
2. <u>Seepage is observed</u>: In this scenario, fractures allow groundwater flow as seepage upwards into the pit.

In short, either the deep aquifer is protected by the upper bedrock aquitard, or there is an upward flow of groundwater into the pit. Both scenarios are protective of groundwater quality because there is no pathway (i.e., no flow of contaminants downward).

The former scenario (dry pit) is expected. Based on investigations and mining progress to date, there has been no observed seepage, indicating that the bedrock is an effective aquitard. This is consistent with rock coring and with the findings of the BC Geological Survey[7].

However, if seepage is encountered, the blast debris layer will act as a drainage blanket to convey the seepage as shallow groundwater flow towards the ephemeral tributary.

If the blast debris layer is not sufficient to convey the flow, additional mitigative measures will be employed as follows:

- A localized drainage blanket will be constructed over the area of seepage and gravity drained towards the ephemeral tributary as shallow groundwater flow. This drainage blanket would be constructed beneath the compacted clay till liner and would thus produce non-contact (uncontaminated) water.
- The seepage blanket will be constructed of a minimum 300 mm of clear crush.
- The blanket will be covered with a geotextile to prevent the migration of fines from the overlying till layer.

If unforeseen conditions warranted, the seepage layer could be intercepted by shallow downgradient trenches to allow collection and monitoring. The substantially greater (orders of magnitude greater) hydraulic conductivity of the seepage blanket compared to the bulk rock implies that flow would effectively be controlled by the seepage layer, simplifying monitoring and control.

10.4 Construction of Landfill Cells

Following preparation and inspection of the bedrock as described above, the base liner system will be completed with the components outlined below:

- Minimum 300 mm of sandy drainage layer; overlying
- 40 mil Linear Low Density Polyethylene (LLDPE) liner; overlying;
- Minimum 300 mm of sandy drainage layer; overlying
- Minimum 1000 mm of till as discussed previously; overlying
- The prepared bedrock surface, as discussed previously.

The upper sandy drainage layer will form part of the leachate collection system and will provide two functions:

1. Physical protection of the liner from puncture during installation

[7] Hancock, K. 2012. Bedrock Geology of the South Island Aggregates Stebbings Road Quarry. BC Geological Survey. October 30, 2012. 15 pp. plus 7 pp. addendum.

2. Allow any incident precipitation or other drainage to drain from the cells.

The lower drainage layer is primarily for liner bedding: it would collect and drain any leaks in the membrane (a "leak detection system"), but such leaks are not expected to occur.

The liner material selected is intended for landfill use and resistant to deformation and puncture. To further protect the liners from puncture during cell construction, an appropriate layer of soil/sand is placed atop it where machine traffic will occur. In addition, continuous monitoring of construction equipment and direction during construction is provided by experienced and qualified personnel.

Given appropriate material conditions, contaminated soil is then placed and compacted in lifts, with provision of compaction results for each 1 vertical meter to the Inspector of Mines. The physical properties of the contaminated soil are considered in terms of geotechnical suitability by the Qualified Professional Engineer. Soils which are determined to be potentially problematic (i.e., high moisture content, compressible, entrained debris, etc.), are subject to a material-specific geotechnical plan, made in consultation with the Site geotechnical engineer. This may include establishing an acceptable range of physical properties, criteria for measuring physical properties, and a plan for ensuring the soil is rendered acceptable for placement.

Where soil is to be stabilized by compaction, incoming soil will be placed, graded and compacted using a vibratory drum roller or sheepsfoot roller. Placement will occur over maximum 600 mm lifts and compacted with a minimum of one pass with a vibratory roller. Successive lifts will be reviewed by the Geotechnical Engineer of Record to ensure adequate compaction and stability. Where soil must be stabilized by other means, such as the addition of cement, the results of the soil treatment will be reviewed by the Engineer of Record and appropriate testing carried out.

The contaminated soil in individual containment cell layers is capped with a second LLDPE liner deployed in the same manner as the base liner, with overlapping and sealing. The cap liner is "sandwiched" between two layers of geotextile and/or sand blankets to protect from potential puncture. Both the cap and base liners are anchored into the side-slopes as necessary.

Upon placement of the upper cap liner, the cell layer will be covered with a minimum of 0.3 m of clean sandy soil. A minimum of 0.66 m soil cover above the cap liner is required in areas that may experience machine traffic over top of the completed cap liner.

Subsequent cells will be constructed adjacent to and overlying previous cells as the landfilling/reclamation activities progress.

As required, vapours from individual encapsulation cells will be monitored prior to construction of a successive layer.

Overall construction of the cells will be done under the direction of the Qualified Professional Engineer and as-built drawings produced to ensure appropriate QA/QC and record keeping. Qualified staff under the supervision and control of the engineer will perform nuclear densitometer, drive tube and/or sand cone density testing to confirm the required compaction is achieved during material placement.

The Qualified Professional Engineer may also carry out field or laboratory hydraulic conductivity testing and grain size testing as necessary to confirm performance to the design criteria set out in the TAR.

10.5 Exposed Excess Liner Protection

During sequential construction of landfill cell segments may require individual segments to remain temporary (non-permanent). Specifically, excess base liner is run up from the floor between compacted waste soil and supporting side berms, so that the berms can later be removed and the excess liner folded down to overlap with the base liner of the neighbouring sub-cell for fusion. For the purposes of temporary waste soil containment during construction, a fraction of this excess liner daylights around the area of waste soil placement.

The exposed excess liner will be folded down to overlap the permanent bottom of the adjacent cell segments as they are constructed. Exposed excess liner will be protected from damage, as needed (i.e. when blasting within 75 metres), during blasting and other regular Site operations.

Prior to and following each blast the Manager will ensure a qualified person visually inspects all exposed liner. If damage to the excess liner is found the Manager will ensure it is repaired to the manufacturer's specifications by qualified personnel. Findings and actions will be promptly reported to the Mines Inspector. A sample plan to protect, inspect and repair exposed liner is included as Appendix L.

10.6 Final Cap

Upon completion of the landfilling activity, a final soil cap will be placed over the entire area that is underlain by containment cells. The final cap is illustrated in Figures 10 and 15 of the TAR, and will consist of a minimum of 2.0 m of uncontaminated soil; the lower 1.0 m acts as a hydraulic barrier with a maximum compacted hydraulic conductivity of 1x10-7 m/s, and the upper 1.0 m consists of a growing medium and is planted with grasses. The final cap will be graded to promote positive surface drainage away from the landfill, and surface water diversion/control measures will be re-direct upland surface water flows around the landfilled area.

10.7 Leak Detection and Leachate Collection

As described in description of water management systems, encapsulation cells include provisions for leachate collection as well as for leak detection. Figures 8 and 10 of the TAR illustrate both systems.

The design includes the use of soil drainage blankets. The soil drainage blankets have a hydraulic conductivity greater than $1x10^{-4}$ m/s and are constructed with a 3% grade and a minimum thickness of 0.3 m.

As shown on Figure 10 of the TAR, the soil drainage blankets will be constructed beneath all successive layers of encapsulation cells. The layers will be able to free drain into the chimney drain that reports to the collection piping at the base of the slope.

Collected water (if any) from drainage systems will be transferred to the containment pond for treatment in the Water Treatment System as contact water.

11 OPERATION, INSPECTION AND MAINTENANCE

The following subsections describe the operation, inspection and maintenance of the soil management area, the permanent encapsulation area, the water treatment system and the settling pond. Major Site features are illustrated on Figure 1.

During operations, inspections will be carried out by Site staff on a daily basis to monitor the effectiveness of the Water Management systems, and to ensure appropriate weather protection of soil stockpiles. Daily inspection observations and Site photographs are filed in the Mines Office.

11.1 Soil Management Area

As discussed previously, soil treatment allowed under Provincial permits will not be conducted until resolution of differing interpretations of Site zoning is obtained.

Precipitation that falls outside the paved Soil Management Area (SMA) will be diverted via berms and perimeter swales / ditches. A cover over the SMA prevents precipitation from falling directly on the SMA. Runoff from the SMA will be controlled and managed in accordance with the water management procedures outlined previously.

Sufficient weather protection and containment will also be provided for any nutrients stored at the Site for protection of human health and the environment. In the absence of soil treatment, relatively limited amounts of nutrients will be stored on-site; such nutrients (fertilizer) will be kept in a storage shed.

Inspection and maintenance associated with the SMA includes the following:

- Assessment of surface water control and diversion works, as well as covers, taking any necessary actions to protect design function and prevent short circuiting or sedimentation. This can include removing debris from swales, ditches or catch basins, replacing/reinstalling silt fencing or moving tarps.
- Inspection of leak detection ports and catch basins.
- Review of incoming soil quantities and ensure adequate room within the SMA by delivery scheduling, material consolidation in the SMA and/or transfer to the active encapsulation cell.
- Inspection of underlying asphalt at the SMA when it is exposed by operations, arranging prompt repair (typically by patching) as appropriate and protecting the area until repair is complete.
- Documentation of soil movement, including consolidation and/or transport to encapsulation.
- Demarcation of areas within the SMA for incoming shipments.
- Communication of designated/demarcated areas to Site staff and ensuring that trucks receive appropriate direction and supervision.
- Monitoring truck movement and dumping.
- Covering of SMA soils at the end of the day and completing a sketch plan of the SMA noting the location of soils (Appendix H).
- Taking at least one photo from a designated vantage point of the SMA and transferring it to file.

11.2 Permanent Encapsulation Area

Precipitation that falls outside of the landfill/encapsulation cell area is managed as non-contact water, in accordance with the water management procedures outlined previously.

Drainage within active encapsulation cells is managed as contact water. The active cells are covered on an interim basis during periods of rain using disposable polyethylene sheeting, appropriately anchored, to limit soil/water contact. Specifically, active filling areas are completely covered from November to April when not actively worked on.

Daily operational considerations associated with the landfill/encapsulation area include the following:

- Assessment of surface water control and diversion works, as well as covers, taking any necessary actions to protect design function and prevent short circuiting or sedimentation. This can include removing debris from swales, ditches or catch basins, replacing/reinstalling silt fencing or moving tarps.
- Inspection of leak detection and leachate collection ports/catch basins on at least a weekly basis.
- Supervision of the transfer of soil from the SMA and/or the direct unloading of incoming trucks to the encapsulation area.
- Verification that appropriate quality assurance (under the Soil Receiving Plan) is carried out.
- Placement, grading and compaction of incoming soil or placement and grading of stabilized soil.
- Completion of as-built compaction records for each 1 metre increment of compacted soil.
- Documentation of the soil volume placed and cell number, creating a permanent record of what material was placed in which cell.

At the end of each day, soils are covered and operations staff sketch a plan of the active encapsulation cell noting the location of soils based on waste approval numbers (which can be traced back to soil tracking IDs). A sample plan is included as Appendix I. A photo from a designated vantage point is required at the end of each active day and forms part of the daily record.

11.3 Water Treatment System

The Water Treatment System may include influent surge, collection and/or equalization tankage as necessary to receive all active influent streams. Typically, influent flows are aggregated in the Containment Pond.

As described in as-builts for the water management system and the commissioning report for the Water Treatment System, contact water is treated utilizing an automated STORMTEC Filtrations Sediment Control System. The system is capable of treating between 200 and 1250 litres per minute, depending on the sediment loading and pH values. Typically, the system is operated below 284 litres per minute (75 US gallons per minute) in batch mode to a discharge tank for testing and later discharge to the Settling Pond.

High pH is treated using the CS250e pH Remediation System module. The system meters carbon dioxide (CO_2) into the water stream using a pH probe interfaced with an electronic controller, flow switch and electronic valuing. The CO_2 is mixed into the water stream utilizing a patent pending static mixer. The

CS250e incorporates an automatic shutdown sensor, which shuts off the flow of the CO_2 when no flow or pressure is detected.

The pH adjusted water flows through a LFI600 Flocculent Injection System for sediment consolidation. The LFI600 incorporates two metering pumps to inject two liquid flocculents in line before a static mixer. A flow switch turns the metering pumps on and off by sensing a flow rate of more than 76 litres per minute (20 U.S. gallons per minute). Proprietary, environmentally safe, STORMTEC flocculants are introduced at dose rates of about 2 parts per million (ppm), depending on the sediment load. The metering pump injection rate is adjusted by on-site personnel depending on the quality of the incoming water. Treated water is discharged into a series of holding tanks for settling. Settled solids are periodically decanted and removed for stabilization/drying and disposal.

The STF245-3 Sediment Control System provides additional treatment, incorporating an FP10 Booster Pump System, Electrically Actuated Ball Valve, Electronic Control System, Automatic Float Controls, and automatically backwashed Sand Filtration System. The sand filtration system filters out flocculated sediment; when pressure loss through the filters is excessive, the flow is reversed into a backwash line that carries accumulated sediment back to the settling tanks for removal.

Filtered water is stored in a transfer tank and then pumped through granular activated carbon filters (to remove residual dissolved organic contaminants, if any). Activated alumina filters (to remove residual dissolved metals concentrations, if any) are available on-site; if dissolved metals are present at levels outside the standards required under Section 1.4.4 of MOE permit PR-105809, the Activated alumina filters will be connected in series with the activated carbon filters.

In batch mode, treated water is stored in tanks for testing before being discharged through a flow meter to the Settling Pond.

Daily inspection and maintenance includes the following:

- Visually inspect hoses, hose fittings, gauges, valves, couplings, sand filters and pump heads for leaks, seepage, wear, splitting, cracking or corrosion. Take corrective action as required.
- Verify power to the unit (generators or mains).
- Inspect flocculent and note remaining quantity. Order/replace as necessary.
- Check CO_2 supply – order/replace tank as necessary.
- Calibrate pH probe at least once per month. Replace probe if calibration is unsuccessful.
- Inspect settling tanks and clean out sediment as necessary.
- Note flows reading on flow meter. Record at least weekly when treatment system is used.
- Change filtration media as required in accordance with manufacturer specifications.
- Check drain valves, noting any abnormal colours or odours in held-up water (backwash to re-retreatment).

Pre-Start checks include the following:

- Walk through system, along the flow direction

- Inspect all hose-connections, verifying that camlocks are fully engaged with ears secured on cam fittings.
- Verify that gate valves are in open position, throttling the feed pump gate valve for flow control.
- Verify that there are no obstructions, kinks or blockages on the hoses and lines, including discharge hose
- Top up feed tank to sand filter with non-contact or previously treated water if necessary to prevent airlocks in system.
- Verify power to system and displays on all controllers

Start-up checks include the following:

- On startup, listen to pump motors for abnormal sounds. Check pumps for abnormal odours, vibration, heat or leaks.
- Monitor pressures on sand filter intake and discharge manifolds (target pressure between 30-40 psig; differential pressure should not exceed 8 psig)
- Check backwash controller setting
- Check pressure sustaining valve settings
- Verify CO_2 and flocculant injection Flow Switch is reading intake flow
- Verify relay is engaging Asco valve to deliver CO_2 (Asco valve will click when engaged)
- Verify the LMI Controller is reading probe pH and there are no errors on controller screen
- Verify carbon and, when necessary, alumina top and bottom pressure differential pressure is below 5 psi (if above, perform backwash)
- Verify flowmeter is illuminated and sensing flow

11.4 Wheel Wash

In accordance with Section 2.7.1 of MOE Permit PR-105809, before contaminated soil transport vehicles leave the Site, their wheels must be rinsed to remove all soil and waste that may have adhered while they were unloading and maneuvering in the unloading area. This is accomplished using an automated wheel and undercarriage wash.

Following the wheel wash, truckers are required to stop, self-inspect, and, if loose soil remains adhered, clean it off using a provided hose on the wash pad draining back to the wheel wash.

Soil and waste from the wheel wash are returned to the SMA, stabilized/solidified/dried as necessary to improve their geotechnical properties, and disposed of in encapsulation cells. Wash water is directed to the Containment Pond for treatment in the Treatment System before discharged to the Settling Pond.

11.5 Settling Pond

The Settling Pond receives inputs from the Water Treatment System as well as diverted surface water flows. Regular operational considerations associated with the Settling Pond include the following:

- Flow, and if flow is occurring, flow rate, are logged.

- Effluent is monitored and sampled as required.
- Vegetation is regularly checked and cautiously removed if required, preserving the integrity of gravel filters and the pond bottom.
- Accumulated sediment is removed to preserve a minimum water depth below the pond decant of 500 mm. This sediment is transported to the SMA for drying/stabilization and testing prior to disposal. Sediment removal is only to occur during periods of low/no flow, when the standing water level is below the Pond outlet such that disturbed, turbid waters do not discharge.
- Inlets and outlets are inspected to ensure appropriate operation and no incumberances
- During periods of high flow, freeboard is monitored to ensure design minimum is maintained (500 mm).
- During periods of low flow, rip-rap and berms are inspected and repaired/replaced as necessary.

11.6 Records Retention

Records are retained for MOE and MEM inspection on-site.

Section 5.1 of MOE Permit PR-105809 requires that, in the absence of soil treatment, records retained for at least three years include:

- Construction as-built drawings and Site QA/QC results, specifically including landfill (encapsulation) cell QA/QC results.
- Maintenance records, specifically including maintenance records for authorised works as listed in MOE Permit PR-105809.
- Inspection reports with preventative and corrective actions, specifically including reports for the SMA, encapsulation area and authorised works.
- Current soil/ash inventory, including both the SMA and encapsulation area.
- Soil/Ash acceptance documentation, including analytical results, and associated QA/QC reports indexed to the soil tracking system.
- The location of soil/ash within the Site, on a map, and quarterly volumes of soil/ash held as suspected or determined to be unacceptable, awaiting disposal.
- Air quality monitoring reports, including vapour and dust.
- Emergency Response Plan exercises and incidents.

If soil treatment, including soil turning, were carried out, additional records would be generated and maintained, as described in the permit.

MEM Permit Q-8-094 requires that on-site records include:

- A complete set of as-built drawings
- Documentation identifying soil condition and suitability of imported soil for intended use.

- Quality Assurance/Quality Control procedure, testing results and inspection logs for waste materials in encapsulation cells
- Blast logs and electronic monitoring records
- Blast videos
- All other documents, including updated mine plans and health and safety documents, as required by the Mines Act and Code

12 EMS AUDITS AND REPORTING

Under MOE Permit PR-105809 and MEM Permit Q-8-094, SIRM submits event-driven and regular reports including, but not limited to:

- A quarterly report, including monitoring data, QA/QC results, interpretations, conclusions and recommendations.
- A quarterly update of the mine plan.
- An Environmental Annual Report, including executive summary, quality/quantity/disposition of soil/ash, updated Site mapping, landfilling status and intent, review of operations and future plans, changes, non-compliances, monitoring results, etc.
- An annual report identifying the volume of water through the Water Treatment System, including all operating costs associated with the operation and maintenance of the treatment plant
- An annual report submitted to the Ministry of Finance in relation to the annual Health and Safety Assessment and the related data on annual production

Internal EMS audits will form part of the regular Environmental Annual Report. External EMS audits will be undertaken every 5 years and included with that year's Environmental Annual Report. The overall objective of the EMS is to document Site operations in relation to environmental impact monitoring. If impacts are observed, then appropriate corrective action can be undertaken since the failure mechanism will be isolated through careful monitoring and performance feedback.

Internal EMS audits include the following key elements:

- Planning
- Implementation
- Checking / Corrective Action
- Review and Improvement

Each of these is discussed in the following sub-sections.

12.1 Planning

The planning components of the EMS requiring evaluation/audit include Site construction, soil screening prior to acceptance and baseline environmental quality monitoring.

Key Site performance requirements/objectives include:

Soil Management Area: Provides an impermeable, bermed operating surface for stockpiling and characterizing soils. Also provides suitable space to temporarily store off-spec material that has been inadvertently imported. Performance indicators include visual inspection of the asphalt surface, leachate inspection ports, and an operable catchment to transfer water to the Containment Pond for treatment prior to discharge.

Permanent Encapsulation Area: Provides permanent control measures to manage contaminated soil. Performance indicators include leak detection and leachate collection inspection ports and suitable compaction.

Water Treatment System: Treats contact water to meet established standards and guidelines. Performance is monitored routinely through regular inspection, monitoring and sampling.

Settling Pond: Collects surface water from the active Site area, and receives treated water from the Water Treatment System. Performance is monitored routinely through regular inspection, monitoring and sampling.

12.2 Implementation

Implementation of the EMS is undertaken through following the EPM/OMS.

12.3 Checking / Corrective Action

Environmental monitoring, will detect whether impacts are occurring in order that timely and effective corrective measures can be implemented. Routine inspections will determine whether works are performing as intended, so that timely repair or improvement can be carried out.

Additional inspections may also be carried out at any time by the MOE or MEM.

12.4 Review and Improvement

Site staff conduct daily and event-driven inspections and monitoring. MOE and MEM may also conduct inspections at any time, giving formal or informal feedback.

Based on the results of this on-going surveillance, the Operations Manager, in coordination with the Mines Manager, orders remedies and improvements, which are reflected in event-driven revisions of the EPM/OMS.

The EPM/OMS is also reviewed at least on an annual basis to determine if changes are required. Annual review and submission of revisions are due on March 31st of each year.

Annual Environmental Reports are submitted on or before March 31st of each year. These reports are reviewed in conjunction with Advisory Committee meeting within three months of report submission. The Advisory Committee provides advice to the MOE within 30 days of the meeting. Based on the advice of the committee, the MOE may revise monitoring sampling and reporting requirements.

13 NOTIFICATION, REPORTING, CORRECTIVE AND PREVENTIVE MEASURES

The Permit requires notification and reporting as summarized in the following tables.

Notification – MOE Permit PR-105809
1.1.3 – If land use or site specific factors specified in Column I of Schedule 5 of the CSR change at the permitted site, the Permittee must promptly notify the Director and immediately apply them for the purpose of Subsections 1.2 and 1.3.
2.3 – If short-term storage of unacceptable soil is to exceed 30 days, then notification and approval is required by the Director.
2.4 – Abnormalities (open fractures, presence of water, percolation, etc.) encountered during the bedrock integrity inspection requires that the Director be notified immediately.
2.12 – In the event of an emergency or condition beyond the control of the Permittee which prevents effective operation of the authorized works or leads to unauthorized discharge, the Permittee must comply with all applicable statutory requirements, immediately notify the Director and take appropriate remedial action for the prevention or migration of pollution.
2.17 – The Director must be notified prior to implementing any changes to any process that may adversely affect the quality and/or quantity of the discharge.
2.19 – The Director must be notified of a change in ownership of the works a minimum of 10 days prior to an ownership change.
Notification – MEM Permit Q-8-094
12 - Substantial changes to the program must be submitted to the Inspector for Approval
15 – Notice of Completion of work shall be filed with Inspector not less than seven days prior to cessation of work.
5 (b) – No topsoil shall be removed from the property without the specific written permission of the inspector.
17(a) – The inspector shall be advised in writing at the earliest opportunity of any unforeseen conditions that could adversely affect the extraction of materials, site stability, erosion control or reclamation of the site.
17(c) - The discovery of any significant subsurface flows of water, seeps, substantial amounts of fine textured, soils, silts and clays, as well as significant adverse geological conditions shall be reported to the inspector as soon as possible and work shall cease until the inspector advises otherwise.
5(c) - Residents within 1km of the centre of the Quarry, and the Inspector, shall be given 24 hours notice of each scheduled blast.
9(d) - Should the provisions of [working outside permitted hours in case of safety concern or declared emergency] be implemented the Manager shall advise the Inspector without delay
19.1(e) and (f) - Any changes to the proposed method of development [geotechnical – design and construction] will require previous approval of the Inspector…Within 30 days of completing construction, a construction QAQC report shall be submitted to the Inspector.
19.1 (g) - The Permittee shall submit an as-built report with drawings to the Inspector prior to operation of the facility.
20 (b) - [Completion of the cell] The permittee shall prior to applying any vegetation cover to the completed cell provide the inspector a plan designed by an appropriate Qualified Person which demonstrates the vegetation cover is suitable for the area, and as cover for the waste cell.

Reporting – MOE Permit PR-105809
2.4 – Bedrock integrity inspection and risk assessment report must be submitted to the Director prior to the construction of any landfill cells. If abnormalities are encountered (open fractures, presence of water, percolation, etc.) then a structural report must be submitted within 30 days.
2.11 – All spills to the environment (as defined in the Spill Reporting Regulations) must be reported immediately in accordance with the Spill Reporting Regulation. Notification must be via the Provincial Emergency Program at 1-800-663-3456.
2.12 – Any scenario that may result in the contamination of surface water and/or groundwater must be immediately reported to MOE (250-751-3100) and VIHA at 250-739-6304 (normal office hours) or at 1-800-204-6166 (weekends and evenings).
2.13 – The Permittee must prepare and submit an Environmental Procedures Manual.
2.14 – The Permittee must establish an Advisory Committee and develop terms of references to the satisfaction of the Director. The Advisory Committee must provide advice to the Director within 30 days of meeting.
2.18 – Plans and specifications related to new works must be submitted to the Director.
4.1 – The Permittee must submit a closure plan the satisfaction of the Director in 6 months after the issuance of the permit.
4.2 – The Permittee must submit a cost estimate for maintenance, monitoring, remediation and closure of the landfill for the active life of the site and a minimum 25 year post-closure period.
5.2 – The Permittee must submit environmental quarterly reports to the Director within 30 days after the end of each quarter.
5.3 – The Permittee must submit an environmental annual report to the Director no later than March 31st each year.
6.1 – The Permittee must submit a written report to the Director within 30 days of any non-compliance occurrence.
Reporting – MEM Permit Q-8-094
16 – Annual reports shall be submitted in a form and containing the information as and if required by the Inspector
10 - The Manager shall forward to the Inspector a copy of the updated mine plan required by the code. This code section refers to updates every three months.
15(c) - Any row of holes to be blasted within 10 meters of the common boundary between the Quarry and property owned by the CVRD shall be surveyed in by a Licensed Land Surveyor. A copy of the survey shall be forwarded to the Inspector within one week of the blast.
17 - At the completion of each 1 meter (compacted) lift [of soil for encapsulation – ed.] the Manager shall provide the Inspector an as built of the lift signed by a suitable registered professional.
19.2 (a) - Prior to operation of the facility [geotechnical – design and construction], the Permittee shall submit an updated OMS manual and a Mine Emergency Response Plan MERP to the Inspector
19.3 (a) - Annual inspections of the waste storage facility [geotechnical – design and construction] shall be undertaken by a qualified Professional Geotechnical Engineer with a report submitted to the Inspector by March 31 of the year following the inspection.
20 (e) - Prior to receiving fill in any cell the Permittee must provide a signed as-built of the construction of the cell to date.
20 (h) - The Manager shall, by March 31 of each year, provide the Inspector a report identifying the volume of water treated through the treatment plant, and shall include all operating costs associated with the operation and maintenance of the treatment plant.
21 - The Manager shall forward to the Inspector a copy of the report submitted to the Minister of Finance in relation to the annual Health and Safety Assessment.

As mentioned previously, the site is subject to daily internal inspection. In addition to receiving notifications and reports, MOE and MEM may inspect the Site at any time.

The results of internal monitoring and inspection, in combination with MOE and MEM observations, will identify issues requiring corrective or preventative measures. Generally, corrective actions and a related implementation schedule will be developed within 30 days (or as directed by MOE or MEM) of identifying a deficiency or area for improvement. However, where health, safety or environmental quality are at risk, mitigation actions will begin immediately.

Corrective actions and improvement initiatives will be implemented under the authority of the Mine Manager, in collaboration with the Operations Manager. Where applicable, Qualified Professionals will be retained or consulted to investigate, analyse, plan, implement and/or monitor.

Implemented and planned corrective and preventative measures will be documented in the Annual Environmental Report, which is submitted to MOE, MEM and the Site's Advisory Committee.

14 REFERENCES

Active Earth Engineering Ltd. (AEEL) 2012. T*echnical Assessment for Authorization to Discharge Waste*. Submitted to BC Ministry of Environment Environmental Management Branch. Prepared for South Island Aggregates Ltd. AEEL file No. 320. 361 pp.

AEEL. 2013a. *Bedrock Integrity Inspection and Risk Assessment, Authorization to Discharge Waste Permit PR-105809*. Letter report to Luc Lachance, P.Eng., BC Ministry of Environment. 640 Stebbings Road, Shawnigan Lake, BC. October 10, 2013. 7 pp.

AEEL. 2013b. *As-Built Summary – Soil Management Area, Authorization to Discharge Waste Permit PR-105809, 640 Stebbings Road, Shawnigan Lake, BC*. Letter report to Luc Lachance, P.Eng., BC Ministry of Environment. October 29, 2013. 7pp.

AEEL. 2013c. *As-Built Summary – Water Management System, Authorization to Discharge Waste Permit PR-105809, 640 Stebbings Road, Shawnigan Lake, BC*. Letter report to Luc Lachance, P.Eng., BC Ministry of Environment. December 6, 2013. 11 pp.

AEEL. 2013d. *Seepage Blanket Details, Authorization to Discharge Waste Permit PR-105809. 640 Stebbings Road, Shawnigan Lake, BC*. Letter report to Luc Lachance, P.Eng., BC Ministry of Environment. December 10, 2013. 4 pp.

AEEL. 2015. *Water Treatment Plant Commissioning Report, Authorization to Discharge Waste Permit PR-105809, 640 Stebbings Road, Shawnigan Lake, BC*. Letter report to Laura Hunse, BC Ministry of Environment. May 1, 2015. 18 pp.

BC Ministry of Energy and Mines (now BC Ministry of Energy, Mines and Petroleum Resources, MEM). 2002a. *Aggregate Operators Best Management Practices Handbook for British Columbia, Volume I, Introduction and Planning.* April 2002. 145 pp.

BC Ministry of Energy and Mines (now BC Ministry of Energy, Mines and Petroleum Resources, MEM). 2002b. *Aggregate Operators Best Management Practices Handbook for British Columbia, Volume II, Best Management Practices*. April 2002. 89 pp.

BC Ministry of Energy, Mines and Petroleum Resources. 2008. *Health, Safety and Reclamation Code for Mines in British Columbia*. ISBN 978-0-7726-6011-4. 356 pp.

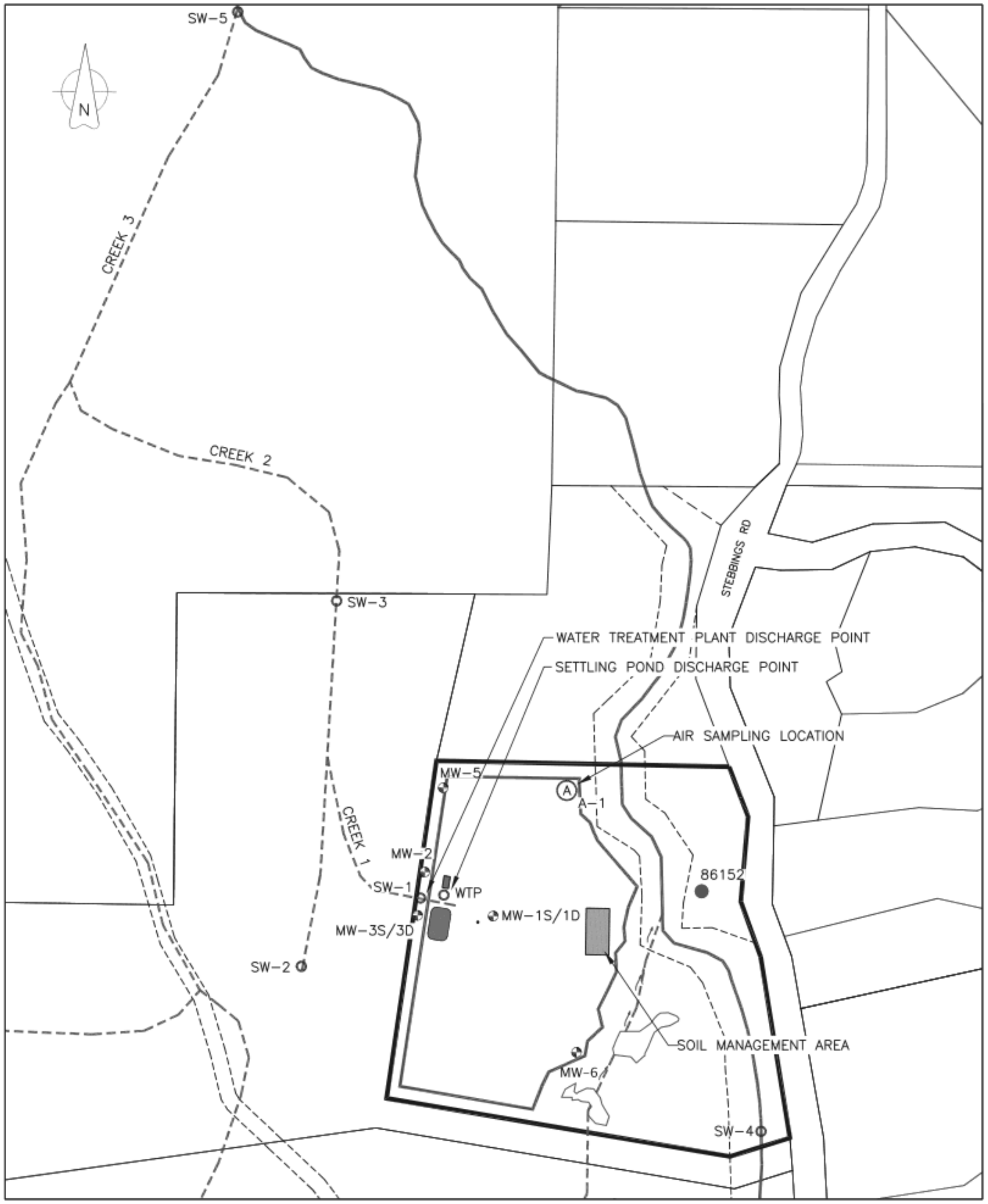
BC Ministry of Energy, Mines and Petroleum Resources. 2012. *Mine Emergency Response Plan Guidelines for the Mining Industry*. September 2012, V1.2/. 48 pp.

Department of Fisheries and Oceans. 1993. Land Development Guidelines for the Protection of Aquatic Habitat. September 1993. 30-31 pp.

Mining Association of Canada. 2011. *Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities*. ISBN 0-921108-25-7. 52 pp.

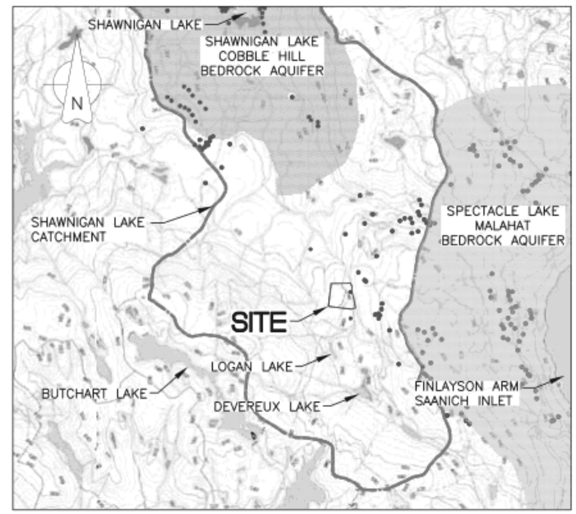
Figure 1

Site Plan



LEGEND

- EXISTING WATER WELLS
  86152 = MOE WELL TAG NUMBER
- EXISTING MONITORING WELL
  (GROUNDWATER SAMPLING POINT) (SECTION 3.3 & 3.6)
- SURFACE WATER MONITORING POINT (SECTION 3.4 & 3.6)
- AIR SAMPLING LOCATION
- SHAWNIGAN LAKE CATCHMENT
- SITE BOUNDARY
- QUARRY BOUNDARY
- WATERCOURSE
- SEASONAL WATERCOURSE



N.T.S.

0 250 500
METRES
SCALE 1:6000

CLIENT NAME:
PROJECT LOCATION:
TITLE:

BASEPLAN AND MONITORING LOCATIONS

DWN BY:	DWG NAME:	DATE: 2016-03-31
CHK'D:	PLOT:	CADFILE:

Appendix A

BC Ministry of Environment Permit PR-105809

(June 4, 2015 Amendment, Followed by August 21, 2013 Original)

June 4, 2015

Tracking Number: 338485
Authorization Number: 105809

Cobble Hill Holdings Ltd. (BC0754588)
Herald Street Law
101 - 536 Herald Street
Victoria BC V8W 1S6

Dear Cobble Hill Holdings Ltd. (BC0754588),

Re: Environmental Appeal Board Directions - Amendments to the Permit under the *Environmental Management Act*

On March 20, 2015, the Environmental Appeal Board confirmed the permit subject to directions. A copy of the decision, including directions, is available at the Environmental Appeal Board's website http://www.eab.gov.bc.ca/index.htm.

Pursuant to the *Environmental Management Act*, Permit 105809 is hereby amended:

1. To amend the subject sentence of section **2.14** **Advisory Committee** from:

> The Committee must be composed of one representative of each relevant regulatory agency and one representative from the local government.

to:

> The Committee must be composed of one representative of each relevant regulatory agency, one representative from the local government, one representative from the Shawnigan Residents Association and/or other interested community members as chosen by the Director.

2. To add section:

2.4.1 Reuse of Landfill Cell Liners Prohibited

> Reuse of geomembrane landfill cell liners is prohibited. This prohibition must be included in the Environmental Procedures Manual.

3. **Effective March 20, 2016,** to amend section **2.7 <u>Weather Protection</u>** from:

2.7 Weather Protection

The Permittee must cover the soil treatment piles, soil holding area and active landfill areas completely from November to April when not actively worked on and provide sufficient weather protection and containment for nutrients stored at the site for the protection of human health and the environment. The Permittee must cover any soil stored within the holding area at all times.

to:

2.7 Weather Protection

A permanent roof must be placed over, cover, and prevent precipitation from entering the soil management and bio-remediation treatment area including the temporary soil holding area (as described under subsection 2.3), referred to in subsection 1.2.1.

The Permittee must cover the active landfill areas completely from November to April when not actively worked on and provide sufficient weather protection and containment for nutrients stored at the site for the protection of human health and the environment.

4. To add section:

2.7.1 Wheel Rinsing

Before soil transport vehicles leave the site, their wheels must be rinsed to remove all soil and waste. Soil and waste must be managed in accordance with the permit. Rinse water must be directed to the leachate and leak detection reservoir(s). These requirements must be included in the Environmental Procedures Manual.

5. To add to section **3.6 Receiving Environment Sampling**, Table, Row 3 Surface Water, Column 3 Frequency:

Immediately after a 1-in-200 year, 24-hour storm event, at Monitoring Locations (SW-2) Ephemeral Creek 1 and (SW-3) Ephemeral Creek 2.

Please note that although a revised permit has not been produced at this time, a copy of this letter is being placed on the permit file, as an addendum to the permit. Your attention is respectfully directed to the conditions of the permit. An annual fee for the permit will be determined in accordance with the Permit Fees Regulation.

This permit 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 permittee. This permit is issued pursuant to the provisions of the *Environmental Management Act* to ensure compliance with Section 120(3) of that statute, which makes it an offence to discharge waste, from a prescribed industry or activity, without proper authorization. It is also the responsibility of the permittee 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.

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 permit will be carried out by staff from the regional office. Plans, data and reports pertinent to the permit are to be submitted to the Regional Director, at Ministry of Environment, Environmental Protection Division, Authorizations - South, 2080A Labieux Rd, Nanaimo BC V9T 6J9.

Yours truly,

A.J. Downie, M.Sc., P.Ag.
for Director, Environmental Management Act

CC: Environment Canada
Ministry of Energy and Mines

ENCL: None

August 21, 2013

Tracking Number: 225272
Authorization Number: 105809

REGISTERED MAIL

Cobble Hill Holdings Ltd. (BC0754588)
Herald Street Law
101-536 Herald Street
Victoria BC V8W 1S6

Dear Permittee:

Enclosed is Permit 105809 issued under the provisions of the *Environmental Management Act*. Your attention is respectfully directed to the terms and conditions outlined in the permit. An annual fee will be determined according to the Permit Fees Regulation.

This permit 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 Permittee. This permit is issued pursuant to the provisions of the *Environmental Management Act* to ensure compliance with Section 120(3) of that statute, which makes it an offence to discharge waste, from a prescribed industry or activity, without proper authorization. It is also the responsibility of the Permittee 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.

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.

Ministry of Environment
Environmental Protection Division
2080A Labieux Road
Nanaimo, BC V9T 6J9
West Coast Region
Telephone: (250) 751-3100
Facsimile: (250) 751-3103

Administration of this permit will be carried out by staff from the West Coast Region. Plans, data and reports pertinent to the permit are to be submitted to the Regional Manager, Environmental Protection, at Ministry of Environment, Regional Operations, West Coast Region, 2080A Labieux Road, Nanaimo, BC V9T 6J9.

Yours truly,

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

Enclosure

cc: Environment Canada

BRITISH COLUMBIA

MINISTRY OF ENVIRONMENT

PERMIT

PR-105809

Under the Provisions of the Environmental Management Act

Cobble Hill Holdings Ltd. (BC0754588)

Herald Street Law
101-536 Herald Street
Victoria BC V8W 1S6

is authorized to discharge refuse to ground and effluent to an ephemeral stream from a contaminated soil treatment facility and a landfill facility located at 640 Stebbings Road, Shawnigan Lake, British Columbia, subject to the terms and conditions listed below. Contravention of any of these conditions is a violation of the *Environmental Management Act* and may lead to prosecution.

1. **AUTHORIZED DISCHARGES**

1.1 **Authorized Discharges – General Conditions**

This section applies to the discharge of refuse from a contaminated soil treatment and to the landfill facility.

1.1.1 The combined maximum rate of discharge from the treatment and to the landfill facility is 100000 tonnes per year. The estimated density of soil accepted at the site ranges from 1.5 to 1.8 t/m^3 for the purpose of sampling incoming soil or treated soil for characterization. The above density estimate may be modified at any time with a scientific sampling method approved by the Director.

1.1.2 The authorized discharge period is between 7am and 5pm Monday to Friday.

1.1.3 The characteristics of the discharges must be as described under Subsections 1.2 and 1.3.

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

Soil relocation requirements of the Contaminated Sites Regulation (CSR) apply to all other parameters than those specified in this permit and in the Soil Acceptance Plan referred to under Section 2.2.

Soils meeting facility location background quality in accordance with CSR Protocol 4 may also be discharged.

If land use or site specific factors specified in Column I of Schedule 5 of the CSR change at the permitted site, the Permittee must promptly notify the Director and immediately apply them for the purpose of Subsections 1.2 and 1.3.

1.1.4 The authorized works as defined under Subsections 1.2.1, 1.3.1, 1.4.5 and 1.5.4 must be complete and in operation while discharging.

1.1.5 The location of the facilities and the points of discharge is Lot 23, Plan VIP78459, Blocks 156, 201 and 323, Malahat Land District.

1.2 Authorized Discharge –Treatment Facility

This section applies to the discharge of refuse from a soil treatment facility. The site reference number for this discharge is E292169.

1.2.1 The authorized works are a lined asphalt paved soil management and bio-remediation treatment area of approximately 1800 m^2, temporary soil holding area (as described under Subsection 2.3), biocell, berm, primary and secondary containment detection and inspection sumps and associated cleanout ports, catch basins, groundwater monitoring wells (as described under Subsection 3.3), management works and related appurtenances approximately located as shown on Figure A.

1.2.2 The characteristics of the discharge must be equivalent to or better than:

soil suitable for industrial land use, as described by the Generic and Matrix Numerical Soil Standards in Schedule 4, 5, 7 and 10 (Column IV "Commercial, Industrial Soil Standard") of the CSR, including the most stringent applicable site specific factors as defined in the Environmental Procedures Manual (EPM) referred to in Subsection 2.13, considering intake of contaminated soil, toxicity to soil invertebrates and plants and

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

groundwater flow to surface water used by freshwater aquatic life for the authorized soil treatment and discharge parameters as specified in Subsection 1.2.3.

1.2.3 The types of soil that can be bio-remediated at the treatment facility are soils contaminated with hydrocarbons, specifically soils contaminated with Benzene, Toluene, Ethylbenzene, Xylene (BTEX), Styrene, Methyl Tertiary Butyl Ether (MTBE), Volatile Petroleum Hydrocarbons (VPHs), Light and Heavy Extractable Petroleum Hydrocarbons (LEPHs/HEPHs), Polycyclic Aromatic Hydrocarbons (PAHs), Chlorinated Hydrocarbons, Phenolic Substances, Chloride, Sodium and Glycols as defined in Schedules 4 and 5 of the CSR.

Soils co-contaminated with hydrocarbons as described in this section and metals or other contaminants not suitable for bioremediation meeting industrial land use standards as defined in Schedules 4 and 5 of the CSR may also be accepted for treatment at the biocell.

1.3 <u>Authorized Discharge – Landfill Facility</u>

This section applies to the discharge of refuse from a soil treatment facility and from relocated contaminated soil and associated ash. The site reference number for this discharge is E292889.

1.3.1 The authorized works are a landfill, engineered lined landfill cells, perimeter ditches, erosion and sedimentation control infrastructure, primary and secondary containment detection and inspection sumps and associated cleanout ports, catch basins, groundwater monitoring wells, management works and related appurtenances approximately located as shown on Figure A.

1.3.2 The characteristics of the discharge must be better than:

Hazardous waste, as described in the Schedule 1, 1.1, 3 and 4 (Part 3, table 1 – Leachate Quality Standards) of the Hazardous Waste Regulation (HWR) and must be limited to contaminated soils and associated ash. Hazardous waste (as defined in the *Environmental Management Act* and the HWR), liquids, putrescible and other wastes must not be discharged.

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

The Director may specify different standards and other substances in writing for the protection of human health or the environment.

1.3.3 The types of soil that can be discharged at the landfill facility are soils and associated ash contaminated with metals, Dioxins, Furans, BTEX, MTBE, VPHs, LEPHs/HEPHs, PAHs, Styrene, Chlorinated Hydrocarbons, Phenolic Substances, Chloride, Sodium and Glycols as defined in Schedules 4 and 5 of the CSR.

1.4 **Ancillary Discharge – Water Treatment System**

This section applies to the discharge of effluent from the water treatment system (WTS). The site reference number for the WTS discharge is E292170.

1.4.1 The annual average rate of the WTS discharge is 12.1 cubic metres per day.

1.4.2 The maximum rate of the WTS discharge is 274 cubic metres per day.

1.4.3 The authorized discharge period is continuous.

1.4.4 The characteristics of the discharged treated effluent must be equivalent to or better than the most stringent of those British Columbia Approved Water Quality Guidelines (BCAWQG) and A Compendium of Working Water Quality Guidelines for British Columbia (BCWWQG) for Freshwater Aquatic Life (AL) protection and Drinking Water (DW) uses for the parameters of concern: Inorganic Substances including metals, VPHw, LEPHw, $VHw_{6\text{-}10}$, $EPHw_{10\text{-}19}$, PAHs, BTEX, Styrene, Chlorinated Hydrocarbons, Phenolic Substances, Chloride, Sodium, Glycols, pH and Oil & Grease.

Dioxins and Furans analysis must be conducted at a laboratory and using an analytical method agreed to by the Director and results must be below detection limit at all times.

The source of the discharge must be limited to site stormwater runoff and water from the primary and secondary containment systems authorized under Subsections 1.2.1, 1.3.1 and 1.4.5.

The Director may specify different standards and other substances in writing for the protection of human health or the environment.

1.4.5 The authorized works are surface runoff collection and diversion ditches associated with the WTS, WTS (including pH control and flocculent injection system, settling tank, bag and activated carbon filters), leachate and leak detection reservoirs, flow measurement device, monitoring and sampling equipment, reservoirs and related appurtenances approximately located as shown on Figure A.

1.4.6 The authorized works must be complete and in operation while discharging.

1.4.7 The location of the facilities from which the discharge originates and the point of discharge is Lot 23, Plan VIP78459, Blocks 156, 201 and 323, Malahat Land District.

1.5 **Ancillary Discharge – Settling Pond**

This section applies to the discharge of stormwater from the settling pond. The site reference number for the settling pond outlet is E292898.

1.5.1 The rate of the settling pond discharge is 42,500 cubic metres per day for up to 1 in 10 year return period flood event of 24 hour duration.

1.5.2 The authorized discharge period is continuous.

1.5.3 The characteristics of the settling pond discharge effluent (SW-1) must be equivalent to or better than the most stringent of those BCAWQG and BCWWQG for Freshwater Aquatic Life uses and Total Suspended Solids (TSS) must not exceed 25 mg/L for up to 1 in 10 year return period flood event of 24 hour duration.

For flood events greater than 1 in 10 year return period flood event of 24 hour duration, the characteristics of the settling pond discharge must not exceed background concentrations (SW-4).

The source of the discharge must be limited to non contact site stormwater runoff and treated effluent released from the WTS described in Subsection 1.4.

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

The Director may specify different standards and other substances in writing for the protection of human health or the environment.

1.5.4 The authorized works are surface runoff collection and diversion ditches, leachate, surface runoff and leak detection control reservoirs, one surface settling pond, flow measurement device, monitoring and sampling equipment, emergency overflow and related appurtenances approximately located as shown on Figure A.

1.5.5 The authorized works must be complete and in operation while discharging.

1.5.6 Settled solids which have accumulated in the settling pond must be removed as required to maintain a minimum water depth below the pond decant of 0.5 metre. The removed solids must be disposed of in a manner approved by the Director.

1.5.7 The location of the facilities from which the discharge originates and the point of discharge is Lot 23, Plan VIP78459, Blocks 156, 201 and 323, Malahat Land District.

2. GENERAL REQUIREMENTS

2.1 Soils and Associated Ash Unacceptable for Treatment

The following types of waste must not be accepted for treatment at the site:

1) Hazardous waste as defined in the HWR;
2) Soils contaminated with any substances not included in Subsection 1.2 above with concentrations exceeding relevant standards specified in Schedule 4 and 5 of the CSR;
3) Soils and associated ash that cannot be treated or landfilled successfully in the opinion of the Director; and
4) Liquid waste or soil and associated ash with a water content exceeding those described in the Soil Acceptance Plan.
5) Restricted wastes listed in the Soil Acceptance Plan described in Subsection 2.2 of this permit.

2.2 Screening and Acceptance of Soil

The Permittee must submit a Soil Acceptance Plan prepared by a Qualified

Professional to the satisfaction of the Director for screening soil and associated ash for all potential contaminants of concern prior to receiving any material at the facility. No changes must be made to the plan without prior approval by the Director. The Director may amend the plan for the protection of human health or the environment.

Those soils suspected to be unacceptable must be either rejected immediately or placed in a holding area (as defined in Subsection 2.3) within the soil management area waiting further re-characterization by a Qualified Professional in accordance with Technical Guidance Document #1 (Site Characterization and Confirmation Testing). If further characterization confirms soils as unacceptable for treatment or landfilling (as defined in Subsections 1.2 and 1.3) the soil must not be mixed with any other soil and must be removed from the facility in accordance with the requirements of the *Environmental Management Act* and of the CSR.

2.3 Holding Area for Soil and Associated Ash Suspected/Determined to be Unacceptable

The Permittee must designate a holding area within the soil management area for short term storage of soil waiting for re-characterization or shipment to an appropriate management site as determined by a Qualified Professional. Short term storage must not exceed 30 days from the day of the delivery or as agreed by the Director. The soil must be kept separate from the soil treatment area and be protected from the weather at all times.

2.4 Bedrock Integrity Inspection and Risk Assessment

A bedrock integrity inspection and risk assessment report must be submitted to the Director prior to the construction of any landfill cells. For any abnormalities (open fractures, presence of water, percolation, etc) identified during the inspection, the Permittee must notify the Director immediately and issue a structural report within 30 days following the inspection. The report must be submitted to the satisfaction of the Director and prepared by a suitably Qualified Professional and must include, but is not limited to:

a) all relevant information collected during the inspection and detailing the abnormality;
b) an explanation and/or interpretation of the abnormality;
c) a risk assessment in regards to the risk to human health and the receiving

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

environment; and

d) remedial action planned and/or taken to control the risks.

2.5 Soil Aeration

a) Where the thickness of contaminated soil within the soil treatment facility is greater than 30 cm, the Permittee must periodically conduct mechanical soil aeration. Soil aeration must only be done under the following conditions to prevent nuisance to potential receptors:

i. Ventilation index for Southern Vancouver Island for the day of soil turning is forecast as "good";
ii. No sooner than three hours after sunrise and no later than two hours before sunset but within the authorized discharge period defined under Subsection 1.1.2;
iii. Favorable weather conditions (considering temperature and wind direction, etc.)

b) Prior to every soil aeration event the Permittee must record the ventilation index forecast, time of sunrise and sunset, time and duration of aeration, and ambient temperature. Records must be tabulated along with soil volumes aerated and chemical characteristics in the biocell at the time of aeration.

2.6 Soil Amendment and Prohibition of Blending

Bioremediation must be undertaken without blending/mixing of contaminated soil with cleaner soils for the purpose of dilution to meet the required standards.

Soil amendments which will enhance remediation potential, including bulking materials such as sawdust or straw, may be added prior to or during treatment. Should water be required to enhance soil treatment, contact water generated at the facility must be used in priority.

2.7 Weather Protection

The Permittee must cover the soil treatment piles, soil holding area and active landfill areas completely from November to April when not actively worked on and provide sufficient weather protection and containment for nutrients stored at the site for the protection of human health and the environment.

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

The Permittee must cover any soil stored within the holding area at all times.

2.8 Erosion and Sedimentation Control

The Permittee must ensure erosion and sedimentation control measures are implemented with the soil management and treatment area and the landfill area, to limit sediment releases to the settling pond, the water treatment system and to the receiving waters. Storm water runoff must be diverted away from the soil management and treatment area and all active landfill areas at all times. Erosion and sedimentation controls must be developed and implemented according to industry best management practices and consider the Aggregate Operators Best Management Practices Handbook prepared by the Ministry of Energy and Mines.

2.9 Odour Control

There must be no objectionable hydrocarbon odour evident outside the property boundaries. The Permitee must, at a minimum, implement contingency measures if the ambient air quality sampling results exceed the air quality standards defined under Subsection 3.5. The contingency measures must be defined in the EPM as documented in Subsection 2.13 and include, but are not limited to, reduced soil aeration times and the covering of soil piles.

The Director may amend the permit to require the implementation of additional control measures to limit odour generation.

2.10 Dust Control

Fugitive dust created within the operation area must be suppressed. Measured dustfall must not exceed the B.C. Ambient Air Quality Residential Objective of 1.7 mg/(dm^2-day) over a two week averaging period at the property boundary. The contingency measures must be documented in the EPM as defined in Subsection 2.13 and include, but not limited to, reduced activities, covering or application of dust suppressant on soil piles and exposed areas.

The Director may amend the permit to require the implementation of additional control measures on fugitive dust sources.

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

2.11 Spill Reporting

All spills to the environment (as defined in the Spill Reporting Regulation) must be reported immediately in accordance with the Spill Reporting Regulation. Notification must be via the Provincial Emergency Program at 1-800-663-3456.

2.12 Maintenance of Works and Emergency Procedures

The Permittee must inspect the authorized works regularly and maintain them in good working order. In the event of an emergency or condition beyond the control of the Permittee which prevents effective operation of the authorized works or leads to unauthorized discharge, the Permittee must comply with all applicable statutory requirements, immediately notify the Director, and take appropriate remedial action for the prevention or mitigation of pollution. The Director may reduce or suspend operations to protect human health or the environment until the authorized works have been restored and/or corrective steps have been taken to prevent unauthorized discharges.

The Permittee must prepare and maintain an Emergency Response Plan (ERP) to the satisfaction of the Director that describes the procedures to be taken to prevent or mitigate any discharge in contravention of the EPM. The ERP must be immediately implemented if there is a discharge, or any risk of a discharge in contravention of the EPM. In addition, an up-dated ERP, including a report on any emergency responses, taken in the previous year, must be kept available, on site for inspection, as defined under Subsection 5.1.

The Permittee must review the ERP at least on an annual basis to determine if any changes are required and submit any revisions to the Director for acceptance.

2.13 Environmental Procedures Manual

An Environmental Procedures Manual (EPM) must be prepared and submitted by the Permittee to the Director. No soil may be received prior to acceptance of the EPM by the Director. The EPM must be kept current and available for use as a guide at all times at the facility. The manual must cover all typical aspects of an Environmental Management Systems (EMS) relevant to the management of the soil treatment, water treatment and landfill facilities including but not limited to, the following items:

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

a) Risk identification and prioritization;
b) Administrative and engineering controls;
c) Roles and responsibilities;
d) Training requirements;
e) A Soil Acceptance Plan;
f) A Water Management Plan;
g) An Environmental Monitoring Plan, including on and off site monitoring locations and the sampling procedures for soil, water, groundwater and air quality, as required;
h) An Emergency Response Plan, including contingency measures.
i) Details on the site preparation and the construction of landfill cells;
j) Operation, inspection and maintenance of the soil management and treatment facility, the landfill facility, the water treatment system, erosion and sediment controls measures, the settling pond and associated appurtenances;
k) Internal and external EMS audits, and;
l) Notification, reporting, investigation and corrective and preventive measures.

The Permittee must review the EPM at least on an annual basis to determine if any changes are required and submit any revisions to the Director for acceptance. Annual reviews and submission of revisions are due on March 31 of each year.

2.14 Advisory Committee

The Permittee must establish an Advisory Committee and develop terms of references to the satisfaction of the Director. The Committee must be composed of one representative of each relevant regulatory agency and one representative from the local government. The Committee must meet annually within 3 months of the submission of the annual report as required under Subsection 5.3 and provide advice to the Director within 30 days of the meeting. Based on advice of the Committee, the Director may revise the monitoring, sampling and reporting requirements in Sections 3 and 5.

2.15 Qualified Professionals

All facilities and information, including works, plans, bedrock integrity and risk assessment, assessments, sampling, monitoring, investigations, surveys, programs and reports, must be conducted and certified by Qualified

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

Professionals.

"Qualified Professional" means a person who

a) is registered to practice 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 permit.

2.16 **Bypasses**

The discharge of contaminants which have bypassed the authorized treatment works is prohibited unless the prior approval of the Director is obtained and confirmed in writing, except those authorized under Subsection 1.2 of this permit.

Temporary storage or accidental deposit of contaminated soil at areas other than the soil management area is considered a bypass.

2.17 **Process Modifications**

The Director must be notified in writing prior to implementing changes to any process that may adversely affect the quality and/or quantity of the discharge.

2.18 **Plans - New Works**

Plans and specifications of the works must be certified by a Qualified Professional registered to practice in the Province of British Columbia, and submitted to the Director. A Qualified Professional must certify that the works have been constructed in accordance with the plans before discharge commences.

2.19 **Notification**

The Director must be notified of a change in ownership of the works a minimum of 10 days prior to an ownership change.

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

2.20 Amended or Additional Requirements

Based on the results of the monitoring programs, the Director may:

a) Amend the monitoring and reporting requirements;
b) Amend the requirements of any of the information required by this permit; including plans, program and studies;
c) Require additional investigations, tests, surveys or studies; or
d) Require additional treatment facilities.

3. MONITORING AND SAMPLING REQUIREMENTS

3.1 Incoming Soil and Associated Ash Sampling and Analysis

The Permittee must follow sampling procedures and frequency specified in the approved Soil Acceptance Plan described under Subsection 2.2 to verify soil and associated ash quality. The contaminants must include, but not be limited to, the parameters of concern listed in Subsection 1.3.3, as determined by a Qualified Professional. The Director may require testing of soil and associated ash for additional parameters.

3.2 Treated Soil Sampling and Analysis

The Permittee must sample and characterize each batch of treated soil in accordance with Technical Guidance #1 Site Characterization and Confirmation Testing or an equivalent sampling protocol approved by the Director. Each batch must be considered to be of suspect waste soil quality. Soil must be analysed prior to disposal as authorised in Subsection 1.2 and 1.3 of this permit. The samples must be analysed for the parameters relevant to the type of contamination for which the soil is undergoing treatment as determined by a Qualified Professional. The appropriate parameters must include, but must not be limited to, the parameters of concern listed in Subsection 1.3.3 as determined by a Qualified Professional.

Confirmation of completion of soil treatment must be obtained in writing from a Qualified Professional prior to discharge, for each stockpile of treated soil.

3.3 Groundwater Sampling and Analysis

The Permittee must install and maintain a minimum of seven groundwater

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

sampling facilities (MW-1(S/D), MW-2, MW-3(S/D), MW-4 and MW-5) as shown on Figure B and obtain groundwater samples once each quarter in a manner satisfactory to the Director. MW-4 and MW-5 must be drilled using a non-destructive method and cores must be logged by a Qualified Professional. The design and location of the wells must be to the satisfaction of the Director. Proper care must be taken in sampling, storing and transporting the samples to adequately control temperature and avoid contamination, breakage, etc.

Groundwater samples must be analysed for all potential contaminants of concern. The contaminants may include, but not be limited to, the parameters of concern listed in Subsection 1.3.3, as determined by a Qualified Professional. The groundwater quality must be compared to the standards described in Schedules 6 and 10 of the CSR or any additional standards specified by the Director in writing.

The Permittee may be required to install additional groundwater sampling facilities upon request. The location and structural details of these sampling facilities are subject to the approval of the Director.

3.4 Surface Water Sampling and Analysis

The Permittee must sample the water treatment system effluent (WTS) and the settling pond discharge point (SW-1) monthly and every 2000 m^3 for the water treatment system discharge effluent in a manner suitable to the Director. Proper care must be taken in sampling, storing and transporting the samples to adequately control temperature and avoid contamination, breakage, etc.

Turbidity of the settling pond discharge effluent (SW-1) must be monitored bi-weekly between November to April and after every event greater than 1 in 10 year return period flood event of 24 hour duration.

Surface water samples must be analysed for all potential contaminants of concern. The contaminants may include, but not be limited to, the parameters of concern listed in Subsection 1.3.3, as determined by a Qualified Professional. The surface water quality results must be compared to the standards set out in Subsection 1.4.4 and 1.4.5.

3.5 Air Quality Monitoring

The Permittee must collect monthly ambient air samples during the active

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

season (i.e. between April and November, inclusive) at the down-wind property line using a Summa® Canister. Ambient air samples must also be collected using a Summa® Canister if and when soils with measurable volatile contaminant concentrations exceeding the established thresholds are being managed or treated at the soil treatment facility at the location and as documented in the EPM.

The ambient air sample must be analysed for the all potential contaminants of concern, as determined by a Qualified Professional, and results must be compared to the CSR Schedule 11 RL standards. In the event that results exceed the standards, the Permittee must follow the requirements stated under Subsection 2.9.

3.6 Receiving Environment Sampling

The Permittee must implement a receiving environment monitoring program for the receiving groundwater and surface water summarized in the table below and as defined under the EPM:

<table>
<tr><th>Receiving Waters</th><th colspan="2">Monitoring Locations</th><th>Frequency</th></tr>
<tr><td rowspan="6">Groundwater</td><td>Up Gradient</td><td>(MW-4) Southeast corner of the site</td><td rowspan="6">Quarterly</td></tr>
<tr><td rowspan="5">Down Gradient</td><td>(MW-1(S/D)) On site</td></tr>
<tr><td>(MW-2) Property boundary</td></tr>
<tr><td>(MW-3(S/D)) Property boundary</td></tr>
<tr><td>(MW-5) North of the site</td></tr>
<tr><td></td></tr>
<tr><td rowspan="4">Surface Water</td><td rowspan="2">Up Gradient</td><td>(SW-4) Shawnigan Creek</td><td rowspan="4">5 in 30** (2 times/year, conducted during fall first flush event and in the spring freshet)</td></tr>
<tr><td>(SW-2) Ephemeral Creek 1</td></tr>
<tr><td rowspan="2">Down Gradient</td><td>(SW-5) Shawnigan Creek</td></tr>
<tr><td>(SW-3) Ephemeral Creek 2</td></tr>
</table>

* 5 in 30 refers to at least 5 weekly samples taken in a period of 30 days. Due to the ephemeral nature of some of the creeks, the first 5 in 30 sample should be collected when the ground has first been saturated.

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

Flow measurements must be collected from all surface water monitoring locations at the time of sampling.
Based on the results from the receiving environment monitoring program, the monitoring requirements may be extended or altered by the Director.

3.7 Sampling Procedures

Sampling is to be carried out 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, 2003 Edition (Permittee)", or most recent edition, or by suitable alternative procedures as authorized by the Director.

A copy of the above manual is available on the Ministry web page at www.env.gov.bc.ca/epd/wamr/labsys/lab_meth_manual.html

3.8 Analytical Procedures

Analyses are to be carried out in accordance with procedures described in the "British Columbia Laboratory Manual (2009 Permittee Edition)", or the most recent edition, or by suitable alternative procedures as authorized by the Director.

A copy of the above manual is available on the Ministry web page at www.env.gov.bc.ca/epd/wamr/labsys/lab_meth_manual.html

3.9 Quality Assurance

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

b) A duplicate sample must be prepared and submitted for analysis for each parameter sampled for each monitoring period.

c) The analytical laboratory (ies) must be registered in accordance with the Canadian Association of Laboratory Accreditation (CALA) unless otherwise instructed by the Director.

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

4. SECURITY REQUIREMENTS

4.1 Closure Plan

The Permittee must submit a closure plan to the satisfaction of the Director in 6 months after the issuance of this permit. Based on monitoring results or changes in the operation, the Director may require amendment of the plan for environmental protection.

The closure plan must include, but may not be limited to investigations of soil, sediments, surface water and groundwater quality and treatment, identification and assessment of any residual contamination. If any residual contamination is identified, the Permittee will be required to remediate the site to meet the applicable soil, surface water and groundwater standards and objectives, as determined by the Director.

The closure plan must be reviewed at least every five (5) years to inform the security adjustment defined in Subsection 4.2.

4.2 Posting of Security and Costs

The Permittee must submit a cost estimate for maintenance, monitoring, remediation and closure of the landfill for the active life of the site and a minimum twenty-five year post-closure period based on the current updated Closure Plan referred to in Subsection 4.1. The cost estimate must be prepared or reviewed by a suitably qualified, independent third party. The cost estimate is subject to the Director's approval.

An updated cost estimate must be reassessed and submitted to the Director for approval at least once every five (5) years and the security adjusted accordingly. The Director has the discretion to require reassessment on a more frequent basis.

The Permittee must provide and maintain security in a form and amount specified by the Director. At the discretion of the Director security may be applied, to any of the following:

- To correct any inadequacy of the works relating to their construction,

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

operation and maintenance;

- To correct any non-compliance with this permit or the *Environmental Management Act*; and remediation.

Any money spent from the posted security must be replenished within sixty (60) days or as otherwise specified by the Director.

The operation of the facility without valid security is not authorized.

The Permittee may request the return of security where the title of the works has been transferred to a municipal authority or where the posted amount exceeds the estimated closure and post-closure costs, including remediation. Granting the request is at the discretion of the Director.

5. REPORTING REQUIREMENTS

5.1 Records

Maintain for inspection by Environmental Protection Division staff, a record of the following logs, suitably tabulated:

1) Landfill cells construction QA/QC results;
2) Maintenance records of pollution control equipments listed as authorized works;
3) Facility inspection log with a record of observations of the soil management and treatment and landfill areas (including but not limited to bedrock integrity, liner, cover, stormwater and effluent collection and treatment works inspections), and preventative and corrective actions identified and implemented;
4) Current soil and associated ash inventory, including volumes and characteristics of soils and associated ash in the soil management and treatment area and landfill area;
5) Tracking ID number linked to soil and associated ash analysis results and the signature of a Qualified Professional who certifies completion of remediation in accordance with the requirements of the CSR and compliance with this permit;
6) Location of each batch of soil and associated ash in the soil management and treatment and landfill area on a map;
7) Analyses of screening of incoming soils and associated ash, and

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

associated QA/QC results, as described in Subsection 2.1 and 2.2 of this permit;

8) Soil treatment activities including turning records and quantities of nutrients, bacteria seed or amendments added by date;
9) Weather conditions during turning events as described in Subsection 2.5 of this permit;
10) Results of the vapour and dust monitoring activities as required;
11) Analyses of treated soil, and associated QA/QC results, as described in Subsection 1.2 of this permit;
12) Quarterly volumes of soil stored in the holding area, awaiting final disposal as described in Subsection 2.3 of this permit;
13) A summary of Emergency Response Plan exercises, and incidents, including effluent/soil spills, requiring the Emergency Response Plan implementation.

The above records of analyses for the re-characterization or characterization of incoming soil or treated soil, respectively, must include batch sizes, number of samples collected and analysed per volume.

Records must be kept on site or at another location acceptable to the Director for at least three years and made available upon request.

5.2 Environmental Quarterly Reports

The Permittee must submit environmental quarterly reports prepared by a Qualified Professional with all monitoring data and associated QA/QC results, interpretations, conclusions and recommendations in a format acceptable to the Director and post the results online and provide a hard copy to the Director no later than 30 days after the end of each quarter.

5.3 Environmental Annual Reports

The Permittee must submit an environmental annual report prepared by a Qualified Professional with monitoring data and associated QA/QC results, interpretations, conclusions and recommendations in a format acceptable to the Director no later than March 31 of each year.

The environmental annual report must include, but is not limited to, the following:

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

1) An executive summary;
2) Quality and quantity (in tonnes and m^3) of soil and associated ash received for treatment, direct landfilling and as direct landfill cover;
3) Quality and quantity (in tonnes and m^3) of soil and associated ash that could not be treated in the soil treatment facility and soil and associated ash rejected and diverted to other facilities for treatment and/or disposal;
4) Updated maps showing the active landfill area, the areas reclaimed and the location of each landfill cells (completed and in progress);
5) Landfill operational plan and remaining landfill life and capacity;
6) Review of the preceding year of operation, plans for the next year and a summary of any new information or changes to the facilities and plans, assessments, programs and reports;
7) Review of any non-compliances with the conditions of this permit, including an action plan and schedule to achieve compliance (as per Subsection 6.1); and
8) Results from the Environmental Monitoring Plan with interpretations, conclusions and recommendations.

The Permittee must post the environmental annual report online and provide a hard copy to the local library by March 31 of each year. The Permittee may omit proprietary information from the publically available environmental annual report in accordance with the Freedom of Information and Protection of Privacy Act, as agreed to by the Director.

6. NON-COMPLIANCE REPORTING

6.1 Non-compliance Reporting

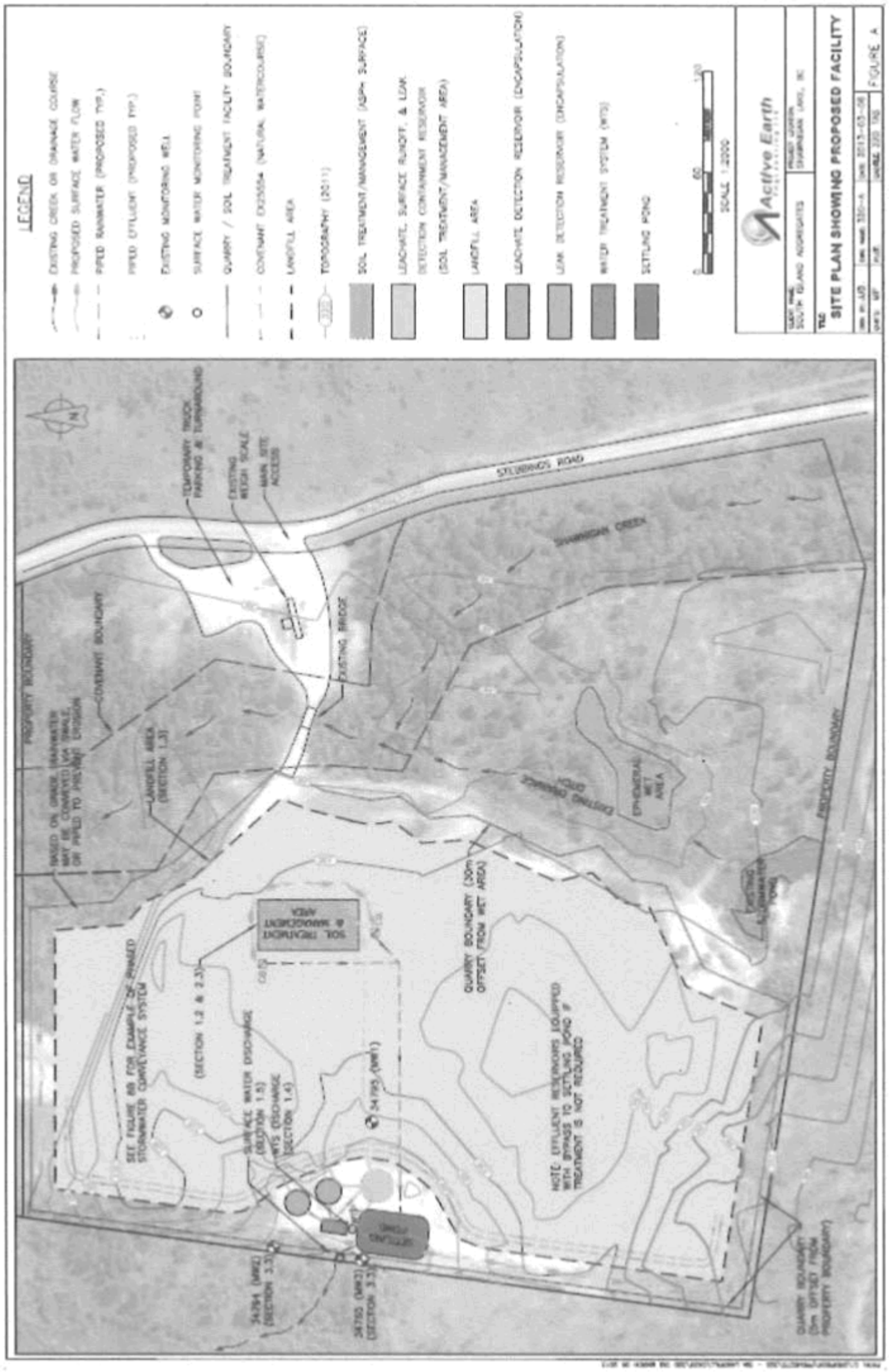
For any non-compliance with the requirements of this permit, the Permittee must submit to the Director, Environmental Protection, a written report within 30 days of the non-compliance occurrence. The report must include, but is not necessarily limited to, the following:

a) all relevant test results related to the non-compliance;
b) an explanation of the most probable cause(s) of the non-compliance; and
c) remedial action planned and/or taken to prevent similar non-compliance(s) in the future.

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

Figure A – Site Plan

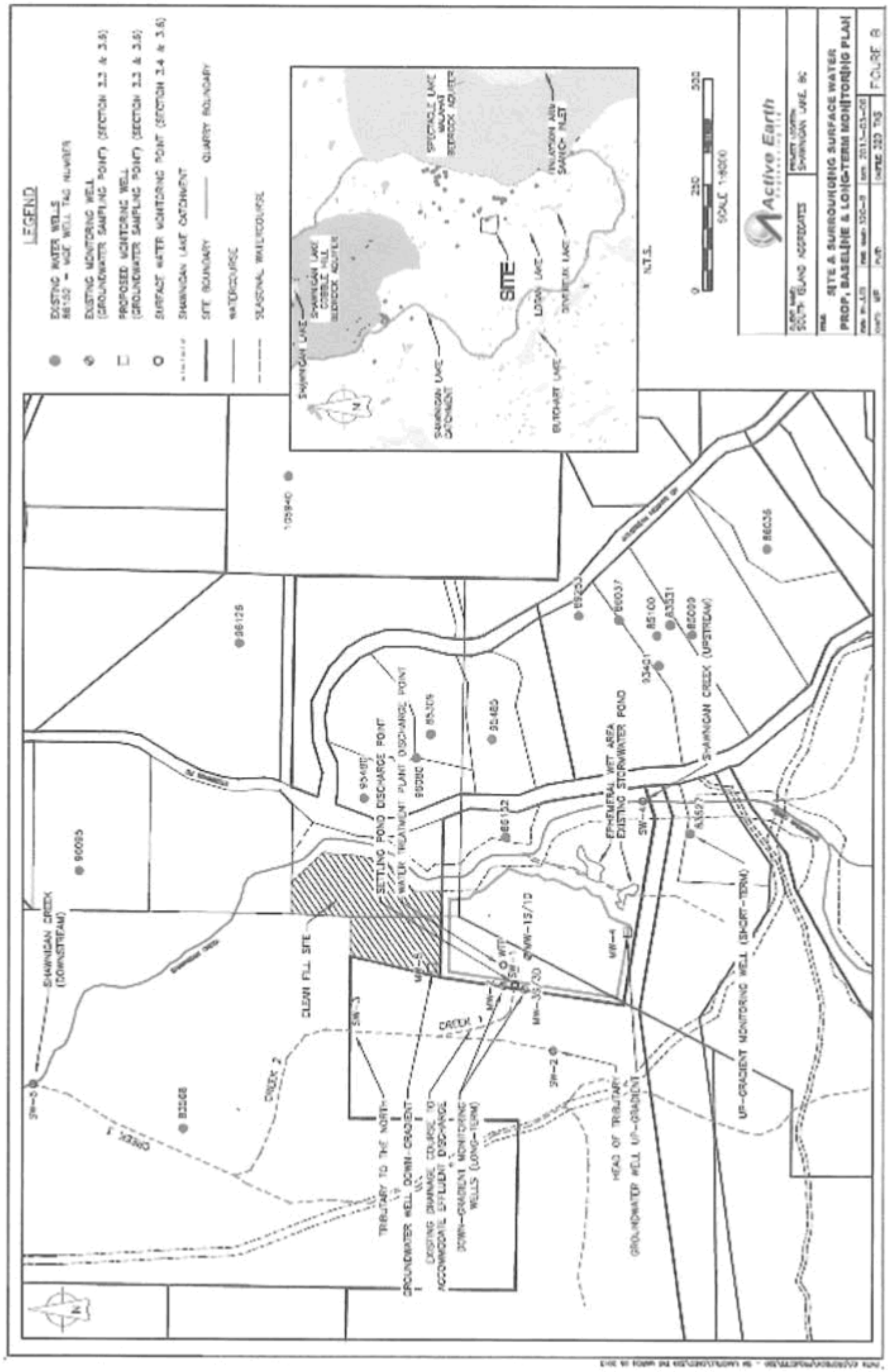


Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

Permit Number: 105809

Figure B – Monitoring Sites



Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

Permit Number: 105809

Appendix B

BC Ministry of Energy, Mines and Petroleum Resources Permit Q-8-094

PROVINCE OF BRITISH COLUMBIA
MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES

QUARRY PERMIT

APPROVING WORK SYSTEM AND RECLAMATION PROGRAM

(Issued pursuant to Section 10 of the **Mines Act** R.S.B.C. 1996, C.293)

Permit: **Q-8-094** Mine No.: **1610355**

Issued to: **South Island Aggregates Ltd**
497 A Garbally Road
Victoria BC V8T 2J9

For work located at the following property: **South Island Aggregates Quarry**

Lot 23, Blocks 156, 201 and 323, Malahat District, Plan VIP78459

This approval and permit is subject to the appended conditions.

Issued this 4th day October in the year 2006
Amended this 20th day of April, in the year 2009
Amended this 17th day of July in the year 2015
Amended this 28th day of October in the year 2015

Jim Dunkley, P. Geo.
Inspector of Mines

INTRODUCTION

This amendment issued October 28, 2015, replaces all previous permits and subsequent amendments. The purpose of this amendment is to clarify the end land use of the site, conform with the terminology used in the Ministry of Environment Permit “PR-105809”, and to simplify jurisdictional issues by re-establishing the boundaries of the mine site to that prior to the amendment dated May 7, 2012.

PREAMBLE

Notice of intention to commence work on a quarry, including a plan of the proposed work system and a program for the protection and reclamation of the surface of the land and watercourses affected by the work dated August 23, 2006, was filed with the Inspector on August 23, 2006. Notice of such filing was published in The Pictorial on September 3, 2006, and in the BC Gazette on September 7, 2006.

This permit contains the requirements of the Ministry of Energy and Mines for reclamation. It is also compatible, to the extent possible, with the requirements of other provincial ministries for reclamation issues. The amount of security required by this permit, and the manner in which this security may be applied, will also reflect the requirements of those ministries. Nothing in this permit, however, limits the authority of other provincial ministries to set other conditions, or to act independently, under their respective permits and legislation.

This amendment references and includes terms of the following Reports:

1. Active Earth Engineering (AEEL) “Technical Assessment for Authorization to Discharge Waste”, August 2012.
2. Active Earth Engineering, “Geotechnical Assessment”, October 24, 2013.
3. Levelton Consultants Ltd “South Island Aggregates Stebbings Road Quarry”, October 2012.
4. BC Geological Survey “Bedrock Geology of the South Island Aggregates Stebbings Road Quarry” October 28, 2013.
5. Active Earth Engineering, “Summary of Core Drilling and Testing Results”, October 2013.
6. Active Earth Engineering “Environmental Procedures Manual for Waste Discharge Permit PR-105809", October 28, 2013.
7. Leveloton Consultants Ltd follow-up memo “South Island Aggregates Containment Area-640 Stebbings Road, Shawnigan Lake, BC”, November 13, 2013.

Unless modified by Permit Q-8-094, or the Ministry of Environment Permit PR-105809, all terms of the referenced reports form a part of this permit. Should there be a conflict between this permit and the Ministry of Environment (MOE) permit related to requirements under the terms of the MOE permit related to environmental protection, the terms of the MOE permit shall take precedence.

Decisions made by staff of the Ministry of Energy and Mines will be made in consultation with other ministries.

CONDITIONS

The Chief Inspector of Mines (Chief Inspector) hereby approves the work plan and the program for protection and reclamation of the land surface and watercourses subject to compliance with the following conditions: Unless modified by this amended permit all conditions within the original Notice of Work, dated August 23, 2006, and the subsequent amendment form an integral part of this permit.

1. Reclamation Security

   (a) The owner, agent or manager (herein called the Permittee) shall maintain with the Minister of Finance securities in the amount of fifty five thousand dollars ($55,000). The security will be held by the Minister of Finance for the proper performance of the approved program and all the conditions of this permit in a manner satisfactory to the Chief Inspector.

   (b) The Permittee shall conform to all forest tenure requirements of the Ministry of Forests. Should the Permittee not conform to these requirements then all or part of the security may be used to cover the costs of these requirements.

   (c) The Permittee shall conform to all Ministry of Environment approval, licence and permit conditions, as well as requirements under the **Wildlife Act**. Should the Permittee not conform to these conditions, then all or part of the security may be used to fulfill these requirements.

2. Land Use

   The surface of the land and watercourses shall be reclaimed to the following land use: **Forestry/Industrial**

3. Productivity

The level of land productivity to be achieved on reclaimed areas shall not be less than existed prior to mining on an average property basis unless the Permittee can provide evidence which demonstrates, to the satisfaction of the Chief Inspector, the impracticality of doing so.

4. Revegetation

Land shall be re-vegetated to a self-sustaining state using appropriate plant species.

5. Use of Suitable Growth Medium

(a) On all lands to be revegetated, the growth medium shall satisfy land use, productivity, and water quality objectives. Topsoil and overburden (to rooting depth) shall be removed from operational areas prior to any disturbance of the land and stockpiled separately on the property for use in reclamation programs, unless the Permittee can provide evidence which demonstrates, to the satisfaction of the Chief Inspector, that reclamation objectives can otherwise be achieved.

(b) No topsoil shall be removed from the property without the specific written permission of the Inspector.

6. Buffer Zones and Berms

Buffer zones and/or berms shall be established between the mine and the property boundary unless exempted in writing by the Inspector.

7. Treatment of Structures and Equipment

Prior to abandonment, and unless the Chief Inspector has made a ruling otherwise, such as heritage project consideration or industrial use:

(a) all machinery, equipment and building superstructures shall be removed;

(b) concrete foundations shall be covered and revegetated unless, because of demonstrated impracticality, they have been exempted by the Inspector; and,

(c) all scrap material shall be disposed of in a manner acceptable to the Inspector.

8. Watercourses

(a) Watercourses shall be reclaimed to a condition that ensures:

(1) long-term water quality is maintained to a standard acceptable to the Chief Inspector;

(2) drainage is restored either to original watercourses or to new watercourses which will sustain themselves without maintenance: and,

(3) use and productivity objectives are achieved and the level of productivity shall not be less than existed prior to mining unless the Permittee can provide evidence which demonstrates to the satisfaction of the Chief Inspector the impracticality of doing so.

(b) Water which flows from disturbed areas shall be collected and diverted into settling ponds.

9. Roads

(a) All roads shall be reclaimed in accordance with land use objectives unless permanent access is required to be maintained.

(b) Individual roads will be exempted from the requirement for total reclamation under condition 9(a) if either:

(1) the Permittee can demonstrate that an agency of the Crown has explicitly accepted responsibility for the operation, maintenance and ultimate deactivation and abandonment of the road, or

(2) the Permittee can demonstrate that another private party has explicitly agreed to accept responsibility for the operation, maintenance and ultimate deactivation and abandonment of the road and has, in this regard, agreed to comply with all the terms and conditions, including bonding provisions, of this reclamation

permit, and to comply with all other relevant provincial government (and federal government) regulatory requirements.

10. Disposal of Fuels and Toxic Chemicals

Fuels, chemicals or reagents which cannot be returned to the manufacturer/supplier are to be disposed of as directed by the Chief Inspector in compliance with municipal, regional, provincial and federal statutes.

11. Temporary Shutdown

If this quarry ceases operation for a period longer than one year the Permittee shall either continue to carry out the conditions of the permit or apply for an amendment setting out a revised program for approval by the Chief Inspector.

12. Safety Provisions

All safety and other provisions of the ***Mines Act*** shall be complied with to the satisfaction of the Chief Inspector.

13. Monitoring

The Permittee shall undertake monitoring programs, as required by the Inspector, to demonstrate that reclamation objectives are being achieved.

14. Alterations to the Program

Substantial changes to the program must be submitted to the Inspector for approval.

15. Notice of Closure

Pursuant to Part 10.6.1 of the Health, Safety and Reclamation Code for Mines in British Columbia, a Notice of Completion of Work shall be filed with the Inspector not less than seven days prior to cessation of work.

16. Annual Report

Annual reports shall be submitted in a form and containing the information as and if required by the Inspector.

17. Site Stability

a) The inspector shall be advised in writing at the earliest opportunity of any unforeseen conditions that could adversely affect the extraction of materials, site stability, erosion control or the reclamation of the site.

b) The stability of the slopes shall be maintained at all times and erosion shall be controlled at all times.

c) The discovery of any significant subsurface flows of water, seeps, substantial amounts of fine textured, soils, silts and clays, as well as significant adverse geological conditions shall be reported to the inspector as soon as possible and work shall cease until the inspector advises otherwise.

SITE SPECIFIC CONDITIONS:

18. The importation of soil is permitted subject to the following conditions:

a) Soil imported must meet Ministry of Environment Soil Guidelines for the intended end land use, as identified in the Ministry of Environment Permit PR-105809.

b) Importation of material other than defined in 18(a) is prohibited unless approved by the Inspector.

c) The approval as required in 18(b) shall be processed as an amendment to this permit.

d) Documentation identifying the soil condition and suitability for the intended end land use must be maintained at the mine site office and made available to the Inspector on demand.

19. Property boundaries shall be permanently marked and maintained, and pit boundaries (mine footprint) shall be permanently marked and maintained. All persons working on the property will be instructed as to the meaning of the markings; and,

a) The Permittee shall install a substantial fence along the property boundary.

b) This fence can be installed in stages with completion by September 1, 2016.

c) The portion of the property abutting the lands owned by the Cowichan Valley Regional District (CVRD) shall be fenced by September 2015. This includes lands abutting the restrictive covenant along Shawinigan Creek.

20. An 8-metre wide vegetation buffer shall be maintained on the northeast property boundary. The exiting trees shall not be removed.

21. All blasts shall be electronically monitored.

22. Blast limits are established at 50 millimeters per second peak particle velocity and 120 decibels on the L scale, at the property boundary, and:

a) The electronic monitor unit shall be located such that the air pressure (microphone) sensor has a clear unobstructed line of sight to the centre of the blast. The Inspector may allow or require monitoring at specific locations on a case by case basis as may be required.

b) The Manager shall maintain at the Mine Site Office, a signed copy of the Blast Log for each blast and a copy of the Electronic Monitor Record. Such records shall be made available to the Inspector on request.

c) Residents within 1km of the centre of the Quarry, and the Inspector, shall be given 24 hours notice of each scheduled blast. This 24 hours notice will establish a window of 1.5 hours within which the blast can be fired.

i. If, due to circumstances beyond the control of the Manager, a blast has been loaded and cannot be detonated within the time frame as described above, the Manager shall secure the site, post a watchman, and fire the blast the next day following the issuing of the required 24 hours notice. The Inspector may, at his discretion, allow the blast to be fired outside of the 24 hour notice window or, outside of normal hours of work. In such cases the Inspector shall establish the conditions necessary for firing the blast.

23. For purposes of establishing the 1 km radius, the centre of the quarry is defined as: **W 48* 33.103, N 123* 36.390**

Standard Quarry Blasting Conditions:

24. To the extent practical, all blasts initiated on the quarry shall be videoed, and:

    a) A copy of the video shall be kept at the mine office, and made available to the Inspector on request.

    b) The video file shall include the following identification information as a word document;

        1. the pit name, and mine number
        2. the bench/location identification, including a map showing the location on the mine footprint.
        3. the name of the blaster
        4. the date of the blast
        5. the time of the blast

    c) Other information and records as may be required as conditions of the permit, or directives of the Inspector.

    d) The video shall clearly show the conduct of the blast in sequence of events including.

    e) The free faces prior to the blast, with emphasis placed on the face profile and the rock structure.

    f) The layout of the blast pattern including the tie ins.

    g) The overall site layout of the area within the “danger zone.”

25. Hours of work shall be between 7am and 5pm Monday to Friday. No work, except as defined below, shall occur on weekends or Statutory Holidays:

    a) Light maintenance is permitted on Saturdays between 9am and 4pm. *Light Maintenance is defined as:* work requiring the only the use of hand tools. It does not include air impact tools, air arcing, or any heavy equipment to perform a task.

    b) Drilling operations shall be limited to the hours of 8am to 4pm Monday to Friday.

c) Notwithstanding the above, nothing in this condition prevents the Manger from working outside the permitted hours of work should:

i) a safety concern on site is such that a failure to complete necessary work can result in harm or risk to workers, members of the public, or the environment or,

ii) an agency having jurisdiction declares an emergency and product from this operation is required to mitigate or assist in the mitigation of the emergency.

d) Should the provisions of condition 25(c) be implemented the Manager shall advise the Inspector without delay.

e) A sign shall be posted at the entrance to the Quarry clearly indicating the permitted hours of work.

26. The Manager shall schedule truck traffic entering or leaving the Quarry such that the trucks do not conflict with elementary school bus pick-up or drop off times.

Permit Conditions related to the Construction, Operation, and Maintenance of the Contaminated Soil Cells as referenced in this Permit.

27. Blasting:

a) No blasts shall be initiated during the installation of the liner, (geo- tech liner) including the upper liner as required by the approved plan.

b) Installation includes the completion of any soil cover to a compactness of 0.66 meters thick.

28. Blasting of final walls in the quarry and for the contaminated soil cells:

a) All final walls within the quarry shall be blasted using controlled blasting techniques, commonly referred to as “smooth blasting”.

b) Following the blast all walls shall be scaled as may be required.

c) Any row of holes to be blasted within 10 meters of the common boundary between the Quarry and property owned by the CVRD shall be surveyed in by a Licensed Land Surveyor. A copy of the survey shall be forwarded to the Inspector within one week of the blast.

29. Clay placed above the bedrock shall be placed in 250mm lifts, and compacted to 90% standard proctor until the Clay is 1 meter compacted thickness.

30. At the completion of each 1 meter (compacted) lift, the Manager shall provide the Inspector an As Built of the lift signed by a suitable registered professional, registered in the Province of British Columbia.

    a) For soil imported into the cell, not including clay or sand, the Engineer of Record shall identify soils where 95 Proctor could not be obtained, and shall identify the type of soil, the maximum compactness the soil can sustain, and the maximum moisture content to attain the compaction.

    b) For purpose of clarity, the Engineer of Record is not required to provide the above information on soil for every square foot of surface area but can provide the report in accordance with good engineering practice and standards.

31. All surface water shall be drained and controlled such that surface water does not have free access to the contaminated soil cell.

    a) Following rainfall, snow melt, or inadvertent flow of water into the contaminated soil cell, the Permittee shall take such measures as may be necessary to drain any accumulations of surface water from the cell.

    b) This may require suitable time frames to allow the drying of the soil to the point that the engineer of record is satisfied the moisture content does not compromise the achievement and maintenance of the required compaction as defined in this permit.

32. **Geotechnical**

1. Design and Construction

    a) The construction of the contaminated soil storage facility, as described in the application, is approved.

    b) The sediment control pond shall be designed with a minimum 1 metre freeboard during the 200-year flood event.

c) The Permittee shall ensure the facility is constructed under the supervision of a qualified professional engineer.

d) Rock cuts and slope design shall be reviewed by a professional geotechnical engineer following blasting and excavation. The requirement for scaling and/or stabilization measures shall be evaluated to ensure the safety of workers working below these slopes.

e) The facility shall be constructed in accordance with the design and construction specifications outlined in the application and approved by the Engineer of Record. The Engineer of Record shall review the construction drawings and specifications to verify that recommendations are properly incorporated as per design. Any changes to the proposed method of development will require previous approval of the Inspector.

f) During construction, appropriate Quality Assurance/Quality Control (QAQC) shall be carried out. Within 30 days of completing construction, a construction QAQC report shall be submitted to the Inspector. This report shall include a summary of the liner installation, materials testing and compaction information and the QAQC measures employed during construction.

g) The Permittee shall submit an As-Built report with drawings to the Inspector prior to operation of the facility. As-Built reports shall be sealed by a professional engineer and shall include a statement indicating that the facility was constructed in general conformance with the design and specifications. A complete set of As-Built drawings shall be kept at the mine site at all times and be provided to any Mines Inspector upon request.

2. Operation and Monitoring

a) Prior to operation of the facility, the Permittee shall submit an updated Operation, Maintenance, and Surveillance (OMS) manual and a Mine Emergency Response Plan (MERP) to the Inspector that outlines procedures for the successful operation, maintenance, and surveillance of the facility and emergency preparedness and response procedures. These documents shall be kept current and updated over time as procedures are modified.

b) All contaminated soil materials entering the facility shall meet the specifications as specified by the geotechnical engineer in the stability analyses and design of the facility. No contaminated soil materials that are subject to liquefaction (regardless of triggering mechanism) shall be disposed in the facility. Materials not meeting design specifications or operational requirements must be spoiled off-site at an alternate approved location.

c) Instrumentation shall be installed as recommended by the professional geotechnical engineer to monitor conditions related to the stability of the facility. Monitoring frequency, thresholds, and response procedures shall be determined by the geotechnical engineer and be clearly described in the OMS manual.

d) During operations, appropriate Quality Assurance/Quality Control (QA/QC) shall be carried out on the contaminated soil materials to ensure material properties meet geotechnical design and compaction requirements. Results of this testing shall be provided to the Inspector upon request. An up-to-date copy of QA/QC procedures, testing results, and inspection logs shall be maintained at site and made available for any Inspector upon request.

3. Reporting

a) Annual inspections of the contaminated soil storage facility shall be undertaken by a qualified Professional Geotechnical Engineer with a report submitted to the Inspector by March 31 of the year following the inspection. The report shall include a summary of observations, review of monitoring data including instrumentation, QA/QC procedures, testing results, and recommendations with respect to any necessary changes to operating procedures. Any recommendations relating to health and safety or geotechnical stability shall be followed unless a suitable alternative course of action is approved in writing by the professional undertaking the review, or by a third party qualified Professional Engineer, as may be determined by the Inspector.

33. **Completion of the cell:**

a) The final cover of each cell shall consist of two meters of till or residential classification soil, compacted to the degree necessary to prevent/limit erosion and sustain growth of appropriate vegetation.

b) The permittee shall, prior to applying any vegetation cover to the completed cell, provide the inspector a plan designed by an appropriate qualified person which demonstrates the vegetation cover is suitable for the area, and as cover for the cell.

c) Filling of the cells shall be conducted on a one cell at a time basis. Filling of the next cell can only commence upon completion of the previous cell.

d) The previous condition does not prevent the Permittee from doing cell preparation, up to the point of being ready to receive fill material.

e) Prior to receiving fill in any cell, the Permittee must provide a signed As-built of the construction of the cell to date. This As-built, signed by the Engineer of Record, shall state that this construction meets the standards required by this permit and the Ministry of Environment Permit PR-105809.

f) Each completed cell shall remain in, and be subject to, ongoing monitoring under the terms of this permit, for the life of the mine.

g) Once completed, a cell shall not be disturbed without the written approval of the Inspector.

h) The Manager shall, by March 31 of each year, provide the Inspector a report identifying the volume of water treated through the treatment plant, and shall include all operating costs associated with the operation and maintenance of the treatment plant.

34. The Manager shall forward to the Inspector a copy of the report submitted to the Minister of Finance in relation to the annual Health and Safety Assessment. This report provides the annual production.

35. Surface water not subject to treatment in the water treatment plant shall be monitored at the discharge point to the receiving environment and suspended solids shall not exceed 25mg/litre. In addition, this monitoring shall include analysis for nitrates and nitrate content shall not exceed the limits specified for drinking water.

36. The mine foot-print shall revert back to that prior to the May 7, 2012 amendment.

37. Production from this quarry is limited to 240,000 tonnes annually.

Appendix C

Example of a Waste Approval Application and Related Documents

SOUTH ISLAND
RESOURCE MANAGEMENT

Waste Approval Application Form

REVISION 0.5

GENERATOR INFORMATION

Generator:		Generating Site Name:	
Address:		Generating Site Address:	
Generator Contact:		Site Contact Name:	
Billing Contact:		Site Contact Phone #:	
Account/Quote #:		BCG # (if applicable):	
Phone #:		Site Reg. ID (if applicable):	
Email Address:			

QUALIFIED ENVIRONMENTAL PROFESSIONAL INFORMATION

Company:		Phone #:	
Contact Name:		Title/Registration:	
Address:		Email Address:	

MATERIAL DETAILS AND ANALYTICAL DATA

Prior Uses of Site*:
Current Use of Site*:
Source of Contamination:
Reason for Soil Removal:
Contaminating Material (waste oil, plating bath, etc):
Type of Soils (grain size, FOC, etc):
Debris in Waste:
Moisture Content (no free liquid):
Shipping Date(s) (est.):
Date/Title of Environmental Consultant's Reports:

Tonnes (est.) per Soil Class	
	< Schedule 7, Col II
	< BC CSR IL
	IL < soil < HW
	Special/Quoted:

Soil Contaminants

	Hydrocarbons
	Metals
	Salt
	Other:

Consultant (Qualified Professsional) Reports and Laboratory Analytical Reports that sufficiently and accurately characterize the material must be attached

** See BC CSR Schedule 2: Industrial and Commercial Purposes and Activities*

CERTIFICATION (completed by Authorized Representative of Generator)

I hereby certify that the information supplied above and attached is complete and accurate to the best of my knowledge and belief,
that material has been characterized as per BC Ministry of Environment guidelines or equivalent by the indicated qualified environmental professional,
that no deliberate or willful omissions of relevant information have been made,
that all known or suspected hazards or contaminants related to the above waste material have been disclosed,
and that all shipping/receiving is subject to the standard terms of service (attached - initial and date)

Name, Title and Organization	Signature	Date

**** OFFICE USE ONLY **** Waste Approval #:

SIRM Project #

Max. Tonnage w/o Additional Data:

Notes

Classification/Destination

M		Modification/Stabilisation
R		Re-Sampling / SHA
D		Direct Placement / PEA
S		SMA
Other		

Date	Name	Title	Signature

SOUTH ISLAND
RESOURCE MANAGEMENT

Waste Approval Change Order

REVISION 0.1

Waste Approval #:		**Max. Tonnage Authorized:**	
Last Change Order		**Max Tonnage Authorized:**	
NO CHANGE ORDER OR WASTE ACCEPTANCE WITHOUT VALID WASTE APPROVAL			

CERTIFICATION (completed by Authorized Representative of Generator)

I hereby certify that: (1) all information (including generator, site and site history information) supplied for the above-referenced Waste Approval, as well as all information herein and attached, is complete and accurate to the best of my knowledge and belief; (2) waste has been characterized as per BC Ministry of Environment guidelines or equivalent; (3) all known or suspected hazards or contaminants related to the above waste material have been disclosed; (4) no deliberate or willful omissions of relevant information have been made; and (5) all shipping/receiving is subject to the standard terms of service.

Name, Title and Organization ______ Signature ______ Date ______

Generator: ______ Generating Site Name: ______

Generator Contact: ______ Generating Site Address: ______

QUALIFIED ENVIRONMENTAL PROFESSIONAL INFORMATION

Company: ______ Phone #: ______

Contact Name: ______ Title/Registration: ______

Address: ______ Email Address: ______

MATERIAL DETAILS AND ANALYTICAL DATA

Shipping Date(s) (est.):

Date/Title of Environmental Consultant's Reports: ______

Consultant (Qualified Professsional) Reports and Laboratory Analytical Reports that sufficiently and accurately characterize the material must be attached

Tonnes (est.) per Soil Class	
	< Schedule 7, Col II
	< BC CSR IL
	IL < soil < HW
	Special/Quoted:

Soil Contaminants	
	Hydrocarbons
	Metals
	Salt
	Other:

**** OFFICE USE ONLY **** Waste Approval_Change Order #:

SIRM Project #

Max. Tonnage w/o Additional Data:

Notes ______

Classification/Destination

M		Modification/Stabilisation
R		Re-Sampling / SHA
D		Direct Placement / PEA
S		SMA
Other		

Date ______ Name ______ Title ______ Signature ______

SOUTH ISLAND
RESOURCE MANAGEMENT

460 Stebbings Road
Shawnigan Lake, BC V0R 2W3
250.743.0811
info@SIRM.ca

Terms of Service: Rev 0.3

460 Stebbings Road: Standard Terms of Service

AUTHORITY TO BIND THE COMPANY

1. Client shall ensure that contracts, credit applications, quote acceptance, Waste Approval Applications (WAAs) and Soil Arrival Forms (SAFs) are completed by representatives with capacity to bind the Entity to the terms, conditions and representations therein.

CHARACTERIZATION

2. Generator warrants and represents that material delivered is not a hazardous waste or a waste prohibited from secure disposal under the B.C. Hazardous Waste Regulation (HWR)
3. Generator warrants and represents that material delivered is characterized by a qualified professional to (a) the prevailing standard of care for similar professionals conducting similar work in British Columbia at the time of the characterization; and (b) BC Ministry of Environment Technical Guidance for Contaminated Sites No. 1, "Site Characterization and Confirmation Testing"
4. Characterization data must be unambiguously traceable to the material shipped; such data must not be more than one year old at time of receipt.
5. Definitive analytical data must be accompanied by a signed certificate of analysis from a laboratory certified by Canadian Association for Laboratory Accreditation Inc. (CALA) and approved by the BC Ministry of the Environment for the analytical method used.
6. For soils containing concentrations of LEPH and/or HEPH in excess of BC Contaminated Sites Regulation Industrial Land (CSR IL) standards, submit analysis of PAHs and calculation of PAH TEQ.
7. For soils containing concentrations of contaminants in soil (mg/kg) with a numeric value more than 20 times the numeric value of the related HWR leachate criteria (in mg/L), submit Toxicity Characteristic Leaching Procedure (TCLP) analysis.
8. For soils potentially containing dioxins and/or furans, submit laboratory analysis utilizing a method documented as acceptable to a Director of the BC Ministry of Environment.

RETAINED RESPONSIBILITY

9. SIRM reserves the right to sample and test any material at any time after arrival.
   1. Where such sampling and testing indicates material is consistent with the submitted WAA, SIRM shall bear costs associated with the sampling, testing and data analysis.
   2. Where such sampling and testing indicates material is not consistent with the submitted WAA, the generator shall be liable for the costs of such sampling, testing and analysis
10. The right of SIRM to inspect and/or sample does not reduce, restrict, or otherwise affect the generator's liability for material.
11. If, after acceptance by SIRM, soil/material is discovered to be inconsistent with the WAA, SIRM will notify the generator. If requested, the generator shall, at its own cost, remove the soil/material, and any additional affected material, within twenty-four (24) hours of notification; shall transport and dispose of such material in accordance with applicable law and regulation; and shall compensate SIRM for any reasonably incurred restoration, repair and business interruption costs.

Client Initial/Date: SIRM Initial/Date:

460 Stebbings Road
Shawnigan Lake, BC V0R 2W3
250.743.0811
info@SIRM.ca

GOOD BEHAVIOUR AND HOUSEKEEPING

12. Business hours are 07:00 to 17:00 local time, Monday through Friday, excepting statutory holidays. Trucks shall not arrive earlier than 07:15 and not later than 16:30 during business hours. Trucks shall not use engine brakes anywhere along Stebbings Road.
13. Trucks shall obey all posted speed limits, including the on-site limit of 10 km/hr, and shall behave courteously with respect to local traffic.
14. All vehicles and equipment are to be in good repair, clean, in workmanlike condition, with no leaks, drips, or loose soil. All vehicles must be equipped with readily accessible spill kits and fire extinguishers in good condition.
15. All loads must be properly secured and covered. All loads within the rated capacity of the vehicle.
16. Drivers must follow instructions from site personnel and shall only dump in specifically identified locations.
17. Drivers are responsible for cleaning/shoveling out adhered soil in the soil receiving area to eliminate clumps of soil cast off between the area and the tire wash. Drivers must stop after the tire wash and inspect around their vehicle, using hand tools and/or supplied hose to eliminate drag out beyond the inspection area, including onto public roads.

RECEIVING

18. All incoming loads must be accompanied by a complete Soil Arrival Form (SAF) bearing a valid Waste Approval number for the source site and material class delivered.
19. No split loads (wastes of more than one classification) are allowed in a single truck/trailer shipment without pre-approval by SIRM. Split loads may be subject to additional handling charges.

NO RIGHT TO DELIVER

20. SIRM reserves the right to cancel or suspend a Waste Approval at any time, or to refuse a shipment or shipments of material, for any reason, at any time, without penalty. A Waste Approval, quote, or active account does not in confer a right to deliver material.

BANS AND CHARGE BACKS

21. SIRM reserves the right to remove, without notice, penalty or compensation of any kind, personnel or equipment from the site, and/or to permanently or temporarily bar them from the site, if, in opinion of the SIRM Operations Manager or designate, they are involved in unsafe behaviour, are in breach of the terms of service, are in contravention of any applicable permit or license, compromise environmental quality or could be construed as a nuisance to the community.
22. Where violations of the terms of service require remedial work, including, but not limited to, cleaning of roads, medians and shoulders, SIRM reserves the right to conduct work without prior notice and apply a service charge equivalent to SIRM's full cost plus 10%.

Client Initial/Date: SIRM Initial/Date:

460 Stebbings Road
Shawnigan Lake, BC V0R 2W3
250.743.0811
info@SIRM.ca

INVOICING

23. All accounts are due and payable according to the terms stated on each invoice (net 30 days from the date of the invoice, unless otherwise specified).
24. Interest will be charged on past due accounts at a rate of 1.5% per 30 calendar days, unless otherwise specified.
25. NSF cheques/bounced cheques will be subject to a $150 processing fee, unless otherwise specified.
26. Customer bears all costs incurred in collecting any unpaid amounts including, but not limited to, collection agencies, legal fees and court costs.

INDEMNIFICATION

27. Client agrees to defend, indemnify and hold harmless SIRM, its partners, affiliates, employees, agents, heirs and successors against any and all claims, demands, orders, causes of action, damages, liabilities, losses, expenses, penalties caused by or resulting from the generator's noncompliance with these terms of service or from waste characteristics not disclosed in a WAA.

Client Initial/Date: SIRM Initial/Date:

Appendix D

Example of a Soil Arrival Form

SOUTH ISLAND
RESOURCE MANAGEMENT

460 Stebbings Road, Shawnigan, BC
Gate: 250.743.0811
receiving@sirm.ca

Soil Arrival Form

Revision 0.5

Waste Approval #:		**[NO SOIL ACCEPTED w/o VALID WASTE APPROVAL #]**
Change Order #:		

GENERATOR & CONTACT INFORMATION

Generator:
Address:
Generator Contact:
Phone #:
Email Address:
Generating Site Name:
Generating Site Address:
Site Contact Phone #:
Billing Contact/Quote#
BCG # (if applicable):
Site Reg. ID (if applicable):

Soil Classification

	< Schedule 7, Col II
	< BC CSR IL
	IL < soil < HW
	Special Per Quote:

No split loads w/o prior approval

Consignor's Signature:

Consignor's name:

Consignment subject to terms of related waste approval

TRANSPORTER INFORMATION

Please Circle: Tandem - w/ Pony w/ Tri-axle w/ Quad-axle Other:

Driver Name:

Company:

Driver Phone:

Signature/Date:

Truck Plate #:

Trailer Plate #:

** OFFICE USE ONLY **

Comment

M		Modification/Stabilisation
R		Re-Sampling / SHA
D		Direct Placement / PEA
S		SMA
Other		

Ticket # Date Time Authorized agent Signature

Appendix E

Sample Collection Methodology

Protocol

Soil Sampling

Active Earth Engineering Ltd

1.0 INTRODUCTION

A standardized sampling protocol has not been established by the BC Ministry of Environment (MOE) under the Contaminated Sites Regulation (CSR). Active Earth Engineering Ltd. (Active Earth) developed the following protocol with the aid of a variety of references including:

- The Canadian Council of Ministers of the Environment (CCME) – "Guidance Manual on Sampling, Analysis, and Data Management for Contaminated Sites", Volume I: Main Report, December 1993;
- MOE Guidance Document 2 – Statistical Criteria for Characterizing a Volume of Contaminated Material;
- MOE Guidance Document 12 – Technical Guidance on Contaminated Sites Statistics for Contaminated Sites; and,
- British Columbia Field Manual, January 2003.

Active Earth maintains dedicated field operating protocols that are intended to provide consistent and reliable field results. Our protocols are reviewed regularly in light of changing regulatory guidance and emerging issues and technology.

2.0 PROTOCOL OBJECTIVE

The objective of the sampling protocol is to allow collection of soil samples which are consistent, representative, and repeatable and to prevent cross-contamination.

3.0 SAMPLE COLLECTION

Active Earth's sample collection protocol comprises sample collection, handling, storage, labeling, and transport. During the sampling process, equipment and instrument cleaning is important to prevent cross-contamination. Active Earth personnel protect themselves from exposure to contaminants and cross-contamination by wearing new disposable nitrile gloves during all sample collection. Half-face respirators, protective goggles and chemical resistant clothing is selected based on site characteristics and risks. A detailed Health and Safety Plan is developed for each class of chemicals at each site that includes identification of hazards associated with the chemicals, defined exclusion zones, washing parameters, PPE and equipment disposal guidelines and emergency response procedures.

When using a drill rig or excavator, Active Earth protocols call for pressure washing decontamination of downhole equipment to remove all visible residue, and full decontamination of sampling equipment (such as SPT) as described below. In general, more stringent protocols are applied where the risk of cross-contamination is considered significant.

When sampling stockpiles or biocells, hand-held equipment is generally employed. Sample collection equipment and utensils are similarly cleaned between sample locations to prevent cross-contamination.

The following describes the specific protocol for soil sampling. Following the soil sampling protocol is a description of our sample labeling, recording, storage, and transport procedures.

3.1 Soil Sample Collection

Soil samples are collected with a variety of tools such as a stainless steel trowel, spoon, hand auger, or shovel. Active Earth personnel may also collect the sample using their hand always ensuring a new nitrile glove is worn for each sample. Active Earth does not use painted equipment. The equipment is cleaned prior to sample collection using detergent (alconox) and water to remove any visible dirt, followed by a thorough rinse with potable water or isopropanol.

Soil sample collection method depends on the sample type: *ex situ* or *in situ*. As our sampling standard protocol, Active Earth follows the sample collection protocol specified in MOE Guidance Document 1 — *Site Characterization and Confirmation Testing* for the two sample types.

3.1.1 In-Situ Samples

Collection of *in situ* or discrete samples (grab samples) is necessary to characterize worst-case soils or hot spot areas. *In situ* samples are used to identify:

- Contaminant levels with minimal dilution effects.
- *In-situ* contaminant distribution patterns (contaminant delineation).
- Heterogeneities in a soil profile.

For an excavation, Active Earth has established standard sampling protocols to collect two types of *in-situ* samples: base samples sidewall samples.

1. Base Samples (or surface)
   i. Remove the disturbed soil from the top with a trowel (roughly 1cm to 5cm).
   ii. With a clean trowel or a gloved hand, remove the top 1cm from the top of the undisturbed soil to remove any residual contamination.
   iii. With a cleaned trowel, obtain a sample from the top of this soil.
   iv. Log the soil characteristics (see Section 5).
   v. Record sample depth and location.

2. Sidewall Samples
   i. Scrape horizontally with a trowel any residual soils left from the excavator bucket from the sidewalls (roughly 5cm).
   ii. Obtain samples with a clean trowel or by hand (always wearing protective gloves for each sample).
   iii. Log the excavation face/stratigraphy and soil characteristics (see Section 5).
   iv. Record sample depth and location.

3. Borehole Samples
   i. Borehole samples are generally collected by either split spoon or sonic core barrel.
   ii. Slough and material in contact with the sampler is generally discarded before sampling.
   iii. Solid stem auger may be used where the auger can be twisted into the formation without churning to minimize the risk of dilution (typically depths less than 3m).

3.1.2 Ex Situ Stockpile Samples

Ex-situ samples are composite samples obtained to provide a representation of stockpiled soil. Our *ex situ* sampling protocol follows Part II of Guidance Document 1 for aliquot sample sizes and composites for stockpiles with a suspected level of contamination (i.e., suspected to exceed residential or industrial criteria). Also, MOE's *Contaminated Site Statistical Application Guidance Document No. 14 — Stockpiling. March 1995*, is used as a guide in obtaining samples and for statistically applying the results to the criteria.

Generally, stockpiles are sampled with a composite of five discrete samples, collected to represent a single stockpile. Stockpile sizes are based on suspect soil quality as follows:

Sampling Guidance for Suspect Material

	Suspect Hazardous Waste (SHW)	**Suspect Waste (<HW>IL)**	**Suspect Industrial Quality Material (<IL>RL)**
Maximum Stockpile Size	$50m^3$	$150m^3$	$250m^3$
Cell Volume	$10m^3$	$30m^3$	$50m^3$
Number of Representative Cell Samples	5	5	5
Aliquots per representative cell sample	1	3	5
Sampling Method	Collect one representative aliquot for each 10 m3 of cell volume. Each aliquot forms one representative cell sample.	Collect one representative aliquot for each 10 m3 of cell volume. Up to three aliquots are combined by equal volume to form one representative cell sample.	Collect one representative aliquot for each 10 m3 of cell volume. Up to five aliquots are combined by equal volume to form one representative cell sample.

The table above demonstrates what is considered to be a *cell* of material. A cell is a portion of a stockpile. For example, a stockpile containing $250m^3$ of material has five cells, each containing $50m^3$. A standard cell size of 20% of the stockpile volume has been used.

The basic assumption of this suspect material sampling procedure is that all material within a cell volume is sufficiently homogeneous that one sample can represent the characteristics of the cell volume. It is therefore important that a representative cell sample be composed of material collected throughout a cell volume. To ensure this, an aliquot should be collected for each $10m^3$ of stockpiled material.

Multiple specimens from within any $10m^3$ volume may be incorporated into its representative aliquot. Using multiple specimens reduces "nugget" effects often suspected when small sample volumes relative to a cell or stockpile volume are collected and analyzed.

Great care must be exercised to ensure that a representative aliquot is made up of equal parts (equal volumes) of the specimens collected. If it's not, sampling error will be introduced. Rigorous quality control and quality assurance, in part outlined below, is integral to site characterization.

There are obvious practical limits to the number of specimens that can be incorporated into a representative aliquot. Collecting an unbiased representative aliquot becomes more difficult as the number of specimens is increased. An unbiased sample is also more difficult to collect if cell material is not homogeneous.

3.2 Cleaning of Soil Sampling Instruments

The sampling trowels are cleaned for each sample. They are wiped clean with a paper towel between metals sampling. For organic sampling, de-ionized water and paper towels are used to clean the trowels. If any oily or similar residue cannot be removed in this manner, isopropanol is used to clean the trowel instead of the water. If the sample is collected by hand, the sampler always wears a new glove for each sample collection. At any time, if the sampler's gloves become soiled or torn, new gloves are put on.

3.3 Field Screening

In addition to physical screening of samples, samples may also be field screened for volaitles (if present) using a vapour analysis method (compound specific gas tech tubes, FID, catalytic hydrocarbon sensor, etc.). Generally the procedure is as follows:

1. Fill a zipper lock bag roughly 1/3 full and seal.
2. Allow to equilibrate at ambient temperature or above 10 degrees C (whichever is higher) for at least 10 minutes.
3. Insert the probe into the headspace and record the concentration.

Pesticides and PCBs are not volatile. Therefore screening for pesticides using a bioassay methods may be used. Field screening for PCBs may include a simple water test where a suspected dielectric fluid is placed in a jar of water, oils will float to the surface and PCBs will sink, since their specific gravity is heavier than water. A field test kit which identifies the presence of chlorine atoms may also be used to reduce the number of laboratory sample analyses required. However, a certain number of laboratory analyses will be required to calibrate the field screening devices to laboratory detections. Since the makeup of pesticides PCBs and pesticides may differ at each site, calibration will have to be repeated at each location.

3.4 Sample Containers

The sampled material is transferred into an appropriate sample container. In most cases this will be a laboratory supplied jar/container or a re-sealable polyethylene bag for inorganic analyses.

All samples for metals analyses are retained in laboratory-prepared plastic jars. All samples for organic analysis are placed in laboratory-prepared teflon lined glass jars. Headspace in the jars is minimized for samples requiring volatile organic analysis. See Section 6 for sample storage and transport details.

3.5 Sample Labeling

Soil or groundwater samples are labeled before placement into the appropriate container. The containers are labeled with water-resistant ink on the lid and an adhesive label. The information included on the label is as follows;

- Date;
- Project number;
- Site Location;
- Company name;

- Sample descriptor (e.g. TP for Test Pit); and
- A unique sample number.

4.0 SAMPLE RECORDING

The sample information recorded in the field notes includes the:

- Unique sample number (in notes and on the container).
- The depth below ground and the location (i.e., test pit number).
- Location on a drawing or sketch.
- Sampling method (i.e., sample from trowel, auger, or split spoon).
- Sampling type (i.e., whether sample is an aliquot, discrete, or composite).
- Physical, visual, and olfactory characteristics.

Active Earth records the above sample information in a field book or test pit/ borehole/ well log form. Active Earth also takes date-stamped photographs for visual documentation of sample characteristics and contaminant indicators. Sample location is recorded using measurements from permanent site features.

4.1 Recording of Sample Characteristics

Sample characteristics depend on the sample type (water or soil). For groundwater samples, Active Earth records such physical characteristics as colour, staining, sediment content, distinctive odours, sheen, and free product. These characteristics are important in the selection of different parameter analyses.

For soils, physical characteristics include a wide variety of contaminant indicators and soil characteristics. Active Earth records contaminant indicators such as staining, sheen, foreign substances (debris, metal, paint, grit, wood etc.), and distinctive odours. Active Earth also records soil physical characteristics such as colour, grain size, density/ consistency, moisture content, and soil structure. The following provides some details on these physical characteristics.

a. Soil Colour

Soil colour is determined using a freshly exposed or broken sample. Varying soil colour can indicate contamination, soil oxidation (weathering), or historical groundwater levels. Coloured spots or streaks are referred to in the soil description as "mottled."

b. Soil Grain Size

Grain size includes particle sizes and qualitative descriptors of their relative proportions. From larger to smaller soil particles, particle size (diameter) identification includes:

- boulders (>200mm)
- cobbles (60 to 200mm)
- gravel (2 to 60mm)
- sand (0.06 *to* 2mm)

- silt (fine powder, dries quickly, and loses consistency when wet and agitated)
- clay (plastic and cohesive)

Particle sizes for silts and clays arc not visible. Silts can be felt as grainy, where clay cannot

Qualitative proportions for secondary constituents (i.e., sands with an estimated weight percent of silt content) would be as follows:

- trace - up to 10% (e.g., SAND, with trace silt)
- some - 10% to 20% (e.g., SAND, with some silt)
- adjectives for lesser constituent - 20% to 35% (e.g., silty SAND)
- 35% to 50% (e.g., SAND and SILT).

c. Soil Density

Density and consistency is used to describe the stiffness of cohesive soils (clays) and density of incohesive sands and gravels. The consistency of clays can be described as:

- Soft (can be moulded by light finger).
- Firm (can be moulded by strong finger).
- Stiff (indented by thumb).
- Hard (difficult to indent with thumbnail).

The density of incohesive soils can be described as:

- Loose (easily excavated with trowel).
- Compact (difficult to excavate with trowel).
- Dense (hard to loosen even with a pick).

d. Moisture Content

Active Earth records moisture content and seepage to estimate groundwater levels. Quantitative moisture levels include dry, moist, and wet (water seepage).

e. Soil Structure

Soil structure includes soil properties such as homogeneous to heterogeneous, stratification (layered), seams (thin lamination or lenses), pockets (varying and discontinuous thickness), fissures, and cemented particles.

5.0 SAMPLE STORAGE AND TRANSPORT

Sample are transported to the laboratory within 48 hours of collection. The samples are kept cool on ice (<10 degrees C) in an insulated cooler or container, and packed in a manner that prevents breakage during transport.

6.0 CHAIN OF CUSTODY

A Chain of Custody form accompanies the samples to the laboratory. The form includes information regarding the samples and the parameters to be analyzed. The form also includes information regarding the sequence of handling and transport of the samples to the laboratory.

7.0 TRAINING

Active Earth staff are thoroughly trained by qualified and experienced personnel.

8.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

Active Earth follows consistent QA/QC protocols for all sampling and analysis. At a minimum, the QA/QC program will include the following:

- Samples will be collected to prevent cross-contamination of soil samples. Samples will be collected using an appropriate contaminant-free utensil and placed in contaminant-free containers provided by the laboratory specifically designed for such use and appropriate to the subsequent analyses. Decontamination of sampling (trowels, mixing bowls) and drilling equipment (augers, split spoons) between samples and boreholes.
- Chain-of-custody documentation for sample submission includes a coding system used for sample submission to the analytical laboratory to ensure that information concerning location or expected concentration is available to the analyst(s).
- Use of a Canadian Association of Laboratory Accreditation (CALA) accredited laboratory. ALS Laboratories will be used for this project.
- Adherence to laboratory sampling and analysis protocols (e.g., hold times, sample containers, preservatives, detection limits, approved methodology).
- Procedures to confirm accurate transcription of laboratory data into tables.
- Review of laboratory QC performance (standards, spike recoveries etc.) to confirm results are within acceptable limits.
- Analysis of samples in batches of no more than ten (10) samples for organic substances. Batch review of the analytical data produced in concert will be completed with all internal QA data for that batch. Failure to achieve appropriate QA will require additional analysis to rectify the problem on a batch by batch basis.
- Results of the laboratory's internal checks will be included in the analytical report.
- Use of dedicated well development and sampling equipment (bailers, Waterra inertial pumps).
- Submission of field QC samples at a rate of 10% of total samples. Implementation of corrective action plans (CAP) when acceptable limits are exceeded.

Protocol

Groundwater and Surface Water Monitoring and Sampling

Active Earth
Engineering Ltd

1.0 INTRODUCTION

A standardized sampling protocol has not been established by the BC Ministry of Environment (MOE) under the Contaminated Sites Regulation (CSR). Active Earth Engineering Ltd. (Active Earth) developed the following protocol with the aid of a variety of references including:

- The Canadian Council of Ministers of the Environment (CCME) – "Guidance Manual on Sampling, Analysis, and Data Management for Contaminated Sites", Volume I: Main Report, December 1993;
- MOE Guidance Document 2 – Statistical Criteria for Characterizing a Volume of Contaminated Material;
- MOE Guidance Document 12 – Technical Guidance on Contaminated Sites Statistics for Contaminated Sites; and,
- British Columbia Field Manual, January 2003.

Active Earth maintains dedicated field operating protocols that are intended to provide consistent and reliable field results. Our protocols are reviewed regularly in light of changing regulatory guidance and emerging issues and technology.

2.0 PROTOCOL OBJECTIVE

The objective of the groundwater and surface water monitoring and sampling protocol is to allow collection of monitoring data and water samples which are consistent, representative, and repeatable and to prevent cross-contamination.

3.0 SAMPLE COLLECTION

Active Earth's water sample collection protocol comprises sample collection, handling, storage, labeling, and transport. During the sampling process, equipment and instrument cleaning is important to prevent cross-contamination. Active Earth personnel protect themselves from exposure to contaminants and cross-contamination by wearing new disposable nitrile gloves during all sample collection. Half-face respirators, protective goggles and chemical resistant clothing is selected based on site characteristics and risks.

When using a drill rig or excavator, Active Earth protocols call for pressure washing decontamination of downhole equipment to remove all visible residue, and full decontamination of sampling equipment (such as SPT) as described below. In general, more stringent protocols are applied where the risk of cross-contamination is considered significant.

The following describes the specific protocol for soil and groundwater sampling. Following the soil and groundwater protocol is a description of our sample labeling, recording, storage, and transport protocol applicable for both groundwater and surface water.

3.1 Groundwater Sample Collection

Active Earth's protocol for collection of groundwater samples includes developing, purging and sampling steps. Active Earth's standard is to use well-dedicated Waterra menial pump systems for development and peristaltic pumps for sampling all parameters except volatile compounds, which are typically collected with a bailer or Waterra inertia pumps. Well-dedicated polyethylene bailers may be used for slow recharge wells, and stainless steel bailers are sometimes used when high concentrations of solvents are expected. Management of development and purge water depends on site risks. Most often the water is drummed while other times it is disposed of onsite through treatment systems or the sanitary sewer.

3.1.1 Installation

Well installation details are dictated by field conditions, but are generally guided by the following principles:

1. Screens to straddle water table where LNAPL is a concern.
2. Typical screen length is 1.5m, and generally not more than 3m.
3. Longer screen lengths are typically used to maximize the likelihood of straddling the water table and capturing seasonal variability in water levels.

Standard design includes surface seal, sand pack with overlying seal, 5cm nominal ID schedule 40 PVC with screw connections and o-ring seals.

3.1.2 Development

Wells are usually developed at the time they are installed or the next day. They are developed to reduce sediment content (to the extent possible) by surging (usually using surge blocks on a Waterra pump) and purging. We customarily use Waterra or electric centrifugal pumps for well development. Active Earth customarily removes at least three to five well volumes and may monitor purge water for:

Parameter	Objective
Conductivity - mandatory	± 20 uS
Temperature - optional	±0.1°C
pH - mandatory	± 0. 1 pH units

Parameter	Objective
eH - optional	+ 30 mv
Dissolved Oxygen - optional	± 0.2 mg/L
Turbidity - target	< 10 NTUs

The turbidity target is our preferred turbidity, but field conditions sometimes make this impractical. Information on development is collected on standard field forms. An example Water Sampling Field Form is attached.

3.1.3 Purging and Sampling

After development, wells are left to geochemically and physically stabilize as long as practical, usually not less than 24 hours. Longer "relaxation" times are applied when project constraints allow or when non-aqueous phase liquid (NAPL) thickness is at issue. It is our experience that longer intervals result in more consistent (and so likely more representative) results, and -shorter intervals lead to more false positives (high) results.

The sampling tasks are:

- Measure the well headspace (where applicable) for volatile contaminants and methane.
- Measure the water level.
- Check for NAPL using an optical interface probe, bailer, or reactive paste.

When testing the well headspace for volatile contaminants and methane, a combustible gas meter is used. For this test, all well openings are sealed for a minimum of twenty minutes to allow vapours to accumulate before measurements are performed.

Procedures for purging vary depending on whether the well is new, and how quickly it recharges:

- Fast recharging wells that are new are purged a minimum of three standing well volumes before sampling.
- Fast recharging wells that are old are purged to stable chemistry, not less than three well volumes.
- Wells that will not recover sufficiently for sampling requirements during a normal field day are sampled from standing water (no purging).

Stable chemistry objectives/targets are the same as outlined in development.

Following purging, samples are obtained with the peristaltic pump or bailer. Samples are placed directly from these apparatus into the sample container except for metals samples, which are field filtered. Active Earth usually samples for sediment sensitive parameters first, and VOCs (which has low sediment sensitivity) last.

3.1.4 Groundwater Sampling Field Measurements

Field measurements for the following parameters will be performed at each groundwater sampling location:

- Temperature;
- Specific conductivity;
- pH;
- redox potential; and
- dissolved oxygen;

A flow-through cell is used for dissolved oxygen measurements to accurately measure groundwater concentrations without equilibration effects with the atmosphere.

3.2 Surface Water Sample Collection

Active Earth's protocol for collection of surface water samples includes selecting an appropriate sample location, monitoring and field measurements of selected surface water chemical and physical parameters, and appropriate sample collection technique.

Active Earth's personnel will select an appropriate surface water sampling location that will provide a representative and repeatable result and avoids stagnant water. Sample locations will also consider accessibility and will be appropriately marked for future identification. A detailed description of the sampling location including photographs, sketches and measurements to nearby permanent feature(s) is also recorded.

Surface water samples are collected directly into the laboratory supplied sample containers. Samples are collected upstream from the access to the surface water body to avoid turbidity associated with disturbed sediments. New nitrile gloves are worn for each sampling location.

3.2.1 Surface Water Sampling Field Measurements

Surface water measurements for the following parameters will be performed at each surface water sampling location:

- Temperature;
- Specific conductivity;
- pH;
- redox potential; and
- dissolved oxygen;

If applicable, surface water flow velocities may also be measured with a flow meter and cross-sectional measurements of the flow channel.

3.3 Sample Containers

Samples are transferred to laboratory supplied sample containers, preservatives added to the samples when applicable, and stored on ice or cold packs until transported to the laboratory.

Samples for volatile contaminants are collected in zero-headspace septum vials with minimum turbulence and must be initially bubble-free to be acceptable. Since zero-headspace septum vials are vulnerable to breakage during sample handling and transport, vials are collected in duplicate. Samples for dissolved metals analyses are filtered in the field using dedicated filtering equipment (usually inline 0.43um cartridge filters), and preserved using concentrated nitric acid.

4.0 GROUNDWATER AND SURFACE WATER MONITORING

4.1 Digital Water Level Monitoring

Active Earth personnel are familiar with the installation and data recovery procedures for various dataloggers and types of pressure transducers. Data will be digitally downloaded to a field laptop computer and checked against manual readings to confirm proper function of the device including battery condition. The devices will be re-set and batteries replaced if needed to continue operating properly and collecting accurate data.

Similar devices are used for both groundwater (monitoring well) and surface water (ditches).

4.2 Manual Groundwater Level Monitoring

Manual groundwater level monitoring includes measurement of the following parameters at each groundwater monitoring well sampling location:

- Depth to water.
- Depth to bottom.
- Casing stick-up above ground.

All measurements will be made to 3 decimal places using a calibrated, metric water level probe. The measurements are typically made to highest point of the well casing, which is marked and corresponds to the point of measurement for the surveyed elevation of the well casing. Manual field measurements will be used to confirm and calibrate digitally recorded data.

4.3 Surface Water Monitoring

Field measurement of surface water levels typically involves reading a staff gauge installed to firm bearing and surveyed to allow for water elevations to be calculated in addition to depth of water above stream/ditch/lake bottom. Manual field measurements will be used to confirm and calibrate digitally recorded data.

5.0 SAMPLE LABELLING

Groundwater and surface water samples are labeled before placement into the appropriate container. The containers are labeled with water-resistant ink on the lid and an adhesive label. The information included on the label is as follows:

- Date;
- Project number;
- Site Location;
- Company name;
- Sample descriptor (e.g. SW for Surface Water); and
- A unique sample number.

6.0 SAMPLE RECORDING

The sample information recorded in the field notes includes the:

- Unique sample number (in notes and on the container).
- The sample location (i.e., monitoring well ID).
- Location on a drawing or sketch.
- Sampling method (i.e., peristaltic pump, bailer).
- Physical, visual, and olfactory characteristics.

Active Earth records the above sample information in a standard field log form. Active Earth also takes date-stamped photographs for visual documentation of sample characteristics and contaminant indicators. Sample location is recorded using measurements from permanent site features.

Physical characteristics as colour, staining, sediment content, distinctive odours, sheen, and free product are recorded for groundwater and surface water samples. These characteristics are important in the selection of different parameter analyses.

7.0 SAMPLE STORAGE AND TRANSPORT

Samples are transported to the laboratory within 48 hours of collection. The samples are kept cool on ice (<10 degrees C) in an insulated cooler or container, and packed in a manner that prevents breakage during transport.

8.0 CHAIN OF CUSTODY

A Chain of Custody form accompanies the samples to the laboratory. The form includes information regarding the samples and the parameters to be analyzed. The form also includes information regarding the sequence of handling and transport of the samples to the laboratory.

9.0 TRAINING

Active Earth staff are thoroughly trained by qualified and experienced personnel.

10.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

Active Earth follows consistent QA/QC protocols for all sampling and analysis. At a minimum, the QA/QC program will include the following:

- Samples will be collected to prevent cross-contamination of soil samples. Samples will be collected using an appropriate contaminant-free utensil and placed in contaminant-free containers provided by the laboratory specifically designed for such use and appropriate to the subsequent analyses. Decontamination of sampling equipment between samples and boreholes.
- Chain-of-custody documentation for sample submission includes a coding system used for sample submission to the analytical laboratory to ensure that information concerning location or expected concentration is available to the analyst(s).
- Use of a Canadian Association of Laboratory Accreditation (CALA) accredited laboratory.
- Adherence to laboratory sampling and analysis protocols (e.g., hold times, sample containers, preservatives, detection limits, approved methodology).
- Procedures to confirm accurate transcription of laboratory data into tables.
- Review of laboratory QC performance (standards, spike recoveries etc.) to confirm results are within acceptable limits.
- Analysis of samples in batches of no more than ten (10) samples for organic substances. Batch review of the analytical data produced in concert will be completed with all internal QA data for that batch. Failure to achieve appropriate QA will require additional analysis to rectify the problem on a batch by batch basis.
- Results of the laboratory's internal checks will be included in the analytical report.
- Use of dedicated well development and sampling equipment (bailers, Waterra inertial pumps).
- Submission of field QC samples at a rate of 10% of total samples. Implementation of corrective action plans (CAP) when acceptable limits are exceeded.

Protocol
Ambient Air Sampling

Active Earth Engineering Ltd

1.0 INTRODUCTION

A standardized sampling protocol has not been established by the BC Ministry of Environment (MOE) under the Contaminated Sites Regulation (CSR). Active Earth Engineering Ltd. (Active Earth) developed the following protocol with the aid of a variety of references including:

- The Canadian Council of Ministers of the Environment (CCME) – "Guidance Manual on Sampling, Analysis, and Data Management for Contaminated Sites", Volume I: Main Report, December 1993;
- MOE Guidance Document 12 – Technical Guidance on Contaminated Sites Statistics for Contaminated Sites; and,
- British Columbia Field Manual, January 2003.

Active Earth maintains dedicated field operating protocols that are intended to provide consistent and reliable field results. Our protocols are reviewed regularly in light of changing regulatory guidance and emerging issues and technology.

2.0 PROTOCOL OBJECTIVE

The objective of the sampling protocol is to allow collection of soil samples which are consistent, representative, and repeatable and to prevent cross-contamination.

3.0 SAMPLE COLLECTION

Active Earth's sample collection protocol comprises sample collection, handling, storage, labeling, and transport. During the sampling process, equipment and instrument cleaning is important to prevent cross-contamination. Active Earth personnel protect themselves from exposure to contaminants and cross-contamination by wearing new disposable nitrile gloves during all sample collection. Half-face respirators, protective goggles and chemical resistant clothing is selected based on site characteristics and risks. A detailed Health and Safety Plan is developed for each class of chemicals at each site that includes identification of hazards associated with the chemicals, defined exclusion zones, washing parameters, PPE and equipment disposal guidelines and emergency response procedures.

The following describes the specific protocol for ambient air sampling. Following the sampling protocol is a description of our sample labeling, recording, storage, and transport procedures.

3.1 Ambient Air Sample Collection

Prior to sampling, a hand-held anemometer is to be appropriately calibrated.

Air samples will be collected using laboratory-supplied and calibrated Summa® Canisters. Sampling requires that the canister be opened at the sampling location, recording canister identification, the time and date, as well as climatic conditions including temperature, wind-speed, wind-direction and operational considerations. At the conclusion of sampling, the time, date and same set of climate data must be recorded. The canister is then to be appropriately sealed, and shipped under Chain of Custody to a CALA-certified laboratory.

In order to ensure that sampling apparatus are not tampered with, equipment is to be concealed as necessary. The sampling location is to be free of any potential outside interference such as marking paint.

3.5 Sample Labeling

Samples are labeled before placement into the appropriate container. The containers are labeled with water-resistant ink on the lid and an adhesive label. The information included on the label is as follows;

- Date;
- Project number;
- Site Location;
- Company name;
- Sample descriptor (e.g. TP for Test Pit); and
- A unique sample number.

4.0 SAMPLE RECORDING

The sample information recorded in the field notes includes the:

- Unique sample number (in notes and on the container).

- Location on a drawing or sketch.
- Sampling method (i.e., Summa Cannister).
- Sampling duration.
- Ambient observations.

Active Earth records the above sample information in a field book or designated form. Active Earth also takes date-stamped photographs for visual documentation of sample characteristics and contaminant indicators. Sample location is recorded using measurements from permanent site features.

5.0 SAMPLE STORAGE AND TRANSPORT

Sample are transported to the laboratory within 48 hours of collection. The samples are kept cool on ice (<10 degrees C) in an insulated cooler or container, and packed in a manner that prevents breakage during transport.

6.0 CHAIN OF CUSTODY

A Chain of Custody form accompanies the samples to the laboratory. The form includes information regarding the samples and the parameters to be analyzed. The form also includes information regarding the sequence of handling and transport of the samples to the laboratory.

7.0 TRAINING

Active Earth staff are thoroughly trained by qualified and experienced personnel.

8.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

Active Earth follows consistent QA/QC protocols for all sampling and analysis. At a minimum, the QA/QC program will include the following:

- Samples will be collected to prevent cross-contamination of soil samples. Samples will be collected using an appropriate contaminant-free utensil and placed in contaminant-free containers provided by the laboratory specifically designed for such use and appropriate to the subsequent analyses. Decontamination of sampling (trowels, mixing bowls) and drilling equipment (augers, split spoons) between samples and boreholes.
- Chain-of-custody documentation for sample submission includes a coding system used for sample submission to the analytical laboratory to ensure that information concerning location or expected concentration is available to the analyst(s).
- Use of a Canadian Association of Laboratory Accreditation (CALA) accredited laboratory. ALS Laboratories will be used for this project.
- Adherence to laboratory sampling and analysis protocols (e.g., hold times, sample containers, preservatives, detection limits, approved methodology).
- Procedures to confirm accurate transcription of laboratory data into tables.

- Review of laboratory QC performance (standards, spike recoveries etc.) to confirm results are within acceptable limits.
- Analysis of samples in batches of no more than ten (10) samples for organic substances. Batch review of the analytical data produced in concert will be completed with all internal QA data for that batch. Failure to achieve appropriate QA will require additional analysis to rectify the problem on a batch by batch basis.
- Results of the laboratory's internal checks will be included in the analytical report.
- Use of dedicated well development and sampling equipment (bailers, Waterra inertial pumps).
- Submission of field QC samples at a rate of 10% of total samples. Implementation of corrective action plans (CAP) when acceptable limits are exceeded.

Appendix F

Soil Aeration Form

[NOT CURRENTLY IN USE – NO SOIL AERATION]

RESOURCE MANAGEMENT

Soil Aeration Record

SOIL AERATION REPORT					
DATE:				DATA RECORDER:	
START TIME:				SIA FILE REFERENCE:	
END TIME:				EVENT NO.:	
DURATION:					
AMBIENT TEMPERATURE:					
VENTILATION INDEX FORECAS				(Southern Vancouver Island - must be "good") Reference: http://www.env.gov.bc.ca/epd/epdpa/venting/venting.html	
SUNRISE:				Reference: http://www.nrc-cnrc.gc.ca/eng/services/sunrise/	
SUNSET:					
MACHINERY:					
OPERATOR:					
SOIL GENERATOR SITE(S):					
SOIL VOLUME:					
SOIL MASS:					
SOIL QUALITY:	COC	RL+	IL+	STARTING CONCENTRATIONS	CURRENT CONCENTRATIONS
	MAH				
	EPH				
	VOC				
REFERENCE LAB REPORT(S)					
PHYSICAL DESCRIPTION					
	include odours, colour, dimensions, rows, relative moisture content, debris,				
NUTRIENTS/ADDITIVES:	DESCRIPTION:				
	QUANTITY:				

Appendix G

Effluent Monitoring Form

SOUTH ISLAND RESOURCE MANAGEMENT

Effluent Monitoring and Sampling Record

EFFLUENT MONITORING AND SAMPLING REPORT				
DATE			**DATA RECORDER**	
WEATHER CONDITIONS				
LEAK DETECTION RESERVIOR				
DEPTH TO BOTTOM (m)		A	SAMPLE ID	
DEPTH TO WATER (m)		B	pH	
HEIGHT OF WATER (m)		H=A-B	Conductivity	
VOLUME OF WATER (m^3)		$Vm=3.14*r^2*H$	Temperature	
VOLUME OF WATER (L)		Vl=Vm*1000	Turbidty	
DEPTH OF BOTTOM SLUDGE (m)			VOC / VPH / EPH / Glycols / DF	ORGANICS
SAMPLED?		Y/N	Total Metals / Dissolved Metals (F/P)	INORGANICS
OTHER OBSERVATIONS				
LEACHATE COLLECTION RESERVIOR				
DEPTH TO BOTTOM (m)		A	SAMPLE ID	
DEPTH TO WATER (m)		B	pH	
HEIGHT OF WATER (m)		H=A-B	Conductivity	
VOLUME OF WATER (m^3)		$Vm=3.14*r^2*H$	Temperature	
VOLUME OF WATER (L)		Vl=Vm*1000	Turbidty	
DEPTH OF BOTTOM SLUDGE (m)			VOC / VPH / EPH / Glycols / DF	ORGANICS
SAMPLED?		Y/N	Total Metals / Dissolved Metals (F/P)	INORGANICS
OTHER OBSERVATIONS				
SMA COLLECTION RESERVIOR				
DEPTH TO BOTTOM (m)		A	SAMPLE ID	
DEPTH TO WATER (m)		B	pH	
HEIGHT OF WATER (m)		H=A-B	Conductivity	
VOLUME OF WATER (m^3)		$Vm=3.14*r^2*H$	Temperature	
VOLUME OF WATER (L)		Vl=Vm*1000	Turbidty	
DEPTH OF BOTTOM SLUDGE (m)			VOC / VPH / EPH / Glycols / DF	ORGANICS
SAMPLED?		Y/N	Total Metals / Dissolved Metals (F/P)	INORGANICS
OTHER OBSERVATIONS				
EFFLUENT TREATMENT SYSTEM OUTLET (WTS)				
SAMPLE ID				
pH			Conductivitiy	
Temperature			Turbidity	
VOC / VPH / EPH / Glycols / DF	ORGANICS		Total Metals / Dissolved Metals (F/P)	INORGANICS
OTHER OBSERVATIONS				
SETTLING POND OUTLET (SW-1)				
SAMPLE ID				
pH			Conductivitiy	
Temperature			Turbidity	
VOC / VPH / EPH / Glycols / DF	ORGANICS		Total Metals / Dissolved Metals (F/P)	INORGANICS
OTHER OBSERVATIONS				
SMA CATCH BASIN				
OBSERVATIONS				
SMA LEAK DETECTION PORTS				
OBSERVATIONS				
ENCAPSULATION AREA LEAK DETECTION PORTS				
OBSERVATIONS				

Appendix H

SMA Daily Record

SOUTH ISLAND RESOURCE MANAGEMENT

Soil Management Area - Daily Record

SOIL MANAGEMENT AREA				
DATE			**DATA RECORDER**	
AMBIENT TEMPERATURE			**SIRM FILE REFERENCE**	2016 _Daily SMA
DAILY PRECIPITATION		>122mm last/next 24hrs	**DAILY PHOTO REFERENCE:**	2016 _SMA
FORECAST PRECIPITATION			**CONFIRM STOCKPILE COVER**	Y / N

WAA #	Grid ID	IL- / IL+	Tonnage/Soil Desc./Comments	Contaminants of Concern

ESTIMATED SOIL VOLUME:	
ESTIMATED SOIL MASS:	

M = Metals S = Salt (NaCl)
PAH = Polycyclic Aromatic Hydrocarbons
PHC = Petroleum Hydrocarbons
Other (Specify Above)

DAILY SKETCH

→ N

	A	B	C	D	E	F
3						
2						
1						

Notes:

Appendix I

Encapsulation Cell Daily Record

RESOURCE MANAGEMENT

Encapsulation Cell - Daily Record

SOIL MANAGEMENT AREA				
DATE			**DATA RECORDER**	
AMBIENT TEMPERATURE			**SIRM FILE REFERENCE**	2016 _Daily EC
DAILY PRECIPITATION		>122mm last/next 24hrs	**DAILY PHOTO REFERENCE:**	2016 _PEA
FORECAST PRECIPITATION			**CONFIRM DAILY COVER**	Y / N
CELL ID:				

Placed Soil (Waste Approval ID)	SMA or Direct Place	Class	Placed Tonnes (Approx)	Location / Notes

ESTIMATED DAILY SOIL VOLUME PLACED (LOOSE):	
ESTIMATED DAILY SOIL MASS PLACED (TONNE)	

Location tracking:

Block 2B4

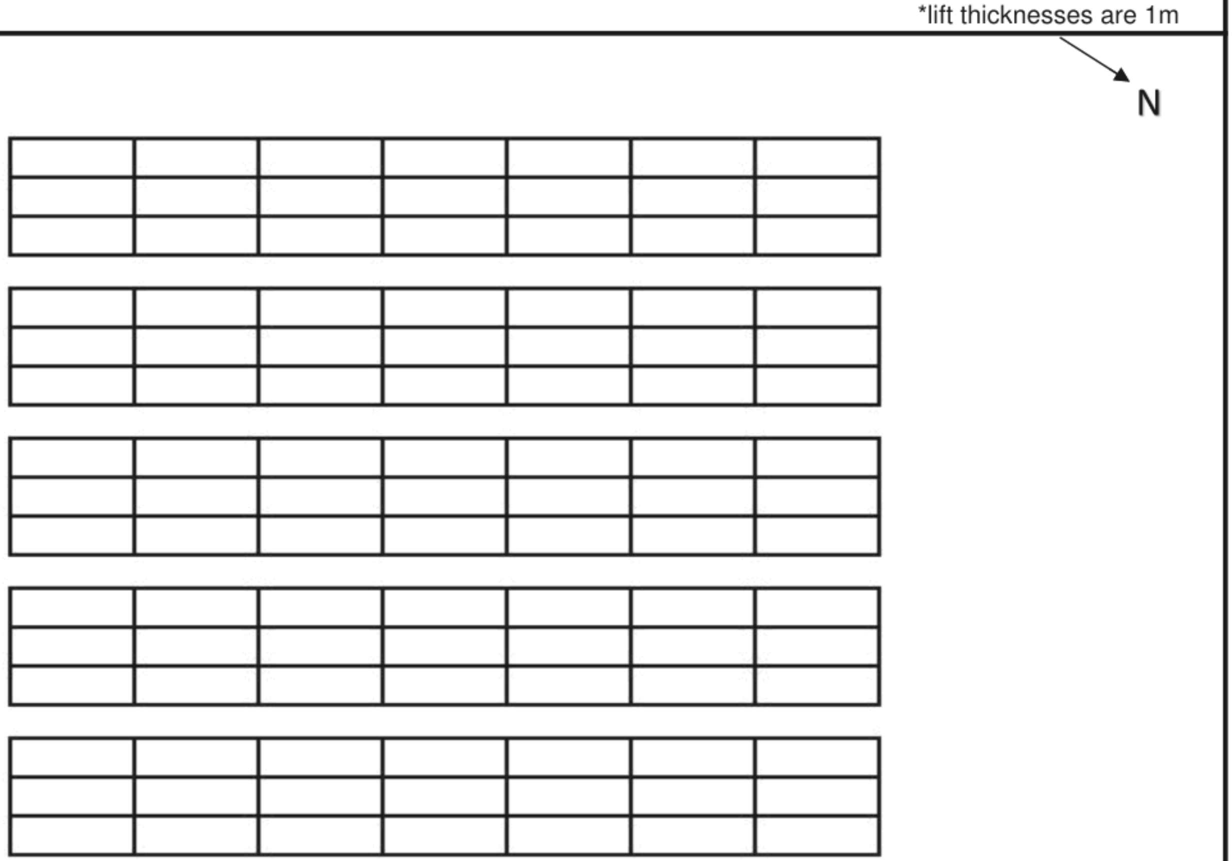
Row

Column

Lift*

*lift thicknesses are 1m

DAILY SKETCH



Appendix J

Daily Inspection and Maintenance Log

SOUTH ISLAND RESOURCE MANAGEMENT

Daily Inspection and Maintenance Log

DAILY OPERATIONS/MAINTENANCE			
DATE:	TIME:		DATA RECORDER:
WEATHER:			
SOIL MANAGEMENT AREA			
ITEM	INSPECTED		ACTIONS TAKEN / COMMENTS/PHOTO REFERENCE
COMPLETED SMA DAILY REPORT	Y	N	
LEAK DETECTION PORT	Y	N	
FLOW TO CONTAINMENT POND	Y	N	
WHEEL WASH	Y	N	
NOTES:			
CONTAINMENT POND			
FENCING, BERM, DITCHES	Y	N	
PIPING & RELATED INFRASTRUCTURE	Y	N	
VISUAL INSPECTION OF EXPOSED LINER	Y	N	
FREEBOARD BELOW DISCHARGE (VALUE)			
FLOW TO WATER TREATMENT SYSTEM	Y	N	
NOTES:			
PERMANENT ENCAPSULATION AREA			
BERMS & SURROUNDING AREA	Y	N	
LINER & RELATED INFRASTRUCTURE	Y	N	
LEACHATE & LEAK COLLECTION	Y	N	
FLOW TO CONTAINMENT POND / WTS	Y	N	
NOTES:			
WATER TREATMENT PLANT			
PIPES & CONNECTIONS	Y	N	
MECHANICAL & SENSOR COMPONENTS	Y	N	
HOLDING TANKS	Y	N	
CHEMICAL/FLOCCULANT STORES	Y	N	
NOTES:			
SETTLING POND			
BERMS & FLOW-WAYS	Y	N	
SPILLWAY	Y	N	
FLOW FROM TREATMENT SYSTEM	Y	N	
FLOW FROM NON-CONTACT WATER	Y	N	
FLOW FROM SETTLING POND DISCHARGE	Y	N	
WEIR READING (VALUE)			
NOTES:			
SEDIMENT CONTROL AND DIVERSION WORKS			
SPLASH GUARDS & ASPHALT ON BRIDGE	Y	N	
DITCHING & BERMS	Y	N	
DRAINAGE	Y	N	
NOTES:			

Appendix K

Emergency Response Plan/Mine Emergency Response Plan

SOUTH ISLAND
RESOURCE MANAGEMENT

SOUTH ISLAND RESOURCE MANAGEMENT EMERGENCY RESPONSE PLAN

Emergency Response Plan/Mine Emergency Response Plan

This Emergency Response Plan/Mine Emergency Response Plan defines emergency response procedures, responsibilities and contingency measures for the 460 Stebbings Road Site in compliance with SIRM's health and safety program (maintained under separate cover), which seeks to exceed the requirements of both the BC Occupational Health and Safety Regulation (the "OHS reg") and the Health, Safety and Reclamation Code for Mines in British Columbia (the "HSRC" or simply "Code").

This plan is reviewed, updated and distributed at least annually, in compliance with BC Ministry of Environment Permit PR-105809 Sections 2.12, 2.13 and 5.1; as well as The Health Safety and Reclamation Code for Mines in British Columbia ("HSRC" or "Code") 3.7.1 and 3.13.1; and Ministry of Energy, Mines and Petroleum Resources Permit Q-8-094, Section 32.2(a).

SIRM Document Revision History

Revision No.	Date	Revisions	Authorized (SIRM)
1.0	July 28, 2015	Combination of existing ERP and MERP to create new, stand-alone document	RPC
1.1	July 31, 2015	Revise Section 4.2 with regard to fatalities, serious injuries and dangerous occurrences. Added MEMPR Inspector contact information	RPC
1.2	March 31, 2016	Emergency contact changes; unknown substance spill section; protestors section;	

Notes:
(1) Review/revise to keep current and at least annually on or before March 31.
(2) Revisions are not effective/applicable until sign-off by SIRM Mines Manager.
(3) At time of issue, revisions must be submitted concurrently to both BC Ministry of Environment and BC Ministry of Energy, Mines and Petroleum Resources.

Approvals

Revision	Approval	Name	Signature	Date
1.2	SIRM Director	Todd Mizuik		March 31, 2016

Distribution

This is a controlled document. The document is the intellectual property of SIRM Ltd., which retains all rights and privileges. Unauthorized alteration or manipulation is strictly prohibited and can endanger life and safety.

When approved, this document must be kept accessible on Site in both original (signed) paper and (searchable) electronic forms, with copies posted in conspicuous places. Electronic copies of the document are for information only; electronic files are subject to manipulation or alteration and only signed original hard-copies can be relied upon.

1.0 INTRODUCTION

This document outlines Emergency Response Plan (ERP) details specific to the Aggregate Mining Operations and Soil Receiving Site at 460 Stebbings Road, Shawnigan Lake, BC (herein referred to as the "Site"). This document is intended to function as a stand-alone ERP while complimenting the existing South Island Resource Management Occupational Health & Safety Manual (OHSM).

This document addresses the emergency procedures that have been identified during the site design and permit application process. It is anticipated that, moving forward, additional potential risks will be identified and incorporated into this ERP. Like all Health and Safety program components, this ERP will be a continually evolving document.

2.0 REGULATORY FRAMEWORK

This ERP, in conjunction with the OHSM, has been developed to conform generally to the following:

- Health, Safety and Reclamation Code for Mines in British Columbia (2008)
- BC Guidelines for Industry Emergency Response Plans (revised from 1992) prepared by the B.C. Ministry of Environment as the key (lead) provincial agency under *the B.C. Emergency Program Act* and its regulation (Schedule 1) and by mandate. (Updated: July, 2002).

The main purpose of the Guidelines is to promote the development of comprehensive and consistent emergency response plans by industry, in cooperation with the provincial government and local governments. Users have the responsibility of judging the extent the Guidelines apply to their specific situation.

If deemed necessary, this ERP document may be expanded to fully address all aspects of the Guidelines.

3.0 EMERGENCY CONTACT INFORMATION

The following table summarizes key contact information for key persons and services that may be required in the event of an emergency related to the Soil Receiving Site:

SERVICE	CONTACT INFORMATION
Fire / Police / Ambulance EMERGENCY	911
Ministry of Energy, Mines and Petroleum Resources (Inspector of Mines – Health and Safety)	Gerry Barcelonia, Sr. Health and Safety Inspector Work: 250-952-0495 Cell: 250-480-9275 Jim McMillan, Health and Safety Inspector Work: 250-952-0405 Cell: 778-679-5696
RCMP (Shawnigan Lake Detachment)	250-743-5514
Poison Control	1-800-567-8911
Emergency Spill Response (Provincial Emergency Program)	1-800-663-3456
MOE Regional Office	Luc Lachance, File Manager 250-751-3125 AJ Downie, Regional Director 250-751-3176
Vancouver Island Health Authority	250-739-6304 (regular office hours) 1-800-204-6166 (evenings and weekends)
WorkSafeBC	1-800-661-2112 1-866-922-4357 (after hours EMERGENCY) 1-604-273-7711 (after hours EMERGENCY)
BC Hydro (Emergency)	1-888-POWERON (1-888-769-3766)
Fortis BC (Natural Gas Emergency)	1-800-663-9911
Independent Site Engineering Consultants	Civil/Enviro: Stantec, Shaun Swarbrick Work: 250-388-9161 ext 545 Cell: 250-507-5876 Geotechnical: Richard Brimmell 250-889-3080
McRae's Environmental Services (Vacuum Truck)	Victoria 24hr: 250-883-7867; 250-479-3205; Nanaimo: 250-740-7867
Coast Environmental	Emergency: 250-252-0586; Blair Tassone Cell: 250-686-0156; Work: 250-246-3216

Terrapure Environmental (Nanaimo Facility)	Rob Gatehouse s.22 Work: 250-722-3885
Stormtec	Steve Gale s.22
SIRM Geotechnical Engineer Acting Mine Manager*	Tom Good s.22
SIRM Environmental Operations Supervisor	Rahim Gaidhar s.22
SIRM Director*	Todd Mizuik s.22

* Alternate – in the case of an emergency and the SIRM Environmental Operations Supervisor is unavailable these personnel must be contacted

4.0 EMERGENCY RESPONSE PROCEDURES

THE FOLLOWING IS TO ENSURE THE SAFE EVACUATION OF ALL WORKERS FROM THE SITE IN AN EMERGENCY:

Contact your Supervisor and do a head count to make sure everyone who was working in your area is accounted for.

- Standby for communication of procedures and be prepared to be first aid responders.
- Once everyone is accounted for, the Supervisors will give direction for further evacuation. When outside assistance and further direction is required the Provincial Emergency Program will be contacted at:

1-800-663-3456.

- The ultimate goal in an emergency procedure is to successfully keep all employees and individuals safe. REMAINING CALM is the key factor in an emergency.

Any event that will result in direct impacts to human health, animal kills and/or immediate and significant impacts to the environment must be reported to the RAPP (Report all Poachers and Polluters) line. Also, any event that is a reportable spill as defined by the Spill Reporting Regulation must also be reported to the Provincial Emergency Program (PEP) at 1-800-663-3456.

Promptly submit reports of non-compliance of any permit condition to EnvironmentalNonCompliance@gov.bc.ca. This reporting requirement applies to any non-compliance with authorization conditions including, but not limited to; unauthorized bypasses, malfunctions, emergency conditions, permit exceedance and toxicity test failures. The following documents provide instruction and templates for non-compliance reporting.

4.1 EVACUATION PROCEDURE

The following evacuation procedure will be used in the event of an emergency:

- The evacuation alarm is one long blast with an air horn. Sound alarm to initiate evacuation order. The air horns will be located at well identified locations on the worksite.
- Evacuate the building or work site.
- Notify appropriate Emergency contact through the appropriate telephone number (in this manual or at the site safety board) and notify Shift boss

- All employees will assemble in the muster area and will remain there until ordered to move by the Shift boss.

- Each contractor supervisor will muster his/her workers, perform a head count, and report to the South Island Resource Management representative.

- Some employees may elect to use emergency equipment to control and/or extinguish flames, spills, etc., but at no time is any employee to remain on the work site, if further exposure will increase the risk to the employees.

- No employee will attempt to control an emergency situation without first ensuring the Shift boss is made aware of what the employee is doing. If the Shift boss cannot be advised, any attempt to control the problem is to be abandoned and left to Emergency Services.

- Render first aid to any workers requiring attention.

- No employee will enter the workplace until a return to the building, or work site, has been authorized by Shift boss and the Emergency Services.

First Aid Emergencies

- Notify First Aid Attendant on Company Radio, or by three air horn blasts, or by contacting the scale shack. Contact 911 as required.
- Person closest to injured person:
  - Ensure the accident scene is safe and that there is no further danger to you or the injured person.
  - Do not move the injured worker unless they are in immediate danger.
  - Keep calm. Do not leave the worker unattended.
- Obtain as much information as possible regarding the injury and the patient.
  - What happened?
  - Number of patients?
  - Exact location of patients?
  - Nature of injuries
  - Type of Transportation required?
  - Is a Billy Pugh or specialized rescue/extraction equipment required?

- Is a First Aid Attendant required?
- Is a spine board or stretcher required?
- Do you need help, oxygen, first aid equipment?
- What are the weather conditions at the scene?

Provide the following information to the first aid attendant/Emergency Services:

- What happened
- Exact location of accident
- Number of workers involved (DO NOT mention names)
- Nature of injuries
- Wait for and allow First Aid to ask any questions
- Return to the injured worker

Provide care for injured worker(s) to the level of training in which you are trained.

4.2 FATALITIES, SERIOUS INJURIES AND DANGEROUS OCCURENCES

In the event of a fatality, the Supervisor must:

- Secure the area
- Notify the Mines Inspector immediately (and no later than 4 hours after)
- Notify WorkSafeBC
- Notify the Occupational Health and Safety Committee and Worker Representative
- Notify RCMP
- Notify Coroner's Office
- Ensure Next of Kin are notified

Advise employees regarding flow of information until all appropriate notifications have been completed.

During times of high emotion such as in an event of this magnitude the assistance of a Critical Incident Stress De- briefer should be used.

In the event of a Serious Injury or a Dangerous Occurrence:

- Secure the area

- Notify the Mines Inspector immediately (and no later than 16 hours after)
- Notify WorkSafeBC
- Notify the Occupational Health and Safety Committee and Worker Representative

Serious Injuries and Dangerous Occurrences include, **but are not limited to**, the following (see Section 1.7.3 of the HSRC and Section 172 of the Workers Compensation Act):

- Major groundfall/subsidence
- Any threat to the integrity of dams, dikes or impoundments, if any
- Any major structural failure or collapse of a building, bridge, tower, crane, hoist, shaft, headframe, temporary construction support system or excavation
- Mine vehicle out of control
- Major flow of water, mud, slurry, debris or gas
- Fire or electrical incident that endangers persons or damages equipment
- Any incident involving the major release of a hazardous substance
- Any blasting accident that results in injury, or unusual event involving explosives
- In general, **any** unusual accident or unexpected event which has the potential to result in serious injury

If in doubt as to whether notification is necessary, notify Mines and WorkSafe BC, explaining the situation and taking their direction.

See Section 3.0, Emergency Contact Information, for emergency contact information, including specific contacts at the Ministry of Mines.

In the case of a worker seeking medical aid, the mine manager shall provide incident and summary reports as required by both the HSRC and the Workers Compensation Act.

In event of fatalities, serious injuries and dangerous occurrences, there are significant additional reporting, investigation, record-keeping, and evidence-preservation requirements beyond the above mentioned initial notifications. Work quickly and efficiently in cooperation with regulatory personnel and law enforcement to safeguard life and property, comfort the injured, and fulfill all follow-up obligations.

4.3 FIRE RESPONSE

In case of fire call Supervisor IMMEDIATELY!

If You Discover a Fire

- Immediately shout "Fire" (on radio)
- For Fire Emergencies, Call 911...State location and nature of the emergency or have someone else do it and report back to you.
- If trained and safe to do so, attempt to extinguish or control fire with appropriate firefighting equipment.
- If not safe to do so or if you cannot extinguish or control the fire, then try to contain it, if possible.
- Sound emergency evacuation, and proceed to assembly area.
    - Supervisor, check all the workers are accounted for.
    - Do not leave the assembly area until instructed to do so by Supervisor.
    - Do not re-enter the building/area for any reason until the evacuation area is said to be safe to return by your Supervisor.

Fire Information to Report:

- Are people at risk!
- How big is the fire? Bathtub Backyard, Ball Field
- Fire location and type of fuel
- Fire Character - Note wind direction and strength
- Slope (aspect, position, steepness)
- Actions taken and planned (if SAFE to do so)
- Be aware of and follow the emergency evacuation procedures when required

General Fire Safety Tips:

- One of the safest spots is a burned-over area or open rock quarry, stripped of all vegetation and at lower elevation than surrounding fuel sources.
- When there is no access to a burned-over area, remember that you can travel faster downhill or along the hill.
- Do not travel ahead of the fire in the direction of the spread. It is almost impossible to out-run a fire.

- In any brush fire, when working in advance with a cat, build a safety strip for retreat.
- In timber, sharp ridges are the best bet.
- When working in extreme conditions, maintain radio contact with the base at all times.

"WATCH OUT" Guidelines:

1. Weather - Dominates fire behavior, so keep informed.
2. Action - Must be based on current and expected fire behavior.
3. Try out - At least two safe escape routes.
4. Communications - Maintained with crew, boss and adjoining forces.
5. Hazards - Watch for flash fuels, chimneys and snags.
6. Observe - Changes in wind direction, velocity, humidity, and clouds.
7. Understand - Your instructions and make sure yours are understood
8. Think - Clearly, be alert, and act decisively before situation becomes critical.

4.4 NATURAL DISASTERS

Earthquake

Earthquakes occur without warning, so there will be no opportunity to evacuate areas in advance. All employees must be prepared to respond appropriately in the event of an earthquake.

During an earthquake the ground will shake and buildings may sway. Sometimes there is a sudden grinding noise or roar. The extent of movement will depend on the severity of the quake. An earthquake of magnitude greater than 6.0 on the Richter scale has potential to be very destructive.

An orderly evacuation is to be conducted after the first shocks have subsided. Strong earthquakes will have aftershocks and may generate a Tsunami at lower elevations. It is therefore important to wait until the entire event has been declared over before employees are allowed back to work.

Immediate Actions

If you are inside during an earthquake:

- Immediately take cover under a table or desk, or stand in a doorway. In areas where cover is not available, kneel at the base of an interior wall, facing the wall with head down and covered by your arms.
- Turn your body away from windows and mirrors.
- Be alert for falling objects and stay away from overhead fixtures, filing cabinets, bookcases, and electrical equipment.

If you are outside during an earthquake:

- Stay away from danger zones around log and pole decks
- Move to an open area away from buildings, trees, steep slopes, and powerlines.
- If unable to move to an open area, watch for falling objects.

If you are in an automobile or machine during an earthquake:

- Stop your vehicle in the nearest open area.
- Stay in the vehicle until the shaking stops.
- Stay away from overpasses, bridges, and powerlines.

If you are trapped under debris during an earthquake:

- Do not light a match.
- Do not move about or kick up dust.
- Cover your mouth with a handkerchief or clothing.
- Tap on a pipe or wall so rescuers can locate you. Use a whistle or air horn if is one is available. Shout only as a last resort. Shouting can cause you to inhale dangerous amounts of dust.

After an Earthquake

1. Remain Calm

2. Be aware of the possibility of further earthquakes, and be prepared to again take emergency shelter and action.
3. Stay at least 10 meters from downed powerlines.
4. Stay away from damaged areas.
5. If possible, and if it is safe to do so, evacuate buildings as soon as the shaking has stopped.
6. Do not move seriously injured persons unless they are in obvious or immediate danger from fire, building collapse, etc.
7. Open all doors carefully, and watch for falling objects.
8. At no time should any open flames, around buildings, be allowed (such as matches or lighters)
9. Limit phone calls to emergency assistance requests, as this may tie up lines needed by emergency personnel.
10. Each building and work area should have a muster area or 'safe area' established, in a previously designated area that is away from known dangers.
11. Conduct a head count and ensure that all personnel are accounted for. Missing personnel are to be reported to Supervisors & emergency response personnel.
12. Do NOT drink tap water, stream/river water, or use the toilets until you know if water and sewer lines are intact and no contamination has occurred.

Do not attempt to drive. Roads may be congested, logging roads and bridges may be down or unstable, and streets may be impassable. Site surveys will need to be conducted by qualified individuals prior to evacuation

After an earthquake, and once the Site has been deemed safe, the following protocols should be followed at the Site regarding the contaminated soil areas:

- A qualified engineer should inspect all Site infrastructure and note any areas of damage, highlighting damage areas that may pose immediate risks of contaminant release to the environment. In particular, inspection should occur at:
  - All slopes and embankments within the Permanent Encapsulation Area, including the active face of the encapsulation areas;
  - The storm water pond and associated piping and infrastructure;
  - The Soil Management Area (asphalt and infrastructure conditions);
  - All runoff and leachate collection and containment infrastructure;
  - The Water Treatment Facility; and,
  - All groundwater monitoring wells.

- If it is suspected that the earthquake could have altered sub-surface conditions at the Site, the installation of additional groundwater monitoring wells may be required to confirm that the groundwater flow regime has not changed, and to ensure no contaminant impacts to the deep underlying bedrock aquifer.
- Following any earthquake where Site infrastructure has been impacted and/or sub-surface conditions may have been affected, no additional soils should be accepted at the Site until all necessary repairs have been made, and a full environmental inspection and review has been completed.

Extreme Storm Event or Hurricane

Although highly unlikely in this area it is important to have an understanding of this potential natural disaster

- A Hurricane: Unlike tsunamis, no specific time of arrival will be available. Depending on their location and strength, tropical cyclones are referred to by various other names, such as hurricane, typhoon, tropical storm, cyclonic storm, and tropical depression. While tropical cyclones can produce extremely powerful winds and torrential rain, they are also able to produce high waves and damaging storm surge. They develop over large bodies of warm water, and lose their strength if they move over land. This is the reason coastal regions can receive significant damage from a tropical cyclone, while inland regions are relatively safe from receiving strong winds. Heavy rains, however, can produce significant flooding inland, and storm surges can produce extensive coastal flooding up to 25 mi (40 km) from the coastline.

- The first person to receive a storm/hurricane warning should transmit the warning on the company radio frequency and inform the office and supervisors.
- Move to 'safe area' with all crewmen in your area - do a head count to ensure everyone is present.
- Power Down - If the potential for tsunami is present shut down all electrical power.
- Pack small equipment and move all mobile equipment if safe to do so and without delay. Be sure to take any water bottles, food, & first aid kits and supplies with you.
- Standby for communication for procedures and be prepared to be first aid responders.
- Remain Calm.
- Do not attempt to drive. Roads may be congested, logging road and bridges may be down or unstable, and streets may be impassable.

Check-in with Supervisors/office and prepare to wait for further evacuation instructions.

Tsunami

Because of the site elevation (300+ m amsl), direct impact from a Tsunami is unlikely. However, Tsunami impacts on lower elevations could significantly impair services and access to the Site. Upon notification of a Tsunami or Tsunami warning, the Mine Manager will assess threats and impacts, suspending operations and re-assigning staff as warranted to keep the Site in safe condition.

A tsunami could lead to damages and losses similar to a hurricane and possibly have a greater impact in destruction. Tsunamis are typically generated by vertical disturbances of the ocean floor that are caused by earthquakes. A tsunami is a series of undersea waves that can be as much as an hour apart if it comes from a considerable distance. A severe tsunami that is generated from afar may not have much of a noticeable result in the first or second wave, but in the waves following after may be devastating, as the water will push farther inland.

Follow evacuation procedure for a Hurricane

4.5 EXCESSIVE CONTAMINANT EXPOSURE

Through the regular operation of the Site, on-site personnel will be working regularly near contaminated soils and may be working with workplace hazardous materials. Prevention is the key to mitigating risks associated with potential contaminant exposure, and as such the Site Health and Safety programs and procedures should be followed at all time. All personnel working within the Site must wear standard site PPE as stipulated in the OHSM, as well as any additional PPE required to mitigate the risks of exposure to contaminants, including but not limited to:

- Disposable Nitrile Gloves;
- Safety Glasses; and,
- A half-mask respirator fitted with organic cartridges (on hand, to be used as needed).

The symptoms for all types of poisoning, including excessive contaminant exposure, may be difficult to recognize. Refer to MSDS sheets as required.

Exposure to contamination may occur through inhalation of contaminated dust/vapours, through the skin, or through the mouth.

As a rule of thumb, if a worker feels ill and may have been exposed to excessive contamination, the following procedure should be followed to stabilize the situation:

- Notify First Aid Attendant on Company Radio or Contact 911.
- Notify Poison Control (1-800-567-8911). Have a bystander assist you.
- Person closest to injured person:
    - Ensure the accident scene is safe and that there is no further danger to you or the injured person.
    - Remove the potential source of contaminant exposure. If this requires moving the worker, do so only if this poses no additional risk. Keep calm. Do not leave the worker unattended.

- Provide care for injured worker(s) to the level of training in which you are trained.
- Continue by following the First Aid Emergency procedure laid out in the OHSM.

An Incident Investigation and assessment of any corrective/preventative actions should be conducted following closure of any first aid emergency. The Incident Investigation forms included in the OHSM should be used.

4.6 CONTAMINATED SOIL RELEASE INTO SHAWNIGAN CREEK

The scenario of a truck tipping over and discharging its contents into Shawnigan Creek is considered extremely unlikely given the site layout, posted speed limits, design and condition of the on-site bridge and other infrastructure, and the standard engineering of all commercial dump trucks and associated trailers.

The following procedure should be followed in the event that contaminated soil is released into Shawnigan Creek due to a truck/trailer-related accident, or other incident:

1. Ensure the Safety of all On-Site personnel

- Notify First Aid Attendant on Company Radio, and Contact 911 if required
- Person closest to accident:
    - Ensure the accident scene is safe to enter. Do not provide assistance if there is an imminent danger to your personal safety. Check for the following:
        - No Fire
        - No Wires (no risk of electrical shock)
        - No Glass (no risk of cuts)
        - No Gas (no risk of explosion or fire)
    - If it is safe to do so, assist any injured individuals. Do not move any

individual unless leaving them in place presents an immediate risk to their health.

- Keep calm. Do not leave the worker unattended.
- Provide care for injured worker(s) to the level of training in which you are trained.
- Continue by following the First Aid Emergency procedure laid out in the OHSM.

2. Manage Risks Associated with Soil Release
    - Deploy spill containment booms immediately downstream of the soil release. Deploy sorption pads across the spill area as necessary where any oily sheen is observed. Booms and pads will be located in a water-tight spill kit near the on-site bridge over Shawnigan Creek.
    - Notify the SIRM Environmental Operations Supervisor, or alternate – see contact table above.
    - Environmental Operations Supervisor to contact Emergency Spill Response (PEP), MOE Regional Office and Vancouver Island Health Authority as required – see contact table above.
    - Deploy additional spill containment booms further downstream, as directed by the Environmental Operations Supervisor.
    - Using on-site equipment, remove any spilled contaminated soils and transport them to the Soil Management Area. Given the regular availability of staff and equipment, spilled soils should be removed within minutes to hours of the spill occurring, depending on access and safety conditions.
    - Environmental Operations Supervisor to collect samples of the underlying soil/sediment to ensure that all contamination has been removed. Sampling spacing/frequency to adhere to BC MOE Technical Guidance Document 1.
    - Environmental Operations Supervisor to collect samples of the water within Shawnigan Creek at locations upstream and downstream of the accident location, to ensure that no impacts to surface water persist.
    - Samples to be analyzed at a third-party laboratory accredited by the Canadian Association for Laboratory Accreditation (CALA), for all Potential Contaminants of Concern (PCOCs) associated with the spilled soils.

All personnel involved in cleanup activities should wear standard site PPE as stipulated in the OHSM, as well as any additional PPE required to mitigate the risks of exposure to contaminants.

4.7 WATER TREATMENT SYSTEM FAILURE/BREACH

The risks associated with a failure of the water treatment system will be mitigated by an automated shut off in the event of a loss in pressure. Should this occur after hours, the storm water detention pond will provide sufficient storage in the short term? In addition, any leakage to ground will report by overland flow to the Settling Pond prior to discharge.

The following procedure should be followed in the event of a failure/breach of the water treatment system:

1. Ensure the Safety of All On-Site Personnel

   - Notify First Aid Attendant on Company Radio, and Contact 911 if required
   - Follow the First Aid Emergency procedure laid out in the OHSM

2. Manage Risks Associated with Treatment System Failure
   - Deploy spill containment booms/pads if a leak is ongoing. Booms and pads will be located in a water-tight spill kit near the Treatment System.
   - Notify the SIRM Environmental Operations Supervisor, or alternate – see contact table above.
   - Shut off power to the treatment system.
   - Environmental Operations Supervisor to contact Emergency Spill Response (PEP), MOE Regional Office and Vancouver Island Health Authority as required – see contact table above.
   - Deploy additional spill containment booms further downstream, as directed by the Environmental Operations Supervisor.
   - Environmental Operations Supervisor to collect samples of the water within the overland drainage course, downstream of the accident location, to ensure that no impacts to surface water persist.
   - Samples to be analyzed at a third-party laboratory accredited by the Canadian Association for Laboratory Accreditation (CALA), for all Potential Contaminants of Concern (PCOCs) associated with the spilled water.
   - Conduct repairs as necessary to the Treatment System. If necessary, a mobile emergency treatment system or vacuum truck may be required to manage water while repairs are underway.
   - Restart treatment system, and pump/treat all untreated water held within the secondary containment berm.

All personnel involved in the repair work should wear standard site PPE as stipulated in the OHSM, as well as any additional PPE required to mitigate the risks of exposure to contaminants.

4.8 BEDROCK FRACTURES / SEEPAGE ENCOUNTERED

The risks associated with a significant fracture encountered during construction of Permanent Encapsulation Cells will be evaluated during the requisite, pre-construction inspections. In accordance with Permit Clause 2.4, if abnormalities are encountered (open fractures, presence of water, percolation, etc.) the Director must be notified immediately.

The following procedure should be followed in the event of encountering bedrock abnormalities:

1. Notify the Director
    - Contact the MOE Regional Office – see contact table above.
2. Prepare a Structural Report
    - A structural report is required within 30 days of inspection
    - The report is to be prepared by a suitably Qualified Professional.
    - The report should include all relevant information collected during the inspection and detailing the abnormality; an explanation and/or interpretation of the abnormality; a risk assessment in regards to the risk to human health and the receiving environment; and, remedial action planned and/or taken to control the risks.

4.9 UNAUTHORIZED DISCHARGE

In accordance with Permit Clause 2.12, in the event of an emergency or condition beyond the control of the Permittee which prevents effective operation of the Site or leads to unauthorized discharge, the Permittee must comply with all applicable statutory requirements, immediately notify the Director and take appropriate remedial action for the prevention or mitigation of pollution.

The following procedure should be followed in the event of an unauthorized discharge to ground or water:

1. Ensure the Safety of All On-Site Personnel
    - Notify First Aid Attendant on Company Radio, and Contact 911 if required
    - Follow the First Aid Emergency procedure laid out in the OHSM

2. Manage Risks Associated with Discharge
   - Deploy spill containment booms/pads as required.
   - Notify the SIRM Environmental Operations Supervisor, or alternate – see contact table above.
   - Shut off power to the treatment system as required.
   - Environmental Operations Supervisor to contact Emergency Spill Response (PEP), MOE Regional Office and Vancouver Island Health Authority as required – see contact table above.
   - Deploy additional spill containment booms further downstream, as directed by the Environmental Engineer.
   - Environmental Operations Supervisor to collect samples of the water within the overland drainage course, downstream of the accident location, to ensure that no impacts to surface water persist.
   - Samples to be analyzed at a third-party laboratory accredited by the Canadian Association for Laboratory Accreditation (CALA), for all Potential Contaminants of Concern (PCOCs) associated with the spilled water.
   - Conduct repairs as necessary to the failed aspect of the system. If necessary, a mobile emergency treatment system or vacuum truck may be required to manage water while repairs are underway.

All personnel involved in the repair work should wear standard site PPE as stipulated in the OHSM, as well as any additional PPE required to mitigate the risks of exposure to contaminants

4.10 UNKNOWN SUBSTANCE SPILL

In the event that an unknown substance is spilled or found in the work area the Permittee must comply with all applicable statutory requirements, contact the SIRM Environmental Operations Supervisor, notify the SIRM Director and any other relevant agency, and take appropriate remedial action for the prevention or mitigation of pollution and risk to on-site personnel, the public and the environment.

The following procedure should be followed in the event of an unknown substance is found or spilled on site:

1. Ensure the Safety of All On-Site Personnel
   - Immediately notify First Aid Attendant on Company Radio, and Contact 911 if

required.

- Follow the First Aid Emergency procedure laid out in the OHSM, if required.
- Deploy caution tape to maintain a 5 meter distance from all sides of the unknown substance or spill area.
- Inform all on-site personnel of the affected area.

2. Manage Risks Associated with Unknown Substance

- DO NOT attempt any work or clean-up in the area without prior attempts to identify and/or sample substance.
- All personnel must wear full PPE when performing clean-up of the area or working in close proximity of the spill.
    - Minimum PPE required is: full mask respirators, impermeable coveralls, nitrile gloves, safety googles and rubber boots.
- On-site staff to use a photo ionization detection device, or other screening equipment, to attempt to identify the unknown substance.
- Collect appropriate samples of the unknown substance and, if necessary, water within the overland drainage course and downstream of the spill location.
- Samples to be analyzed at a third-party laboratory accredited by the Canadian Association for Laboratory Accreditation (CALA), for all Potential Contaminants of Concern (PCOCs) associated with the unknown substance.
- Deploy spill containment booms and pads, as required.
- Environmental Operations Supervisor to contact Emergency Spill Response (PEP), MOE Regional Office and Vancouver Island Health Authority as required – see contact table above.
- Deploy additional spill containment booms into nearby waterways, as directed by the Environmental Operations Supervisor and/or Mine Manager.
- The Environmental Operations Supervisor shall direct clean up procedures, given the information available.
- All material associated with the clean-up shall be appropriately stored in the Soil Management Area till results from sampling are received. Disposal of the material will be in accordance with applicable statutory requirements.
- Conduct repairs as necessary to systems or infrastructure impacted by the clean-up of the substance.

All personnel involved in the repair or clean-up work should wear standard site PPE as stipulated in the OHSM, and must wear additional PPE to mitigate the risks of exposure to an unknown contaminant.

An Incident Investigation of the spill and documentation of the clean-up efforts should be conducted. The Incident Investigation forms included in the OHSM can be used.

4.11 PROTESTORS

There is potential for employees to be approached by protestors both on and off the job site. Never confront a protestor and always remain calm. If a protestor tries to engage you, direct them to make their enquiries to South Island Resource Management's Media and Engagement personnel at **media@sirm.ca**.

Be proactive when dealing with protestors:

- Keep unnecessary people away from the demonstration.
- Never proceed into or through demonstrations if faced with resistance.
- Handle unrest in a non-confrontational manner.
- If there is violence, property damage or credible threat, contact the police immediately.
- Inform protestors of legal boundaries or court injunctions and what requirements those have.
- Inform staff and families when protest activity is expected to increase.
- NEVER block on-site security cameras.
- Report any unusual or unacceptable activity to your supervisor.
- Fill out incident reports, if necessary.

The following procedure should be followed in the event of civil unrest or a large number of protestors come on-site unannounced/invited:

1. <u>Ensure the Safety of All On-Site Personnel</u>
   - Stop all work and ensure the work area is reasonably safe.
   - Remove and/or secure all tools and equipment in the area, if possible.
   - When possible, go to a safe place, inside a work trailer or vehicle, with other workers and lock doors and close windows.
   - If you are operating heavy equipment and it is not possible to clear the work area, remain in the equipment; close and lock doors and windows; rest equipment in a safe position.
2. <u>Communication</u>
   - The worker who sees the protestors come onto the property or sees critical levels of unrest must immediately radio all staff about the situation.
   - Call 911
   - Use the radio, or use other communication devices, to establish your condition, your

location, and who is present to other on-site personnel.

- Be prepared to answer more questions about the situation, eg: the conditions of other personnel, how many protestors came onto Site, etc.
- Establish the number of people on-site, using the sign-in binder and staff lists, and perform a head count.
- Notify the ownership group, as soon as practical.

3. <u>During Civil Unrest</u>

- DO NOT provoke, antagonize or approach the protestors.
- Stay out of harm's way. Tools, equipment and material can be replaced, not people.
- When taking videos or pictures of the event, be safe.
- Wait for direction from police or other emergency personnel.
- Check-in periodically by radio/cellphone.

4. <u>After the Civil Unrest has Finished</u>

- Wait for police, emergency personnel or point person to give the all clear before proceeding.
- Meet at muster station and perform a head count.
- Assess all damage, theft and injuries.
- Complete incident reports and consolidate all footage of the event.

Dealing with protestors is difficult. Personnel should approach all situations involving protestors with the utmost caution.

Appendix A:

Plan View of Mine

McElhanney

McElhanney Consulting Services Ltd.
#500 - 3960 Quadra Street
Victoria, BC V8X 4A3
PH (250) 370-9221

SOUTH ISLAND RESOURCE MANAGEMMENT
Client

QUARRY MINE PLANNING
Title

Date:	SEPT. 02, 2015	MCSL PROJECT No.	2113-02799
Scale:	1:1000		
Drawn:	HTC	Drawing No.	02799-SK 1
Checked:	GQ		

Appendix L

Exposed LDPPE Liner Protection and Inspection Plan

SIRM SOUTH ISLAND RESOURCE MANAGEMENT

460 Stebbings Road
Shawnigan Lake, BC V0R 2W3
250.743.0811
info@SIRM.ca

EXPOSED LDPPE LINER PROTECTION AND INSPECTION PLAN

October 19, 2015
Revision 2.0
Mine 1610355
Permit Q-8-094

For the purposes of protecting exposed liner during regular quarry rock blasting operations, the following 'Protection/Inspection Plan' has been developed and will be implemented.

As per Permit Q-8-094 Section 14, no blasts shall be initiated during the installation of permanent (i.e., intended to remain in position) encapsulation cell lower and upper liners until such liners are protected by a soil cover of at least 0.66 metres thickness. There is no variance from this permit requirement.

The construction of cell segments in sequence requires individual segments to retain temporary (non-permanent) excess liner beyond the segment's footprint. Specifically, excess base liner is run up from the floor between compacted waste soil and supporting side berms, so that the berms can later be removed and the excess liner folded down to overlap with the base liner of the neighbouring sub-cell for fusion. For the purposes of temporary waste soil containment during construction, a fraction of this excess liner daylights around the area of waste soil placement (and has less than 0.66 metres soil cover).

The exposed excess liner is not permanent liner as it will be folded down to overlap true permanent bottom liner in adjacent cell segments as they are constructed. At no point in the construction sequence will exposed excess liner be required to (or expected to) contain leachate.

Although exposed excess liner is not "permanent liner", and has no design requirement for 100% integrity, it will be protected from damage as good construction practice.

This 'Protection/Inspection Plan' describes the procedure followed to ensure that exposed excess liner is protected, inspected and/or repaired.

Liner with less than 0.66 m soil cover currently consists of three areas: East, West, and South of PEA Cell Segment 1A. The northern end is adequately covered by a temporary toe berm. All sides are intended to allow for future welding of extensions.

Exposed excess liner protection consists of three components:

(1) Temporary physical barriers during small-scale, local (within 75 metres of exposed excess liner) construction blasting, such as related to future cell area back wall clean up, ramp construction and road construction;

(2) Blast planning so that, in general, production blasting does not occur within 75 metres of exposed excess liner; and

(3) Inspection (and, if necessary, repair) of exposed excess liner after any blasting conducted as per (1) and (2), above.

With regard to (1), above, if and when small blasts for construction purposes are required within 75 metres of exposed excess liner, the excess liner will be pulled back over the cell by hand and covered with road plates and/or at least 0.66 metres of uncontaminated soil.

Due to the liner dimensions, slope, orientation and structural elements, broad application of physical barriers, such as road plates and blasting mats, is not a feasible solution for routine production blasting. As per (2), above, production blasting will be planned and scheduled to be at least 75 meters from exposed excess liner. Based on blast design, flyrock observations and the location of additional sensitive infrastructure (overhead power and the water treatment system) between production blasting and the current exposed excess liner, the Mine Manager is confident that this distance is protective.

Notwithstanding the above, prior to and following each blast the Manager will ensure a qualified person visually inspects all exposed excess liner. In the event of any indication of damage the Manager will ensure the liner is repaired according to manufacturer's instructions. Findings and actions will be promptly reported to the Inspector.

It is noted that filming of blasts and maintenance of thorough blasting records are permit requirements. The Manager will assess the risks to exposed excess liner on a per blast basis and, when warranted (i.e., blasting within 75 meters), film the active PEA/exposed liner as well.

Before undertaking any exposed excess liner repair, the Manager will verify relevant procedures with the liner material's supplier.

The current liner supplier is Western Tank & Liner (WTL). The following is their recommended **Repair Procedure**:

- Both 60mil double sided seaming tape (DST), and M-50 Cover tape are for temporary liner patching;
- Liner needs to be permanently repaired by a qualified technician using extrusion welding technique.

LLDPE Liner Temporary Patching Instructions:

- Any cuts, rips or tears in the LLDPE Geomembrane Liner should be temporarily patched with a piece of the same membrane material, and a dual tape system (DTS).
- Patches should be cut with rounded corners and should overlap the damaged area a minimum of 6 inches.
- The patch and damaged membrane area should be clean and dry.
- 60mil DTS is applied to underside of patch. Remove backing plastic to apply.
- Roller pressure over a hard surface should be applied during the process in such a way as to smooth out any wrinkles while mating both surfaces.
- Apply M-50 Cover tape around perimeter of patch. 2" on parent sheet, 2" on patch.

- Check for any voids.
- Mark areas that have been temporarily repaired for WTL tech to permanently repair.

Approvals

Revision	Approval	Name	Signature	Date
2.0	SIRM Mines Manager	Doug Harlow		19 OCT 15.

Appendix M

Orientation Record (Site Specific)

ORIENTATION RECORD (SITE SPECIFIC)

Answer the questions below as you follow along with the orientation. Once your orientation is completed, signed and dated on the bottom and returned the orientation record to the South Island Resource Management representative who gave you the orientation. We will keep the original for our records and return a copy to you for your reference.

Your Name: ______________________________ Company: ________________________

Site Supervisor: ____________________________ Phone: ___________________________

Question	Answer
Where is the Emergency Plan and safety contact information posted?	
Where are the muster points?	
How do you contact first aid?	
Where is first aid located?	
List the Personal Protective Equipment required on this worksite.	
List 3 hazards identified for this worksite.	
What types of injuries must be reported to first aid?	
Does the South Island Resource Management safety program override the Work Safe BC regulation?	
Are alcohol and drugs permitted on South Island Resource Management worksites?	
Where are the Material Safety Data Sheets for controlled products located?	

Signature: _______________________________ Date: _________________________

460 Stebbings Road
Shawnigan Lake, BC V0R 2W3
250.743.0811
info@SIRM.ca

Environmental Procedures Manual/ Operation, Maintenance and Surveillance Manual [EPM/OMS]

Waste Discharge Permit PR-105809

~~Version~~Quarry Permit Q-8-094

Rev. 1.30
July 29, 2015

South Island Aggregates Ltd.

SIRM Document Revision History

Revision No.	Date	Revisions	Authorized (SIRM)
1.0	July 29, 2015	Conversion of SIA EPM v. 1.3 to reflect SIRM assumption of operations; merger with MEMPR OMS to create a new document	RPC

Notes:
(1) Review/revise to keep current and at least annually on or before March 31.
(2) Revisions are not effective until review/approval by technical reviewers and sign-off by SIRM Mines Manager.
(3) At time of issue, revisions must be submitted concurrently to both BC Ministry of Environment and BC Ministry of Energy, Mines and Petroleum Resources.

Approvals

Revision	Approval	Name	Signature	Date
1.0	Qualified Environmental Professional	Pete Craig, M.Sc., PChem		
	Professional Geotechnical Engineer	Matt Pye, P.Geo.		
	SIRM Mines Manager	Doug Harlow		

Distribution

This is a controlled document.

When approved, this document must be kept accessible on site in both original (signed) paper and (searchable) electronic forms. Electronic copies of the document are for information only; electronic files are subject to manipulation or alteration and only signed original hard-copies can be relied upon.

The document is the intellectual property of SIRM Ltd., which retains all rights and privileges. Unauthorized alteration or manipulation is strictly prohibited.

Other than the Province of British Columbia and its properly designated agents, no third party may rely on this document in part or in full, without the written permission of SIRM. SIRM is in no way liable for any damages of any kind resulting from third-party use, reference or citation.

EXECUTIVE SUMMARY AND COMPLIANCE POINT OVERVIEW

This document comprises the integrated site operations manual, the *Environmental Procedures Manual/ Operation, Maintenance and Surveillance Manual* (EPM/OMS), for the quarry (mine) located at 460 Stebbings Road, south of Shawnigan Lake, BC (Lot 23, Blocks 156, 201 and 323, Malahat District, Plan VIP78459).

The operations of the mine include both the commercial production of rock products and the reclamation of the mine with encapsulated non-hazardous waste classification contaminated soils. As such, the mine operates under the following permits:

- BC Ministry of Environment (MOE) Permit PR-105809 (issued August 21, 2013; confirmed by the Environmental Appeal Board March 20, 2015; last amended June 4, 2015); and
- BC Ministry of Energy, Mines and Petroleum Resources (MEMPR) Permit Q-8-94 (issued October 4, 2006; last amended July 17, 2015).

This EPM/OMS has been developed as a single operating guide for the site, meeting the related requirements of both MOE and MEMPR permits. Though based on a pre-existing Environmental Procedures Manual (v. 1.3, dated June 8, 2015), it represents an extensive revision and expansion of site guidance.

Changes also reflect a change in the site operator. The site continues to be owned, and relevant permits maintained, by Cobble Hill Holdings Ltd. (BC0754588, "CHH"). However, South Island Resource Management Ltd. (SIRM), a wholly-owned subsidiary of Allterra Construction Ltd., executed a renewable long-term operating agreement with CHH in April, 2015, and formally took control of the site on June 11, 2015, replacing South Island Aggregates Ltd. (SIA) as the operator.

This initial issue (v. 1.0) of the SIRM EPM/OMS is intended as a living document, to be routinely updated, with all updates submitted concurrently to MOE and MEMPR. A current version of the EPM/OMS is maintained at the site, available to staff and Ministry representatives at all times.

The EPM/OMS comprises a comprehensive guide to site operations, procedures, maintenance, surveillance/monitoring and compliance. It, with its appendices, present a detailed program for maintaining and improving the environmental performance of the site.

For convenience, major compliance points are summarized briefly below in this executive summary, followed by synopses of effluent water and receiving environment water monitoring.

EXECUTIVE SUMMARY - GENERAL COMPLIANCE POINTS

Compliance Point/Item	General Overview
Quarry Production	• Max. 240,000 tonne/year
Contaminated Soil Import for Reclamation	• Max. 100,000 tonne/year
Hours of Operation	• Quarry and Landfilling/Reclamation: 7 am to 5 pm (normal business days) • Drilling: Restricted to 8 am to 4 pm (normal business days) • Light maintenance permitted in Quarry: 9 am to 4 pm Saturday
Authorized Works	• As described in permits. • No bypasses or changes that adversely affect quality or quantity of discharges
Authorized Discharge - Landfill	• No hazardous waste • No liquids, slurries, putrescible (rotting) material • Multicomponent (compacted clay till and landfill geomembrane liners on low permeability bedrock) encapsulation system • Importation, handling and record keeping as per Section 6 (Soil Acceptance Plan) of the EPM/OMS • Soils must be classified by qualified professional prior to arrival, and have supporting analytical data from an approved laboratory • Incoming soils re-sampled at prescribed frequency for quality assurance • All trucks from contaminated soil areas must go through wheel wash and be inspected before exiting site.
Authorized Discharge – Water Treatment System	• Annual avg. rate 12.1 m^3/d; maximum instantaneous rate 274 m^3/d • Treat all contact water (runoff from areas with contaminated soil) • Comply with most stringent of BCAWQG and BCWWQG for Freshwater Aquatic Life (AL) protection and Drinking Water (DW) uses for parameters of concern
Authorized Discharge – Settling Pond	• 42,500 m^3/d for up to a 1 in 10 year flood event of 24 hrs duration • Maintain minimum water depth below decant and minimum freeboard during storm events. • Comply with most stringent of BCAWQG and BCWWQG for AL. • Total Suspended Solids (TSS) shall not exceed 25 mg/L for up to a 1:10 year storm event; nitrate shall not exceed standards applicable to DW.
Air/Odour/Dust	• No objectionable hydrocarbon odour evident at property boundary • No exceedance of CSR Schedule RL Standards at property boundary • No exceedance of 1.7 mg/dm2/day over 2 week averaging period at property boundary • Cover contaminated soils (including in active encapsulation cells) to protect from rain and wind
Notifications	• See Section 13 of the EPM/OMS - Notification is required for most significant upset Conditions, 24 hours in advance of blasting, and before placing soils in a new encapsulation cell.
Reporting	• See Section 13 of the EPM/OMS - Reports include: (a) regular quarterly and annual reports, including public posting and advisory committee review; and (b) certified as-built records for major work, including cell liner and cap construction.

SYNOPSIS: EFFLUENT WATER MONITORING

Monitoring Location	Minimum Monitoring Frequency	Minimum Sampling Frequency
Catch Basins and Leak/Leachate Detection Inspection Ports (soil management and encapsulation areas)	Visually inspected on at least a weekly basis. Cleaned out as needed.	N/A
Water Treatment System Holding Tanks (When Applicable) and/or Containment Pond	Weekly	Monthly (or as generated)
Water Treatment System Outlet (WTS)	Weekly	Monthly and Every 2,000m^3 of Effluent Treated Effluent
Settling Pond Outlet (SW-1)	Weekly	Monthly and Every 2,000m^3 of Effluent Treated Effluent
		Turbidity Assessed Bi-Weekly from November to April and After >1:10 year storm events*

*1:10 Year Return Event estimated based on 122mm of precipitation over a 24 hour period as measured at the on-Site rain gauge.

SYNOPSIS: RECEIVING ENVIRONMENT MONITORING – GROUNDWATER AND SURFACE WATER

Receptor	Monitoring Locations			Monitoring Schedule
Groundwater	Up-gradient	MW-4	On-Site, near southeast corner	Quarterly
	Down-gradient	MW-1(S/D)	On-Site, near centre	
		MW-2	On-Site, near west property boundary	
		MW-3(S/D)	On-Site, near west property boundary	
		MW-5S	On-Site, north	
Surface Water	Up-stream	SW-4	Shawnigan Creek	5 in 30* (2 times/year, conducted during fall first flush event and during spring freshet); and after a 1:200 year storm event** at SW-2 and SW-3
		SW-2	Ephemeral Creek	
	Down-stream	SW-5	Shawnigan Creek	
		SW-3	Ephemeral Creek	

*5 in 30 refers to at least 5 weekly samples taken in a period of 30 days. Due to the ephemeral nature of some of the creeks, the first 5 in 30 samples should be collected when the ground has first been saturated.

~~June 2015~~

** 156 mm of rain over 24 hours

TABLE OF CONTENTS

Field Code Changed
Field Code Changed
Field Code Changed
Field Code Changed
Field Code Changed
Field Code Changed
Field Code Changed
Field Code Changed
Field Code Changed
Field Code Changed
Field Code Changed
Field Code Changed
Field Code Changed
Field Code Changed
Field Code Changed
Field Code Changed
Field Code Changed
Field Code Changed
Field Code Changed
Field Code Changed

Field Code Changed

Field Code Changed

Field Code Changed

Field Code Changed

Field Code Changed

Field Code Changed

Field Code Changed

Field Code Changed

Field Code Changed

Field Code Changed

Field Code Changed

FIGURES

APPENDICES

Appendix ~~G~~H: SMA Daily Record

Appendix ~~H~~I: Encapsulation Cell Daily Record

Appendix J: Daily Inspection and Maintenance Log

Appendix ~~I~~K: Emergency Response Plan/Mine Emergency Response Plan

1 INTRODUCTION

This document comprises the ~~Environmental Procedures Manual (EPM)~~integrated site operations manual for the ~~South Island Aggregates Contaminated Soil Disposal Facility (the "Facility"),~~quarry (mine) located at ~~640~~460 Stebbings Road ~~in~~, south of Shawnigan Lake, BC. ~~Preparation~~ (Lot 23, Blocks 156, 201 and ~~implementation of the EPM are a requirement of the Waste Discharge Authorization (Permit No. 105809), issued in relation to the Facility on August 21, 2013. A copy of the Permit is attached as Appendix A.~~323, Malahat District, Plan VIP78459).

~~1.1 Summary Description of the Facility~~

~~The Facility is capable of treating and permanently immobilizing contaminated soils. The Facility~~The site is owned, and relevant permits maintained, by Cobble Hill Holdings Ltd. (BC0754588, "CHH"). South Island Resource Management Ltd. (SIRM), a wholly-owned subsidiary of Allterra Construction Ltd., executed a renewable long-term operating agreement with CHH in April, 2015, and formally took control of the site on June 11, 2015, replacing South Island Aggregates Ltd. (SIA), the previous operator.

The operations of the mine include both the commercial production of rock products and the reclamation of the mine with encapsulated non-hazardous waste classification contaminated soils. As such, the mine operates under the following permits:

- BC Ministry of Environment (MOE) Permit PR-105809 (issued August 21, 2013; confirmed by the Environmental Appeal Board March 20, 2015; last amended June 4, 2015); and
- BC Ministry of Energy, Mines and Petroleum Resources (MEMPR) Permit Q-8-94 (issued October 4, 2006; last amended July 17, 2015).

Current versions of both permits are attached in Appendix A and B, respectively.

As per Section 2.13 of MOE Permit PR-1058089, the site must operate under an Environmental Procedures Manual (EPM), which is to be kept current; as per Section 2(a) of MEMPR Permit Q-8-94, the site must also operate under an Operation, Maintenance and Surveillance (OMS) manual, also to be kept current.

This integrated site operations manual, the *Environmental Procedures Manual/ Operation, Maintenance and Surveillance Manual* (EPM/OMS), has been developed as a single operating guide for the site, meeting the related requirements of both MOE and MEMPR permits.

The EPM/OMS is a living document, routinely updated, with all updates submitted concurrently to MOE and MEMPR. A current version of the EPM/OMS is maintained at the site, available to staff and Ministry representatives at all times.

1.1 Health, Safety, Security and Environment (HSSE) Policy Statement

SRIM's policy on Health, Safety, Security and Environment, as reflected in this EPM/OMS and in its separate Occupational Health and Safety Program manual, is an integral part of all operations and procedures. All employees, at all levels, are expected to embody our core values, to be "Reliable, Responsible and Accountable".

SIRM recognizes the importance of protecting the safety and health of both its workers and the communities in which they live, work and play. SIRM is committed to consulting with its employees and communities in a spirit of co-operation to continuously promote and improve healthy, safe, environmentally responsible operations.

Management at all levels is accountable for ensuring the health and safety of employees and for the effectiveness of health, safety, security and environmental programs. Employees are responsible for following the procedures, protocols, reporting requirements and other responsibilities laid out in the EPM/OMS and the SIRM Occupational Health and Safety Program (maintained under separate cover).

With respect to occupational health and safety, areas outside the mine boundary are under the jurisdiction of WorkSafeBC and the BC Occupational Health and Safety Regulation (the "OHS reg", B.C. Regulation 296/97, as amended). Areas within the mine are within the jurisdiction of the Inspector of Mines, and the Health, Safety and Reclamation Code for Mines in British Columbia (the "Code"). SIRM's policy is to meet or exceed the more stringent of the related requirements at all times, in all locations on site, only deferring in case of unresolvable conflict to the legally enforceable standard where such is less protective.

1.2 Summary Description of the Site and Works

The site is a shallow bedrock quarry approximately 5 km south of Shawnigan Lake in a rural, forested portion of the Cowichan Valley Regional District (CVRD) on Vancouver Island, British Columbia. The quarry has an estimated remaining productive life of 40 to 50 years. The pit cuts into an extensive mass of relatively impermeable rock, the Wark Gneiss (West Coast Crystalline Complex). The rock is hard, dense (about 2.85 g/mL) and resistant to cracking, spalling or degradation from mechanical, wet/dry or freeze/thaw action, making it highly desirable as, e.g., armour stone and wall rock.

Seepage through the rock mass is minimal (less than 0.3 m^3/day over the entire quarry footprint of nearly 20 acres, including a conservative allowances for potentially weathered horizons). Where groundwater has been encountered in rock fractures deep below the pit, it occurs with an upward hydraulic gradient (i.e., water in fractured bedrock deep beneath the pit is confined by overlying bedrock; if a flow path were available, water would flow upwards, into the pit).

Given the extremely low probability of contaminant transport out of pit fill under these conditions, the reclamation plan includes the use of fully encapsulated non-hazardous waste class contaminated soil and ash for bulk fill, with a final (future) revegetation cover of uncontaminated soil. To date, only soil has been received at the site, and soils comprise the bulk of intended future acceptance. "Soil" is therefore used in this document in the context of soil acceptance and soil encapsulation to mean "soil and/or ash".

To provide additional assurance of permanent isolation, cells of soil are encapsulated in a composite liner and cover system using both natural clay material and commercial landfill geomembranes.

The site accepts contaminated soils that exceed residential, commercial and industrial land use standards as defined by the BC Contaminated Sites Regulation (CSR) Schedules 4, 5 and 10. However, it does not accept ~~soils exceed~~soil exceeding the BC Hazardous Waste Regulation (HWR) standards, including standards based on leachability or toxicity.

Under permit terms, organic/treatable contaminants ~~can~~could be treated~~/bioremediated~~ prior to encapsulating on-Site, or prior to shipping off-Site for ~~re-use if~~ appropriate~~. However,~~ re-use. In deference to CVRD's current interpretation of zoning ~~may prohibit the~~ terminology, **no contaminant treatment ~~of~~ is currently conducted on site**.

The site is an active quarry, with contract drill/blast operations and rock processing. Rock products are exported and the pit is (aside from incident precipitation) dry. While the site is classified as a mine, there is no permanent explosives magazine, mine tailings storage or waste rock storage. There is also no dam, other than a low (approximately 3 m high) wall comprising one side of the stormwater settling pond.

Current site operations include:

(a) Rock product production under MEMPR Permit Q-8-094, to a maximum of 240,000 tonnes annually (Mine 1610355).

~~(a)~~(b) Discharge of relocated contaminated ~~soils. Inorganic/untreatable contaminants are permanently encapsulated within~~ soil and ash to engineered ~~containment cells.~~landfill cells under MOE Permit PR-105809, to a maximum of 100,000 tonnes per year (site reference E292889.)

~~The facility includes a Soil Management Area (SMA) comprised of an asphalt-paved surface with water control/collection/treatment infrastructure. Soils within the SMA are covered to prevent exposure to precipitation. A portion of the SMA is also designated to store suspect soils requiring further characterization. Following any requisite characterization, soils are moved to the Permanent Encapsulation Area (PEA) and placed within engineered containment cells.~~

(c) ~~The imported contaminated soils serve as backfill in relation to reclaiming the mined~~Discharge of treated water from a water treatment system to a general settling pond, under PR-105809, to an average annual daily rate of 12.1 cubic metres per day, with a maximum rate of 274 cubic metres per day (site reference E292170).

(d) Discharge of stormwater and water treatment system effluent from a settling pond to a seasonal (ephemeral) creek bed on the western boundary of the site (site reference E292898).

Site features include:

- An active quarry pit.
- A visual and noise screening berm along Stebbings Road
- Site fencing
- A buffer zone between the property line and the mine area
- Designated, controlled access ways to the permitted mine area (as required by the Mines Act)
- A deep (approximately 100 m) water supply well east of Shawnigan Creek from the pit (Well tag 86152)
- Incoming and outgoing scales
- Offices, storage buildings and laydown areas
- A conservation easement along Shawnigan Creek, which runs between the scale area/parking lot and the quarry area
- A Soil Management Area (SMA), to stage soil, and/or re-test them before discharge to landfill cells in the quarry
- Landfill (encapsulation cells) in the quarry to receive and permanently isolate compacted contaminated soil from the environment in composite clay till and geomembrane cells on low permeability bedrock
- A collection/containment system for water that may come into contact with contaminated soil ("contact water")
- A Water Treatment System to treat contact water
- A collection/management system for runoff water within the active site area which has not come into contact with contaminated soil ("non-contact water")
- A settling pond and combined final discharge for combined collected non-contact water and treated contact water

As per the amendment to MOE Permit PR-105809 dated June 4, 2015, a permanent roof must be placed over the SMA before March 20, 2016. Soil in the SMA and exposed materials in encapsulation cells are currently covered with polyethylene sheeting when not being actively worked.

Figure 1, attached, shows the site layout.

The positions of the overall landfill area boundaries (the mine limits), the overall soil management area, the settling pond discharge, the water treatment system discharge, surface water sampling locations and down- and up- gradient groundwater monitoring wells are fixed under PR-105809 (Figures A and B of the permit).

Mining operations are continuing, and reclamation activities are being undertaken ~~concurrent with the~~concurrently (referred to in mining ~~activities. As a result, the soil management operations may need to be moved~~ as ~~the~~ "progressive reclamation"). Within the specifications of the relevant permits, individual components of individual systems, such as the active quarry face, the location of individual pieces of water treatment system equipment, on-site monitoring locations, stockpiles and support structures, are moved to adapt as mining progresses ~~at the Site. The mine has an anticipated life-span of approximately 50-60 years, therefore, the facility operations will not require regular movement.~~.

~~1.2~~1.3 EPM/OMS Objectives

~~The EPM is intended as a practical tool to both facilitate and assure environmental compliance during the operation of the Facility. The required level of environmental compliance is driven by the Permit conditions and applicable environmental legislation, regulation, bylaws, standards, codes of practice and guidelines.~~

~~The EPM is intended to help achieve environmental compliance in three main ways:~~

As per Section 2.13 of MOE Permit PR-1058089, an EPM must cover all typical aspects of an Environmental Management System relevant to soil treatment, water treatment and landfill facilities (including operation, maintenance and inspection of works, as well as an emergency response plan). Minimum contents of the EPM are outlined in the permit.

As per Section 2(a) of MEMPR Permit Q-8-94, an OMS must outline procedures for successful operation, maintenance and surveillance of the site (and of emergency preparedness and response procedures).

Specifically, with respect to the Health Safety and Reclamation Code for Mines in British Columbia (the Code), Section 10.5.2,

> *An Operation, Maintenance and Surveillance (OMS) manual shall be prepared and provided to an inspector and to all employees involved in the operation of a major dam or major impoundment, prior to commissioning. The manual shall be revised regularly during operations, decommissioning and closure of the structure.*

As per the Code, Part 10, Reclamation and Closure, "Definitions":

> *"major dam" means a dam that is used to store and control water, slurry or solids and has a maximum height at any point that exceeds 15 metres or is between 10 and 15 metres in height and has either a crest length that exceeds 500 metres, a flood discharge rate that exceeds 2000 cubic metres per second,*

a reservoir capacity that exceeds one million cubic metres, or any other dam so declared by the chief inspector.

and

"major impoundment" means an impoundment that has a maximum depth of material greater than 10 metres at any point, or a maximum height of retaining dam or dike at any point that exceeds 15 metres, or is a storage facility designed to contain more than one million cubic metres of material or is constructed with dams or dikes that contain more than 50000 cubic metres of fill, or any other impoundment or water management facility so declared by the chief inspector

Neither a "major dam" or "major impoundment" for solids will be constructed on site for at least 10 years (and at no point will a major liquid or slurry dam or impoundment be constructed at all). Current OMS content has been developed with regard to the water management facilities of the site, including the stormwater system, containment pond, water treatment system and settling pond.

The overall objectives of the amalgamated EPM/OMS are: (a) compliance with the above permit requirements; and (b) continuous improvement in environmental performance, health, safety and security.

These objectives are attained through:

1. Summarizing both general and specific (i.e., activity specific and/or site specific) ~~environmental~~ requirements that must be complied with~~;~~
2. Providing the procedures to facilitate attainment of the environmental requirements and objectives~~; and;~~
3. Defining the overall management system and supporting operational procedures~~.~~

~~The current and approved version of the EPM is to be maintained at the Facility, available to staff and Ministry Officials at all times.~~

4. Describing the process of change management and continuous improvement

~~*1.3*~~*1.4 EPM/OMS* ***Scope and Function***

~~The EPM's focus is on environmentally sensitive aspects of the Facility operation. Unless specifically required by the permit, design aspects are discussed only where they have direct relevance to environmental management of the Facility.~~

~~As required by Section 2.13 of the Permit, this EPM is structured to cover all typical aspects of an Environmental Management System (EMS) relevant to the Facility and includes~~The EPM/OMS includes, but is not limited to the following:

- Site and works description
- Risk identification and prioritization~~;~~
- Administrative and engineering controls~~;~~
- Roles and responsibilities~~;~~
- Training requirements~~;~~ and competency demonstration
- A Soil Acceptance Plan~~;~~
- A Water Management Plan~~;~~, including operations, maintenance and system monitoring (surveillance)
- An Environmental Monitoring Plan including ~~on~~surveillance parameters, surveillance procedures, on- and off-site monitoring locations and the sampling procedures for soil and ash, water, groundwater and air quality, as required
- An Emergency Response Plan/Mine Emergency Response Plan, including contingency measures~~.~~
- Site preparation for the construction of landfill cells~~;~~
- ~~Operation, inspection and maintenance of the soil management facility, the landfill facility, the water treatment system, erosion and sediment control measures, the settling pond and associated appurtenances;~~
- Internal and external EMS audits~~; and,~~
- Notification, reporting, ~~investigation and~~ corrective and preventive measures~~.~~
- Change management
- References

The EPM ~~is structured in accordance with the above for ease~~/OMS focuses on operations and maintenance of ~~confirming all permit requirements are included.~~

~~1.4 Source Material~~

~~Reference material that~~a site constructed to approved designs. It has been ~~used in preparing the EPM includes the permit~~developed in reference to site permits, applicable legislation, regulations, standards, guidelines and codes of practice~~ referenced throughout.~~.

~~Source material includes the Technical Assessment Report (TAR), and associated documents, correspondence and specifications, prepared as part of the permit application process. While these documents are not included as attachments, pertinent sections are reproduced as appropriate.~~

Basis of design and design criteria information is included only to the extent necessary for conveying intended capacity and operating ranges, enabling the comparison of performance to design intent, and guide evaluation of whether design modification is necessary. For more information on detailed design, the reader is referred to the "Technical Assessment for Authorization to Discharge Waste" (TAR), the current mine plan, and the on-site file of as-built records.

*1.5 EPM/OMS **Updates** and Change Management*

The EPM/OMS is prepared to the best of the author's, reviewer's and approver's knowledge at the time of writing. Except as noted, the EPM/OMS is a "living" document that ~~will be~~is modified as required to reflect advancement of design and refinement of operation methods, as well as changing regulatory requirements and environmental conditions.

As a condition of the permit, the EPM ~~will be~~/OMS is reviewed at least annually to reflect such changes. Annual reviews and submission of revisions are due to Province on March 31st of each year.

~~The modular structure of the document will allow revisions to be easily distributed to plan holders for incorporation into a previously distributed version of the EPM (e.g., page numbering changes for a particular component of the EPM will not affect page numbering in other parts of the EPM).~~

Additional review, revision and submission to the Province may be taken at any time on the direction of the SIRM Operations Manager.

Revision history and approvals for the current revision are presented before the Table of Contents.

2 RISK IDENTIFICATION AND PRIORITIZATION

~~The risks evaluated within the design of the Facility included all potential sources, pathways and receptors as summarized in the table below.~~

~~**Summary of Risk Identification**~~

~~Source~~	~~Pathways~~	~~Receptors~~
~~Contaminated Soil~~ ~~Contact Water~~ ~~Non-Contact Water~~	~~Surface Water, Groundwater, Air~~	~~Humans, Ecological Environment~~

Site risks are broadly categorized into two groups: (A) risks specific to the handling and encapsulation of contaminated soil and ash; and (B) risks normally associated with operation of a quarry. Both are discussed below.

2.1 Risks Related to Contaminated Soil and Ash

The potential for contaminated soil or ash to impact human and/or ecological receptors requires a pathway for ~~the~~ contaminants to reach ~~to the receptor.~~receptors. The ~~Facility~~Site was designed to eliminate potential pathways ~~and requisite monitoring~~ , which eliminates the risk. Monitoring and inspection programs are ~~designed~~required to confirm that the ~~Facility~~Site design and operations are effective at eliminating ~~all off-Site pathways~~exposure pathways; quality assurance and maintenance programs are required to ensure that works are as designed and approved, and that they will continue to function as intended.

~~As a result of the above, the potential risks associated with the Facility can be prioritized and managed according to most likely pathways.~~ The prioritization of ~~the risks is somewhat subjective and may include a number of~~ risks if pathways were somehow activated and contingency measures not taken is subjective. It requires comparing speculative low-probability scenarios, for example, where design and monitoring simultaneously fail, where deliberate vandalism occurs, or where improbable natural disasters impinge.

Based on factors ~~including the~~such as rate of contaminant migration, ~~available dilution,~~ remedial alternatives, response time available, toxicity to ~~receptor and others. Upon consideration of the risks, the~~receptors and attenuation along the pathway before contact with a receptor, prioritization is considered to be as follows:

1. Surface water impacts (transport of particulate and dissolved-phase contaminants in surface water)
2. Groundwater impacts (transport of dissolved-phase contaminants in groundwater)

3. Air quality impacts (transport of particulate/dust and volatile contaminants in air, including odours).

The potential for surface water impacts is considered to be the highest priority as a result of the potential for direct contact of precipitation ~~to~~with contaminated soil (resulting in ~~'~~"contact~~-water') and~~ water") and the potential for sedimentation associated with diverted overland runoff (resulting in ~~'~~"non-contact ~~water').~~ water").

The volume of water requiring management and treatment, and the anticipated rate of migration ~~is expected to~~will vary seasonally and in relation to storm events. The ~~facility has therefore~~site design considered a 1:200 year storm event and anticipated a worst-case scenario whereby such an event also results in a near-instantaneous snow melt. ~~Also, the facility design plan includes provisions~~However, site procedures include cover requirements for trucks, piles and active cell faces. Moreover, a permanent roof~~-structure to~~ will be installed ~~over~~on the SMA~~ in the medium-term.~~.

Potential groundwater impacts are considered to be the second highest priority. Although damage to the groundwater resource could have significant impacts, the risk is mitigated ~~largely~~ by~~ the~~ natural geological and hydrogeological conditions at the Site~~,~~ in addition to ~~the~~ engineered controls~~ including liners~~.

Impacts to groundwater would require simultaneous failure of multiple levels of physical and procedural control. For example, for significant groundwater impacts related to an encapsulation cell to impact off-site receptors, the following safeguards must be breached:

- The final (graded) revegetation cap
- The geomembrane cap
- Quality assurance procedures to bar placement of leachate toxic materials
- The leachate collection ~~mechanisms.~~ layer
- The geomembrane bottom liner
- The leachate detection liner under the geomembrane
- The compacted clay layer under the liner leachate detection layer
- Leachate detection at the bedrock interface
- On the order of 75 metres of relatively impermeable bedrock
- An upwards hydraulic gradient
- Natural attenuation along the flowpath to the receptor

The potential for air quality impacts is considered to lowest priority, based on the temporal (temporary) nature, ease of management~~, dilution~~ (slowing/limiting soil disturbance, tarps, mists, sprays and foams), rapid attenuation with distance from the point of release, and the lack of nearby receptors. Essentially, the air risks are similar to, but lower (because of distances to receptors such as residences), than similar air risks routinely managed at contaminated soil excavations throughout the province.

~~The following section defines the controls and audits used to ensure the risks are being appropriately managed.~~

2.2 Risks Related to Quarry Operations

Risks related to routine quarry operations fall into two general categories: risks to workers in the quarry, and risks to human and ecological health outside the quarry. With regard to the former, the site is managed under SIRM's health and safety program (maintained under separate cover), which seeks to exceed the requirements of both the BC Occupational Health and Safety Regulation (the "OHS reg") and the Health, Safety and Reclamation Code for Mines in British Columbia (the "HSRC" or simply "Code"). In addition, the site has established a management-worker Occupational Health & Safety Committee (OHSC), dedicated to continuously improving worker health and safety. Worker health and safety are not considered further herein.

Risks to human and ecological health outside the quarry are conceptualized as follows, based on experience and on the "Aggregate Operators Best Management Practices Handbook for British Columbia" (Ministry of Energy, Mines and Petroleum Resources, 2002):

Item	Issue(s)	Existing Mitigation	Existing Relative Risk
Noise	Noise from equipment operations, loading and transportation.	• Berm • Buffer Zones • Hours of operation (generally 7 to 5 weekdays; drilling restricted to 8 to 4 weekdays)	Low
Dust	Dust from exposed soils, traffic and processing	• Distance to receptors • Sprinklers • Tarps and Covers • Wheel wash • Paving	Low
Traffic	Heavy truck traffic into/from the facility	• Hours of operation • Limited production tonnage • Facility terms of service restrictions on trucker conduct • Trucker orientations	Low
Viewscapes	Changes to landscape	• Berm • Buffer areas • Revegetation • Housekeeping and maintenance	Moderate
Stormwater	Increased erosion and siltation; pollution	• Buffer zones and Conservation Easement • Housekeeping and maintenance • Ditches, bioswales, checkdams, gravel filters and retention/stilling basins • Designated (controlled) equipment maintenance areas	High

		• Paved areas around wheel wash sloping to wheel wash catch basin • Spill (emergency) response plan and spill kits • Settling Pond • Revegetation of disturbed areas • Gravelled parking lot • Facility terms of service restrictions on truck condition/trucker conduct	
Groundwater	Reduced filtering capacity; altered recharge rates; lowering of groundwater table; contamination	• Massive, low permeability bedrock • No pit groundwater dewatering necessary (dry pit) • Designated (controlled) equipment maintenance areas • Spill (emergency) response plan and spill kits	Low
Acid Rock Drainage	Increased acidity	• Test results show rock is not acid generating.	Low

Based on the above risk identification, risk prioritization and management is as follows:

Item	Relative Prioritization & Related Action(s)
Noise	Low – no specific additional measures in the absence of triggering event.
Dust	Low – no specific additional measures in the absence of triggering event.
Traffic	Low – no specific additional measures in the absence of triggering event.
Viewscapes	Low – no specific additional measures in the absence of triggering event.
Stormwater	High – integrate general quarry stormwater management with contaminated soil/ash surface water monitoring program.
Groundwater	Low – no specific additional measures in the absence of triggering event
Acid Rock Drainage	Low – no specific additional measures in the absence of triggering event

3 ADMINISTRATIVE AND ENGINEERING CONTROLS

In order to frame the EPM/OMS within the context of an Environmental Management System (EMS~~,~~), the following table ~~is provided to present~~presents the prioritized risks ~~and~~ from the preceding section, their associated controls ~~and audits. The risks are managed through implementation of the plans described in the EPM that specify the controls used to mitigate the risks of impacting the environment. Details of the auditing (i.e.~~or monitoring~~, inspections, sampling, etc.) to be performed are also provided within the EPM.~~/surveillance, and related audit mechanisms.

Summary of EMS Framework within EPM/OMS

Prioritized Risk	Controls	Audits
Surface Water Impacts	**Soil Acceptance Plan**: Only non-leachable soils accepted to ~~Facility~~Site, confirmed via laboratory data review and soil sampling in accordance with MOE Guidelines.	Quarterly and Annual Reporting, Internal and External EMS Audits, Advisory Committee Recommendations
	Water Management Plan: ~~Discharge~~Collection, treatment and monitoring of contact water; collection and monitoring (with ability to treat) of non-contact water from adjacent areas (active site). Combined discharge from active site only occurs at one location, allowing for simplified control/~~management/monitoring, diversion of non-contact waters, surface water and leachate collection system, settling pond, water treatment plant~~intervention.	
	Environmental Monitoring Plan: Routine inspection and monitoring of surface water quality to confirm no impacts are occurring.	
Groundwater Impacts	**Bedrock Integrity Inspections**: Bedrock underlying proposed cells is ~~required to be~~ inspected prior to construction. Identified fractures ~~may require~~ are subject to risk mitigation prior to construction.	~~Inspections~~Inspection/reporting required prior to the construction of each new cell
	Soil Acceptance Plan: Only non-leachable soils accepted to ~~Facility~~Site, confirmed via laboratory data review and soil sampling in accordance with MOE Guidelines.	Quarterly and Annual Reporting, Internal and External EMS Audits, Advisory Committee Recommendations, Inspection/reporting required prior to the construction of each new cell
	Environmental Monitoring Plan: Routine inspection and monitoring of groundwater quality to confirm no impacts are occurring.	
	~~Facility~~Site Design and Natural Setting: Both compacted natural clay till and synthetic liners/landfill geomembranes are utilized ~~in design~~ for ~~additional protection, shallow~~contaminated soil isolation; bedrock ~~is~~comprises a very low-permeability aquitard~~,~~; bedrock inspection and risk assessment is conducted prior to cell construction~~,~~; construction includes QA/QC ~~measures.~~with	

	qualified professional oversight and reporting to the Province.	
Air Quality Impacts	**Environmental Monitoring Plan:** Routine monitoring of air quality~~.~~ during soil treatment or as triggered by site observations.	Quarterly and Annual Reporting, Internal and External EMS Audits, Advisory Committee Recommendations
	~~**Facility**~~**Site Operational Procedures**: Soil covered when not actively being worked/relocated, soil worked only during suitable climatic conditions, routine monitoring of climatic conditions including wind and precipitation.	

The above table links the risks associated with the ~~Facility~~Site to the ~~controls~~"Controls" that are detailed within the EPM~~, largely in the form of~~/OMS. The related plans ~~pertaining to specific aspects of the Facility and operations. The primary plans that form~~forming subsections ~~of~~with the EPM ~~include the following~~/OMS are as follows:

- Soil Acceptance Plan (Section 6);
- Water Management Plan (Section 7);
- Sediment and Erosion Control Measures (Section 7);
- Environmental Monitoring Plan (Section 8); and,
- Emergency Response Plan (Section ~~8 and Appendix H~~9).

In addition to the above plans, the EPM/OMS details all other procedural aspects of the ~~Facility~~Site including:

- Roles and Responsibilities of ~~Facility~~Site Personnel (Section 4);
- Training Requirements for ~~Facility~~Site Personnel (Section 5);
- ~~Details of Facility~~Site Construction~~ (Section 10);~~
- , Construction QA/QC and As-Builts~~; and,~~ (Section 10);
- ~~Facility~~Site Operation, Inspection and Maintenance Procedures (Section 11).

4 ROLES AND RESPONSIBILITIES

~~Facility~~ Staff includes ~~on-Site~~ both core staff and personnel ~~and off-Site~~ who come to the site on an as-needed basis for oversight and specialty work (technical ~~support.~~specialists). The roles and responsibilities for both ~~the on-~~core staff and ~~off-Site personnel~~technical specialists are described below. ~~In addition, some staff members are complementary to both~~

4.1 Core Staff

Core Staff include the ~~Facility operations and the ongoing aggregate mining at the Site. For example, the weigh scale staff will track all incoming trucks, both in relation to the Aggregate Operations and the Facility.~~following key roles:

~~*4.1 On-Site Personnel*~~

- ~~On-Site staff, dedicated to the Facility operations, includes one Operations Manager and one~~Environmental Technician~~.~~
- Scale Operator
- Shiftboss
- Operations Manager
- Mine Manager
- General Staff

Key ~~roles and~~ responsibilities associated with each position are as follows:

- ~~Operations Manager:~~
    - ~~Confirm appropriate Waste Approval Applications have been submitted and reviewed and approved by a Qualified Professional;~~
    - ~~Liaise with Generator Site personnel and issue site-specific Soil Arrival Form;~~
- Environmental Technician
    - Conduct and document site orientations for visitors, contractors and staff
    - Receive ~~incoming trucks and~~ completed Soil Arrival Forms~~;~~, verifying valid Waste Approval numbers
    - Assess incoming trucks for consistency with the relevant Waste Approval
    - Direct and observe unloading and consolidation at the SMA or encapsulation cell
    - Collect soil samples at SMA or encapsulation cell according to the Soil Acceptance Plan
    - Collect air samples according to the Environmental Monitoring Plan

- Collect water samples according to the Environmental Monitoring Plan~~Track~~
- Direct and inspect the covering of soil as required based on operations and precipitation
- Conduct visual and olfactory monitoring for visible dust emissions and~~ input~~/or objectionable odours at the property boundary
- Reconcile Waste Approval numbers, Soil Arrival Form numbers, and scale ticket numbers under unique tracking IDs (as per the Soil Acceptance Plan)
- Track weights received from weigh scale operator and provide daily totals to ~~Generator Site personnel;~~Operations Manager
- Document and demarcate soil in the Soil Management Area on a daily basis~~;~~
- Document soil placed in encapsulation cells on a daily basis
- Complete daily log documenting soil source(s), locations and status ~~; and,~~
- Conduct and document routine inspections of infrastructure including the SMA, Containment Pond, Water Treatment System, Water Treatment System Discharge, Settling Pond, Settling Pond Discharge, Leachate Detection Ports; Leak Detection Ports, ancillary equipment, catch basins, clean-outs and appurtenances.
- Routinely assess site works and procedures, promptly bringing potential improvements in health, safety, security and/or environmental performance to the attention of the Mine Manager.

- Scale Operator
  - Receive incoming trucks and monitor outgoing trucks, including:
    - Conducting driver orientations
    - Verifying truck information and compliance with site terms of service
    - Taking truck weights and tares
    - Monitoring truck arrival and departure, keeping track of all haul trucks within site boundaries
    - Verifying that incoming trucks are clean and have secured loads
    - Verifying that outbound trucks from the SMA have passed through the wheel wash and self-inspected to ensure that loose soil has been removed
    - Verifying that all outbound trucks are clean and have secured loads (if applicable)
    - Liaising with generating and receiving sites to schedule truck arrival/departure;
    - Printing truck and site copies of scale tickets

        - Collecting Soil Arrival Forms and verifying that such are filled out fully and completely, including designation of a valid Waste Approval number
    - Maintain the site sign-in/sign out sheet (mine tally)
    - Routinely assess site works and procedures, promptly bringing potential improvements in health, safety, security and/or environmental performance to the attention of the Mine Manager.
- Shiftboss
    - Carry out all duties associated with an Open Pit Shift Boss as per the *Mines Act* and Code
    - Supervise workers in the pit
    - Monitor works, traffic, water and other pertinent site features, promptly alerting the Environmental Technician of any unusual observations, high risk conditions, near misses, conditions that might lead to contravention permit or EPM/OMS requirements, or any known or suspected non-compliances with respect to permits, law or regulation
    - Routinely assess site works and procedures, promptly bringing potential improvements in health, safety, security and/or environmental performance to the attention of the Mine Manager.
- Operations Manager
    - Verify Environmental Technician and Scale Operator completion of routine duties
    - Schedule routine flow-triggered, event-triggered, daily, weekly, monthly, quarterly and bi-annual monitoring events
    - Ensure that required environmental logs and records are maintained on-site for Provincial inspection
    - Confirm appropriate Waste Approval Applications have been submitted to, reviewed by and approved by a Qualified Environmental Professional
    - Complete monthly, quarterly and annual reports related to soil quantity and quality tracking for Qualified Environmental Professional input and review~~.~~
    - Review permitted capacity and approve any quotes/offers to accept suitable waste soils
    - Document and report instances of non-compliance in accordance with permit requirements and as outlined in the Emergency Response Plan~~.~~/Mine Emergency Response Plan
- ~~Technician~~
    - ~~Direct unloading and consolidation at the SMA;~~

- ~~Collect soil samples at SMA according to the Soil Acceptance Plan;~~
- ~~Collect air samples according to~~Routinely assess site works and procedures, promptly bringing potential improvements in health, safety, security and/or environmental performance to the attention of the Mine Manager
- Liaise with the ~~Environmental~~Advisory Committee established under MOE Permit PR-105809

- Mine Manager
  - Carry out designated responsibilities under the Mines Act and Code
  - Retain a current roster of site personnel, clearly identifying the staff carrying out each role identified in the EPM/OMS
  - Carry out designated responsibilities under the Site Mine Permit, including but not limited to:
    - Maintain copies of Blast Logs, Electronic Monitoring ~~Plan;~~Reports, blast videos and geotechnical/compaction quality assurance/quality control testing results and inspection logs for waste material in encapsulation cells
    - Notify the Inspector of Mines, and residents within 1 km from the centre of the quarry[1], 24 hours before to create a scheduled window, not more than 1.5 hours long, for any blasting.
  - Forward, to the Inspector of Mines, certified as-built records,~~Collect water samples according to the Environmental Monitoring Plan;~~
  - ~~Cover soil as required based on operations and precipitation; and,~~
    - ~~Conduct daily inspections of all infrastructure~~ including ~~the SMA,~~records for encapsulation cell liner construction prior to waste soil/ash placement, and compaction records for each subsequent 1 meter lift of waste soil/ash fill in
    - Forward, to the Inspector of Mines, a construction QA/QC report within 30 days of completing encapsulation cell construction
    - Forward to the Inspector of Mines an updated mine plan on a quarterly basis.
    - Provide the Inspector of Mines an annual report identifying the volume of water through the Water Treatment ~~Facility, swales~~System, including all operating costs associated with the operation and ~~diversions,~~maintenance of the treatment plant

[1] 48°33'06.2"N,123°36'23.4"W

- Forward, to the Inspector of Mines, a copy of the report submitted to the Ministry of Finance in relation to the annual Health and ~~all piping, catch basins, cleanouts, etc.~~ Safety Assessment and the related data on annual production
- ~~Both Facility~~Direct and verify compliance with mining procedures and plans beyond the scope of the EPM/OMS, including specific procedures for blasting within 3 m of the buffer zone and the approved plan to comply with Part 8 Section 8.7.1 to 8.7.4 of the Code
- Schedule truck traffic such that trucks do not conflict with school bus pick-up and drop-off
- Maintain an Occupational Health and Safety Committee
- Forward copies of licensed land survey of any row of holes blasted within 10 metres of the boundary with CVRD property to the Inspector of Mines within one week of the subject blast

General staff ~~may also be~~are utilized to operate equipment such as excavators, rock trucks, graders, rollers, street sweepers, and front end loaders in order to move, consolidate and manage soil ~~according to a pre-established plan.~~and rock. During periods of significant waste soil inputs, and when receiving soil from more than one source site concurrently, additional staff members may be employed on a temporary basis to ensure that soils from different source sites are appropriately segregated and stockpiled. ~~These temporary~~General staff ~~will~~ work under the direct supervision of the ~~dedicated Facility staff.~~Environmental Technician for activities related to waste soil receipt, management and encapsulation, and under the direct supervision of the shiftboss when in the pit.

~~4.2 Off-Site Personnel~~

4.2 ~~In addition to Facility staff, a~~Technical Specialists

A variety of specialists are employed on an as-needed basis by the Mine Manager and the Operations Manager. They attend site on an as-needed basis.

These specialists include contract blasters, electricians, liner installation experts and water treatment experts.

Registered Qualified Professionals are retained to oversee, check, audit, and certify operations and/or works within their specific fields of expertise and accreditation. For example, registered professional biologists direct/supervise ecological impact assessment; a professional engineer stamps electrical designs, etc.

All permit works, plans, bedrock integrity and risk assessment, assessments, sampling, monitoring, investigations and reports, surveys, programs and reports must be conducted and certified by Qualified Professionals.

Two such Qualified Persons have substantial, continuing roles:

- The site Qualified Environmental Professional (QEP) ~~will be retained to oversee landfill~~oversees operations related to contaminated materials operations under MOE Permit PR-105809; and ~~provide general, technical oversight~~
- The site Qualified Professional Engineer (QPE) oversees operations related to ground engineering work as specified in MEMPR Permit Q-8-094, and ~~input. In addition, the QEP will be responsible for~~related to bedrock integrity inspection and risk assessment under MOE Permit PR-105809.

4.2.1 Qualified Environmental Professional

The site Qualified Environmental Professional's responsibilities include the following~~ tasks:~~:

- ~~Undertake bedrock integrity inspections prior to cell construction;~~
- ~~Undertake regular inspections during construction of the SMA, PEA, Sediment Pond, and associated infrastructure and facilities;~~
- Prepare/approve any changes to the approved Soil Acceptance Plan (a subsection of this EPM/OMS), and verify that MOE is approval obtained prior to implementing any substantive changes
- Determine contaminants of concern for chemical analysis of environmental media
- Oversee sample collection and analysis
- Supervise/approve the re-characterization of any soils suspected as being unacceptable
- Designate/verify off-site disposal of any unacceptable soils at an appropriate off-site disposal site within 30 days of delivery
- Review soil quality data from proposed receiving sites (Generator Sites) in relation to the permit requirements~~;~~
- Review Quality Assurance sample results ~~in relation to Generator soil data results;~~
- Review data collected specific to the Environmental Monitoring Plan (groundwater~~ and~~, surface water~~);~~, and, as applicable, air)
- Oversee the preparation of, and ~~sign off on~~review/approve, Quarterly and Annual Reports in accordance with Permit requirements including requirements for data, interpretations, conclusions and recommendations~~.~~

4.2.2 Qualified Professional Engineer

The site Qualified Professional Engineer's responsibilities include the following:

- Undertake bedrock integrity inspection and risk assessments, and submit a report on such to the province, prior to construction of any encapsulation cell
- Prior to receiving fill in any encapsulation cell, provide a signed as-built of work completed to date to both the Inspector of Mines and MOE, including a statement that the construction meets the standards of both MOE Permit PR-105809 and MEMPR Permit Q-8-094
- Undertake an annual inspection of waste storage and submit a report to the Inspector of Mines by March 31 of the year following the inspection
- Supervise site construction
- Review rock cuts and slope design, evaluating the need for scaling and/or stabilization for worker safety
- Review site conditions and monitoring results regularly and recommend, as necessary, additional instrumentation, monitoring frequencies, thresholds and response procedures related to stability

5 TRAINING AND COMPETENCY REQUIREMENTS

~~5.1 On-Site Personnel~~

All ~~on-Site~~ personnel ~~(Operations Manager and Technicians)~~ are required to complete ~~the necessary~~a site orientation, refreshed at least annually, which includes a site health and safety orientation, an overview of permits, hours of operation, the meanings of property line and buffer markings and an overview of emergency response procedures. They must comply with SIRM's health and safety program, which includes minimum training standards with respect to conventional quarry activities.

Competency in ~~order to have~~ emergency response is demonstrated as a team, in periodic exercises. Additional training requirements and required demonstrations of competence are role-dependent, as described in the following sub-sections. Copies of training records are retained on site.

5.1 Core Staff

Core Staff have specific training and competency ~~in the following:~~requirements related to their designations under law and regulation. For example, shiftbosses are evaluated and tested by MEMPR.

~~Site specific Health and Safety Plan including~~ Additional training and competencies related to the EPM/OMS depend on role and are as presented in a training matrix, below.

For the purposes of the matrix, training requirements are as follows:

- OFA1+T - Transportation Endorsement for Level 1 First Aid~~;~~
- ~~Site specific~~ ERP - Emergency Response Plan~~;~~/Mine Emergency Response Plan
- ~~Standard procedures and operation of technical instrumentation for monitoring and sampling soil, water and air; and,~~
- ~~Standard~~ TDG - Transportation of Dangerous Goods
- PACWEIGH – Scale Software, Weighing, Taring and Scale Ticket Generation
- ICS - Incident Command Systems Level 100
- ENVIRO - Environmental Sample Collection and Analysis as per the EPM/OMS, BC MOE Technical Guidance for Contaminated Sites, as well as the British Columbia Field Sampling Manual (2013)
- HAZWOP - 24 Hour HAZWOPER (Hazardous Waste Operations and Emergency Response Standard)
- EQUIP - Equipment-specific procedures for ~~Facility operations including soil acceptance and tracking, water treatment, and routine~~ the maintenance ~~of infrastructure.~~

- ~~In addition, all on-Site Personnel are required~~, calibration, use, decontamination and record keeping related to ~~have a thorough understanding of the Permit conditions and requirements, including operational and reporting provisions. A training module, specific to the Permit will be developed and delivered to all on-Site Personnel which will consider the technical and legal provisions of the Permit, as founded in the TAR, CSR and HWR.~~ field instrumentation, such as water quality and air monitoring instruments.

~~5.2 Off-Site Personnel~~

- ~~Off-Site personnel include~~ EPM/OMS - An overview of the EPM/OMS, and requirements of the EPM/OMS specific to relevant roles
- PERMIT/REG - The EPM/OMS in detail, site permits, the Technical Assessment Report, the Contaminated Sites Regulation, the Hazardous Waste Regulation, the Mines Act and Code, the and related law and regulation.

Role	OFA1+T	ERP	TDG	PACWEIGH	ICS	ENVIRO	HAZWOP	EQUIP	EPM/OMS Overview	PERMIT/REG
Environmental Technician		•	•	•		•	•	•	•	•
Scale Operator		•	•	•					•	
Shiftboss	•	•							•	
Operations Manager		•	•	•	•	•	•	•	•	•
Mine Manager	•	•		•	•				•	•

With the concurrence of the Operations Manager, the Mine Manager may designate staff into roles on a provisional basis, under enhanced supervision, as they complete additional training in a timely manner.

Competency is demonstrated by fulfilling the training course requirements to demonstrate competency, and by performance under the supervision of the Operations Manager or Mine Manager.

5.2 Technical Specialists

A wide range of specialists are involved with the ~~Facility~~Site operations and attend site on an as-needed basis. These specialists will include engineers, geologists and ~~synthetic~~ liner installation experts.

These personnel will be required to demonstrate competency as appropriate for the specific discipline/expertise including both technical and regulatory competencies. Outlining training requirements for the ~~Facility~~Technical Specialists is beyond the scope of this document.

6 SOIL ACCEPTANCE PLAN

The following sub-sections outline the process for receiving and tracking imported soils.

These sub-sections relate directly to Section 2.2 (Screening and Acceptance of Soil) in MOE Permit PR-105809; no changes may be made to the substantive requirements of this Soil Acceptance Plan without the prior approval of MOE.

Modifications of "example" procedures or forms, general references and matters of format or diction are submitted to MOE in the form of a revised EPM/OMS as soon as practicable (and not less often than annually).

6.1 Waste Approval Application

Prior to receipt of any contaminated soils, a Waste Approval Application will be completed by the Generator (or the QEP representative of the Generator). The Waste Approval Application will include generator site details including land use and land use history, and waste characterization information. An example of a "WAA" with examples of supporting documents is included as Appendix ~~B~~C.

Waste characterization details will include: nature of contamination, physical soil descriptions, soil moisture content, list of Potential Contaminants of Concern (PCOCs), maximum identified contaminant concentrations, and estimated soil quantity.

The Waste Approval Application must be accompanied by analytical results from a CALA (Canadian Association for Laboratory Accreditation) accredited laboratory. To ensure that no soil is received with contaminant concentrations in excess of the standards outlined in the Permit, the ~~facility~~site will require the following analytical information~~:~~ (see the example "Terms of Service" accompanying the WAA in Appendix C):

- For soils containing concentrations of LEPH and/or HEPH in excess of the CSR IL standards, the ~~facility~~site requires analysis of PAHs to ensure the PAH Toxicity Equivalent (TEQ) does not exceed that outlined in Schedule 1.1 of the HWR.
- For soils containing concentrations of metals with the potential to produce leachate as determined by the "rule of 20", the ~~facility~~site requires Toxicity Characteristic Leaching Procedure (TCLP) analysis.
- For soils containing any substances potentially classified as Hazardous Waste, appropriate laboratory analytical data is required by the ~~Facility~~Site to confirm no concentrations exceed the HRW standards.

- For soils potentially containing dioxins and/or furans, laboratory analysis must be conducted utilizing a method acceptable to the Director.

The “rule of 20” is used to determine whether it is theoretically possible to produce leachate from a contaminated soil sample, thereby providing the trigger for TCLP analyses. The “rule of 20” simply converts the concentration of an analyte in soil (mg/kg) to a theoretical maximum leachate concentration in water (mg/L) by dividing the soil concentration by 20. The theoretical maximum leachate concentration is then compared to the leachate quality standards. If the theoretical leachate concentration exceeds, then TCLP analyses will be conducted to determine the actual expected leachate concentrations from the particular material. The division factor of 20 reflects the ratio of extraction fluid to solid used in the TCLP analysis. Therefore, this is a conservative screening tool as the “rule of 20” assumes that 100% of the contaminant is leached from the soil which is highly atypical.

The Waste Approval Application and analytical information will be reviewed by the ~~facility QEP~~site Qualified Environmental Professional prior to acceptance of any soil.

Prior to accepting soil, the physical properties of the soil will also be considered in terms of geotechnical suitability. For soils which are determined to be likely problematic (i.e. high moisture content, compressible, entrained debris, etc.), a project-specific geotechnical plan will be prepared and implemented. This will include establishing an acceptable range of physical properties, criteria for measuring physical properties, and a plan for ensuring the soil is rendered acceptable for placement and compaction.

6.2 Soil Receiving and Verification

Contaminated soils entering the ~~Facility~~Site will be managed according to the types and concentrations of contaminants, and the level of characterization undertaken at the Generator Site. If soils have been adequately characterized and do not demonstrate a risk of containing hazardous waste, the soils may be directly deposited into a permanent containment Cell. Soils requiring further characterization or suspected of containing hazardous waste will be deposited in the SMA. The SMA may also be utilized for the temporary storage of soil as needed, conceivably to avoid exposure to inclement weather or to allow for preparation of a cell within the Permanent Encapsulation Area (PEA).

An area of the SMA will be designated at all times to facilitate temporary stockpiling of suspect soil. This area is referred to as the Soil Handling Area (SHA). The SHA is demarcated using temporary fencing since its size is anticipated to fluctuate.

Upon deposit of the soil, ~~Facility~~Site staff will inspect the soils using field-screening techniques (visual/olfactory inspection, headspace vapour measurements using a portable gas meter) to determine whether there is an appreciable risk that actual soil quality differs from the information presented on the Waste Approval Application. As necessary, and in accordance with standard QA/QC protocols established below, soil samples will be collected and submitted to a Canadian Association for Laboratory Accreditation Inc. (CALA) accredited laboratory for analysis of applicable PCOCs.

Analysis will be performed if contaminant concentrations are suspected to exceed those detailed in the Waste Approval Application and compared to submitted analytical results. For example, analyses will be performed for LEPH/HEPH/PAHs if hydrocarbon contamination is suspected to exceed concentrations detailed in the Waste Approval Application, to determine whether concentrations of individual PAHs and/or PAH TEQ exceed the applicable HWR standards. Similarly, if metals concentrations are suspected to exceed those detailed in the Waste Approval Application, total metals and TCLP analysis will be performed to determine if potential leachate concentrations risk exceeding the applicable HWR standards.

6.3 Soil Acceptance

Soils will be accepted at the Site only once a Waste Approval Application has been submitted, reviewed and approved by the QEP, as outlined above. Once approved, the ~~facility~~site will provide the generator (or qualified professional representative) with Soil Arrival Forms. An example Soil Arrival Form is included in Appendix ~~C~~D. One Soil Arrival Form will accompany each soil load from the generator site to the ~~Facility~~Site. Soil Arrival Forms will include three areas of information, as follows:

- **Section A – Generator Information:** This section will be completed and signed by the generator or qualified professional representative. Section A information will include generator name and contact information, source site location and site contact details, and a description of soil characteristics and classification. The soil classification will be pre-determined by the ~~facility~~site during the Waste Approval Application review process.
- **Section B – Transporter Information:** This section will be completed and signed by the transporter (i.e. shipping company). Section B information will include transporter company name and contact details, driver name and contact details, truck number, vehicle license number, and an indication of the type of load (tandem truck, truck & pony trailer, truck & transfer trailer, etc.).
- **Section C – ~~Facility~~Site Information**: This section will be completed and signed by the ~~facility~~site staff upon receipt of the soil. This section will include the name and location of the receiving ~~facility~~site, and any additional pertinent details (i.e. condition of soil, debris observed, etc.). Upon receipt of the soil, ~~facility~~site staff will assign a unique code to each project (common to the Generator Site and contaminants), using the coding system described below.

All soil loads will be weighed and logged upon entry to the ~~Facility~~Site. At the close of each business day, a copy of the daily scale logs and Soil Arrival Forms will be provided to each generator to allow for a cross-check of load counts and total daily soil volumes. Hard copies of the daily weigh scale logs and Soil Arrival Forms will retained on-Site, and electronic backups of these documents will be stored in a secure off-Site location and updated weekly.

6.4 Soil Tracking

The soil deposit areas, including the SMA and PEA, will be equipped with facilities to demarcate and sign deposit zones for the truck traffic. Facilities will include delineators placed along three sides of each zone, and a movable sign-post with appropriate signage.

Prior to importing soil onto the Site, a tracking identification number will be assigned to each project and noted on the Soil Acceptance Form. The tracking ID will be unique to the source site and will include notations regarding the nature and level of contamination. An example tracking ID is as follows:

XXX-YY-ZZ

Where XXX will be a unique three digit code relating to the source site, YY will be a unique two digit code unique to the suspect contaminant level (i.e. IL+, RL+) and ZZ will be a unique two digit code unique to the nature of contamination (e.g. Hydrocarbons, Metals, etc.). This tracking ID will follow the soil through the remediation and disposal process.

Soils imported to either the SMA or PEA will be end-dumped into demarcated zones as directed by ~~Facility~~Site staff. Between shipments, soil will be moved and consolidated using a front-loader as required. The sub-areas will be established prior to shipment, following review and acceptance of the soil by the QEP.

At the end of each day, soils within the SMA and PEA will be covered as appropriate, and a standardized plan will be prepared mapping soils within the ~~Facility~~Site.

6.5 QA/QC for Incoming Soils

As outlined above, soils will be inspected by ~~facility~~site staff, field-screened, and, where there is a risk of actual soil quality differing from the soil quality presented on the Waste Approval Application, ~~facility~~site staff will collect soil samples and submit these samples for analyses of the applicable PCOCs.

If analytical results indicate that contaminant concentrations exceed HWR standards, the soil will be placed in the SHA for immediate characterization and off-Site disposal. Under these circumstances, no additional shipments will be accepted from the Generator Site.

If analytical results indicate that contaminant concentrations are significantly higher than indicated on the applicable Waste Approval Application, but still below HWR standards, then related soil stockpiles may be re-classified. The decision to require re-classification will be based on a review by the ~~facility~~site QEP and will depend on the degree and consequence of the analytical variability.

In addition, the ~~facility~~site will conduct routine QA/QC sampling, generally in accordance with MOE Document 1 (GD-1). Guidance Document 1 prescribes stockpile sizes for Suspect Waste Soil to be 150 m^3. This is approximately equivalent to 250 tonnes (assuming density of 1.7 tonnes/m^3). As such, the QA/QC sampling program will include:

- Collect one sample, comprised of a minimum of three aliquots, for the first 250 tonnes of any individual shipment (for any amount up to 250 tonnes);
- Collect an additional random sample (minimum three aliquots) representing soil exceeding 250 tonnes, but less than 1,000 tonnes for any individual shipment;

- Collect an additional random sample (minimum three aliquots) representing soil exceeding 1,000 tonnes; and,
- Collect one random sample for every additional 1,000 tonnes up to the maximum amount of the shipment.

Soil QA/QC Sampling Frequency

0-250 tonnes	250-1,000 tonnes	>1,000 tonnes
1 random sample	1 random sample	1 random sample per 1,000 tonnes

For example, on a shipment of 2,500 tonnes, one sample would represent the first 250 tonnes, a second sample would represent 250-1,000 tonnes, a third sample would represent 1,000-2,000 tonnes, and a fourth sample would represent 2,000-2,500 tonnes.

Sample results would be compared to pre-shipment data and soil classification provided by the Generator. If results indicate systematic soil characterization problems, all shipments would be halted until further characterization was undertaken by the Generator.

Soil tonnage would be recorded at the ~~facility~~site such that accurate quantities could be established for any given Generator. Soil quality data would be recorded and tracked against representative shipments. If soil density is observed vary significantly from the anticipated range of 1.5 to 1.8 tonnes/m^3 (based on anticipated tonnage for standard haulers), then on-Site density determination may be undertaken under the direction of the QEP. This may include filling ten, 5-gallon pails to capacity and determining an average weight to calculate density.

On a case-by-case basis, the QEP may consider an alternative QA/QC sampling plan. For example, smaller shipments of heterogeneous soil (such as fill) may be sampled more frequently, while larger shipments of homogeneous soil (such as dredgate) may be sampled less frequently. The frequency of sampling will also be dictated by relative correlation of the pre-and post-shipment data. Any deviation from the Permit requirements must be pre-approved by the Director.

6.6 Procedures for Removal of Unacceptable Soils

The ~~Facility~~Site will not knowingly accept any soils that exceed the standards outlined in the HWR. However, if during the soil receiving and verification process, or through random QA/QC soil sampling, it is determined that soil quality exceeds the applicable HWR standards, the generator will be contacted and the relevant soils will be transported to an appropriate licensed ~~facility~~site.

Given that all loads will be received by ~~Facility~~Site staff, and will be observed during unloading, no soils that are physically unsuitable for permanent encapsulation (e.g. due to high debris content or moisture in accordance with an established acceptance plan) will be permitted to unload. However, in the event that physically unsuitable soils are unloaded, no further material will be accepted from the generator site until the issue has been discussed with the generator or qualified professional, and safeguards have been established to ensure that all further material received from the generator site will be physically suitable.

Unsuitable materials will require temporary storage on Site in order to confirm soil quality, identify an appropriate disposal ~~facility~~site off-Site and arrange for the material to be transferred. During this temporary storage period, the unsuitable materials will be appropriately covered and relocated to a demarcated and dedicated zone within the SMA.

Soils classified as Hazardous Waste will be transported directly to an approved ~~facility~~site. Soils physically unsuitable will be transported directly to appropriate ~~facility~~site determined by the nature of the material.

7 WATER MANAGEMENT PLAN

The Water Management Plan for the ~~Facility is divided into~~Site includes the following ~~eight~~ components:

- ~~Diverted surface waters;~~
- Pit and active area run-off which was diverted from contact with contaminated soils
- Surface water from undisturbed and ancillary areas
- Soil Management Area run-off~~;~~
- ~~Permanent Encapsulation Area leak detection/collection system;~~
- Permanent Encapsulation Area leachate detection/collection system ~~;~~
- Permanent Encapsulation Area leak detection/collection system
- Permanent Encapsulation Area groundwater seepage~~;~~ system
- Water Treatment ~~Plant;~~System
- Water Treatment System Discharge
- Settling Pond~~; and~~
- ~~Point of~~Settling Pond Discharge~~.~~

The above components, along with a description of the design ~~storm event~~basis, are discussed in the following sections. ~~This is intended to be a high level plan.~~ Inspection and maintenance of the water management infrastructure is covered ~~below,~~ in Section 11.

7.1 Design Storm Event

The "worst case scenario" that was used to design the components of the water management system, included a melting snowpack during a 1/200 year rainfall event.

The 200-year storm event from the North Cowichan Rainfall Intensity Duration Frequency (IDF) curve was used along with a conservative time of concentration of 10 minutes producing a rainfall intensity of 50 mm/hr.

Due to the small size of the catchment, a conservative water equivalent depth method was chosen over degree day or temperature index melt equations to model the effect of snowmelt. This approach linked melt directly to rainfall, therefore, the resultant peak runoff from rainfall and snowmelt occurred simultaneously in the modeled output producing flows which are considered conservative estimates.

The existing Settling Ponds and runoff detention system for the Quarry Operation have been augmented to detain the runoff volume calculated for the ~~Facility~~Site combined with the quarry activities. Runoff volumes were initially based on a 200-year, 24-hour storm and modeled using the unitless Type 1A SCS hyetograph with all calculations confirmed using HydroCAD stormwater modeling software.

The average maximum snow depth for the region was derived from the Natural Resources Canada atlas (0 mm - 300 mm), a snowpack depth of 300mm (new snow) was assumed to have a water equivalent depth of 25mm or approximately 8% of the snow volume. The values for additional rainfall from snowmelt were added to the 200 year rainfall depths to provide a "worst case scenario" event which conservatively models complete melting of a 300 mm snow pack concurrently with a 24 hour 200 year rainfall event (SNOWPACK + 200). The resulting rainfall/melt depth is **181.4 mm**, and the unit hyetograph places the peak instantaneous intensity approximately 8 hours into the storm event.

*7.2 ~~Diverted~~Non-Contact **Surface** ~~Waters~~Water*

~~The~~Surface water in undeveloped and ancillary areas of the site, such as the vegetated areas on the backsides of the pit crest and abutting the conservation easement, as well as east of Shawnigan Creek, including the parking lot, is monitored and managed by reinforcement of existing drainage paths with stilling pools, gravel check dams, woody debris and similar features to prevent sedimentation and promote vegetation.

Active management of surface waters on the Site begins with diversion of waters ~~not incident to~~away from contaminated soil working areas in order to minimize the amount of water requiring monitoring for chemical quality and possible treatment. ~~This water is considered "non-contact" water.~~

~~All existing surface water flow pathways are diverted away from the SMA and PEA. In addition, surface swales have been constructed around the perimeters to divert any surface waters not incident to these areas. The surface water diversion works report directly to the settling pond.~~

~~The~~ Water within the active pit and in active working areas around the pit, is diverted away from the SMA and active encapsulation cells. This water is considered "non-contact" water. It is collected in the Settling Pond to remove sediment and allow verification of chemical quality.

Surface water ~~diversion works may require modifications~~management will be modified as the ~~facility develops in order to control the surface flows in conjunction~~pit grows and encapsulation areas are constructed. The basic strategy, however, will remain the same:

- Undisturbed and ancillary areas (such as the east side of Shawnigan Creek) will be protected and monitored to prevent sedimentation and minimize disturbance of natural stormwater flow and infiltration.
- To the degree feasible, surface water will be diverted around (and isolated from) contact with ~~site development.~~ contaminated soils in the SMA and encapsulation areas.
- Water diverted from contact (non-contact water) will be collected to the Settling Pond to remove sediment and allow observation and/or testing prior to discharge

*7.3 Contact Water: **Soil Management Area Run-off***

Precipitation incident to the SMA is collected within a ~~catchbasin~~catch basin via gravity flow across the paved asphalt surface. The ~~catchbasin~~catch basin water is piped to a ~~holding~~Containment Pond capable of storing up to 326.6 m^3 of water. The volume ~~is determined from~~was set based on the size of the uncovered, paved surface of the Soil Management Area (1,800 m^2) and the design 1 in 200 year storm event (181.4 mm).

~~The holding pond reports to the Water Treatment Plant reservoir. Water is actively pumped from the pond to the reservoir to maintain full storage capacity. The flow rates and volumes of water to be managed may be reduced by the construction of a permanent roof structure over all or part of the SMA at a later date.~~

A roof will be installed over the SMA prior to March 20, 2016. At time of writing, the roof installation is anticipated to be complete before the beginning of November, 2015, in advance of seasonal increases in precipitation.

Water in the Containment Pond is treated (must be treated, by permit) in the Water Treatment System before discharge.

Beneath the SMA liner is a leak detection system including a network of perforated piping sloped towards a single manhole/inspection port. This manhole/inspection port is piped to the main catchbasin for the SMA. It is expected that inspection port will be dry, but is in place to identify and collect any water that may pass through both the asphalt surface and the underlying synthetic liner.

7.4 Permanent Encapsulation Area Leachate Detection/Collection System

Each encapsulation cell has a drainage layer above the base liner, allowing encapsulated soils to drain (if needed). This serves as a leachate detection and collection system.

Despite temporary cover used when cells are not actively worked, precipitation that falls upon an active cell before permanent convert installation may generate contact water. This contact water is collected in the drainage layer. Very little water will result from soil dewatering; in the long-term, following cover installation, this system is anticipated to be dry

Accumulated water from encapsulation cell leachate detection/collection system is transferred to the Water Treatment System for treatment. An inspection port/manhole allows monitoring of flow/volume and for sample collection.

~~7.4~~7.5 Permanent Encapsulation Area Leak Detection/Collection System

~~The leak detection system~~Each cell constructed ~~beneath~~in the ~~PEA reports to the Water Treatment Plant reservoir. An inspection port/manhole allows for monitoring of flows and sample collection for any water that is collected by the leak detection system prior to reporting to the Water Treatment Plant reservoir.~~

~~This system is constructed beneath the~~ permanent encapsulation area (landfill area) includes a drainage layer under the 40 mil base liner~~ of the PEA, and~~ , above the compacted clay/till layer ~~placed over~~on the ~~final~~ bedrock surface. ~~As such,~~ If there were (a) leachate in the leachate collection layer above the liner; and (b) a defect in the liner, leachate would flow into the drainage layer above the compacted clay/till layer for detection and collection.

This system is expected to be dry~~, but is in place to identify and collect any water that may pass through the base liner.~~

~~7.5 Permanent Encapsulation Area Leachate Detection/Collection~~. *If water accumulated, it would be transferred to the Water Treatment System*

~~The Permanent Encapsulation Area leachate detection/collection system will report to the Water Treatment Plant reservoir.~~ for treatment. An inspection port/manhole allows monitoring of flow/volume and for ~~monitoring of flows and sample collection for any water that is collected by the leak detection system prior to reporting to the Water Treatment Plant reservoir~~sample collection.

~~The system has been constructed within the base of each cell, above the base liner, in order to allow the encapsulated soils to drain if/as needed. The majority of water anticipated to require management via this system is from precipitation that falls upon an active cell that has not been closed with a cover. Very little water will result from soil dewatering. In the long-term, this system is anticipated to be dry.~~

7.6 Permanent Encapsulation Area Groundwater Seepage System

The final rock surface at the base of the quarry consists of a layer of broken rock from blasting. This broken rock layer ~~has been~~is levelled off with crush gravel to prepare a surface for the clay/till liner. The broken rock layer and crush gravel will have significant permeability, and will act as a drainage blanket for any groundwater ~~seepage that may occur~~occurring between the compacted clay till layer and the bedrock, i.e., seepage from the base of the pit and from the sidewalls.

This groundwater seepage, if it occurs, will migrate through the subsurface to the ephemeral tributary to the west of the Site~~.~~ , i.e., to the area of the Settling Pond Discharge. Downgradient surface water monitoring allows determination of water quality.

If other site monitoring indicated a need at any time in the future, shallow interception trenches would be installed to intercept and collect this drainage.

7.7 Water Treatment ~~Plant~~System

The Water Treatment ~~Plant will~~System is fed from the Containment Pond, and can receive inputs from ~~three pathways:~~any of the following:

- Soil Management Area
- Permanent Encapsulation Area Leachate Collection System
- Permanent Encapsulation Area Leak Detection System
- ~~Permanent Encapsulation Area Leachate Collection System~~
- ~~All three inputs will report to a single reservoir that will feed the Water Treatment Plant. The~~Any other site water, such as water treatment system backwash, SMA washdown water,

truckwash water, or stormwater collected using vacuum trucks or sump pumps, designated by the Operations Manager or MOE for treatment

Water may be sampled in ~~the~~ holding ~~tank~~areas prior to treatment for potential contaminants of concern. If laboratory analytical testing indicates that the water in the holding ~~tank~~area is not impacted, the ~~tank will~~holding area may be discharged to the settling pond.

If the water quality is ~~impacted~~above discharge standards, the water will be processed through the treatment system and sampled post-treatment to confirm acceptable quality prior to discharge. ~~Alternatively, if water within the holding tank is not tested prior to treatment, it will be processed through the treatment system and tested prior to discharge to the settling pond. Analyses will be performed by a CAEL certified laboratory.~~

~~*7.81.1Settling Pond*~~

~~The requirements of the Settling Pond and Ancillary Discharge are described in Section 1.5 of the Permit. Details of the design are provided in Section 8.4 of the Technical Assessment Report.~~

~~The Settling Pond receives inputs from two pathways:~~

- ~~Diverted (non-contact) Surface Flows~~
- ~~Post Treatment Waters~~

~~The chemical quality of the water entering the Settling Pond has been confirmed and therefore the water quality objective for discharges~~ The authorised works in MOE Permit PR-105809 must be complete and in operation when discharging; the discharge (and point of sampling/compliance) must be as indicated on Figure A of the permit. Additional equipment, including activated alumina water treatment units, additional settling tanks, sand filters, influent batching tanks, equalization basins, effluent holding tanks and recycle lines for re-treating treated water may be used to ensure that discharges comply with permit standards and to improve effluent quality.

7.8 Settling Pond

~~from~~ The Settling Pond ~~only~~is fed from active site stormwater diversion and Water Treatment System effluent.

The authorised works in MOE Permit PR-105809 must be complete and in operation when discharging; the discharge (and point of sampling/compliance) must be as indicated on Figure A of the permit.

Stormwater from the pit must not bypass the pond, which includes ~~Total Suspended Solids (TSS).~~settling areas and gravel filters.

Settled solids, which have accumulated ~~on~~in the pond, will be removed as required to maintain a minimum water depth below the pond decant of 0.5 m. This material will be treated as suspect-~~Waste~~ waste soil, transferred to the SMA and characterized ~~according GD-1.~~ .

~~*7.9 Point of Discharge*~~

~~All managed waters ultimately discharge from the Site at a single location at the outlet of the Settling Pond. The outlet discharges to the existing natural surface water drainage pathway consisting of an ephemeral tributary on the west side of the property.~~

8 ENVIRONMENTAL MONITORING PLAN

The following Environmental Monitoring Plan (EMP) addresses on- and off-Site monitoring requirements~~, as stipulated by the Permit. Monitoring requirements are stipulated for all potentially impacted media including air, water (surface and ground) and soil. The following subsections describe monitoring locations, procedures and rationale associated with each potentially impacted media. Also described is how monitoring results are incorporated, and evaluated as part of the Facility EMS.~~ and their evaluation in the site EMS.

Sampling is carried out in accordance with the "British Columbia Field Sampling Manual"[2] or as authorized by MOE.

Samples for chemical analysis will be appropriately collected, filtered and preserved (as applicable), and shipped under Chain of Custody to a Canadian Association of Laboratory Accreditation (CALA) certified laboratory for analysis as per the "British Columbia Environmental Laboratory Manual"[3] or as directed by MOE. Sampling procedures are detailed Appendix E. Quality Assurance / Quality Control measures will include at least one duplicate sample for each parameter sampled for each monitoring period.

[2] BC Ministry of Water, Land and Air Protection (Now BC Ministry of Environment). 2003. British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples. January 2003. ISBN 0-7726-2741-X. 401 pp.
[3] BC Ministry of Environment. 2009. British Columbia Environmental Laboratory Manual. 2009 Edition. July 14, 2009.

8.1 Air Quality Monitoring

Air quality monitoring is required by permit during periods of mechanical soil aeration ~~(Permit Section 2.5).~~ for soil treatment. However, given ~~the current~~ a difference of interpretation with CVRD in regard to activities permitted by the F1 Zoning at the ~~Facility, bioremediation~~Site, **soil treatment, including aeration, is not planned**~~, other than what occurs incidentally as a result of aeration during routine movement including end-dumping, consolidation and stockpiling for~~ **or carried ou**t.

It is anticipated that there will be no vapour impacts at the ~~purposes~~down-wind property boundary resulting from site operations with the possible exception of periods of soil aeration, if such is ever conducted. Thr aeration process has the greatest potential to release significant vapours and cause impacts at the property boundary. As a result, real-time vapour monitoring will be conducted using a PID during soil movement activities, and soil movement will be immediately ceased if unacceptable readings are obtained. Initially, 100 ppb will be used as the threshold reading but may be subject to adjustment as site-specific vapour monitoring data is obtained and correlations established. In general, soil turning activities will not be undertaken on warm, dry days with moderate to high winds.

The established, prevailing wind directions at the Site is from the Northeast and Southwest. A residence is located approximately 300 m from the northeast boundary of the Site, representing the most sensitive receptor. As such, a sampling point has been established near the northeast property line. The air monitoring station is shown on Figure 1.

Section 3.5 of the Permit requires that monthly ambient air samples are collected during the active season for soil treatment (if applicable) at the down-wind property line using a Summa® Canister. Event-based ambient air samples are also required if and when soils with measurable volatile contaminant concentrations exceeding established thresholds are being managed at the SMA.

The Summa® Canister is regulated to collect an ambient air sample over a 24 hour period. Prior to, and immediately following, sample collection, wind speed and direction will be measured and recorded using a hand-held anemometer or by the on-site weather station. The suite of analytes will be pre-approved by a Qualified Professional. Sample collection methods are outlined in Appendix D. Results will be used to assess potential impacts and to determine whether procedural adjustments or mitigative measures are required. ~~characterization.~~

Air quality monitoring is also required as an ongoing operations measure. Section 2.9 of the Permit requires that there must be no objectionable hydrocarbon odour evident outside the property boundaries, and Section 2.10 of the Permit requires that fugitive dust must be suppressed and is not to exceed the BC Ambient Air Quality Residential Objective of 1.7 mg/(dm^2-day) over a two-week averaging period at the property boundary~~.~~

~~Section 3.5 of the Permit requires that monthly ambient air samples are collected during the active season (i.e. between April and November, inclusive) at the down-wind property line using a Summa® Canister. Ambient air samples are also required if and when soils with measurable~~

~~volatile contaminant concentrations exceeding established thresholds are being managed at the SMA.~~

using conventional dustfall jars. Sample collection and analysis for both parameters are event-driven, based on the day-to-day observations of the Environmental Technician.~~The established, prevailing wind directions at the Site is from the Northeast and Southwest. A residence is located approximately 300 m from the northeast boundary of the Site, representing the most sensitive receptor. As such, a sampling point has been established near the northeast property line. The air monitoring station is shown on Figure 1.~~

~~The Summa® Canister is regulated to collect an ambient air sample over a 24 hour period. Prior to, and immediately following, sample collection, wind speed and direction will be measured and recorded using a hand-held anemometer. The sample will be analyzed for a full suite of Volatile Organic Compounds, including Monoaeromatic Hydrocarbons (MAH), and Volatile Petroleum Hydrocarbons. The suite of analytes will be pre-approved by a Qualified Professional. Sample collection methods are outlined in Appendix D. Results will be used to assess potential impacts and to determine whether procedural adjustments or mitigative measures are required. Mitigative measures are briefly described as follows:~~

~~**Dust:** On-Site truck/equipment traffic and soil handling activities may result in localized fugitive dust (airborne soil particulate) emissions. These dust emissions are not expected to exceed any dust emissions currently generated by the on-Site mining operations. Given the size of the Site, distance to potential receptors, and given anticipated natural dispersion, the risk of fugitive dust impacting off-Site receptors is minimal.~~

~~Dust emissions are to be monitored and controlled through the following processes:~~

- ~~*When* dust is observed to be potentially migrating off-Site during dry/windy weather, dust suppression measures will be undertaken on high-traffic areas of the Site, as needed. Only environmentally acceptable dust suppressants or water will be used to suppress dust;~~
- ~~Fine-grained soils will be covered during transportation on-Site;~~
- ~~Fine-grained soil stockpiles will not be exposed for extended periods of time and will be covered as needed; and,~~
- ~~All soil import/handling activities will abide by any fugitive dust controls currently regulating the on-Site mining activities (as outlined in applicable regulations, by-laws and/or permits).~~

~~**Odours:** On-Site soil stockpiles, particularly hydrocarbon-contaminated soils being processed in the SMA, may at times generate hydrocarbon-like odours (volatile organic emissions). Given the size of the Site, distance to potential receptors, and expected natural dispersion, it is~~

~~anticipated that the risk of odours impacting these off-Site receptors is low. Odours are to be monitored using a hand-held PID.~~

If contaminant concentrations measured in the Summa® Canister sample collected from the down-wind property line are found to exceed the CSR Schedule 11 Column III RL standards, soils within the SMA will be covered with non-permeable polyethylene sheeting or a cap of non-hydrocarbon contaminated soils. Covering the soils will be adequate to suppress the vapour emissions from impacting down-wind receptors~~.~~, which will be verified by additional sample collection and analysis. Dust exceedances will trigger a review of dust suppression methods.

~~It is anticipated that there will be no vapour impacts at the down-wind property boundary resulting from the facility operations with the possible exception of periods of soil movement. This process has the greatest potential to release significant vapours and cause impacts at the property boundary. As a result, real-time vapour monitoring will be conducted using a PID during soil movement activities, and soil movement will be immediately ceased if unacceptable readings are obtained. Initially, 100 ppb will be used as the threshold reading but may be subject to adjustment as site-specific vapour monitoring data is obtained and correlations established. In general, soil turning activities will not be undertaken on warm, dry days with moderate to high winds.~~

~~**Noise:** On-Site truck/equipment traffic and soil handling activities may result in localized noise generation. However, these activities will occur simultaneously with on-Site mining work (blasting and aggregate removal) and therefore the additional noise generated from soil import/handling is considered negligible. When mining activities cease at the Site and soil import/handling continues, it is anticipated that the total noise generated will be significantly reduced.~~

~~All soil import/handling activities will abide by the same noise restrictions currently regulating the on-Site mining activities (as outlined in applicable regulations, by-laws and/or permits).~~

8.2 Effluent Water Monitoring

~~Effluent monitoring accounts for inputs from the following three on-Site~~Water effluent ~~sources:~~

1. ~~Potential leachate collected at the SMA;~~
2. ~~Any potential leachate collected by the Leachate Detection System from the PEA; and,~~
3. ~~Any potential leachate collected by the Leak Detection System from the PEA.~~

~~These inputs are shown schematically on the attached Figure 1. All three inputs are to be regularly monitored and sampled, prior to ultimate discharge to the environment,~~encompasses both contact water and active site non-contact water systems as follows:

Effluent Water Monitoring Program

~~Monitoring Location~~	~~Monitoring Frequency~~	~~Sampling Frequency~~
~~Catch Basins and Leak Detection Inspection Ports (SMA and PEA)~~	~~Visually inspected on weekly basis.~~	~~N/A~~

	~~Cleaned out as needed.~~	
~~Water Treatment System Holding Tank~~	~~Weekly~~	~~Monthly (or as generated)~~
~~Soil Management Area Reservoir~~	~~Weekly~~	~~Monthly~~
Monitoring Location	**Minimum Monitoring Frequency**	**Minimum Sampling Frequency**
Catch Basins and Leak Detection Inspection Ports (SMA and encapsulation areas)	Visually inspected on at least a weekly basis. Cleaned out as needed.	N/A
Water Treatment System Holding Tanks (When Applicable) and/or Containment Pond	Weekly	Monthly (or as generated)
Water Treatment System Outlet (WTS)	Weekly	Monthly and Every 2,000m^3 of Effluent Treated Effluent
Settling Pond Outlet (SW-1)	Weekly	Monthly and Every 2,000m^3 of Effluent Treated Effluent ~~Turbidity Assessed Bi-Weekly from November to April and After Events >1:10 year return*~~ Turbidity Assessed Bi-Weekly from November to April and After >1:10 year storm events*

*1:10 Year Return Event estimated based on 122mm of precipitation over a 24 hour period as measured at the on-Site rain gauge. Turbidity will be assessed using a *Hatch 2100Q Portable Turbidimeter* (or equivalent).

Monitoring at the Water Treatment System ~~Outlet (WTS)~~discharge includes recording the flow meter value and pH, and making any observations about the physical properties of the discharge (colour, odour, turbidity, etc.).

Monitoring at the Settling Pond Outlet (SW-1) includes measuring turbidity and recording observations about the discharge (estimated flow, colour, odour, etc.). In addition, the Settling Pond includes regular visual inspection to ensure ongoing competency and function (rip-rap integrity, requisite freeboard, accumulated sediment, ~~etc.).~~tension cracking or erosion of sidewalls, etc.).

Monitoring associated with ~~the~~ Leak Detection and Leachate Collection Systems ~~(SMA and PEA)~~ will occur at inline catch basins/inspection ports~~ with sealed lids, facilitating regular inspection and analysis~~, noting presence/absence of ~~any flows observed.~~ liquid, estimated flow, colour, odour, etc.

Samples will be collected as outlined below. An example Effluent Monitoring and Sampling Form is included as Appendix ~~F~~G.

Effluent samples are analyzed for ~~a suite~~all potential contaminants of ~~parameters~~concern as determined by the Qualified Environmental Professional~~. This~~ based on soil contaminants received at the facility, monitoring results to date and input from MOE. Analytes could include~~:~~ the following (cf. PR-105809, section 3.4 and 1.3.3):

- ~~Organics:~~ Metals~~LEPH/HEPH/PAH, VOC/VPH,~~
- BTEX (Benzene, Toluene, Ethybenzene and Xylenes)
- MTBE (Methyl Tert-Butyl Ether)
- VPH (Volatile Petroleum Hydrocarbons)
- LEPH/HEPH (Light Extractable Petroleum Hydrocarbons and Heavy Extractable Petroleum Hydrocarbons)
- PAHs (Polycyclic Aromatic Hydrocarbons)
- Styrene
- Chlorinated Hydrocarbons
- Phenolic Substances
- ~~Glycols, Phenols~~
- ~~Inorganics: Dissolved Metals~~Chloride
- Sodium
- Glycols
- ~~, Total Metals~~
- ~~Physical Parameters: pH, hardness, conductivity, TSS, TDS, Tubidity~~
- ~~Anions and Nutrients: Total Alkalinity (as CaCO3), Ammonia (N), Chloride, Fluoride, Nitrate (as N), Nitrite (N), Total Phosphate, Sulphate~~
- Dioxins and Furans
- ~~Other – flow (instantaneous and cumulative)~~

~~Results are compared and the Drinking Water and Aquatic Life Standards outlined in Schedule 6 of the CSR, and to the BCAWWQG.~~

~~The effluent treatment system default will be to treat all collected waters prior to discharge to the Settling Pond. Managing collected waters by batches may be done at times when representative samples are collected for batch discharges. However, there are logistical challenges to this approach that may limit the ability characterize batches in manner that is more efficient than simply treating all of the collected waters. Therefore, the default operation will be to treat all collected waters from the three potential leachate generation pathways.~~

~~All water managed on Site ultimately reports to the~~ As per MOE Permit PR-105809, section 1.4.4 the characteristics of the discharged treated effluent from the Water Treatment System must be equivalent to or better than the most stringent of those British Columbia Approved Water Quality Guidelines

(BCAWQG) and A Compendium of Working Water Quality Guidelines for British Columbia (BCWWQG) for Freshwater Aquatic Life (AL) protection and Drinking Water (DW) uses for the parameters of concern.

As per MOE Permit PR-105809, section 1.5.3 the characteristics of the discharged treated effluent from the Settling Pond must be equivalent to or better than the most stringent of BCAWQG and BCWWQG for AL. Total Suspended Solids (TSS) shall not exceed 25 mg/L for up to a 1:10 year storm event. Per MEMPR Permit Q-8-094, nitrate shall not exceed standards applicable to DW.

Per MOE Permit PR-105809, for flood events greater than the 1 in 10 year event (122 mm of precipitation over a 24 hour period), the characteristics of the settling pond discharge must not exceed background concentrations (i.e., SW-4).

8.3 Receiving Environment Monitoring – Groundwater and Surface Water

Settling Pond. ~~This provides a secondary level of protection as the water reporting to the pond will have already been monitored if reporting from an area on-Site with a potential to encounter contamination. Runoff without the potential to encounter contamination (non-contact waters) will report directly to the Settling Pond. Therefore, monitoring at this location prior to discharge will ensure all managed waters meet the BCAWWQG standards and no impact to the eventual receiving water body will occur.~~

~~*8.3 Receiving Water Monitoring*~~

~~The effluent is discharged to the environment by way of the Settling Pond to an~~ water (including Water Treatment System Effluent) is discharged to a pre-existing, typically dry, drainage course along the west side of the Site. The drainage course ~~is a headwater to~~transitions into an ephemeral tributary ~~to the west of the Site~~. The tributary flows north, eventually reporting to Shawnigan Creek. The confluence of the tributary and Shawnigan Creek is located approximately 1 km north of the Site.

~~The receiving~~Receiving environment water monitoring includes both surface water and groundwater monitoring locations. There are four long-term surface water monitoring locations within the ephemeral tributary and Shawnigan Creek (SW-2 through SW-5). These have been surveyed and permanently (though discretely) marked.

There are also five on-Site monitoring wells, including three with nested completions for a total of eight piezometers; seven of these locations are included in the groundwater monitoring program. ~~The receiving water monitoring program is summarized in the following table and shown on Figure 1 attached. These locations reflect the requirements of Section 3.6 of the Permit.~~

The receiving environment monitoring program for groundwater and surface water is summarized in the following table and shown on Figure 1 (attached).

Receiving ~~Water~~Environment Monitoring ~~Program~~– Groundwater and Surface Water

Receptor	Monitoring Locations			Monitoring Schedule
Groundwater	Up-gradient	MW-4	On-Site, near southeast corner	Quarterly
	Down-gradient	MW-1(S/D)	On-Site, near centre	
		MW-2	On-Site, near west property boundary	
		MW-3(S/D)	On-Site, near west property boundary	
		MW-5S	On-Site, north	
Surface Water	Up-stream	SW-4	Shawnigan Creek	5 in 30* (2 times/year, conducted during fall first flush event and during spring freshet~~)~~); and after a 1:200 year storm event** at SW-2 and SW-3
		SW-2	Ephemeral Creek	
	Down-stream	SW-5	Shawnigan Creek	
		SW-3	Ephemeral Creek	
		~~SW-2~~	~~Ephemeral Creek~~	
	~~Down-stream~~	~~SW-5~~	~~Shawnigan Creek~~	
		~~SW-3~~	~~Ephemeral Creek~~	

~~*5 in 30 refers to at least 5 weekly samples taken in a period of 30 days. Due to the ephemeral nature of some of the creeks, the first 5 in 30 samples should be collected when the ground has first been saturated.~~

~~In addition,~~*5 in 30 refers to at least 5 weekly samples taken in a period of 30 days. Due to the ephemeral nature of some of the creeks, the first 5 in 30 samples should be collected when the ground has first been saturated.
** 156 mm of rain over 24 hours

This program includes event-based monitoring: immediately following a 1-in-200 year, 24-hour storm event, ~~monitoring~~ locations ~~(~~SW-2~~) Ephemeral Creek 1~~ and ~~(~~SW-3~~) Ephemeral Creek 2~~ are ~~to be~~ monitored. A 1:200 year storm event is defined as 156mm of rain over a 24 hour period, as determined by the on-Site rain gauge.

~~All sampling locations may be analysed~~Samples are analyzed for ~~the following suite~~all potential contaminants of ~~parameters,~~concern as determined by the Qualified ~~Professional:~~Environmental Professional based on soil contaminants received at the facility, monitoring results to date and input from MOE.

- ~~Groundwater: Depth (piezometric elevation)~~
- ~~Surface Water: Depth, Width,~~ Flow
- ~~Organics: LEPH/HEPH/PAH, VOC/VPH, Glycols, Phenols~~
- ~~Inorganics: Dissolved Metals, Total Metals~~
- ~~Physical Parameters: pH, hardness, conductivity, TSS, TDS~~
- ~~Anions and Nutrients: Total Alkalinity (as CaCO3), Ammonia (N), Chloride, Fluoride, Nitrate (as N), Nitrite (N), Total Phosphate, Sulphate~~

~~Samples will be appropriately~~ measurements are collected~~, filtered and preserved, and shipped under Chain of Custody to a Canadian Association of Laboratory Accreditation (CALA) certified laboratory for analysis. Sampling procedures are detailed Appendix D. Quality Assurance / Quality Control measures will include at least one duplicate sample for each parameter for each monitoring period.~~

from surface water sampling locations at time of sampling.

8.4 Routine Inspection and Physical Observation

The condition of systems, locations of contaminated materials, presence of flow, estimated flow, and other critical site parameters are inspected on a regular basis. These inspections are guided and documented with specialized field forms:

- Appendix H presents an example of a SMA Daily Monitoring Form. The SMA is inspected daily when active and at least weekly overall.
- Appendix I presents an example of an Encapsulation Cell Daily Monitoring Form. Encapsulation cells are inspected daily when an encapsulation cell being actively filled and at least weekly overall, until the cell is closed.
- Appendix J presents an example of a Daily Inspection and Monitoring Log, which is completed daily when the site is receiving or placing waste, and at least weekly overall. This type of inspection documents the condition of works and the presence/absence, characteristics and flow rate for contact and non-contact water.

9 EMERGENCY RESPONSE PLAN

The ~~facility~~site Emergency Response Plan (ERP)/Mine Emergency Response Plan (MERP) is attached as Appendix ~~H.~~ K. It is maintained as a single stand-alone document that applies to all on-site personnel.

The objectives of the ERP~~ includes an addendum, specifically addressing the Facility, within the context of an operating mine.~~

~~The objective of the ERP, and the facility-specific addendum, is ~~/MERP are to provide effective ~~response to~~responses (including evacuation protocols) for both workplace/mine site emergencies and for urgent situations involving the discharge of contaminated soil, run-off or leachate from the ~~facility and most importantly to~~site, including accident scenarios involving Shawnigan Creek~~.~~

~~The proposed facility has been conceptually developed to contain runoff and leachate at a low point on the west side of the Site. This will minimize the potential for the discharge of surface runoff or leachate directly to Shawnigan Creek, located~~ (which, it is noted, is approximately 250 m to the east and at a higher elevation~~. Although unlikely, it is possible through human error, an accident or force of nature, that leachate or contaminated soil could enter the Creek. These scenarios have been accounted for as part of the Addendum.~~, than the pit).

10 SITE PREPARATION AND CONSTRUCTION OF LANDFILL CELLS

The following sections summarize Site Preparation and encapsulation cell construction within the ~~PEA.~~ authorized landfilling area (the mine pit, as ultimately developed).

10.1 Site Preparation

Soil ~~containment~~encapsulation cells are engineered to provide permanent isolation of the contaminated soils. ~~Synthetic~~Compacted clay till and landfill geosynthetic liners are used to fully encapsulate the soil placed in each cell. Details of a typical cell design are provided ~~on Figures 10 and 10B of~~in the TAR.

~~The~~ Cells are filled one at a time; however, cells may be prepared up to the point of receiving waste material before previous cells have been completed.

No blasts will be initiated during installation of liners (base or cover), nor will machine traffic be allowed on liners, until such liners are covered with at least 0.66 m of compacted soil. Only new, high-quality, purpose-manufactured geosynthetic liners shall be used for construction, and their installation, quality assurance/control process, sealing and use shall be in accordance with manufacturer's guidance for materials, methods, equipment and training. In accordance with Section 2.4.1 of MOE Permit PR-105809, the reuse of geomembranes/liners in encapsulation cells is strictly prohibited.

Liner panels are pre-fabricated in controlled manufacturing conditions for a specific cell. This reduces the number of field welds that required.

Site preparation for the construction of landfill cells includes the following:

- Final blasting and removal of rock for aggregate production.
- ~~Bedrock inspection by a qualified professional and an inspection report is prepared for the landfill area as required by Section 2.4 of the Permit. Details of the inspection report are discussed below.~~
- The final blasting surface of the bedrock will be sharply undulating and contain shattered rock fragments up to approximately 2 m in depth. ~~This surface will be leveled with crush and proof-rolled with a sheep's-foot vibrating compactor to fill in any voids and prepare the surface for placement of the clay till.~~
- ~~The prepared~~ Bedrock inspection by a qualified professional and preparation of an assessment report
- Levelling of the surface ~~will be covered~~with compacted crushed rock
- Covering the leveled surface with a minimum of ~~300~~1000 mm of compacted clay till soils~~, placed with survey control in accordance with the elevation plan provided as Figure 8C of the TAR~~.

The clay till layer is used to create the desired sloping for drainage over the bedrock surface~~.~~ and also seves as an additional layer of leachate protection, one constructed from natural, geologically stable materials. The specifications for the clay till are as follows:

- The ~~soil~~clay till must contain a minimum of 10% clay, defined as a particle size of 0.~~001mm.~~002 mm or less (2 µm, as per ISO 14688).
- Alternatively, laboratory testing results may be used to verify the required hydraulic conductivity of the till.
- ~~The~~As of July 17, 2015, per MEMPR Permit Q-8-094, Section 16, the clay till will be placed in maximum ~~600mm~~250 mm lifts, and compacted ~~with a sheep's foot compactor~~ to ~~95~~**at least** 90% Standard Proctor Maximum Dry Density (SPMMDD – ASTM D698~~).~~), with an objective of 95% SPMMD (95% SPMMD being the standard used for cell 1).

Depending on pit layout and the layout of pit walls, temporary side berms of till may be used to support the edges of liner panels until the neighbouring panel is installed to overlap and be sealed together. These berms are temporary construction aids, not intended or used as liner components.

10.2 Bedrock Integrity Inspection Report

A bedrock integrity inspection and risk assessment report ~~will be~~is completed and submitted to the ~~MOE~~province prior to the construction of any ~~landfill~~encapsulation cells. For any abnormalities (open fractures, presence of water, percolation, etc.) identified during the inspection, the MOE will be immediately notified and a structural report will be completed within 30 days following inspection.

In general, the following items will be included in a bedrock inspection report:

- Rock type~~;~~
- Description of fractures~~;~~
- Presence/absence and description of any seepage~~.~~

The final blasting surface of the bedrock will be sharply undulating and contain shattered rock fragments up to approximately 2 m in depth. It is~~ therefore~~ not feasible to expose the entire surface for visual inspection, and spot-checking via test pits ~~will be required. It is also understood that~~ is used.

The final bedrock surface ~~will be~~is impacted by blasting, influencing the ability to visually ascertain the undisturbed condition of the rock. However, the rock type~~ will be~~, fracturing and weathering is ascertainable, and presence/absence of seepage will provide information pertaining to ~~the occurrence of any~~potentially water-bearing fractures.

10.3 Seepage

The base of the ~~encapsulation area~~pit bottom is below the piezometric elevation of the groundwater beneath the Site. ~~As such,~~ There are ~~only~~ two ~~possible~~ scenarios ~~that may occur, with respect~~ to ~~groundwater conditions, upon the mine reaching the ultimate~~be considered at pit bottom:

1. Seepage is not observed: In this scenario, the bedrock is not significantly fractured and is acting as an aquitard ~~not allowing~~, preventing any substantial groundwater ~~flow to occur~~ as seepage upwards into the pit.

2. Seepage is observed: In this scenario, ~~there are sufficient~~ fractures ~~that are allowing~~allow groundwater flow ~~to occur~~ as seepage upwards into the pit.

~~As a consequence of the above, there is no risk to groundwater quality at the Site posed by the overlying contaminated soil cells.~~ In short, either the deep aquifer is protected by the upper bedrock aquitard, or there is an upward flow of groundwater into the pit. Both scenarios ~~mitigate the risk to impacting~~are protective of groundwater quality because there is no pathway (i.e~~.~~., no flow of contaminants downward). ~~However, the latter scenario may require mitigation.~~

The former scenario (dry pit) is expected. Based on investigations and mining progress to date, there has been no observed seepage, indicating that the bedrock is ~~acting as~~ an effective aquitard. This is consistent with rock coring and with the findings of the BC Geological Survey[4].

However, ~~the potential exists for~~if seepage ~~to be~~is encountered ~~as the mine is expanded. If seepage is encountered, the following mitigative measures will be employed:~~

, the blast debris layer will act as a drainage blanket to convey the seepage as shallow groundwater flow towards the ephemeral tributary.

If the blast debris layer is not sufficient to convey the flow, additional mitigative measures will be employed as follows:

- A localized drainage blanket will be constructed over the area of seepage and gravity drained towards the ephemeral tributary as shallow groundwater flow. This drainage blanket would be constructed beneath the compacted clay till liner~~. The seepage is considered as~~ and would thus produce non-contact ~~groundwater, therefore this~~(uncontaminated) water ~~does not require management through monitoring and sampling. Any seepage that penetrated the till would report to the leak detection system.~~.
- The seepage blanket will be constructed of a minimum 300 mm of clear crush.
- The blanket will be covered with a geotextile to prevent the migration of fines from the overlying till layer.

If unforeseen conditions warranted, the seepage layer could be intercepted by shallow downgradient trench(es) to allow collection and monitoring. The substantially greater (orders of magnitude greater) hydraulic conductivity of the seepage blanket compared to the bulk rock implies that flow would effectively be controlled by the seepage layer, simplifying monitoring and control.

[4] Hancock, K. 2012. Bedrock Geology of the South Island Aggregates Stebbings Road Quarry. BC Geological Survey. October 30, 2012. 15 pp. plus 7 pp. addendum.

10.4 Construction of Landfill Cells

Following preparation and inspection of the bedrock as described above, the base liner system will be ~~constructed as~~completed with the components outlined below:

- Minimum 300 mm of sandy drainage layer; overlying
- 40 mil Linear Low Density Polyethylene (LLDPE) liner; overlying;
- Minimum 300 mm of sandy drainage layer~~ (sloped at 3%, K>1x10^{-3} m/s);~~; overlying
- Minimum ~~300~~1000 mm of till ~~compacted to 95% Standard Proctor Maximum Dry Density (SPMMDD – ASTM D698) with a permeability of less than 1x10^{-8} m/sec~~as discussed previously; overlying
- The prepared bedrock surface, as discussed previously.

~~In accordance with Section 2.4.1 of the Permit, reuse of geomembranes is prohibited.~~

The upper sandy drainage layer will form part of the leachate collection system and will provide two functions:

1. Physical ~~separation and~~ protection of the ~~synthetic~~ liner~~.~~ from puncture during installation
2. ~~Allow soil to drain if necessary and~~ Allow any incident precipitation or other drainage to drain from the cells.

The lower drainage layer is primarily for liner bedding: it would collect and drain any leaks in the membrane (a "leak detection system"), but such leaks are not expected to occur.

Protection of the liner from puncture due to deformation ~~from differential settlement will be completed by~~ is ensured by the specification of an appropriate liner material, intended for landfill use, and by compacting the contaminated soil in controlled lifts during placement. ~~No~~ Differential settlement of the subgrade will not occur~~ since~~, based on compaction of subgrade materials ~~will be monitored~~ and the effectively incompressible nature of the underlying bedrock~~ is not susceptible to settlement.~~.

To protect the liners from puncture during cell construction, a minimum of 0.~~6~~66 m soil ~~must be~~is placed atop it where machine traffic will occur. In addition, continuous monitoring of construction equipment and direction during construction ~~will be~~is provided by experienced and qualified personnel.

Contaminated soil is then placed and compacted in lifts, with provision of compaction results for each 1 vertical meter to the Inspector of Mines. The physical properties of the contaminated soil are considered in terms of geotechnical suitability by the Qualified Professional Engineer. Soils which are determined to be potentially problematic (i.e., high moisture content, compressible, entrained debris, etc.), are subject to a material-specific geotechnical plan. This will include establishing an acceptable range of physical properties, criteria for measuring physical properties, and a plan for ensuring the soil is rendered acceptable for placement and compaction.

Generally, incoming soil will be placed, graded and compacted using a vibratory drum roller. Placement will occur over maximum 600 mm lifts and compacted with a minimum of one pass with a vibratory roller. ~~The liner is pre-fabricated in controlled manufacturing conditions for a specific cell. This reduces the number of field welds that will be required, thereby ensuring a more consistent product. The liner will be installed in accordance with the manufacturer's specifications and all field welds will be completed by qualified manufacturer's technicians.~~

Successive lifts will be reviewed by the project Geotechnical Engineer to ensure adequate compaction and stability.

The contaminated soil in individual containment cell layers is capped with a second LLDPE liner deployed in the same manner as the base liner, with ~~necessary~~ overlapping and ~~field welding~~sealing. The cap liner is "sandwiched" between two layers of geotextile and/or sand blankets to protect from potential puncture. Both the cap and base liners are anchored into the sideslopes as necessary, ~~achieved with the use~~for example, using of anchor trenches.

Upon placement of the upper cap liner, ~~each~~the cell layer will be covered with a minimum of 0.3 m of clean sandy soil. A minimum of 0.~~6~~66 m soil cover above the cap liner is required in areas that may experience machine traffic over top of the completed ~~cell.~~cap liner.

Subsequent cells will be constructed ~~immediately~~ adjacent to and overlying previous cells as the landfilling/reclamation activities progress. In~~ each~~ successive ~~layer~~layers, the upper cap liner will also serve as the base liner for the overlying cell layer.

As required, vapours from individual encapsulation cells will be monitored prior to construction of ~~the~~a successive layer.

Overall construction of the cells will be done under the direction of ~~a QP~~ the Qualified Professional Engineer and as-built drawings produced to ensure appropriate QA/QC and record keeping. ~~A bedrock integrity inspection~~Qualified staff under the supervision and ~~risk assessment report~~control of the engineer will ~~be prepared prior to the construction of each new cell. This inspection will also serve to identify the presence/absence of any significant groundwater seepage and facilitate the design on the seepage blanket as needed. A QP will undertake these assessments and designs, and will also supervise the construction of the seepage blanket. A QP will also~~ perform nuclear densitometer, drive tube and/or sand cone density testing to confirm the required compaction is achieved during material placement~~ of the till layer.~~.

The ~~physical properties of the accepted soil will be considered in terms of geotechnical suitability. For soils which are determined to be likely problematic (i.e. high moisture content, compressible, entrained debris, etc.), a project-specific geotechnical plan will be prepared and implemented. This will include establishing an acceptable range of physical properties, criteria for measuring physical properties, and a plan for ensuring the soil is rendered acceptable for placement and compaction. Generally, incoming soil will be placed, graded and compacted using a vibratory drum roller. Placement will occur over maximum 600 mm lifts and compacted with a minimum of one pass with a vibratory roller. Successive lifts may be reviewed by the project Geotechnical Engineer to~~

~~ensure adequate compaction and stability.~~Qualified Professional Engineer may also carry out field or laboratory hydraulic conductivity testing and grain size testing as necessary to confirm performance to the design criteria set out in the TAR.

10.5 Final Cap

Upon completion of the landfilling activity, a final soil cap will be placed over the entire area that is underlain by containment cells. The final cap is illustrated in Figures 10 and 15 of the TAR, and will consist of a minimum of 2.0 m of ~~clean~~uncontaminated soil; the lower 1.0 m acts as a hydraulic barrier with a maximum compacted hydraulic conductivity of 1x10-7 m/s, and the upper 1.0 m consists of a growing medium and is planted with grasses. The final cap will be graded to promote positive surface drainage away from the landfill, and surface water diversion/control measures will be ~~taken to~~ re-direct upland surface water flows around the landfilled area.

~~Overall, the engineered containment cell design will remove the potential pathways for human or terrestrial contact with the contaminated soils, as well as the pathway for potential groundwater impacts and leachate generation.~~

10.6 Leak Detection and Leachate Collection

~~Engineered~~As described in description of water management systems, encapsulation cells include provisions for ~~leak detection and the~~ leachate collection~~.~~

as well as for leak detection. Figures 8 and 10 of the TAR illustrate ~~the details of~~ both ~~the leak detection and the leachate collection systems. The leak detection system is below the base liner, and the leachate detection system is located beneath all cells.~~systems.

The design includes the use of soil drainage blankets~~ without perforated piping.~~. The soil drainage blankets ~~will~~ have a hydraulic conductivity greater than $1x10^{-4}$ m/s and ~~will be~~are constructed with a 3% grade and a minimum thickness of 0.3 m. ~~These specifications refer to the compacted soil.~~

As shown on Figure 10 of the TAR, the soil drainage blankets will be constructed beneath all successive layers of encapsulation cells. The layers will be able to free drain into the chimney drain that reports to the collection piping at the base of the slope. ~~The collection piping reports to the Water Treatment Plant reservoir for monitoring prior to treatment and discharge.~~

Collected water (if any) from drainage systems will be transferred to the containment pond for treatment in the Water Treatment System as contact water.

11 OPERATION, INSPECTION AND MAINTENANCE

The following subsections describe the operation, inspection and maintenance of the soil management ~~and treatment facility~~area, the permanent encapsulation area, the water treatment system and the settling pond. Major site ~~facilities~~features are illustrated on Figure 1.

During operations, inspections will be carried out by Site staff on a daily basis to monitor the effectiveness of the Water Management systems, and to ensure appropriate weather protection of soil stockpiles. ~~At the end of each day, a Site plan will be prepared indicating the locations of various stockpiles according to their tracking ID as described above~~ Daily inspection observations and site photographs are filed in the Mines Office.

11.1 Soil Management Area

~~The Technical Assessment envisioned treating soils contaminated with organic contaminants (e.g. petroleum hydrocarbons or chlorinated hydrocarbons). However, given the current F1 Zoning at the facility, bioremediation is not planned, other than what occurs incidentally as a result of aeration during routine movement including end-dumping, consolidation and stockpiling for the purposes of characterization.~~ As discussed previously, soil treatment allowed under Provincial permits will not be conducted until resolution of differing interpretations of site zoning is obtained.

Precipitation that falls outside the paved Soil Management Area (SMA) will be diverted via berms and perimeter swales / ditches. A roof will be constructed over the SMA prior to March 20, 2016 in order to prevent precipitation from entering the SMA. It is currently anticipated that the roof will be in place before November 2015. Until the roof is constructed, all stockpiled soil within the SMA will be covered during periods of rain using disposable polyethylene sheeting, appropriately anchored. Runoff from the SMA will be controlled and managed in accordance with the water management procedures outlined ~~above~~previously.

Sufficient weather protection and containment ~~must~~will also be provided for any nutrients stored at the Site for protection of human health and the environment. In the absence of soil treatment, relatively limited amounts of nutrients will be stored on site; such nutrients (fertilizer) will be kept in a storage shed.

~~Daily operational considerations~~Inspection and maintenance associated with the SMA ~~include~~includes the following:

- ~~Surrounding~~ Assessment of surface water control and diversion ~~measures are inspected and~~ works, as well as roofs and covers, taking any necessary ~~corrective action is taken.~~ actions to protect design function and prevent short circuiting or sedimentation. This ~~could~~can include removing ~~physical barriers~~debris from swales, ditches or catch basins, replacing/reinstalling silt fencing or ~~other sediment control measures, and documenting and rectifying any short circuiting (i.e. during precipitation).~~moving tarps.
- Inspection of leak detection ports and catch basins ~~are inspected on a weekly basis as required (reference Section 8.2).~~.
- ~~Operational Staff review~~Review of incoming soil quantities and ensure adequate room within the SMA. ~~If necessary, the facility loader is utilized to consolidate existing~~ by delivery scheduling, material consolidation in the SMA and/or ~~transport existing material~~transfer to the ~~Permanent Encapsulation Area (PEA) to accommodate incoming soil~~active encapsulation cell.

- ~~As areas of the SMA are exposed, the underlying asphalt is inspected and any perforations or other damage is documented and corrective measures are planned and undertaken. This could include patching the asphalt where damage is significant. Damaged areas are to be marked and avoided until repairs are undertaken.~~
- ~~Any~~Inspection of underlying asphalt at the SMA when it is exposed by operations, arranging prompt repair (typically by patching) as appropriate and protecting the area until repair is complete.
- Documentation of soil movement, including consolidation and/or transport to ~~the PEA is documented such that volumes and locations are recorded.~~encapsulation.
- Demarcation of areas within the SMA ~~are designated and appropriately demarcated ahead of~~ for incoming shipments. ~~This includes an area allocated for suspect hazardous waste soil.~~
- ~~Designated areas are communicated to gate / weigh scale staff. Operations staff remain at the SMA to direct truck traffic and unloading, consolidating as required.~~
- ~~At the end of each day,~~ Communication of designated/demarcated areas to site staff and ensuring that trucks receive appropriate direction and supervision.
- Monitoring truck movement and dumping.
- Covering of SMA soils ~~are covered and operations staff complete~~at the end of the day and completing a sketch plan of the SMA noting the location of soils ~~based on their designated tracking ID (reference Section 6.4). A sample plan is included as~~ (Appendix ~~G.~~ H).
- ~~A~~Taking at least one photo from a designated vantage point ~~is required at the end of each day and will form part of the daily record.~~of the SMA and transferring it to file.

11.2 Permanent Encapsulation Area

Precipitation that falls outside of the ~~Permanent Encapsulation Area (PEA) will be~~landfill/encapsulation cell area is diverted via berms and perimeter swales / ditches~~. All soil will be compacted following placement~~ to the Settling Pond.

Drainage within ~~a PEA cell. In addition, the PEA will be~~active encapsulation cells is managed as contact water. The active cells are covered on an interim basis during periods of rain using disposable polyethylene sheeting, appropriately anchored~~.~~, to limit soil/water contact. Specifically, active filling areas ~~must be~~are completely covered from November to April when not actively worked on. ~~Runoff from the PEA will be controlled and managed in accordance with the water management procedures outlined above.~~

Daily operational considerations associated with the ~~PEA~~ landfill/encapsulation area include the following:

- ~~Surrounding~~ Assessment of surface water control and diversion ~~measures are inspected and~~ works, as well as covers, taking any necessary ~~corrective action is taken. This could~~actions to protect design function and prevent short circuiting or sedimentation. This can include removing ~~physical barriers~~debris from swales, ditches or catch basins, replacing/reinstalling silt fencing or ~~other sediment control measures, and documenting and rectifying any short circuiting (i.e. during precipitation).~~moving tarps.

- Inspection of leak detection and leachate collection ports/catch basins ~~are inspected~~ on at least a weekly basis ~~as required (reference Section 8.2).~~.
- ~~Soil is transported~~ Supervision of the transfer of soil from the SMA~~, or directly end-dumped into the PEA.~~
- ~~Incoming soil is placed, graded and compacted using a vibratory drum roller. Placement will occur over maximum 600 mm lifts and compacted with a minimum of one pass with a vibratory roller.~~
- ~~Any soil imported to~~ and/or the ~~PEA is documented such that volumes and locations are recorded.~~
- ~~If soil is to be directly end-dumped into the PEA, a designated dump area and truck turn-around is demarcated and communicated to gate / weigh scale staff. Operations staff remain at the PEA to~~ direct ~~truck traffic and~~ unloading~~, grading and compacting as required.~~ of incoming trucks to the encapsulation area.
- Verification that appropriate quality assurance (under the Soil Receiving Plan) is carried out.
- Placement, grading and compaction of incoming soil ~~QA/QC is undertaken~~.
- Completion of as-built compaction records for each 1 metre increment of compacted soil.
- Documentation of the soil ~~directly~~volume placed and cell number, creating a permanent record of what material was placed ~~into the PEA, as described in Section 6.5.~~in which cell.
- At the end of each day, soils are covered and operations staff sketch a plan of the ~~PEA~~active encapsulation cell noting the location of soils based on ~~their designated~~ waste approval numbers (which can be traced back to soil tracking ~~ID (reference Section 6.4).~~IDs). A sample plan is included as Appendix ~~G.~~

I. A photo from a designated vantage point is required at the end of each active day and ~~will form~~forms part of the daily record.

11.3 Water Treatment System

~~The Water Treatment System contains a 5,000 gallon surge tank that receives inputs from the SMA reservoir and the PEA Leak Detection and Leachate Collection systems. The Water Treatment System has been designed to be fully automated and regular water quality readings are logged electronically (e.g. flow and turbidity). The flow reading will be logged and used to evaluate monitoring requirements as stipulated by volume (reference Section 8.2 above). The turbidity readings will be used in conjunction with manual measurements to document sediment loadings of the discharge in accordance with the Permit conditions (i.e. maximum 25mg/L for up to 1 in 10 year return period flood event of 24 hour duration.~~

~~Water will be treated utilizing~~The Water Treatment System may include influent surge/collection/equalization tankage as necessary to receive all active influent streams. Typically, influent flows are aggregated in the Containment Pond.

As described in as-builts for the water management system and the commissioning report for the Water Treatment System, contact water is treated utilizing an automated STORMTEC Filtrations Sediment Control System. The system is capable of treating between 200 and 1250 litres per minute, depending on the sediment loading and pH values~~ and flow rate. All water will collected into~~. Typically, the ~~surge tank then routed through the treatment~~ system ~~for processing~~is operated at approximately 284 litres per minute (75 US gallons per minute) in batch mode to ~~allowable~~a discharge ~~values.~~tank for testing and later discharge to the Settling Pond.

High pH ~~effluent which exceeds the water quality standards for discharge of 9.0 standard units will be~~ is treated ~~utilizing~~using the CS250e pH Remediation System module. The system ~~utilizes a source of~~meters carbon dioxide (CO2~~); the system controls the introduction of CO2~~) into the water stream ~~by~~using a pH probe interfaced with an electronic controller, flow switch and electronic valuing. The CO2 is ~~incorporated~~mixed into the water stream utilizing a patent pending static mixer. The CS250e incorporates an automatic ~~shut down~~shutdown sensor~~; this sensor automatically~~, which shuts off the flow of the CO2 when no flow or pressure is detected.

The pH ~~remediated~~adjusted water ~~will flow~~flows through ~~two LFI300~~a LFI600 Flocculent Injection ~~Systems~~System for sediment consolidation. The ~~LFI300 Injection System~~ LFI600 incorporates ~~a~~two metering ~~pump~~pumps to inject two liquid ~~flocculent~~flocculents in line ~~at a pre-determined setting followed by~~before a static mixer. A flow switch turns the metering ~~pump~~pumps on and off by sensing a flow rate of more than 76 litres per minute (20 ~~GPM using the same principals as detailed above regarding the CS250e.~~U.S. gallons per minute). Proprietary, environmentally safe, STORMTEC flocculants ~~will be~~are introduced at dose rates of about 2 parts per million (ppm), depending on the sediment load. ~~The treated water will be discharged into 4 - 3,000 gallon holding tanks for settlement prior to discharge.~~ The metering pump injection rate ~~may be~~is adjusted by on-Site personnel depending on the quality of the incoming water. Treated water is discharged into a series of holding tanks for settling. Settled solids are periodically decanted and removed for stabilization/drying and disposal.

The STF245-3 Sediment Control System provides ~~final~~additional treatment~~ and incorporates a~~, incorporating an FP10 Booster Pump System, Electrically Actuated Ball Valve, Electronic Control System, Automatic Float Controls, ~~SMF30-3 Sand Filtration System. Power requirements for the sediment control system FP10 pump system are 230 volt 50 amp single phase. EPDM hose will be used to interconnect the system to the tanks, this type of hose will facilitate reduced relocation and assembly time over schedule 40 polyvinylchloride (PVC) pipe, all hose will be rated to a minimum of 50 psi.~~and automatically backwashed Sand Filtration System. The sand filtration system filters out flocculated sediment; when pressure loss through the filters is excessive, the flow is reversed into a backwash line that carries accumulated sediment back to the settling tanks for removal.

Filtered water is stored in a transfer tank and then pumped through granular activated carbon filters (to remove residual dissolved organic contaminants, if any) and activated alumina filters (to remove residual dissolved metals concentrations, if any.

In batch mode, treated water is stored in tanks for testing before being discharged through a flow meter to the Settling Pond.

Daily inspection and maintenance includes the following:

- ~~Inspect all~~Visually inspect hoses, hose fittings~~ for indications of wear and ~~, gauges, valves, couplings, sand filters and pump heads for leaks~~.~~, seepage, wear, splitting, cracking or corrosion. Take corrective action as required.
- Verify power to the unit (generators or mains).
- Inspect flocculent and note remaining quantity. Order~~ / ~~/replace as necessary.
- ~~Inspect all pressure gauges. If not within normal operating ranges, take corrective action.~~
- Check CO_2 supply – order/replace tank as necessary.
- Calibrate pH probe at least once per month. Replace probe if calibration is unsuccessful.
- Inspect settling tanks and clean out sediment as necessary.
- ~~Inspect power source (generator) and fuel / maintain as necessary.~~
- Note flows reading on flow meter. Record at least weekly ~~as required (reference Section 8.2).~~when treatment system is used.
- Change ~~bag filters ~~filtration media as required in accordance with manufacturer specifications.
- Check drain valves, noting any abnormal colors or odours in held-up water (backwash to re-retreatment).

Pre-Start checks include the following:

- Walk through system, along the flow direction
- Inspect all hose connections, verifying that camlocks are fully engaged with ears secured on cam fittings.
- Verify that gate valves are in open position, throttling the feed pump gate valve for flow control.
- Verify that there are no obstructions, kinks or blockages on the hoses and lines, including discharge hose
- Top up feed tank to sand filter with non-contact or previously treated water if necessary to prevent airlocks in system.
- Verify power to system and displays on all controllers

Start-up checks include the following:

- On startup, listen to pump motors for abnormal sounds. Check pumps for abnormal odours, vibration, heat or leaks.
- Monitor pressures on sand filter intake and discharge manifolds (target pressure between 30-40 psig; differential pressure should not exceed 8 psig)
- Check backwash controller setting
- Check pressure sustaining valve settings
- Verify CO_2 and flocculant injection Flow Switch is reading intake flow
- Verify relay is engaging Asco valve to deliver CO_2 (Asco valve will click when engaged)

- Verify the LMI Controller is reading probe pH and there are no errors on controller screen
- Verify carbon and alumina top and bottom pressure differential pressure is below 5 psi (if above, perform backwash)
- Verify flowmeter is illuminated and sensing flow

11.4 Wheel Wash

In accordance with Section 2.7.1 of ~~the~~MOE Permit PR-105809, before contaminated soil transport vehicles leave the Site, their wheels must be rinsed to remove all soil and waste~~. —~~ that may have adhered while they were unloading and maneuvering in the unloading area. This is accomplished using an automated wheel and undercarriage wash.

Following the wheel wash, truckers are required to stop, self-inspect, and, if loose soil remains adhered, clean it off using a provided hose on the wash pad draining back to the wheel wash.

Soil and waste ~~must be maintained on-Site and~~ from the wheel wash are returned to the SMA ~~or PEA~~, stabilized/solidified/dried as ~~appropriate. Rinse~~necessary to improve their geotechnical properties, and disposed of in encapsulation cells. Wash water ~~must be~~/rinse water is directed to the Containment Pond for treatment in the Treatment System before ~~being~~ discharged to the Settling Pond.

~~Alternatively, a standalone wheel wash system is to be employed. Maintenance procedures should be as per the manufacturers specifications with any solid wastes being returned the SMA or PEA and any liquid wastes being directed to the Treatment System.~~

11.5 Settling Pond

The Settling Pond receives inputs from the Water Treatment System as well as diverted surface water flows. Regular operational considerations associated with the Settling Pond include the following:

- Flow, and if flow is occurring, flow rate, are logged.
- Effluent is monitored and sampled as required ~~(reference Section 8.2).~~.
- Vegetation is regularly and cautiously removed, preserving the integrity of gravel filters and the pond bottom.
- Accumulated sediment is removed ~~as required, and~~to preserve a minimum water depth below the pond decant of 500 mm. This sediment is transported to the ~~PEA~~SMA for drying/stabilization and testing prior to disposal. Sediment removal is only to occur during periods of low/no flow, when the standing water level is below the Pond outlet such that disturbed, turbid waters do not discharge.
- Inlets and outlets are inspected to ensure appropriate operation and no incumberances~~.~~
- During periods of high flow, freeboard is monitored to ensure design minimum is maintained (500 mm).
- During periods of low flow, rip-rap and berms are inspected and repaired/replaced as necessary.

11.6 Records Retention

Records are retained for MOE and MEMPR inspection on-Site.

Section 5.1 of ~~the~~MOE Permit PR-105809 requires that, in the absence of soil treatment, records ~~be maintained documenting the following~~retained for at least three years include:

- Construction as-built drawings and ~~records including~~ site QA/QC results~~.~~, specifically including landfill (encapsulation) cell QA/QC results.
- ~~•~~ Maintenance records~~.~~
- ~~Facility inspection reports~~ , specifically including maintenance records for authorised works as listed in MOE Permit PR-105809.
- Inspection reports with preventative and corrective actions~~.~~, specifically including reports for the SMA, encapsulation area and authorised works.
- Current soil/ash inventory, including both the SMA and ~~PEA.~~encapsulation area.
- Soil~~ Acceptance Reports~~/Ash acceptance documentation, including analytical results, and associated QA/QC ~~screening~~ reports~~.~~ indexed to the soil tracking system.
- The location of soil/ash within the site, on a map, and quarterly volumes of soil/ash held as suspected or determined to be unacceptable, awaiting disposal.
- Air quality monitoring reports~~.~~, including vapour and dust.
- Emergency Response Plan exercises and incidents.

~~12 INTERNAL AND EXTERNAL EMS AUDITS~~

~~Sections 5.2~~If soil treatment, including soil turning, were carried out, additional records would be generated and ~~5.3 of~~ maintained, as described in the permit.

MEMPR Permit ~~outline requisite~~Q-8-094 requires that on site records include:

- A complete set of as-built drawings
- Documentation identifying soil condition and suitability of imported soil for intended use.
- Quality Assurance/Quality Control procedure, testing results and inspection logs for waste materials in encapsulation cells
- Blast logs and electronic monitoring records
- Blast videos
- All other documents, including updated mine plans and health and safety documents, as required by the Mines Act and Code

12 EMS AUDITS AND REPORTING

Under MOE Permit PR-105809 and MEMPR Permit Q-8-094, SIRM submits event-driven and regular reports including, but not limited to:

- A quarterly ~~and~~ report, including monitoring data, QA/QC results, interpretations, conclusions and recommendations.
- A quarterly update of the mine plan.
- An Environmental Annual Report, including executive summary, quality/quantity/disposition of soil/ash, updated site mapping, landfilling status and intent, review of operations and future plans, changes, non-compliances, monitoring results, etc.
- An annual ~~reporting. In addition,~~ report identifying the volume of water through the Water Treatment System, including all operating costs associated with the operation and maintenance of the treatment plant
- An annual report submitted to the Ministry of Finance in relation to the annual Health and Safety Assessment and the related data on annual production

Internal EMS audits will form part of the ~~annual report.~~

~~The~~regular Environmental Annual Report. External EMS ~~Audit includes the following key elements:~~

- ~~Planning~~
- ~~Implementation~~
- ~~Checking / Corrective Action~~
- ~~Review and Improvement~~

audits will be undertaken every 5 years and included with that year's Environmental Annual Report. The overall objective of the EMS is to document ~~facility~~site operations in relation to environmental ~~impacts~~impact monitoring. If impacts are observed, then appropriate corrective action can be undertaken since the failure mechanism will be isolated through careful monitoring and performance feedback.

~~External EMS audits will be undertaken every 5 years and included with that year's annual report.~~

Internal EMS audits include the following key elements:

- Planning
- Implementation
- Checking / Corrective Action
- Review and Improvement

Each of these is discussed in the following sub-sections.

12.1 Planning

The planning components of the EMS requiring evaluation/audit include ~~facility~~site construction, soil screening prior to acceptance and baseline environmental quality monitoring. ~~The Technical Assessment Report documented construction requirements considering the local natural setting (i.e. geology and hydrogeology and nearby receptors).~~

~~In particular, construction reviews will be documented and as-built drawings produced. The key facility~~Key site performance requirements/objectives include:

Soil Management Area: Provides an impermeable, bermed operating surface for stockpiling and characterizing soils. Also provides suitable space to temporarily store off-spec material that has been inadvertently imported. Performance indicators include visual inspection of the asphalt surface, leachate inspection ports, and an operable catchment to transfer water to the ~~SMA Reservoir~~Containment Pond for treatment prior to discharge.

Permanent Encapsulation Area: Provides permanent control measures to ~~indefinitely~~ manage contaminated soil. Performance indicators include leak detection and leachate collection inspection ports and suitable compaction.

Water Treatment System: Treats ~~all water reporting from the SMA Reservoir and the PEA leachate collection and leak detection systems~~contact water to meet established standards and guidelines. Performance is monitored routinely through regular inspection, monitoring and sampling.

Settling Pond: Collects ~~all~~ surface water from the active site area, and receives treated water from the Water Treatment System. Performance is monitored routinely through regular inspection, monitoring and sampling.

12.2 Implementation

Implementation of the EMS is undertaken ~~by way of~~through following the ~~Environmental Procedures Manual, specifically including the Facility Design and Construction, Administrative and Management Procedures, Soil Acceptance Plan, Water Management Plan and Emergency Response Plan~~EPM/OMS.

12.3 Checking / Corrective Action

~~The~~ Environmental monitoring ~~Plan forms the basis for establishing~~, will detect whether impacts are occurring~~. The monitoring requirements are intended to provide ongoing feedback~~ in order that timely and effective corrective measures can be implemented. Routine inspections ~~and maintenance of facility infrastructure~~will determine whether works are performing as intended, so that timely repair or improvement can be carried out.

Additional inspections may also ~~form part of the EMS checking and corrective action.~~be carried out at any time by the MOE or MEMPR.

12.4 Review and Improvement

Site staff conduct daily and event-driven inspections and monitoring. MOE and MEMPR may also conduct inspections at any time, giving formal or informal feedback.

Based on the results of this on-going surveillance, the Operations Manager, in coordination with the Mines Manager, orders remedies and improvements, which are reflected in event-driven revisions of the EPM/OMS.

The EPM/OMS is also reviewed at least on an annual basis to determine if changes are required. Annual review and submission of revisions are due on March 31st of each year.

Annual Environmental Reports are submitted on or before March 31st of each year. These reports are reviewed in conjunction with~~ the established~~ Advisory Committee~~,~~ meeting within three months of report submission. The Advisory Committee provides ~~feedback to the Permittee and~~ advice to the ~~Director regarding the facility operations and effectiveness of the permit~~MOE within 30 days of the meeting. Based on the advice of the committee, the MOE may revise monitoring sampling and reporting requirements. ~~Based on this feedback, procedural adjustments are anticipated in order to achieve continual improvement.~~

13 NOTIFICATION, REPORTING, ~~INVESTIGATION AND~~ CORRECTIVE AND PREVENTIVE MEASURES

The Permit requires notification and reporting as summarized in the following tables.

Notification – MOE Permit PR-105809
~~Section~~ 1.1.3 – If land use or site specific factors specified in Column I of Schedule 5 of the CSR change at the permitted site, the Permittee must promptly notify the Director and immediately apply them for the purpose of Subsections 1.2 and 1.3.
~~Section~~ 2.3 – If short-term storage of unacceptable soil is to exceed 30 days, then notification and approval is required by the Director.
2.4 – Abnormalities (open fractures, presence of water, percolation, etc.) encountered during the bedrock integrity inspection requires that the Director be notified immediately.
2.12 – In the event of an emergency or condition beyond the control of the Permittee which prevents effective operation of the authorized works or leads to unauthorized discharge, the Permittee must comply with all applicable statutory requirements, immediately notify the Director and take appropriate remedial action for the prevention or migration of pollution.
~~Section~~ 2.17 – The Director must be notified prior to implementing any changes to any process that may adversely affect the quality and/or quantity of the discharge.
~~Section~~ 2.19 – The Director must be notified of a change in ownership of the works a minimum of 10 days prior to an ownership change.
Notification – MEMPR Permit Q-8-094
12 - Substantial changes to the program must be submitted to the Inspector for Approval
15 – Notice of Completion of work shall be filed with Inspector not less than seven days prior to cessation of work.
5 (b) – No topsoil shall be removed from the property without the specific written permission of the inspector.
17(a) – The inspector shall be advised in writing at the earliest opportunity of any unforeseen conditions that could adversely affect the extraction of materials, site stability, erosion control or reclamation of the site.
17(c) - The discovery of any significant subsurface flows of water, seeps, substantial amounts of fine textured, soils, silts and clays, as well as significant adverse geological conditions shall be reported to the inspector as soon as possible and work shall cease until the inspector advises otherwise.
5(c) - Residents within 1km of the centre of the Quarry, and the Inspector, shall be given 24 hours notice of each scheduled blast.
9(d) - Should the provisions of [working outside permitted hours in case of safety concern or declared emergency] be implemented the Manager shall advise the Inspector without delay
19.1(e) and (f) - Any changes to the proposed method of development [geotechnical – design and construction] will require previous approval of the Inspector…Within 30 days of completing construction, a construction QAQC report shall be submitted to the Inspector.
19.1 (g) - The Permittee shall submit an as-built report with drawings to the Inspector prior to operation of the facility.
20 (b) - [Completion of the cell] The permitted shall prior to applying any vegetation cover to the completed cell provide the inspector a plan designed by an appropriate Qualified Person which demonstrates the vegetation cover is suitable for the area, and as cover for the waste cell.

Reporting – MOE Permit PR-105809

~~Section~~ 2.4 – Bedrock integrity inspection and risk assessment report must be submitted to the Director prior to the construction of any landfill cells. If abnormalities are encountered (open fractures, presence of water, percolation, etc.) then a structural report must be submitted within 30 days.
~~Section~~ 2.11 – All spills to the environment (as defined in the Spill Reporting Regulations) must be reported immediately in accordance with the Spill Reporting Regulation. Notification must be via the Provincial Emergency Program at 1-800-663-3456.
~~Section~~ 2.12 – Any scenario that may result in the contamination of surface water and/or groundwater must be immediately reported to MOE (250-751-3100) and VIHA at 250-739-6304 (normal office hours) or at 1-800-204-6166 (weekends and evenings).
~~Section~~ 2.13 – The Permittee must prepare and submit an Environmental Procedures Manual.
~~Section~~ 2.14 – The Permittee must establish an Advisory Committee and develop terms of references to the satisfaction of the Director. The Advisory Committee must provide advice to the Director within 30 days of meeting.
~~Section~~ 2.18 – Plans and specifications related to new works must be submitted to the Director.
~~Section~~ 4.1 – The Permittee must submit a closure plan the satisfaction of the Director in 6 months after the issuance of the permit.
4.2 – The Permittee must submit a cost estimate for maintenance, monitoring, remediation and closure of the landfill for the active life of the site and a minimum 25 year post-closure period.
5.2 – The Permittee must submit environmental quarterly reports to the Director within 30 days after the end of each quarter.
5.3 – The Permittee must submit an environmental annual report to the Director no later than March 31st each year.
6.1 – The Permittee must submit a written report to the Director within 30 days of any non-compliance occurrence.

~~Corrective and~~**Reporting – MEMPR Permit Q-8-094**
16 – Annual reports shall be submitted in a form and containing the information as and if required by the Inspector
8 - Within 1 month of the date of this amendment to Permit Q-8-094 [August 17, 2015 – ed.] , the Manager shall file with the Inspector an approved plan for ensuring compliance with Part 8, sections 8.7.1 to 8.7.4 of the Code
10 - The Manager shall forward to the Inspector a copy of the updated mine plan required by the code. This code section refers to updates every three months.
15(c) - Any row of holes to be blasted within 10 meters of the common boundary between the Quarry and property owned by the CVRD shall be surveyed in by a Licensed Land Surveyor. A copy of the survey shall be forwarded to the Inspector within one week of the blast.
17 - At the completion of each 1 meter (compacted) lift [of soil for encapsulation – ed.] the Manager shall provide the Inspector an as built of the lift signed by a suitable registered professional.
19.2 (a) - Prior to operation of the facility [geotechnical – design and construction], the Permittee shall submit an updated OMS manual and a Mine Emergency Response Plan MERP to the Inspector
19.3 (a) - Annual inspections of the waste storage facility [geotechnical – design and construction] shall be undertaken by a qualified Professional Geotechnical Engineer with a report submitted to the Inspector by March 31 of the year following the inspection.
20 (e) - Prior to receiving fill in any cell the Permittee must provide a signed as built of the construction of the cell to date.
20 (h) - The Manager shall, by March 31 of each year, provide the Inspector a report identifying the volume of water treated through the treatment plant, and shall include all operating costs associated with the operation and maintenance of the treatment plant.
21 - The Manager shall forward to the Inspector a copy of the report submitted to the Minister of Finance in relation to the annual Health and Safety Assessment.

As mentioned previously, the site is subject to daily internal inspection. In addition to receiving notifications and reports, MOE and MEMPR may inspect the site at any time.

The results of internal monitoring and inspection, in combination with MOE and MEMPR observations, will identify issues requiring corrective or preventative measures~~ will be devised and~~. Generally, corrective actions and a related implementation schedule will be developed within 30 days (or as directed by MOE or MEMPR) of identifying a deficiency or area for improvement. However, where health, safety or environmental quality are at risk, mitigation actions will begin immediately.

Corrective actions and improvement initiatives will be implemented ~~as required, based on data and feedback obtained during routine inspections, monitoring and sampling. In addition, recommended corrective~~ under the authority of the Mine Manager, in collaboration with the Operations Manager. Where applicable, Qualified Professionals will be retained or consulted to investigate, analyse, plan, implement and/or monitor.

Implemented and planned corrective and preventative measures will be ~~part of the EMS, to be considered by the~~documented in the Annual Environmental Report, which is submitted to MOE, MEMPR and the site's Advisory Committee~~ on an annual basis.~~

.

14 REFERENCES

Active Earth Engineering Ltd. (AEEL) 2012. T*echnical Assessment for Authorization to Discharge Waste*. Submitted to BC Ministry of Environment Environmental Management Branch. Prepared for South Island Aggregates Ltd. AEEL file No. 320. 361 pp.

AEEL. 2013a. *Bedrock Integrity Inspection and Risk Assessment, Authorization to Discharge Waste Permit PR-105809*. Letter report to Luc Lachance, P.Eng., BC Ministry of Environment. 640 Stebbings Road, Shawnigan Lake, BC. October 10, 2013. 7 pp.

AEEL. 2013b. *As-Built Summary – Soil Management Area, Authorization to Discharge Waste Permit PR-105809, 640 Stebbings Road, Shawnigan Lake, BC*. Letter report to Luc Lachance, P.Eng., BC Ministry of Environment. October 29, 2013. 7pp.

AEEL. 2013c. *As-Built Summary – Water Management System, Authorization to Discharge Waste Permit PR-105809, 640 Stebbings Road, Shawnigan Lake, BC*. Letter report to Luc Lachance, P.Eng., BC Ministry of Environment. December 6, 2013. 11 pp.

AEEL. 2013d. *Seepage Blanket Details, Authorization to Discharge Waste Permit PR-105809. 640 Stebbings Road, Shawnigan Lake, BC*. Letter report to Luc Lachance, P.Eng., BC Ministry of Environment. December 10, 2013. 4 pp.

AEEL. 2015. *Water Treatment Plant Commissioning Report, Authorization to Discharge Waste Permit PR-105809, 640 Stebbings Road, Shawnigan Lake, BC*. Letter report to Laura Hunse, BC Ministry of Environment. May 1, 2015. 18 pp.

BC Ministry of Energy and Mines (now BC Ministry of Energy, Mines and Petroleum Resources, MEMPR). 2002a. *Aggregate Operators Best Management Practices Handbook for British Columbia, Volume I, Introduction and Planning.* April 2002. 145 pp.

BC Ministry of Energy and Mines (now BC Ministry of Energy, Mines and Petroleum Resources, MEMPR). 2002b. *Aggregate Operators Best Management Practices Handbook for British Columbia, Volume II, Best Management Practices*. April 2002. 89 pp.

BC Ministry of Energy, Mines and Petroleum Resources. 2008. *Health, Safety and Reclamation Code for Mines in British Columbia*. ISBN 978-0-7726-6011-4. 356 pp.

BC Ministry of Energy, Mines and Petroleum Resources. 2012. *Mine Emergency Response Plan Guidelines for the Mining Industry*. September 2012, V1.2/. 48 pp.

Mining Association of Canada. 2011. *Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities*. ISBN 0-921108-25-7. 52 pp.

460 Stebbings Road
Shawnigan Lake, BC V0R 2W3
250.743.0811
info@SIRM.ca

Environmental Procedures Manual/ Operation, Maintenance and Surveillance Manual [EPM/OMS]

Waste Discharge Permit PR-105809
Quarry Permit Q-8-094

Rev. 1.0
July 29, 2015

SIRM Document Revision History

Revision No.	Date	Revisions	Authorized (SIRM)
1.0	July 29, 2015	Conversion of SIA EPM v. 1.3 to reflect SIRM assumption of operations; merger with MEMPR OMS to create a new document	RPC

Notes:
(1) Review/revise to keep current and at least annually on or before March 31.
(2) Revisions are not effective until review/approval by technical reviewers and sign-off by SIRM Mines Manager.
(3) At time of issue, revisions must be submitted concurrently to both BC Ministry of Environment and BC Ministry of Energy, Mines and Petroleum Resources.

Approvals

Revision	Approval	Name	Signature	Date
1.0	Qualified Environmental Professional	Pete Craig, M.Sc., PChem		
	Professional Geotechnical Engineer	Matt Pye, P.Geo.		
	SIRM Mines Manager	Doug Harlow		

Distribution

This is a controlled document.

When approved, this document must be kept accessible on site in both original (signed) paper and (searchable) electronic forms. Electronic copies of the document are for information only; electronic files are subject to manipulation or alteration and only signed original hard-copies can be relied upon.

The document is the intellectual property of SIRM Ltd., which retains all rights and privileges. Unauthorized alteration or manipulation is strictly prohibited.

Other than the Province of British Columbia and its properly designated agents, no third party may rely on this document in part or in full, without the written permission of SIRM. SIRM is in no way liable for any damages of any kind resulting from third-party use, reference or citation.

EXECUTIVE SUMMARY AND COMPLIANCE POINT OVERVIEW

This document comprises the integrated site operations manual, the *Environmental Procedures Manual/ Operation, Maintenance and Surveillance Manual* (EPM/OMS), for the quarry (mine) located at 460 Stebbings Road, south of Shawnigan Lake, BC (Lot 23, Blocks 156, 201 and 323, Malahat District, Plan VIP78459).

The operations of the mine include both the commercial production of rock products and the reclamation of the mine with encapsulated non-hazardous waste classification contaminated soils. As such, the mine operates under the following permits:

- BC Ministry of Environment (MOE) Permit PR-105809 (issued August 21, 2013; confirmed by the Environmental Appeal Board March 20, 2015; last amended June 4, 2015); and
- BC Ministry of Energy, Mines and Petroleum Resources (MEMPR) Permit Q-8-94 (issued October 4, 2006; last amended July 17, 2015).

This EPM/OMS has been developed as a single operating guide for the site, meeting the related requirements of both MOE and MEMPR permits. Though based on a pre-existing Environmental Procedures Manual (v. 1.3, dated June 8, 2015), it represents an extensive revision and expansion of site guidance.

Changes also reflect a change in the site operator. The site continues to be owned, and relevant permits maintained, by Cobble Hill Holdings Ltd. (BC0754588, "CHH"). However, South Island Resource Management Ltd. (SIRM), a wholly-owned subsidiary of Allterra Construction Ltd., executed a renewable long-term operating agreement with CHH in April, 2015, and formally took control of the site on June 11, 2015, replacing South Island Aggregates Ltd. (SIA) as the operator.

This initial issue (v. 1.0) of the SIRM EPM/OMS is intended as a living document, to be routinely updated, with all updates submitted concurrently to MOE and MEMPR. A current version of the EPM/OMS is maintained at the site, available to staff and Ministry representatives at all times.

The EPM/OMS comprises a comprehensive guide to site operations, procedures, maintenance, surveillance/monitoring and compliance. It, with its appendices, present a detailed program for maintaining and improving the environmental performance of the site.

For convenience, major compliance points are summarized briefly below in this executive summary, followed by synopses of effluent water and receiving environment water monitoring.

EXECUTIVE SUMMARY - GENERAL COMPLIANCE POINTS

Compliance Point/Item	General Overview
Quarry Production	• Max. 240,000 tonne/year
Contaminated Soil Import for Reclamation	• Max. 100,000 tonne/year
Hours of Operation	• Quarry and Landfilling/Reclamation: 7 am to 5 pm (normal business days) • Drilling: Restricted to 8 am to 4 pm (normal business days) • Light maintenance permitted in Quarry: 9 am to 4 pm Saturday
Authorized Works	• As described in permits. • No bypasses or changes that adversely affect quality or quantity of discharges
Authorized Discharge - Landfill	• No hazardous waste • No liquids, slurries, putrescible (rotting) material • Multicomponent (compacted clay till and landfill geomembrane liners on low permeability bedrock) encapsulation system • Importation, handling and record keeping as per Section 6 (Soil Acceptance Plan) of the EPM/OMS • Soils must be classified by qualified professional prior to arrival, and have supporting analytical data from an approved laboratory • Incoming soils re-sampled at prescribed frequency for quality assurance • All trucks from contaminated soil areas must go through wheel wash and be inspected before exiting site.
Authorized Discharge – Water Treatment System	• Annual avg. rate 12.1 m^3/d; maximum instantaneous rate 274 m^3/d • Treat all contact water (runoff from areas with contaminated soil) • Comply with most stringent of BCAWQG and BCWWQG for Freshwater Aquatic Life (AL) protection and Drinking Water (DW) uses for parameters of concern
Authorized Discharge – Settling Pond	• 42,500 m^3/d for up to a 1 in 10 year flood event of 24 hrs duration • Maintain minimum water depth below decant and minimum freeboard during storm events. • Comply with most stringent of BCAWQG and BCWWQG for AL. • Total Suspended Solids (TSS) shall not exceed 25 mg/L for up to a 1:10 year storm event; nitrate shall not exceed standards applicable to DW.
Air/Odour/Dust	• No objectionable hydrocarbon odour evident at property boundary • No exceedance of CSR Schedule RL Standards at property boundary • No exceedance of 1.7 mg/dm2/day over 2 week averaging period at property boundary • Cover contaminated soils (including in active encapsulation cells) to protect from rain and wind
Notifications	• See Section 13 of the EPM/OMS - Notification is required for most significant upset Conditions, 24 hours in advance of blasting, and before placing soils in a new encapsulation cell.
Reporting	• See Section 13 of the EPM/OMS - Reports include: (a) regular quarterly and annual reports, including public posting and advisory committee review; and (b) certified as-built records for major work, including cell liner and cap construction.

SYNOPSIS: EFFLUENT WATER MONITORING

Monitoring Location	Minimum Monitoring Frequency	Minimum Sampling Frequency
Catch Basins and Leak/Leachate Detection Inspection Ports (soil management and encapsulation areas)	Visually inspected on at least a weekly basis. Cleaned out as needed.	N/A
Water Treatment System Holding Tanks (When Applicable) and/or Containment Pond	Weekly	Monthly (or as generated)
Water Treatment System Outlet (WTS)	Weekly	Monthly and Every 2,000m^3 of Effluent Treated Effluent
Settling Pond Outlet (SW-1)	Weekly	Monthly and Every 2,000m^3 of Effluent Treated Effluent
		Turbidity Assessed Bi-Weekly from November to April and After >1:10 year storm events*

*1:10 Year Return Event estimated based on 122mm of precipitation over a 24 hour period as measured at the on-Site rain gauge.

SYNOPSIS: RECEIVING ENVIRONMENT MONITORING – GROUNDWATER AND SURFACE WATER

Receptor	Monitoring Locations			Monitoring Schedule
Groundwater	Up-gradient	MW-4	On-Site, near southeast corner	Quarterly
	Down-gradient	MW-1(S/D)	On-Site, near centre	
		MW-2	On-Site, near west property boundary	
		MW-3(S/D)	On-Site, near west property boundary	
		MW-5S	On-Site, north	
Surface Water	Up-stream	SW-4	Shawnigan Creek	5 in 30* (2 times/year, conducted during fall first flush event and during spring freshet); and after a 1:200 year storm event** at SW-2 and SW-3
		SW-2	Ephemeral Creek	
	Down-stream	SW-5	Shawnigan Creek	
		SW-3	Ephemeral Creek	

*5 in 30 refers to at least 5 weekly samples taken in a period of 30 days. Due to the ephemeral nature of some of the creeks, the first 5 in 30 samples should be collected when the ground has first been saturated.
** 156 mm of rain over 24 hours

TABLE OF CONTENTS

FIGURES

APPENDICES

1 INTRODUCTION

This document comprises the integrated site operations manual for the quarry (mine) located at 460 Stebbings Road, south of Shawnigan Lake, BC (Lot 23, Blocks 156, 201 and 323, Malahat District, Plan VIP78459).

The site is owned, and relevant permits maintained, by Cobble Hill Holdings Ltd. (BC0754588, "CHH"). South Island Resource Management Ltd. (SIRM), a wholly-owned subsidiary of Allterra Construction Ltd., executed a renewable long-term operating agreement with CHH in April, 2015, and formally took control of the site on June 11, 2015, replacing South Island Aggregates Ltd. (SIA), the previous operator.

The operations of the mine include both the commercial production of rock products and the reclamation of the mine with encapsulated non-hazardous waste classification contaminated soils. As such, the mine operates under the following permits:

- BC Ministry of Environment (MOE) Permit PR-105809 (issued August 21, 2013; confirmed by the Environmental Appeal Board March 20, 2015; last amended June 4, 2015); and
- BC Ministry of Energy, Mines and Petroleum Resources (MEMPR) Permit Q-8-94 (issued October 4, 2006; last amended July 17, 2015).

Current versions of both permits are attached in Appendix A and B, respectively.

As per Section 2.13 of MOE Permit PR-1058089, the site must operate under an Environmental Procedures Manual (EPM), which is to be kept current; as per Section 2(a) of MEMPR Permit Q-8-94, the site must also operate under an Operation, Maintenance and Surveillance (OMS) manual, also to be kept current.

This integrated site operations manual, the *Environmental Procedures Manual/ Operation, Maintenance and Surveillance Manual* (EPM/OMS), has been developed as a single operating guide for the site, meeting the related requirements of both MOE and MEMPR permits.

The EPM/OMS is a living document, routinely updated, with all updates submitted concurrently to MOE and MEMPR. A current version of the EPM/OMS is maintained at the site, available to staff and Ministry representatives at all times.

1.1 Health, Safety, Security and Environment (HSSE) Policy Statement

SRIM's policy on Health, Safety, Security and Environment, as reflected in this EPM/OMS and in its separate Occupational Health and Safety Program manual, is an integral part of all operations and procedures. All employees, at all levels, are expected to embody our core values, to be "Reliable, Responsible and Accountable".

SIRM recognizes the importance of protecting the safety and health of both its workers and the communities in which they live, work and play. SIRM is committed to consulting with its employees and communities in a spirit of co-operation to continuously promote and improve healthy, safe, environmentally responsible operations.

Management at all levels is accountable for ensuring the health and safety of employees and for the effectiveness of health, safety, security and environmental programs. Employees are responsible for following the procedures, protocols, reporting requirements and other responsibilities laid out in the EPM/OMS and the SIRM Occupational Health and Safety Program (maintained under separate cover).

With respect to occupational health and safety, areas outside the mine boundary are under the jurisdiction of WorkSafeBC and the BC Occupational Health and Safety Regulation (the "OHS reg", B.C. Regulation 296/97, as amended). Areas within the mine are within the jurisdiction of the Inspector of Mines, and the Health, Safety and Reclamation Code for Mines in British Columbia (the "Code"). SIRM's policy is to meet or exceed the more stringent of the related requirements at all times, in all locations on site, only deferring in case of unresolvable conflict to the legally enforceable standard where such is less protective.

1.2 Summary Description of the Site and Works

The site is a shallow bedrock quarry approximately 5 km south of Shawnigan Lake in a rural, forested portion of the Cowichan Valley Regional District (CVRD) on Vancouver Island, British Columbia. The quarry has an estimated remaining productive life of 40 to 50 years. The pit cuts into an extensive mass of relatively impermeable rock, the Wark Gneiss (West Coast Crystalline Complex). The rock is hard, dense (about 2.85 g/mL) and resistant to cracking, spalling or degradation from mechanical, wet/dry or freeze/thaw action, making it highly desirable as, e.g., armour stone and wall rock.

Seepage through the rock mass is minimal (less than 0.3 m^3/day over the entire quarry footprint of nearly 20 acres, including a conservative allowances for potentially weathered horizons). Where groundwater has been encountered in rock fractures deep below the pit, it occurs with an upward hydraulic gradient (i.e., water in fractured bedrock deep beneath the pit is confined by overlying bedrock; if a flow path were available, water would flow upwards, into the pit).

Given the extremely low probability of contaminant transport out of pit fill under these conditions, the reclamation plan includes the use of fully encapsulated non-hazardous waste class contaminated soil and ash for bulk fill, with a final (future) revegetation cover of uncontaminated soil. To date, only soil has been received at the site, and soils comprise the bulk of intended future acceptance. "Soil" is therefore used in this document in the context of soil acceptance and soil encapsulation to mean "soil and/or ash".

To provide additional assurance of permanent isolation, cells of soil are encapsulated in a composite liner and cover system using both natural clay material and commercial landfill geomembranes.

The site accepts contaminated soils that exceed residential, commercial and industrial land use standards as defined by the BC Contaminated Sites Regulation (CSR) Schedules 4, 5 and 10. However, it does not accept soil exceeding the BC Hazardous Waste Regulation (HWR) standards, including standards based on leachability or toxicity.

Under permit terms, organic/treatable contaminants could be treated prior to encapsulating on-Site, or prior to shipping off-Site for appropriate re-use. In deference to CVRD's current interpretation of zoning terminology, **no contaminant treatment is currently conducted on site**.

The site is an active quarry, with contract drill/blast operations and rock processing. Rock products are exported and the pit is (aside from incident precipitation) dry. While the site is classified as a mine, there is no permanent explosives magazine, mine tailings storage or waste rock storage. There is also no dam, other than a low (approximately 3 m high) wall comprising one side of the stormwater settling pond.

Current site operations include:

(a) Rock product production under MEMPR Permit Q-8-094, to a maximum of 240,000 tonnes annually (Mine 1610355).

(b) Discharge of relocated contaminated soil and ash to engineered landfill cells under MOE Permit PR-105809, to a maximum of 100,000 tonnes per year (site reference E292889.)

(c) Discharge of treated water from a water treatment system to a general settling pond, under PR-105809, to an average annual daily rate of 12.1 cubic metres per day, with a maximum rate of 274 cubic metres per day (site reference E292170).

(d) Discharge of stormwater and water treatment system effluent from a settling pond to a seasonal (ephemeral) creek bed on the western boundary of the site (site reference E292898).

Site features include:

- An active quarry pit
- A visual and noise screening berm along Stebbings Road
- Site fencing
- A buffer zone between the property line and the mine area
- Designated, controlled access ways to the permitted mine area (as required by the Mines Act)
- A deep (approximately 100 m) water supply well east of Shawnigan Creek from the pit (Well tag 86152)
- Incoming and outgoing scales
- Offices, storage buildings and laydown areas
- A conservation easement along Shawnigan Creek, which runs between the scale area/parking lot and the quarry area

- A Soil Management Area (SMA), to stage soil, and/or re-test them before discharge to landfill cells in the quarry
- Landfill (encapsulation cells) in the quarry to receive and permanently isolate compacted contaminated soil from the environment in composite clay till and geomembrane cells on low permeability bedrock
- A collection/containment system for water that may come into contact with contaminated soil ("contact water")
- A Water Treatment System to treat contact water
- A collection/management system for runoff water within the active site area which has not come into contact with contaminated soil ("non-contact water")
- A settling pond and combined final discharge for combined collected non-contact water and treated contact water

As per the amendment to MOE Permit PR-105809 dated June 4, 2015, a permanent roof must be placed over the SMA before March 20, 2016. Soil in the SMA and exposed materials in encapsulation cells are currently covered with polyethylene sheeting when not being actively worked.

Figure 1, attached, shows the site layout.

The positions of the overall landfill area boundaries (the mine limits), the overall soil management area, the settling pond discharge, the water treatment system discharge, surface water sampling locations and down- and up- gradient groundwater monitoring wells are fixed under PR-105809 (Figures A and B of the permit).

Mining operations are continuing, and reclamation activities are being undertaken concurrently (referred to in mining as "progressive reclamation"). Within the specifications of the relevant permits, individual components of individual systems, such as the active quarry face, the location of individual pieces of water treatment system equipment, on-site monitoring locations, stockpiles and support structures, are moved to adapt as mining progresses.

1.3 EPM/OMS Objectives

As per Section 2.13 of MOE Permit PR-1058089, an EPM must cover all typical aspects of an Environmental Management System relevant to soil treatment, water treatment and landfill facilities (including operation, maintenance and inspection of works, as well as an emergency response plan). Minimum contents of the EPM are outlined in the permit.

As per Section 2(a) of MEMPR Permit Q-8-94, an OMS must outline procedures for successful operation, maintenance and surveillance of the site (and of emergency preparedness and response procedures).

Specifically, with respect to the Health Safety and Reclamation Code for Mines in British Columbia (the Code), Section 10.5.2,

> *An Operation, Maintenance and Surveillance (OMS) manual shall be prepared and provided to an inspector and to all employees involved in the operation of a major dam or major impoundment, prior to commissioning. The manual shall be revised regularly during operations, decommissioning and closure of the structure.*

As per the Code, Part 10, Reclamation and Closure, "Definitions":

> *"major dam" means a dam that is used to store and control water, slurry or solids and has a maximum height at any point that exceeds 15 metres or is between 10 and 15 metres in height and has either a crest length that exceeds 500 metres, a flood discharge rate that exceeds 2000 cubic metres per second, a reservoir capacity that exceeds one million cubic metres, or any other dam so declared by the chief inspector.*

and

> *"major impoundment" means an impoundment that has a maximum depth of material greater than 10 metres at any point, or a maximum height of retaining dam or dike at any point that exceeds 15 metres, or is a storage facility designed to contain more than one million cubic metres of material or is constructed with dams or dikes that contain more than 50000 cubic metres of fill, or any other impoundment or water management facility so declared by the chief inspector*

Neither a "major dam" or "major impoundment" for solids will be constructed on site for at least 10 years (and at no point will a major liquid or slurry dam or impoundment be constructed at all). Current OMS content has been developed with regard to the water management facilities of the site, including the stormwater system, containment pond, water treatment system and settling pond.

The overall objectives of the amalgamated EPM/OMS are: (a) compliance with the above permit requirements; and (b) continuous improvement in environmental performance, health, safety and security.

These objectives are attained through:

1. Summarizing both general and specific (i.e., activity specific and/or site specific) requirements that must be complied with
2. Providing the procedures to facilitate attainment of the environmental requirements and objectives

3. Defining the overall management system and supporting operational procedures
4. Describing the process of change management and continuous improvement

1.4 EPM/OMS Scope and Function

The EPM/OMS includes, but is not limited to the following:

- Site and works description
- Risk identification and prioritization
- Administrative and engineering controls
- Roles and responsibilities
- Training requirements and competency demonstration
- A Soil Acceptance Plan
- A Water Management Plan, including operations, maintenance and system monitoring (surveillance)
- An Environmental Monitoring Plan including surveillance parameters, surveillance procedures, on- and off-site monitoring locations and the sampling procedures for soil and ash, water, groundwater and air quality, as required
- An Emergency Response Plan/Mine Emergency Response Plan, including contingency measures
- Site preparation for the construction of landfill cells
- Internal and external EMS audits
- Notification, reporting, corrective and preventive measures
- Change management
- References

The EPM/OMS focuses on operations and maintenance of a site constructed to approved designs. It has been developed in reference to site permits, applicable legislation, regulations, standards, guidelines and codes of practice.

Basis of design and design criteria information is included only to the extent necessary for conveying intended capacity and operating ranges, enabling the comparison of performance to design intent, and guide evaluation of whether design modification is necessary. For more information on detailed design, the reader is referred to the "Technical Assessment for Authorization to Discharge Waste" (TAR), the current mine plan, and the on-site file of as-built records.

1.5 EPM/OMS Updates and Change Management

The EPM/OMS is prepared to the best of the author's, reviewer's and approver's knowledge at the time of writing. Except as noted, the EPM/OMS is a "living" document that is modified as required to reflect advancement of design and refinement of operation methods, as well as changing regulatory requirements and environmental conditions.

As a condition of the permit, the EPM/OMS is reviewed at least annually to reflect such changes. Annual reviews and submission of revisions are due to Province on March 31st of each year.

Additional review, revision and submission to the Province may be taken at any time on the direction of the SIRM Operations Manager.

Revision history and approvals for the current revision are presented before the Table of Contents.

2 RISK IDENTIFICATION AND PRIORITIZATION

Site risks are broadly categorized into two groups: (A) risks specific to the handling and encapsulation of contaminated soil and ash; and (B) risks normally associated with operation of a quarry. Both are discussed below.

2.1 Risks Related to Contaminated Soil and Ash

The potential for contaminated soil or ash to impact human and/or ecological receptors requires a pathway for contaminants to reach receptors. The Site was designed to eliminate potential pathways, which eliminates the risk. Monitoring and inspection programs are required to confirm that the Site design and operations are effective at eliminating exposure pathways; quality assurance and maintenance programs are required to ensure that works are as designed and approved, and that they will continue to function as intended.

The prioritization of risks if pathways were somehow activated and contingency measures not taken is subjective. It requires comparing speculative low-probability scenarios, for example, where design and monitoring simultaneously fail, where deliberate vandalism occurs, or where improbable natural disasters impinge.

Based on factors such as rate of contaminant migration, remedial alternatives, response time available, toxicity to receptors and attenuation along the pathway before contact with a receptor, prioritization is considered to be as follows:

1. Surface water impacts (transport of particulate and dissolved-phase contaminants in surface water)
2. Groundwater impacts (transport of dissolved-phase contaminants in groundwater)
3. Air quality impacts (transport of particulate/dust and volatile contaminants in air, including odours).

The potential for surface water impacts is considered to be the highest priority as a result of the potential for direct contact of precipitation with contaminated soil (resulting in “contact water”) and the potential for sedimentation associated with diverted overland runoff (resulting in “non-contact water”).

The volume of water requiring management and treatment, and the anticipated rate of migration will vary seasonally and in relation to storm events. The site design considered a 1:200 year storm event and anticipated a worst-case scenario whereby such an event also results in a near-instantaneous snow melt. However, site procedures include cover requirements for trucks, piles and active cell faces. Moreover, a permanent roof will be installed on the SMA.

Potential groundwater impacts are considered to be the second highest priority. Although damage to the groundwater resource could have significant impacts, the risk is mitigated by natural geological and hydrogeological conditions at the Site in addition to engineered controls.

Impacts to groundwater would require simultaneous failure of multiple levels of physical and procedural control. For example, for significant groundwater impacts related to an encapsulation cell to impact off-site receptors, the following safeguards must be breached:

- The final (graded) revegetation cap
- The geomembrane cap
- Quality assurance procedures to bar placement of leachate toxic materials
- The leachate collection layer
- The geomembrane bottom liner
- The leachate detection liner under the geomembrane
- The compacted clay layer under the liner leachate detection layer
- Leachate detection at the bedrock interface
- On the order of 75 metres of relatively impermeable bedrock
- An upwards hydraulic gradient
- Natural attenuation along the flowpath to the receptor

The potential for air quality impacts is considered to lowest priority, based on the temporal (temporary) nature, ease of management (slowing/limiting soil disturbance, tarps, mists, sprays and foams), rapid attenuation with distance from the point of release, and the lack of nearby receptors. Essentially, the air risks are similar to, but lower (because of distances to receptors such as residences), than similar air risks routinely managed at contaminated soil excavations throughout the province.

2.2 Risks Related to Quarry Operations

Risks related to routine quarry operations fall into two general categories: risks to workers in the quarry, and risks to human and ecological health outside the quarry. With regard to the former, the site is managed under SIRM's health and safety program (maintained under separate cover), which seeks to exceed the requirements of both the BC Occupational Health and Safety Regulation (the "OHS reg") and the Health, Safety and Reclamation Code for Mines in British Columbia (the "HSRC" or simply "Code"). In addition, the site has established a management-worker Occupational Health & Safety Committee (OHSC), dedicated to continuously improving worker health and safety. Worker health and safety are not considered further herein.

Risks to human and ecological health outside the quarry are conceptualized as follows, based on experience and on the “Aggregate Operators Best Management Practices Handbook for British Columbia” (Ministry of Energy, Mines and Petroleum Resources, 2002):

Item	Issue(s)	Existing Mitigation	Existing Relative Risk
Noise	Noise from equipment operations, loading and transportation.	• Berm • Buffer Zones • Hours of operation (generally 7 to 5 weekdays; drilling restricted to 8 to 4 weekdays)	Low
Dust	Dust from exposed soils, traffic and processing	• Distance to receptors • Sprinklers • Tarps and Covers • Wheel wash • Paving	Low
Traffic	Heavy truck traffic into/from the facility	• Hours of operation • Limited production tonnage • Facility terms of service restrictions on trucker conduct • Trucker orientations	Low
Viewscapes	Changes to landscape	• Berm • Buffer areas • Revegetation • Housekeeping and maintenance	Moderate
Stormwater	Increased erosion and siltation; pollution	• Buffer zones and Conservation Easement • Housekeeping and maintenance • Ditches, bioswales, checkdams, gravel filters and retention/stilling basins • Designated (controlled) equipment maintenance areas • Paved areas around wheel wash sloping to wheel wash catch basin • Spill (emergency) response plan and spill kits • Settling Pond • Revegetation of disturbed areas • Gravelled parking lot • Facility terms of service restrictions on truck condition/trucker conduct	High
Groundwater	Reduced filtering capacity; altered recharge rates; lowering of groundwater table; contamination	• Massive, low permeability bedrock • No pit groundwater dewatering necessary (dry pit) • Designated (controlled) equipment maintenance areas • Spill (emergency) response plan and spill kits	Low
Acid Rock Drainage	Increased acidity	• Test results show rock is not acid generating.	Low

Based on the above risk identification, risk prioritization and management is as follows:

Item	Relative Prioritization & Related Action(s)
Noise	Low – no specific additional measures in the absence of triggering event.
Dust	Low – no specific additional measures in the absence of triggering event.
Traffic	Low – no specific additional measures in the absence of triggering event.
Viewscapes	Low – no specific additional measures in the absence of triggering event.
Stormwater	High – integrate general quarry stormwater management with contaminated soil/ash surface water monitoring program.
Groundwater	Low – no specific additional measures in the absence of triggering event
Acid Rock Drainage	Low – no specific additional measures in the absence of triggering event

3 ADMINISTRATIVE AND ENGINEERING CONTROLS

In order to frame the EPM/OMS within the context of an Environmental Management System (EMS), the following table presents the prioritized risks from the preceding section, their associated controls or monitoring/surveillance, and related audit mechanisms.

Summary of EMS Framework within EPM/OMS

Prioritized Risk	Controls	Audits
Surface Water Impacts	**Soil Acceptance Plan**: Only non-leachable soils accepted to Site, confirmed via laboratory data review and soil sampling in accordance with MOE Guidelines.	Quarterly and Annual Reporting, Internal and External EMS Audits, Advisory Committee Recommendations
	Water Management Plan: Collection, treatment and monitoring of contact water; collection and monitoring (with ability to treat) of non-contact water from adjacent areas (active site). Combined discharge from active site only occurs at one location, allowing for simplified control/intervention.	
	Environmental Monitoring Plan: Routine inspection and monitoring of surface water quality to confirm no impacts are occurring.	
Groundwater Impacts	**Bedrock Integrity Inspections**: Bedrock underlying proposed cells is inspected prior to construction. Identified fractures are subject to risk mitigation prior to construction.	Inspection/reporting required prior to the construction of each new cell
	Soil Acceptance Plan: Only non-leachable soils accepted to Site, confirmed via laboratory data review and soil sampling in accordance with MOE Guidelines.	Quarterly and Annual Reporting, Internal and External EMS Audits, Advisory Committee Recommendations, Inspection/reporting required prior to the construction of each new cell
	Environmental Monitoring Plan: Routine inspection and monitoring of groundwater quality to confirm no impacts are occurring.	
	Site Design and Natural Setting: Both compacted natural clay till and synthetic liners/landfill geomembranes are utilized for contaminated soil isolation; bedrock comprises a very low-permeability aquitard; bedrock inspection and risk assessment is conducted prior to cell construction; construction includes QA/QC with qualified professional oversight and reporting to the Province.	
Air Quality Impacts	**Environmental Monitoring Plan:** Routine monitoring of air quality during soil treatment or as triggered by site observations.	Quarterly and Annual Reporting, Internal and External EMS Audits, Advisory Committee Recommendations
	Site Operational Procedures: Soil covered when not actively being worked/relocated, soil worked only during suitable climatic conditions, routine monitoring of climatic conditions including wind and precipitation.	

The above table links the risks associated with the Site to the "Controls" that are detailed within the EPM/OMS. The related plans forming subsections with the EPM/OMS are as follows:

- Soil Acceptance Plan (Section 6);
- Water Management Plan (Section 7);
- Sediment and Erosion Control Measures (Section 7);
- Environmental Monitoring Plan (Section 8); and,
- Emergency Response Plan (Section 9).

In addition to the above plans, the EPM/OMS details all other procedural aspects of the Site including:

- Roles and Responsibilities of Site Personnel (Section 4);
- Training Requirements for Site Personnel (Section 5);
- Site Construction, Construction QA/QC and As-Builts (Section 10);
- Site Operation, Inspection and Maintenance Procedures (Section 11).

4 ROLES AND RESPONSIBILITIES

Staff includes both core staff and personnel who come to the site on an as-needed basis for oversight and specialty work (technical specialists). The roles and responsibilities for both core staff and technical specialists are described below.

4.1 Core Staff

Core Staff include the following key roles:

- Environmental Technician
- Scale Operator
- Shiftboss
- Operations Manager
- Mine Manager
- General Staff

Key responsibilities associated with each position are as follows:

- Environmental Technician
    - Conduct and document site orientations for visitors, contractors and staff
    - Receive completed Soil Arrival Forms, verifying valid Waste Approval numbers
    - Assess incoming trucks for consistency with the relevant Waste Approval
    - Direct and observe unloading and consolidation at the SMA or encapsulation cell
    - Collect soil samples at SMA or encapsulation cell according to the Soil Acceptance Plan
    - Collect air samples according to the Environmental Monitoring Plan
    - Collect water samples according to the Environmental Monitoring Plan
    - Direct and inspect the covering of soil as required based on operations and precipitation
    - Conduct visual and olfactory monitoring for visible dust emissions and/or objectionable odours at the property boundary
    - Reconcile Waste Approval numbers, Soil Arrival Form numbers, and scale ticket numbers under unique tracking IDs (as per the Soil Acceptance Plan)
    - Track weights received from weigh scale operator and provide daily totals to Operations Manager
    - Document and demarcate soil in the Soil Management Area on a daily basis

- Document soil placed in encapsulation cells on a daily basis
- Complete daily log documenting soil source(s), locations and status
- Conduct and document routine inspections of infrastructure including the SMA, Containment Pond, Water Treatment System, Water Treatment System Discharge, Settling Pond, Settling Pond Discharge, Leachate Detection Ports; Leak Detection Ports, ancillary equipment, catch basins, clean-outs and appurtenances.
- Routinely assess site works and procedures, promptly bringing potential improvements in health, safety, security and/or environmental performance to the attention of the Mine Manager.

- Scale Operator
  - Receive incoming trucks and monitor outgoing trucks, including:
    - Conducting driver orientations
    - Verifying truck information and compliance with site terms of service
    - Taking truck weights and tares
    - Monitoring truck arrival and departure, keeping track of all haul trucks within site boundaries
    - Verifying that incoming trucks are clean and have secured loads
    - Verifying that outbound trucks from the SMA have passed through the wheel wash and self-inspected to ensure that loose soil has been removed
    - Verifying that all outbound trucks are clean and have secured loads (if applicable)
    - Liaising with generating and receiving sites to schedule truck arrival/departure;
    - Printing truck and site copies of scale tickets
    - Collecting Soil Arrival Forms and verifying that such are filled out fully and completely, including designation of a valid Waste Approval number
  - Maintain the site sign-in/sign out sheet (mine tally)
  - Routinely assess site works and procedures, promptly bringing potential improvements in health, safety, security and/or environmental performance to the attention of the Mine Manager.
- Shiftboss
  - Carry out all duties associated with an Open Pit Shift Boss as per the *Mines Act* and Code
  - Supervise workers in the pit

  - Monitor works, traffic, water and other pertinent site features, promptly alerting the Environmental Technician of any unusual observations, high risk conditions, near misses, conditions that might lead to contravention permit or EPM/OMS requirements, or any known or suspected non-compliances with respect to permits, law or regulation
  - Routinely assess site works and procedures, promptly bringing potential improvements in health, safety, security and/or environmental performance to the attention of the Mine Manager.
- Operations Manager
  - Verify Environmental Technician and Scale Operator completion of routine duties
  - Schedule routine flow-triggered, event-triggered, daily, weekly, monthly, quarterly and bi-annual monitoring events
  - Ensure that required environmental logs and records are maintained on-site for Provincial inspection
  - Confirm appropriate Waste Approval Applications have been submitted to, reviewed by and approved by a Qualified Environmental Professional
  - Complete monthly, quarterly and annual reports related to soil quantity and quality tracking for Qualified Environmental Professional input and review
  - Review permitted capacity and approve any quotes/offers to accept suitable waste soils
  - Document and report instances of non-compliance in accordance with permit requirements and as outlined in the Emergency Response Plan/Mine Emergency Response Plan
  - Routinely assess site works and procedures, promptly bringing potential improvements in health, safety, security and/or environmental performance to the attention of the Mine Manager
  - Liaise with the Advisory Committee established under MOE Permit PR-105809
- Mine Manager
  - Carry out designated responsibilities under the Mines Act and Code
  - Retain a current roster of site personnel, clearly identifying the staff carrying out each role identified in the EPM/OMS
  - Carry out designated responsibilities under the Site Mine Permit, including but not limited to:

- Maintain copies of Blast Logs, Electronic Monitoring Reports, blast videos and geotechnical/compaction quality assurance/quality control testing results and inspection logs for waste material in encapsulation cells
- Notify the Inspector of Mines, and residents within 1 km from the centre of the quarry[1], 24 hours before to create a scheduled window, not more than 1.5 hours long, for any blasting.
- Forward, to the Inspector of Mines, certified as-built records, including records for encapsulation cell liner construction prior to waste soil/ash placement, and compaction records for each subsequent 1 meter lift of waste soil/ash fill in
- Forward, to the Inspector of Mines, a construction QA/QC report within 30 days of completing encapsulation cell construction
- Forward to the Inspector of Mines an updated mine plan on a quarterly basis.
- Provide the Inspector of Mines an annual report identifying the volume of water through the Water Treatment System, including all operating costs associated with the operation and maintenance of the treatment plant
- Forward, to the Inspector of Mines, a copy of the report submitted to the Ministry of Finance in relation to the annual Health and Safety Assessment and the related data on annual production
- Direct and verify compliance with mining procedures and plans beyond the scope of the EPM/OMS, including specific procedures for blasting within 3 m of the buffer zone and the approved plan to comply with Part 8 Section 8.7.1 to 8.7.4 of the Code
- Schedule truck traffic such that trucks do not conflict with school bus pick-up and drop-off
- Maintain an Occupational Health and Safety Committee
- Forward copies of licensed land survey of any row of holes blasted within 10 metres of the boundary with CVRD property to the Inspector of Mines within one week of the subject blast

[1] 48°33'06.2"N,123°36'23.4"W

General staff are utilized to operate equipment such as excavators, rock trucks, graders, rollers, street sweepers, and front end loaders in order to move, consolidate and manage soil and rock. During periods of significant waste soil inputs, and when receiving soil from more than one source site concurrently, additional staff members may be employed on a temporary basis to ensure that soils from different source sites are appropriately segregated and stockpiled. General staff work under the direct supervision of the Environmental Technician for activities related to waste soil receipt, management and encapsulation, and under the direct supervision of the shiftboss when in the pit.

4.2 Technical Specialists

A variety of specialists are employed on an as-needed basis by the Mine Manager and the Operations Manager. They attend site on an as-needed basis.

These specialists include contract blasters, electricians, liner installation experts and water treatment experts.

Registered Qualified Professionals are retained to oversee, check, audit, and certify operations and/or works within their specific fields of expertise and accreditation. For example, registered professional biologists direct/supervise ecological impact assessment; a professional engineer stamps electrical designs, etc.

All permit works, plans, bedrock integrity and risk assessment, assessments, sampling, monitoring, investigations and reports, surveys, programs and reports must be conducted and certified by Qualified Professionals.

Two such Qualified Persons have substantial, continuing roles:

- The site Qualified Environmental Professional (QEP) oversees operations related to contaminated materials operations under MOE Permit PR-105809; and
- The site Qualified Professional Engineer (QPE) oversees operations related to ground engineering work as specified in MEMPR Permit Q-8-094, and related to bedrock integrity inspection and risk assessment under MOE Permit PR-105809.

4.2.1 Qualified Environmental Professional

The site Qualified Environmental Professional's responsibilities include the following:

- Prepare/approve any changes to the approved Soil Acceptance Plan (a subsection of this EPM/OMS), and verify that MOE is approval obtained prior to implementing any substantive changes
- Determine contaminants of concern for chemical analysis of environmental media
- Oversee sample collection and analysis
- Supervise/approve the re-characterization of any soils suspected as being unacceptable

- Designate/verify off-site disposal of any unacceptable soils at an appropriate off-site disposal site within 30 days of delivery
- Review soil quality data from proposed receiving sites (Generator Sites) in relation to the permit requirements
- Review Quality Assurance sample results
- Review data collected specific to the Environmental Monitoring Plan (groundwater, surface water, and, as applicable, air)
- Oversee the preparation of, and review/approve, Quarterly and Annual Reports in accordance with Permit requirements including requirements for data, interpretations, conclusions and recommendations

4.2.2 Qualified Professional Engineer

The site Qualified Professional Engineer's responsibilities include the following:

- Undertake bedrock integrity inspection and risk assessments, and submit a report on such to the province, prior to construction of any encapsulation cell
- Prior to receiving fill in any encapsulation cell, provide a signed as-built of work completed to date to both the Inspector of Mines and MOE, including a statement that the construction meets the standards of both MOE Permit PR-105809 and MEMPR Permit Q-8-094
- Undertake an annual inspection of waste storage and submit a report to the Inspector of Mines by March 31 of the year following the inspection
- Supervise site construction
- Review rock cuts and slope design, evaluating the need for scaling and/or stabilization for worker safety
- Review site conditions and monitoring results regularly and recommend, as necessary, additional instrumentation, monitoring frequencies, thresholds and response procedures related to stability

5 TRAINING AND COMPETENCY REQUIREMENTS

All personnel are required to complete a site orientation, refreshed at least annually, which includes a site health and safety orientation, an overview of permits, hours of operation, the meanings of property line and buffer markings and an overview of emergency response procedures. They must comply with SIRM's health and safety program, which includes minimum training standards with respect to conventional quarry activities.

Competency in emergency response is demonstrated as a team, in periodic exercises. Additional training requirements and required demonstrations of competence are role-dependent, as described in the following sub-sections. Copies of training records are retained on site.

5.1 Core Staff

Core Staff have specific training and competency requirements related to their designations under law and regulation. For example, shiftbosses are evaluated and tested by MEMPR.

Additional training and competencies related to the EPM/OMS depend on role and are as presented in a training matrix, below.

For the purposes of the matrix, training requirements are as follows:

- OFA1+T - Transportation Endorsement for Level 1 First Aid
- ERP - Emergency Response Plan/Mine Emergency Response Plan
- TDG - Transportation of Dangerous Goods
- PACWEIGH – Scale Software, Weighing, Taring and Scale Ticket Generation
- ICS - Incident Command Systems Level 100
- ENVIRO - Environmental Sample Collection and Analysis as per the EPM/OMS, BC MOE Technical Guidance for Contaminated Sites, as well as the British Columbia Field Sampling Manual (2013)
- HAZWOP - 24 Hour HAZWOPER (Hazardous Waste Operations and Emergency Response Standard)
- EQUIP - Equipment-specific procedures for the maintenance, calibration, use, decontamination and record keeping related to field instrumentation, such as water quality and air monitoring instruments.
- EPM/OMS - An overview of the EPM/OMS, and requirements of the EPM/OMS specific to relevant roles

- PERMIT/REG - The EPM/OMS in detail, site permits, the Technical Assessment Report, the Contaminated Sites Regulation, the Hazardous Waste Regulation, the Mines Act and Code, the and related law and regulation.

Role	OFA1+T	ERP	TDG	PACWEIGH	ICS	ENVIRO	HAZWOP	EQUIP	EPM/OMS Overview	PERMIT/REG
Environmental Technician		•	•	•		•	•	•	•	•
Scale Operator		•	•	•					•	
Shiftboss	•	•							•	
Operations Manager		•	•	•	•	•	•	•	•	•
Mine Manager	•	•		•	•				•	•

With the concurrence of the Operations Manager, the Mine Manager may designate staff into roles on a provisional basis, under enhanced supervision, as they complete additional training in a timely manner.

Competency is demonstrated by fulfilling the training course requirements to demonstrate competency, and by performance under the supervision of the Operations Manager or Mine Manager.

5.2 Technical Specialists

A wide range of specialists are involved with the Site operations and attend site on an as-needed basis. These specialists will include engineers, geologists and liner installation experts.

These personnel will be required to demonstrate competency as appropriate for the specific discipline/expertise including both technical and regulatory competencies. Outlining training requirements for the Technical Specialists is beyond the scope of this document.

6 SOIL ACCEPTANCE PLAN

The following sub-sections outline the process for receiving and tracking imported soils.

These sub-sections relate directly to Section 2.2 (Screening and Acceptance of Soil) in MOE Permit PR-105809; no changes may be made to the substantive requirements of this Soil Acceptance Plan without the prior approval of MOE.

Modifications of "example" procedures or forms, general references and matters of format or diction are submitted to MOE in the form of a revised EPM/OMS as soon as practicable (and not less often than annually).

6.1 Waste Approval Application

Prior to receipt of any contaminated soils, a Waste Approval Application will be completed by the Generator (or the QEP representative of the Generator). The Waste Approval Application will include generator site details including land use and land use history, and waste characterization information. An example of a "WAA" with examples of supporting documents is included as Appendix C.

Waste characterization details will include: nature of contamination, physical soil descriptions, soil moisture content, list of Potential Contaminants of Concern (PCOCs), maximum identified contaminant concentrations, and estimated soil quantity.

The Waste Approval Application must be accompanied by analytical results from a CALA (Canadian Association for Laboratory Accreditation) accredited laboratory. To ensure that no soil is received with contaminant concentrations in excess of the standards outlined in the Permit, the site will require the following analytical information (see the example "Terms of Service" accompanying the WAA in Appendix C):

- For soils containing concentrations of LEPH and/or HEPH in excess of the CSR IL standards, the site requires analysis of PAHs to ensure the PAH Toxicity Equivalent (TEQ) does not exceed that outlined in Schedule 1.1 of the HWR.
- For soils containing concentrations of metals with the potential to produce leachate as determined by the "rule of 20", the site requires Toxicity Characteristic Leaching Procedure (TCLP) analysis.
- For soils containing any substances potentially classified as Hazardous Waste, appropriate laboratory analytical data is required by the Site to confirm no concentrations exceed the HRW standards.

- For soils potentially containing dioxins and/or furans, laboratory analysis must be conducted utilizing a method acceptable to the Director.

The “rule of 20” is used to determine whether it is theoretically possible to produce leachate from a contaminated soil sample, thereby providing the trigger for TCLP analyses. The “rule of 20” simply converts the concentration of an analyte in soil (mg/kg) to a theoretical maximum leachate concentration in water (mg/L) by dividing the soil concentration by 20. The theoretical maximum leachate concentration is then compared to the leachate quality standards. If the theoretical leachate concentration exceeds, then TCLP analyses will be conducted to determine the actual expected leachate concentrations from the particular material. The division factor of 20 reflects the ratio of extraction fluid to solid used in the TCLP analysis. Therefore, this is a conservative screening tool as the “rule of 20” assumes that 100% of the contaminant is leached from the soil which is highly atypical.

The Waste Approval Application and analytical information will be reviewed by the site Qualified Environmental Professional prior to acceptance of any soil.

Prior to accepting soil, the physical properties of the soil will also be considered in terms of geotechnical suitability. For soils which are determined to be likely problematic (i.e. high moisture content, compressible, entrained debris, etc.), a project-specific geotechnical plan will be prepared and implemented. This will include establishing an acceptable range of physical properties, criteria for measuring physical properties, and a plan for ensuring the soil is rendered acceptable for placement and compaction.

6.2 Soil Receiving and Verification

Contaminated soils entering the Site will be managed according to the types and concentrations of contaminants, and the level of characterization undertaken at the Generator Site. If soils have been adequately characterized and do not demonstrate a risk of containing hazardous waste, the soils may be directly deposited into a permanent containment Cell. Soils requiring further characterization or suspected of containing hazardous waste will be deposited in the SMA. The SMA may also be utilized for the temporary storage of soil as needed, conceivably to avoid exposure to inclement weather or to allow for preparation of a cell within the Permanent Encapsulation Area (PEA).

An area of the SMA will be designated at all times to facilitate temporary stockpiling of suspect soil. This area is referred to as the Soil Handling Area (SHA). The SHA is demarcated using temporary fencing since its size is anticipated to fluctuate.

Upon deposit of the soil, Site staff will inspect the soils using field-screening techniques (visual/olfactory inspection, headspace vapour measurements using a portable gas meter) to determine whether there is an appreciable risk that actual soil quality differs from the information presented on the Waste Approval Application. As necessary, and in accordance with standard QA/QC protocols established below, soil samples will be collected and submitted to a Canadian Association for Laboratory Accreditation Inc. (CALA) accredited laboratory for analysis of applicable PCOCs.

Analysis will be performed if contaminant concentrations are suspected to exceed those detailed in the Waste Approval Application and compared to submitted analytical results. For example, analyses will be performed for LEPH/HEPH/PAHs if hydrocarbon contamination is suspected to exceed concentrations detailed in the Waste Approval Application, to determine whether concentrations of individual PAHs and/or PAH TEQ exceed the applicable HWR standards. Similarly, if metals concentrations are suspected to exceed those detailed in the Waste Approval Application, total metals and TCLP analysis will be performed to determine if potential leachate concentrations risk exceeding the applicable HWR standards.

6.3 Soil Acceptance

Soils will be accepted at the Site only once a Waste Approval Application has been submitted, reviewed and approved by the QEP, as outlined above. Once approved, the site will provide the generator (or qualified professional representative) with Soil Arrival Forms. An example Soil Arrival Form is included in Appendix D. One Soil Arrival Form will accompany each soil load from the generator site to the Site. Soil Arrival Forms will include three areas of information, as follows:

- **Section A – Generator Information:** This section will be completed and signed by the generator or qualified professional representative. Section A information will include generator name and contact information, source site location and site contact details, and a description of soil characteristics and classification. The soil classification will be pre-determined by the site during the Waste Approval Application review process.
- **Section B – Transporter Information:** This section will be completed and signed by the transporter (i.e. shipping company). Section B information will include transporter company name and contact details, driver name and contact details, truck number, vehicle license number, and an indication of the type of load (tandem truck, truck & pony trailer, truck & transfer trailer, etc.).
- **Section C – Site Information**: This section will be completed and signed by the site staff upon receipt of the soil. This section will include the name and location of the receiving site, and any additional pertinent details (i.e. condition of soil, debris observed, etc.). Upon receipt of the soil, site staff will assign a unique code to each project (common to the Generator Site and contaminants), using the coding system described below.

All soil loads will be weighed and logged upon entry to the Site. At the close of each business day, a copy of the daily scale logs and Soil Arrival Forms will be provided to each generator to allow for a cross-check of load counts and total daily soil volumes. Hard copies of the daily weigh scale logs and Soil Arrival Forms will retained on-Site, and electronic backups of these documents will be stored in a secure off-Site location and updated weekly.

6.4 Soil Tracking

The soil deposit areas, including the SMA and PEA, will be equipped with facilities to demarcate and sign deposit zones for the truck traffic. Facilities will include delineators placed along three sides of each zone, and a movable sign-post with appropriate signage.

Prior to importing soil onto the Site, a tracking identification number will be assigned to each project and noted on the Soil Acceptance Form. The tracking ID will be unique to the source site and will include notations regarding the nature and level of contamination. An example tracking ID is as follows:

XXX-YY-ZZ

Where XXX will be a unique three digit code relating to the source site, YY will be a unique two digit code unique to the suspect contaminant level (i.e. IL+, RL+) and ZZ will be a unique two digit code unique to the nature of contamination (e.g. Hydrocarbons, Metals, etc.). This tracking ID will follow the soil through the remediation and disposal process.

Soils imported to either the SMA or PEA will be end-dumped into demarcated zones as directed by Site staff. Between shipments, soil will be moved and consolidated using a front-loader as required. The sub-areas will be established prior to shipment, following review and acceptance of the soil by the QEP.

At the end of each day, soils within the SMA and PEA will be covered as appropriate, and a standardized plan will be prepared mapping soils within the Site.

6.5 QA/QC for Incoming Soils

As outlined above, soils will be inspected by site staff, field-screened, and, where there is a risk of actual soil quality differing from the soil quality presented on the Waste Approval Application, site staff will collect soil samples and submit these samples for analyses of the applicable PCOCs.

If analytical results indicate that contaminant concentrations exceed HWR standards, the soil will be placed in the SHA for immediate characterization and off-Site disposal. Under these circumstances, no additional shipments will be accepted from the Generator Site.

If analytical results indicate that contaminant concentrations are significantly higher than indicated on the applicable Waste Approval Application, but still below HWR standards, then related soil stockpiles may be re-classified. The decision to require re-classification will be based on a review by the site QEP and will depend on the degree and consequence of the analytical variability.

In addition, the site will conduct routine QA/QC sampling, generally in accordance with MOE Document 1 (GD-1). Guidance Document 1 prescribes stockpile sizes for Suspect Waste Soil to be 150 m^3. This is approximately equivalent to 250 tonnes (assuming density of 1.7 tonnes/m^3). As such, the QA/QC sampling program will include:

- Collect one sample, comprised of a minimum of three aliquots, for the first 250 tonnes of any individual shipment (for any amount up to 250 tonnes);

- Collect an additional random sample (minimum three aliquots) representing soil exceeding 250 tonnes, but less than 1,000 tonnes for any individual shipment;
- Collect an additional random sample (minimum three aliquots) representing soil exceeding 1,000 tonnes; and,
- Collect one random sample for every additional 1,000 tonnes up to the maximum amount of the shipment.

Soil QA/QC Sampling Frequency

0-250 tonnes	250-1,000 tonnes	>1,000 tonnes
1 random sample	1 random sample	1 random sample per 1,000 tonnes

For example, on a shipment of 2,500 tonnes, one sample would represent the first 250 tonnes, a second sample would represent 250-1,000 tonnes, a third sample would represent 1,000-2,000 tonnes, and a fourth sample would represent 2,000-2,500 tonnes.

Sample results would be compared to pre-shipment data and soil classification provided by the Generator. If results indicate systematic soil characterization problems, all shipments would be halted until further characterization was undertaken by the Generator.

Soil tonnage would be recorded at the site such that accurate quantities could be established for any given Generator. Soil quality data would be recorded and tracked against representative shipments. If soil density is observed vary significantly from the anticipated range of 1.5 to 1.8 tonnes/m^3 (based on anticipated tonnage for standard haulers), then on-Site density determination may be undertaken under the direction of the QEP. This may include filling ten, 5-gallon pails to capacity and determining an average weight to calculate density.

On a case-by-case basis, the QEP may consider an alternative QA/QC sampling plan. For example, smaller shipments of heterogeneous soil (such as fill) may be sampled more frequently, while larger shipments of homogeneous soil (such as dredgate) may be sampled less frequently. The frequency of sampling will also be dictated by relative correlation of the pre-and post-shipment data. Any deviation from the Permit requirements must be pre-approved by the Director.

6.6 Procedures for Removal of Unacceptable Soils

The Site will not knowingly accept any soils that exceed the standards outlined in the HWR. However, if during the soil receiving and verification process, or through random QA/QC soil sampling, it is determined that soil quality exceeds the applicable HWR standards, the generator will be contacted and the relevant soils will be transported to an appropriate licensed site.

Given that all loads will be received by Site staff, and will be observed during unloading, no soils that are physically unsuitable for permanent encapsulation (e.g. due to high debris content or moisture in accordance with an established acceptance plan) will be permitted to unload. However, in the event that physically unsuitable soils are unloaded, no further material will be accepted from the generator site until the issue has been discussed with the generator or qualified professional, and safeguards have been established to ensure that all further material received from the generator site will be physically suitable.

Unsuitable materials will require temporary storage on Site in order to confirm soil quality, identify an appropriate disposal site off-Site and arrange for the material to be transferred. During this temporary storage period, the unsuitable materials will be appropriately covered and relocated to a demarcated and dedicated zone within the SMA.

Soils classified as Hazardous Waste will be transported directly to an approved site. Soils physically unsuitable will be transported directly to appropriate site determined by the nature of the material.

7 WATER MANAGEMENT PLAN

The Water Management Plan for the Site includes the following components:

- Pit and active area run-off which was diverted from contact with contaminated soils
- Surface water from undisturbed and ancillary areas
- Soil Management Area run-off
- Permanent Encapsulation Area leachate detection/collection system
- Permanent Encapsulation Area leak detection/collection system
- Permanent Encapsulation Area groundwater seepage system
- Water Treatment System
- Water Treatment System Discharge
- Settling Pond
- Settling Pond Discharge

The above components, along with a description of the design basis, are discussed in the following sections. Inspection and maintenance of the water management infrastructure is covered in Section 11.

7.1 Design Storm Event

The "worst case scenario" that was used to design the components of the water management system, included a melting snowpack during a 1/200 year rainfall event.

The 200-year storm event from the North Cowichan Rainfall Intensity Duration Frequency (IDF) curve was used along with a conservative time of concentration of 10 minutes producing a rainfall intensity of 50 mm/hr.

Due to the small size of the catchment, a conservative water equivalent depth method was chosen over degree day or temperature index melt equations to model the effect of snowmelt. This approach linked melt directly to rainfall, therefore, the resultant peak runoff from rainfall and snowmelt occurred simultaneously in the modeled output producing flows which are considered conservative estimates.

The existing Settling Ponds and runoff detention system for the Quarry Operation have been augmented to detain the runoff volume calculated for the Site combined with the quarry activities. Runoff volumes were initially based on a 200-year, 24-hour storm and modeled using the unitless Type 1A SCS hyetograph with all calculations confirmed using HydroCAD stormwater modeling software.

The average maximum snow depth for the region was derived from the Natural Resources Canada atlas (0 mm - 300 mm), a snowpack depth of 300mm (new snow) was assumed to have a water equivalent depth of 25mm or approximately 8% of the snow volume. The values for additional rainfall from snowmelt were added to the 200 year rainfall depths to provide a "worst case scenario" event which conservatively models complete melting of a 300 mm snow pack concurrently with a 24 hour 200 year rainfall event (SNOWPACK + 200). The resulting rainfall/melt depth is **181.4 mm**, and the unit hyetograph places the peak instantaneous intensity approximately 8 hours into the storm event.

7.2 Non-Contact Surface Water

Surface water in undeveloped and ancillary areas of the site, such as the vegetated areas on the backsides of the pit crest and abutting the conservation easement, as well as east of Shawnigan Creek, including the parking lot, is monitored and managed by reinforcement of existing drainage paths with stilling pools, gravel check dams, woody debris and similar features to prevent sedimentation and promote vegetation.

Active management of surface waters on the Site begins with diversion of waters away from contaminated soil working areas in order to minimize the amount of water requiring monitoring for chemical quality and possible treatment.

Water within the active pit and in active working areas around the pit, is diverted away from the SMA and active encapsulation cells. This water is considered "non-contact" water. It is collected in the Settling Pond to remove sediment and allow verification of chemical quality.

Surface water management will be modified as the pit grows and encapsulation areas are constructed. The basic strategy, however, will remain the same:

- Undisturbed and ancillary areas (such as the east side of Shawnigan Creek) will be protected and monitored to prevent sedimentation and minimize disturbance of natural stormwater flow and infiltration.
- To the degree feasible, surface water will be diverted around (and isolated from) contact with contaminated soils in the SMA and encapsulation areas.
- Water diverted from contact (non-contact water) will be collected to the Settling Pond to remove sediment and allow observation and/or testing prior to discharge

7.3 Contact Water: Soil Management Area Run-off

Precipitation incident to the SMA is collected within a catch basin via gravity flow across the paved asphalt surface. The catch basin water is piped to a Containment Pond capable of storing up to 326.6 m^3 of water. The volume was set based on the size of the uncovered, paved surface of the Soil Management Area (1,800 m^2) and the design 1 in 200 year storm event (181.4 mm).

A roof will be installed over the SMA prior to March 20, 2016. At time of writing, the roof installation is anticipated to be complete before the beginning of November, 2015, in advance of seasonal increases in precipitation.

Water in the Containment Pond is treated (must be treated, by permit) in the Water Treatment System before discharge.

Beneath the SMA liner is a leak detection system including a network of perforated piping sloped towards a single manhole/inspection port. This manhole/inspection port is piped to the main catchbasin for the SMA. It is expected that inspection port will be dry, but is in place to identify and collect any water that may pass through both the asphalt surface and the underlying synthetic liner.

7.4 Permanent Encapsulation Area Leachate Detection/Collection System

Each encapsulation cell has a drainage layer above the base liner, allowing encapsulated soils to drain (if needed). This serves as a leachate detection and collection system.

Despite temporary cover used when cells are not actively worked, precipitation that falls upon an active cell before permanent convert installation may generate contact water. This contact water is collected in the drainage layer. Very little water will result from soil dewatering; in the long-term, following cover installation, this system is anticipated to be dry

Accumulated water from encapsulation cell leachate detection/collection system is transferred to the Water Treatment System for treatment. An inspection port/manhole allows monitoring of flow/volume and for sample collection.

7.5 Permanent Encapsulation Area Leak Detection/Collection System

Each cell constructed in the permanent encapsulation area (landfill area) includes a drainage layer under the 40 mil base liner, above the compacted clay/till layer on the bedrock surface. If there were (a) leachate in the leachate collection layer above the liner; and (b) a defect in the liner, leachate would flow into the drainage layer above the compacted clay/till layer for detection and collection.

This system is expected to be dry. If water accumulated, it would be transferred to the Water Treatment System for treatment. An inspection port/manhole allows monitoring of flow/volume and for sample collection.

7.6 Permanent Encapsulation Area Groundwater Seepage System

The final rock surface at the base of the quarry consists of a layer of broken rock from blasting. This broken rock layer is levelled off with crush gravel to prepare a surface for the clay/till liner. The broken rock layer and crush gravel will have significant permeability, and will act as a drainage blanket for any groundwater occurring between the compacted clay till layer and the bedrock, i.e., seepage from the base of the pit and from the sidewalls.

This groundwater seepage, if it occurs, will migrate through the subsurface to the ephemeral tributary to the west of the Site, i.e., to the area of the Settling Pond Discharge. Downgradient surface water monitoring allows determination of water quality.

If other site monitoring indicated a need at any time in the future, shallow interception trenches would be installed to intercept and collect this drainage.

7.7 Water Treatment System

The Water Treatment System is fed from the Containment Pond, and can receive inputs from any of the following:

- Soil Management Area
- Permanent Encapsulation Area Leachate Collection System
- Permanent Encapsulation Area Leak Detection System
- Any other site water, such as water treatment system backwash, SMA washdown water, truckwash water, or stormwater collected using vacuum trucks or sump pumps, designated by the Operations Manager or MOE for treatment

Water may be sampled in holding areas prior to treatment for potential contaminants of concern. If laboratory analytical testing indicates that the water in the holding area is not impacted, the holding area may be discharged to the settling pond.

If the water quality is above discharge standards, the water will be processed through the treatment system and sampled post-treatment to confirm acceptable quality prior to discharge.

The authorised works in MOE Permit PR-105809 must be complete and in operation when discharging; the discharge (and point of sampling/compliance) must be as indicated on Figure A of the permit. Additional equipment, including activated alumina water treatment units, additional settling tanks, sand filters, influent batching tanks, equalization basins, effluent holding tanks and recycle lines for re-treating treated water may be used to ensure that discharges comply with permit standards and to improve effluent quality.

7.8 Settling Pond

The Settling Pond is fed from active site stormwater diversion and Water Treatment System effluent.

The authorised works in MOE Permit PR-105809 must be complete and in operation when discharging; the discharge (and point of sampling/compliance) must be as indicated on Figure A of the permit.

Stormwater from the pit must not bypass the pond, which includes settling areas and gravel filters.

Settled solids, which have accumulated in the pond, will be removed as required to maintain a minimum water depth below the pond decant of 0.5 m. This material will be treated as suspect waste soil, transferred to the SMA and characterized.

8 ENVIRONMENTAL MONITORING PLAN

The following Environmental Monitoring Plan (EMP) addresses on- and off-Site monitoring requirements and their evaluation in the site EMS.

Sampling is carried out in accordance with the "British Columbia Field Sampling Manual"[2] or as authorized by MOE.

Samples for chemical analysis will be appropriately collected, filtered and preserved (as applicable), and shipped under Chain of Custody to a Canadian Association of Laboratory Accreditation (CALA) certified laboratory for analysis as per the "British Columbia Environmental Laboratory Manual"[3] or as directed by MOE. Sampling procedures are detailed Appendix E. Quality Assurance / Quality Control measures will include at least one duplicate sample for each parameter sampled for each monitoring period.

[2] BC Ministry of Water, Land and Air Protection (Now BC Ministry of Environment). 2003. British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples. January 2003. ISBN 0-7726-2741-X. 401 pp.
[3] BC Ministry of Environment. 2009. British Columbia Environmental Laboratory Manual. 2009 Edition. July 14, 2009.

8.1 Air Quality Monitoring

Air quality monitoring is required by permit during periods of mechanical soil aeration for soil treatment. However, given a difference of interpretation with CVRD in regard to activities permitted by the F1 Zoning at the Site, **soil treatment, including aeration, is not planned or carried ou**t.

It is anticipated that there will be no vapour impacts at the down-wind property boundary resulting from site operations with the possible exception of periods of soil aeration, if such is ever conducted. Thr aeration process has the greatest potential to release significant vapours and cause impacts at the property boundary. As a result, real-time vapour monitoring will be conducted using a PID during soil movement activities, and soil movement will be immediately ceased if unacceptable readings are obtained. Initially, 100 ppb will be used as the threshold reading but may be subject to adjustment as site-specific vapour monitoring data is obtained and correlations established. In general, soil turning activities will not be undertaken on warm, dry days with moderate to high winds.

The established, prevailing wind directions at the Site is from the Northeast and Southwest. A residence is located approximately 300 m from the northeast boundary of the Site, representing the most sensitive receptor. As such, a sampling point has been established near the northeast property line. The air monitoring station is shown on Figure 1.

Section 3.5 of the Permit requires that monthly ambient air samples are collected during the active season for soil treatment (if applicable) at the down-wind property line using a Summa® Canister. Event-based ambient air samples are also required if and when soils with measurable volatile contaminant concentrations exceeding established thresholds are being managed at the SMA.

The Summa® Canister is regulated to collect an ambient air sample over a 24 hour period. Prior to, and immediately following, sample collection, wind speed and direction will be measured and recorded using a hand-held anemometer or by the on-site weather station. The suite of analytes will be pre-approved by a Qualified Professional. Sample collection methods are outlined in Appendix D. Results will be used to assess potential impacts and to determine whether procedural adjustments or mitigative measures are required.

Air quality monitoring is also required as an ongoing operations measure. Section 2.9 of the Permit requires that there must be no objectionable hydrocarbon odour evident outside the property boundaries, and Section 2.10 of the Permit requires that fugitive dust must be suppressed and is not to exceed the BC Ambient Air Quality Residential Objective of 1.7 mg/(dm^2-day) over a two-week averaging period at the property boundary using conventional dustfall jars. Sample collection and analysis for both parameters are event-driven, based on the day-to-day observations of the Environmental Technician.

If contaminant concentrations measured in the Summa® Canister sample collected from the down-wind property line are found to exceed the CSR Schedule 11 Column III RL standards, soils within the SMA will be covered with non-permeable polyethylene sheeting or a cap of non-hydrocarbon contaminated soils.

Covering the soils will be adequate to suppress the vapour emissions from impacting down-wind receptors, which will be verified by additional sample collection and analysis. Dust exceedances will trigger a review of dust suppression methods.

8.2 Effluent Water Monitoring

Water effluent encompasses both contact water and active site non-contact water systems as follows:

Effluent Water Monitoring Program

Monitoring Location	Minimum Monitoring Frequency	Minimum Sampling Frequency
Catch Basins and Leak Detection Inspection Ports (SMA and encapsulation areas)	Visually inspected on at least a weekly basis. Cleaned out as needed.	N/A
Water Treatment System Holding Tanks (When Applicable) and/or Containment Pond	Weekly	Monthly (or as generated)
Water Treatment System Outlet (WTS)	Weekly	Monthly and Every 2,000m^3 of Effluent Treated Effluent
Settling Pond Outlet (SW-1)	Weekly	Monthly and Every 2,000m^3 of Effluent Treated Effluent
		Turbidity Assessed Bi-Weekly from November to April and After >1:10 year storm events*

*1:10 Year Return Event estimated based on 122mm of precipitation over a 24 hour period as measured at the on-Site rain gauge. Turbidity will be assessed using a *Hatch 2100Q Portable Turbidimeter* (or equivalent).

Monitoring at the Water Treatment System discharge includes recording the flow meter value and pH, and making any observations about the physical properties of the discharge (colour, odour, turbidity, etc.).

Monitoring at the Settling Pond Outlet (SW-1) includes measuring turbidity and recording observations about the discharge (estimated flow, colour, odour, etc.). In addition, the Settling Pond includes regular visual inspection to ensure ongoing competency and function (rip-rap integrity, requisite freeboard, accumulated sediment, tension cracking or erosion of sidewalls, etc.).

Monitoring associated with Leak Detection and Leachate Collection Systems will occur at inline catch basins/inspection ports, noting presence/absence of liquid, estimated flow, colour, odour, etc.

Samples will be collected as outlined below. An example Effluent Monitoring and Sampling Form is included as Appendix G.

Effluent samples are analyzed for all potential contaminants of concern as determined by the Qualified Environmental Professional based on soil contaminants received at the facility, monitoring results to date and input from MOE. Analytes could include the following (cf. PR-105809, section 3.4 and 1.3.3):

- Metals
- BTEX (Benzene, Toluene, Ethybenzene and Xylenes)
- MTBE (Methyl Tert-Butyl Ether)
- VPH (Volatile Petroleum Hydrocarbons)
- LEPH/HEPH (Light Extractable Petroleum Hydrocarbons and Heavy Extractable Petroleum Hydrocarbons)
- PAHs (Polycyclic Aromatic Hydrocarbons)
- Styrene
- Chlorinated Hydrocarbons
- Phenolic Substances
- Chloride
- Sodium
- Glycols
- Dioxins and Furans

As per MOE Permit PR-105809, section 1.4.4 the characteristics of the discharged treated effluent from the Water Treatment System must be equivalent to or better than the most stringent of those British Columbia Approved Water Quality Guidelines (BCAWQG) and A Compendium of Working Water Quality Guidelines for British Columbia (BCWWQG) for Freshwater Aquatic Life (AL) protection and Drinking Water (DW) uses for the parameters of concern.

As per MOE Permit PR-105809, section 1.5.3 the characteristics of the discharged treated effluent from the Settling Pond must be equivalent to or better than the most stringent of BCAWQG and BCWWQG for AL. Total Suspended Solids (TSS) shall not exceed 25 mg/L for up to a 1:10 year storm event. Per MEMPR Permit Q-8-094, nitrate shall not exceed standards applicable to DW.

Per MOE Permit PR-105809, for flood events greater than the 1 in 10 year event (122 mm of precipitation over a 24 hour period), the characteristics of the settling pond discharge must not exceed background concentrations (i.e., SW-4).

8.3 Receiving Environment Monitoring – Groundwater and Surface Water

Settling Pond water (including Water Treatment System Effluent) is discharged to a pre-existing, typically dry, drainage course along the west side of the Site. The drainage course transitions into an ephemeral tributary. The tributary flows north, eventually reporting to Shawnigan Creek. The confluence of the tributary and Shawnigan Creek is located approximately 1 km north of the Site.

Receiving environment water monitoring includes both surface water and groundwater monitoring locations. There are four long-term surface water monitoring locations within the ephemeral tributary and Shawnigan Creek (SW-2 through SW-5). These have been surveyed and permanently (though discretely) marked.

There are also five on-Site monitoring wells, including three with nested completions for a total of eight piezometers; seven of these locations are included in the groundwater monitoring program.

The receiving environment monitoring program for groundwater and surface water is summarized in the following table and shown on Figure 1 (attached).

Receiving Environment Monitoring – Groundwater and Surface Water

Receptor	Monitoring Locations			Monitoring Schedule
Groundwater	Up-gradient	MW-4	On-Site, near southeast corner	Quarterly
	Down-gradient	MW-1(S/D)	On-Site, near centre	
		MW-2	On-Site, near west property boundary	
		MW-3(S/D)	On-Site, near west property boundary	
		MW-5S	On-Site, north	
Surface Water	Up-stream	SW-4	Shawnigan Creek	5 in 30* (2 times/year, conducted during fall first flush event and during spring freshet); and after a 1:200 year storm event** at SW-2 and SW-3
		SW-2	Ephemeral Creek	
	Down-stream	SW-5	Shawnigan Creek	
		SW-3	Ephemeral Creek	

*5 in 30 refers to at least 5 weekly samples taken in a period of 30 days. Due to the ephemeral nature of some of the creeks, the first 5 in 30 samples should be collected when the ground has first been saturated.
** 156 mm of rain over 24 hours

This program includes event-based monitoring: immediately following a 1-in-200 year, 24-hour storm event, locations SW-2 and SW-3 are monitored. A 1:200 year storm event is defined as 156mm of rain over a 24 hour period, as determined by the on-Site rain gauge.

Samples are analyzed for all potential contaminants of concern as determined by the Qualified Environmental Professional based on soil contaminants received at the facility, monitoring results to date and input from MOE.

Flow measurements are collected from surface water sampling locations at time of sampling.

8.4 Routine Inspection and Physical Observation

The condition of systems, locations of contaminated materials, presence of flow, estimated flow, and other critical site parameters are inspected on a regular basis. These inspections are guided and documented with specialized field forms:

- Appendix H presents an example of a SMA Daily Monitoring Form. The SMA is inspected daily when active and at least weekly overall.
- Appendix I presents an example of an Encapsulation Cell Daily Monitoring Form. Encapsulation cells are inspected daily when an encapsulation cell being actively filled and at least weekly overall, until the cell is closed.
- Appendix J presents an example of a Daily Inspection and Monitoring Log, which is completed daily when the site is receiving or placing waste, and at least weekly overall. This type of inspection documents the condition of works and the presence/absence, characteristics and flow rate for contact and non-contact water.

9 EMERGENCY RESPONSE PLAN

The site Emergency Response Plan (ERP)/Mine Emergency Response Plan (MERP) is attached as Appendix K. It is maintained as a single stand-alone document that applies to all on-site personnel.

The objectives of the ERP/MERP are to provide effective responses (including evacuation protocols) for both workplace/mine site emergencies and for urgent situations involving the discharge of contaminated soil, run-off or leachate from the site, including accident scenarios involving Shawnigan Creek (which, it is noted, is approximately 250 m to the east and at a higher elevation, than the pit).

10 SITE PREPARATION AND CONSTRUCTION OF LANDFILL CELLS

The following sections summarize Site Preparation and encapsulation cell construction within the authorized landfilling area (the mine pit, as ultimately developed).

10.1 Site Preparation

Soil encapsulation cells are engineered to provide permanent isolation of the contaminated soils. Compacted clay till and landfill geosynthetic liners are used to fully encapsulate the soil placed in each cell. Details of a typical cell design are provided in the TAR.

Cells are filled one at a time; however, cells may be prepared up to the point of receiving waste material before previous cells have been completed.

No blasts will be initiated during installation of liners (base or cover), nor will machine traffic be allowed on liners, until such liners are covered with at least 0.66 m of compacted soil. Only new, high-quality, purpose-manufactured geosynthetic liners shall be used for construction, and their installation, quality assurance/control process, sealing and use shall be in accordance with manufacturer's guidance for materials, methods, equipment and training. In accordance with Section 2.4.1 of MOE Permit PR-105809, the reuse of geomembranes/liners in encapsulation cells is strictly prohibited.

Liner panels are pre-fabricated in controlled manufacturing conditions for a specific cell. This reduces the number of field welds that required.

Site preparation for the construction of landfill cells includes the following:

- Final blasting and removal of rock for aggregate production. The final blasting surface of the bedrock will be sharply undulating and contain shattered rock fragments up to approximately 2 m in depth.
- Bedrock inspection by a qualified professional and preparation of an assessment report
- Levelling of the surface with compacted crushed rock
- Covering the leveled surface with a minimum of 1000 mm of compacted clay till soils.

The clay till layer is used to create the desired sloping for drainage over the bedrock surface and also seves as an additional layer of leachate protection, one constructed from natural, geologically stable materials. The specifications for the clay till are as follows:

- The clay till must contain a minimum of 10% clay, defined as a particle size of 0.002 mm or less (2 µm, as per ISO 14688).
- Alternatively, laboratory testing results may be used to verify the required hydraulic conductivity of the till.

- As of July 17, 2015, per MEMPR Permit Q-8-094, Section 16, the clay till will be placed in maximum 250 mm lifts, and compacted to **at least** 90% Standard Proctor Maximum Dry Density (SPMMDD – ASTM D698), with an objective of 95% SPMMD (95% SPMMD being the standard used for cell 1).

Depending on pit layout and the layout of pit walls, temporary side berms of till may be used to support the edges of liner panels until the neighbouring panel is installed to overlap and be sealed together. These berms are temporary construction aids, not intended or used as liner components.

10.2 Bedrock Integrity Inspection Report

A bedrock integrity inspection and risk assessment report is completed and submitted to the province prior to the construction of any encapsulation cells. For any abnormalities (open fractures, presence of water, percolation, etc.) identified during the inspection, the MOE will be immediately notified and a structural report will be completed within 30 days following inspection.

In general, the following items will be included in a bedrock inspection report:

- Rock type
- Description of fractures
- Presence/absence and description of any seepage

The final blasting surface of the bedrock will be sharply undulating and contain shattered rock fragments up to approximately 2 m in depth. It is not feasible to expose the entire surface for visual inspection, and spot-checking via test pits is used.

The final bedrock surface is impacted by blasting, influencing the ability to visually ascertain the undisturbed condition of the rock. However, the rock type, fracturing and weathering is ascertainable, and presence/absence of seepage will provide information pertaining to potentially water-bearing fractures.

10.3 Seepage

The base of the pit bottom is below the piezometric elevation of the groundwater beneath the Site. There are two scenarios to be considered at pit bottom:

1. <u>Seepage is not observed</u>: In this scenario, the bedrock is not significantly fractured and is acting as an aquitard, preventing any substantial groundwater as seepage upwards into the pit.
2. <u>Seepage is observed</u>: In this scenario, fractures allow groundwater flow as seepage upwards into the pit.

In short, either the deep aquifer is protected by the upper bedrock aquitard, or there is an upward flow of groundwater into the pit. Both scenarios are protective of groundwater quality because there is no pathway (i.e., no flow of contaminants downward).

The former scenario (dry pit) is expected. Based on investigations and mining progress to date, there has been no observed seepage, indicating that the bedrock is an effective aquitard. This is consistent with rock coring and with the findings of the BC Geological Survey[4].

However, if seepage is encountered, the blast debris layer will act as a drainage blanket to convey the seepage as shallow groundwater flow towards the ephemeral tributary.

If the blast debris layer is not sufficient to convey the flow, additional mitigative measures will be employed as follows:

- A localized drainage blanket will be constructed over the area of seepage and gravity drained towards the ephemeral tributary as shallow groundwater flow. This drainage blanket would be constructed beneath the compacted clay till liner and would thus produce non-contact (uncontaminated) water.
- The seepage blanket will be constructed of a minimum 300 mm of clear crush.
- The blanket will be covered with a geotextile to prevent the migration of fines from the overlying till layer.

If unforeseen conditions warranted, the seepage layer could be intercepted by shallow downgradient trench(es) to allow collection and monitoring. The substantially greater (orders of magnitude greater) hydraulic conductivity of the seepage blanket compared to the bulk rock implies that flow would effectively be controlled by the seepage layer, simplifying monitoring and control.

10.4 Construction of Landfill Cells

Following preparation and inspection of the bedrock as described above, the base liner system will be completed with the components outlined below:

- Minimum 300 mm of sandy drainage layer; overlying
- 40 mil Linear Low Density Polyethylene (LLDPE) liner; overlying;
- Minimum 300 mm of sandy drainage layer; overlying
- Minimum 1000 mm of till as discussed previously; overlying
- The prepared bedrock surface, as discussed previously.

The upper sandy drainage layer will form part of the leachate collection system and will provide two functions:

1. Physical protection of the liner from puncture during installation

[4] Hancock, K. 2012. Bedrock Geology of the South Island Aggregates Stebbings Road Quarry. BC Geological Survey. October 30, 2012. 15 pp. plus 7 pp. addendum.

2. Allow any incident precipitation or other drainage to drain from the cells.

The lower drainage layer is primarily for liner bedding: it would collect and drain any leaks in the membrane (a “leak detection system”), but such leaks are not expected to occur.

Protection of the liner from puncture due to deformation is ensured by the specification of an appropriate liner material, intended for landfill use, and by compacting the contaminated soil in controlled lifts during placement. Differential settlement of the subgrade will not occur, based on compaction of subgrade materials and the effectively incompressible nature of the underlying bedrock.

To protect the liners from puncture during cell construction, a minimum of 0.66 m soil is placed atop it where machine traffic will occur. In addition, continuous monitoring of construction equipment and direction during construction is provided by experienced and qualified personnel.

Contaminated soil is then placed and compacted in lifts, with provision of compaction results for each 1 vertical meter to the Inspector of Mines. The physical properties of the contaminated soil are considered in terms of geotechnical suitability by the Qualified Professional Engineer. Soils which are determined to be potentially problematic (i.e., high moisture content, compressible, entrained debris, etc.), are subject to a material-specific geotechnical plan. This will include establishing an acceptable range of physical properties, criteria for measuring physical properties, and a plan for ensuring the soil is rendered acceptable for placement and compaction.

Generally, incoming soil will be placed, graded and compacted using a vibratory drum roller. Placement will occur over maximum 600 mm lifts and compacted with a minimum of one pass with a vibratory roller. Successive lifts will be reviewed by the project Geotechnical Engineer to ensure adequate compaction and stability.

The contaminated soil in individual containment cell layers is capped with a second LLDPE liner deployed in the same manner as the base liner, with overlapping and sealing. The cap liner is “sandwiched” between two layers of geotextile and/or sand blankets to protect from potential puncture. Both the cap and base liners are anchored into the sideslopes as necessary, for example, using of anchor trenches.

Upon placement of the upper cap liner, the cell layer will be covered with a minimum of 0.3 m of clean sandy soil. A minimum of 0.66 m soil cover above the cap liner is required in areas that may experience machine traffic over top of the completed cap liner.

Subsequent cells will be constructed adjacent to and overlying previous cells as the landfilling/reclamation activities progress. In successive layers, the upper cap liner will also serve as the base liner for the overlying cell layer.

As required, vapours from individual encapsulation cells will be monitored prior to construction of a successive layer.

Overall construction of the cells will be done under the direction of the Qualified Professional Engineer and as-built drawings produced to ensure appropriate QA/QC and record keeping. Qualified staff under the supervision and control of the engineer will perform nuclear densitometer, drive tube and/or sand cone density testing to confirm the required compaction is achieved during material placement.

The Qualified Professional Engineer may also carry out field or laboratory hydraulic conductivity testing and grain size testing as necessary to confirm performance to the design criteria set out in the TAR.

10.5 Final Cap

Upon completion of the landfilling activity, a final soil cap will be placed over the entire area that is underlain by containment cells. The final cap is illustrated in Figures 10 and 15 of the TAR, and will consist of a minimum of 2.0 m of uncontaminated soil; the lower 1.0 m acts as a hydraulic barrier with a maximum compacted hydraulic conductivity of 1x10-7 m/s, and the upper 1.0 m consists of a growing medium and is planted with grasses. The final cap will be graded to promote positive surface drainage away from the landfill, and surface water diversion/control measures will be re-direct upland surface water flows around the landfilled area.

10.6 Leak Detection and Leachate Collection

As described in description of water management systems, encapsulation cells include provisions for leachate collection as well as for leak detection. Figures 8 and 10 of the TAR illustrate both systems.

The design includes the use of soil drainage blankets. The soil drainage blankets have a hydraulic conductivity greater than $1x10^{-4}$ m/s and are constructed with a 3% grade and a minimum thickness of 0.3 m.

As shown on Figure 10 of the TAR, the soil drainage blankets will be constructed beneath all successive layers of encapsulation cells. The layers will be able to free drain into the chimney drain that reports to the collection piping at the base of the slope.

Collected water (if any) from drainage systems will be transferred to the containment pond for treatment in the Water Treatment System as contact water.

11 OPERATION, INSPECTION AND MAINTENANCE

The following subsections describe the operation, inspection and maintenance of the soil management area, the permanent encapsulation area, the water treatment system and the settling pond. Major site features are illustrated on Figure 1.

During operations, inspections will be carried out by Site staff on a daily basis to monitor the effectiveness of the Water Management systems, and to ensure appropriate weather protection of soil stockpiles. Daily inspection observations and site photographs are filed in the Mines Office.

11.1 Soil Management Area

As discussed previously, soil treatment allowed under Provincial permits will not be conducted until resolution of differing interpretations of site zoning is obtained.

Precipitation that falls outside the paved Soil Management Area (SMA) will be diverted via berms and perimeter swales / ditches. A roof will be constructed over the SMA prior to March 20, 2016 in order to prevent precipitation from entering the SMA. It is currently anticipated that the roof will be in place before November 2015. Until the roof is constructed, all stockpiled soil within the SMA will be covered during periods of rain using disposable polyethylene sheeting, appropriately anchored. Runoff from the SMA will be controlled and managed in accordance with the water management procedures outlined previously.

Sufficient weather protection and containment will also be provided for any nutrients stored at the Site for protection of human health and the environment. In the absence of soil treatment, relatively limited amounts of nutrients will be stored on site; such nutrients (fertilizer) will be kept in a storage shed.

Inspection and maintenance associated with the SMA includes the following:

- Assessment of surface water control and diversion works, as well as roofs and covers, taking any necessary actions to protect design function and prevent short circuiting or sedimentation. This can include removing debris from swales, ditches or catch basins, replacing/reinstalling silt fencing or moving tarps.
- Inspection of leak detection ports and catch basins.
- Review of incoming soil quantities and ensure adequate room within the SMA by delivery scheduling, material consolidation in the SMA and/or transfer to the active encapsulation cell.
- Inspection of underlying asphalt at the SMA when it is exposed by operations, arranging prompt repair (typically by patching) as appropriate and protecting the area until repair is complete.
- Documentation of soil movement, including consolidation and/or transport to encapsulation.
- Demarcation of areas within the SMA for incoming shipments.
- Communication of designated/demarcated areas to site staff and ensuring that trucks receive appropriate direction and supervision.
- Monitoring truck movement and dumping.
- Covering of SMA soils at the end of the day and completing a sketch plan of the SMA noting the location of soils (Appendix H).
- Taking at least one photo from a designated vantage point of the SMA and transferring it to file.

11.2 Permanent Encapsulation Area

Precipitation that falls outside of the landfill/encapsulation cell area is diverted via berms and perimeter swales / ditches to the Settling Pond.

Drainage within active encapsulation cells is managed as contact water. The active cells are covered on an interim basis during periods of rain using disposable polyethylene sheeting, appropriately anchored, to limit soil/water contact. Specifically, active filling areas are completely covered from November to April when not actively worked on.

Daily operational considerations associated with the landfill/encapsulation area include the following:

- Assessment of surface water control and diversion works, as well as covers, taking any necessary actions to protect design function and prevent short circuiting or sedimentation. This can include removing debris from swales, ditches or catch basins, replacing/reinstalling silt fencing or moving tarps.
- Inspection of leak detection and leachate collection ports/catch basins on at least a weekly basis.
- Supervision of the transfer of soil from the SMA and/or the direct unloading of incoming trucks to the encapsulation area.
- Verification that appropriate quality assurance (under the Soil Receiving Plan) is carried out.
- Placement, grading and compaction of incoming soil.
- Completion of as-built compaction records for each 1 metre increment of compacted soil.
- Documentation of the soil volume placed and cell number, creating a permanent record of what material was placed in which cell.

At the end of each day, soils are covered and operations staff sketch a plan of the active encapsulation cell noting the location of soils based on waste approval numbers (which can be traced back to soil tracking IDs). A sample plan is included as Appendix I. A photo from a designated vantage point is required at the end of each active day and forms part of the daily record.

11.3 Water Treatment System

The Water Treatment System may include influent surge/collection/equalization tankage as necessary to receive all active influent streams. Typically, influent flows are aggregated in the Containment Pond.

As described in as-builts for the water management system and the commissioning report for the Water Treatment System, contact water is treated utilizing an automated STORMTEC Filtrations Sediment Control System. The system is capable of treating between 200 and 1250 litres per minute, depending on the sediment loading and pH values. Typically, the system is operated at approximately 284 litres per minute (75 US gallons per minute) in batch mode to a discharge tank for testing and later discharge to the Settling Pond.

High pH is treated using the CS250e pH Remediation System module. The system meters carbon dioxide (CO2) into the water stream using a pH probe interfaced with an electronic controller, flow switch and electronic valuing. The CO2 is mixed into the water stream utilizing a patent pending static mixer. The CS250e incorporates an automatic shutdown sensor, which shuts off the flow of the CO2 when no flow or pressure is detected.

The pH adjusted water flows through a LFI600 Flocculent Injection System for sediment consolidation. The LFI600 incorporates two metering pumps to inject two liquid flocculents in line before a static mixer. A flow switch turns the metering pumps on and off by sensing a flow rate of more than 76 litres per minute

(20 U.S. gallons per minute). Proprietary, environmentally safe, STORMTEC flocculants are introduced at dose rates of about 2 parts per million (ppm), depending on the sediment load. The metering pump injection rate is adjusted by on-Site personnel depending on the quality of the incoming water. Treated water is discharged into a series of holding tanks for settling. Settled solids are periodically decanted and removed for stabilization/drying and disposal.

The STF245-3 Sediment Control System provides additional treatment, incorporating an FP10 Booster Pump System, Electrically Actuated Ball Valve, Electronic Control System, Automatic Float Controls, and automatically backwashed Sand Filtration System. The sand filtration system filters out flocculated sediment; when pressure loss through the filters is excessive, the flow is reversed into a backwash line that carries accumulated sediment back to the settling tanks for removal.

Filtered water is stored in a transfer tank and then pumped through granular activated carbon filters (to remove residual dissolved organic contaminants, if any) and activated alumina filters (to remove residual dissolved metals concentrations, if any.

In batch mode, treated water is stored in tanks for testing before being discharged through a flow meter to the Settling Pond.

Daily inspection and maintenance includes the following:

- Visually inspect hoses, hose fittings, gauges, valves, couplings, sand filters and pump heads for leaks, seepage, wear, splitting, cracking or corrosion. Take corrective action as required.
- Verify power to the unit (generators or mains).
- Inspect flocculent and note remaining quantity. Order/replace as necessary.
- Check CO2 supply – order/replace tank as necessary.
- Calibrate pH probe at least once per month. Replace probe if calibration is unsuccessful.
- Inspect settling tanks and clean out sediment as necessary.
- Note flows reading on flow meter. Record at least weekly when treatment system is used.
- Change filtration media as required in accordance with manufacturer specifications.
- Check drain valves, noting any abnormal colors or odours in held-up water (backwash to re-retreatment).

Pre-Start checks include the following:

- Walk through system, along the flow direction
- Inspect all hose connections, verifying that camlocks are fully engaged with ears secured on cam fittings.
- Verify that gate valves are in open position, throttling the feed pump gate valve for flow control.
- Verify that there are no obstructions, kinks or blockages on the hoses and lines, including discharge hose
- Top up feed tank to sand filter with non-contact or previously treated water if necessary to prevent airlocks in system.
- Verify power to system and displays on all controllers

Start-up checks include the following:

- On startup, listen to pump motors for abnormal sounds. Check pumps for abnormal odours, vibration, heat or leaks.
- Monitor pressures on sand filter intake and discharge manifolds (target pressure between 30-40 psig; differential pressure should not exceed 8 psig)
- Check backwash controller setting
- Check pressure sustaining valve settings
- Verify CO_2 and flocculant injection Flow Switch is reading intake flow
- Verify relay is engaging Asco valve to deliver CO_2 (Asco valve will click when engaged)
- Verify the LMI Controller is reading probe pH and there are no errors on controller screen
- Verify carbon and alumina top and bottom pressure differential pressure is below 5 psi (if above, perform backwash)
- Verify flowmeter is illuminated and sensing flow

11.4 Wheel Wash

In accordance with Section 2.7.1 of MOE Permit PR-105809, before contaminated soil transport vehicles leave the Site, their wheels must be rinsed to remove all soil and waste that may have adhered while they were unloading and maneuvering in the unloading area. This is accomplished using an automated wheel and undercarriage wash.

Following the wheel wash, truckers are required to stop, self-inspect, and, if loose soil remains adhered, clean it off using a provided hose on the wash pad draining back to the wheel wash.

Soil and waste from the wheel wash are returned to the SMA, stabilized/solidified/dried as necessary to improve their geotechnical properties, and disposed of in encapsulation cells. Wash water/rinse water is directed to the Containment Pond for treatment in the Treatment System before discharged to the Settling Pond.

11.5 Settling Pond

The Settling Pond receives inputs from the Water Treatment System as well as diverted surface water flows. Regular operational considerations associated with the Settling Pond include the following:

- Flow, and if flow is occurring, flow rate, are logged.
- Effluent is monitored and sampled as required.
- Vegetation is regularly and cautiously removed, preserving the integrity of gravel filters and the pond bottom.
- Accumulated sediment is removed to preserve a minimum water depth below the pond decant of 500 mm. This sediment is transported to the SMA for drying/stabilization and testing prior to disposal. Sediment removal is only to occur during periods of low/no flow, when the standing water level is below the Pond outlet such that disturbed, turbid waters do not discharge.

- Inlets and outlets are inspected to ensure appropriate operation and no incumberances
- During periods of high flow, freeboard is monitored to ensure design minimum is maintained (500 mm).
- During periods of low flow, rip-rap and berms are inspected and repaired/replaced as necessary.

11.6 Records Retention

Records are retained for MOE and MEMPR inspection on-Site.

Section 5.1 of MOE Permit PR-105809 requires that, in the absence of soil treatment, records retained for at least three years include:

- Construction as-built drawings and site QA/QC results, specifically including landfill (encapsulation) cell QA/QC results.
- Maintenance records, specifically including maintenance records for authorised works as listed in MOE Permit PR-105809.
- Inspection reports with preventative and corrective actions, specifically including reports for the SMA, encapsulation area and authorised works.
- Current soil/ash inventory, including both the SMA and encapsulation area.
- Soil/Ash acceptance documentation, including analytical results, and associated QA/QC reports indexed to the soil tracking system.
- The location of soil/ash within the site, on a map, and quarterly volumes of soil/ash held as suspected or determined to be unacceptable, awaiting disposal.
- Air quality monitoring reports, including vapour and dust.
- Emergency Response Plan exercises and incidents.

If soil treatment, including soil turning, were carried out, additional records would be generated and maintained, as described in the permit.

MEMPR Permit Q-8-094 requires that on site records include:

- A complete set of as-built drawings
- Documentation identifying soil condition and suitability of imported soil for intended use.
- Quality Assurance/Quality Control procedure, testing results and inspection logs for waste materials in encapsulation cells
- Blast logs and electronic monitoring records
- Blast videos

- All other documents, including updated mine plans and health and safety documents, as required by the Mines Act and Code

12 EMS AUDITS AND REPORTING

Under MOE Permit PR-105809 and MEMPR Permit Q-8-094, SIRM submits event-driven and regular reports including, but not limited to:

- A quarterly report, including monitoring data, QA/QC results, interpretations, conclusions and recommendations.
- A quarterly update of the mine plan.
- An Environmental Annual Report, including executive summary, quality/quantity/disposition of soil/ash, updated site mapping, landfilling status and intent, review of operations and future plans, changes, non-compliances, monitoring results, etc.
- An annual report identifying the volume of water through the Water Treatment System, including all operating costs associated with the operation and maintenance of the treatment plant
- An annual report submitted to the Ministry of Finance in relation to the annual Health and Safety Assessment and the related data on annual production

Internal EMS audits will form part of the regular Environmental Annual Report. External EMS audits will be undertaken every 5 years and included with that year's Environmental Annual Report. The overall objective of the EMS is to document site operations in relation to environmental impact monitoring. If impacts are observed, then appropriate corrective action can be undertaken since the failure mechanism will be isolated through careful monitoring and performance feedback.

Internal EMS audits include the following key elements:

- Planning
- Implementation
- Checking / Corrective Action
- Review and Improvement

Each of these is discussed in the following sub-sections.

12.1 Planning

The planning components of the EMS requiring evaluation/audit include site construction, soil screening prior to acceptance and baseline environmental quality monitoring.

Key site performance requirements/objectives include:

Soil Management Area: Provides an impermeable, bermed operating surface for stockpiling and characterizing soils. Also provides suitable space to temporarily store off-spec material that has been inadvertently imported. Performance indicators include visual inspection of the asphalt surface, leachate inspection ports, and an operable catchment to transfer water to the Containment Pond for treatment prior to discharge.

Permanent Encapsulation Area: Provides permanent control measures to manage contaminated soil. Performance indicators include leak detection and leachate collection inspection ports and suitable compaction.

Water Treatment System: Treats contact water to meet established standards and guidelines. Performance is monitored routinely through regular inspection, monitoring and sampling.

Settling Pond: Collects surface water from the active site area, and receives treated water from the Water Treatment System. Performance is monitored routinely through regular inspection, monitoring and sampling.

12.2 Implementation

Implementation of the EMS is undertaken through following the EPM/OMS.

12.3 Checking / Corrective Action

Environmental monitoring, will detect whether impacts are occurring in order that timely and effective corrective measures can be implemented. Routine inspections will determine whether works are performing as intended, so that timely repair or improvement can be carried out.

Additional inspections may also be carried out at any time by the MOE or MEMPR.

12.4 Review and Improvement

Site staff conduct daily and event-driven inspections and monitoring. MOE and MEMPR may also conduct inspections at any time, giving formal or informal feedback.

Based on the results of this on-going surveillance, the Operations Manager, in coordination with the Mines Manager, orders remedies and improvements, which are reflected in event-driven revisions of the EPM/OMS.

The EPM/OMS is also reviewed at least on an annual basis to determine if changes are required. Annual review and submission of revisions are due on March 31st of each year.

Annual Environmental Reports are submitted on or before March 31st of each year. These reports are reviewed in conjunction with Advisory Committee meeting within three months of report submission. The Advisory Committee provides advice to the MOE within 30 days of the meeting. Based on the advice of the committee, the MOE may revise monitoring sampling and reporting requirements.

13 NOTIFICATION, REPORTING, CORRECTIVE AND PREVENTIVE MEASURES

The Permit requires notification and reporting as summarized in the following tables.

Notification – MOE Permit PR-105809
1.1.3 – If land use or site specific factors specified in Column I of Schedule 5 of the CSR change at the permitted site, the Permittee must promptly notify the Director and immediately apply them for the purpose of Subsections 1.2 and 1.3.
2.3 – If short-term storage of unacceptable soil is to exceed 30 days, then notification and approval is required by the Director.
2.4 – Abnormalities (open fractures, presence of water, percolation, etc.) encountered during the bedrock integrity inspection requires that the Director be notified immediately.
2.12 – In the event of an emergency or condition beyond the control of the Permittee which prevents effective operation of the authorized works or leads to unauthorized discharge, the Permittee must comply with all applicable statutory requirements, immediately notify the Director and take appropriate remedial action for the prevention or migration of pollution.
2.17 – The Director must be notified prior to implementing any changes to any process that may adversely affect the quality and/or quantity of the discharge.
2.19 – The Director must be notified of a change in ownership of the works a minimum of 10 days prior to an ownership change.
Notification – MEMPR Permit Q-8-094
12 - Substantial changes to the program must be submitted to the Inspector for Approval
15 – Notice of Completion of work shall be filed with Inspector not less than seven days prior to cessation of work.
5 (b) – No topsoil shall be removed from the property without the specific written permission of the inspector.
17(a) – The inspector shall be advised in writing at the earliest opportunity of any unforeseen conditions that could adversely affect the extraction of materials, site stability, erosion control or reclamation of the site.
17(c) - The discovery of any significant subsurface flows of water, seeps, substantial amounts of fine textured, soils, silts and clays, as well as significant adverse geological conditions shall be reported to the inspector as soon as possible and work shall cease until the inspector advises otherwise.
5(c) - Residents within 1km of the centre of the Quarry, and the Inspector, shall be given 24 hours notice of each scheduled blast.
9(d) - Should the provisions of [working outside permitted hours in case of safety concern or declared emergency] be implemented the Manager shall advise the Inspector without delay
19.1(e) and (f) - Any changes to the proposed method of development [geotechnical – design and construction] will require previous approval of the Inspector…Within 30 days of completing construction, a construction QAQC report shall be submitted to the Inspector.
19.1 (g) - The Permittee shall submit an as-built report with drawings to the Inspector prior to operation of the facility.
20 (b) - [Completion of the cell] The permitted shall prior to applying any vegetation cover to the completed cell provide the inspector a plan designed by an appropriate Qualified Person which demonstrates the vegetation cover is suitable for the area, and as cover for the waste cell.

Reporting – MOE Permit PR-105809
2.4 – Bedrock integrity inspection and risk assessment report must be submitted to the Director prior to the construction of any landfill cells. If abnormalities are encountered (open fractures, presence of water, percolation, etc.) then a structural report must be submitted within 30 days.
2.11 – All spills to the environment (as defined in the Spill Reporting Regulations) must be reported immediately in accordance with the Spill Reporting Regulation. Notification must be via the Provincial Emergency Program at 1-800-663-3456.
2.12 – Any scenario that may result in the contamination of surface water and/or groundwater must be immediately reported to MOE (250-751-3100) and VIHA at 250-739-6304 (normal office hours) or at 1-800-204-6166 (weekends and evenings).
2.13 – The Permittee must prepare and submit an Environmental Procedures Manual.
2.14 – The Permittee must establish an Advisory Committee and develop terms of references to the satisfaction of the Director. The Advisory Committee must provide advice to the Director within 30 days of meeting.
2.18 – Plans and specifications related to new works must be submitted to the Director.
4.1 – The Permittee must submit a closure plan the satisfaction of the Director in 6 months after the issuance of the permit.
4.2 – The Permittee must submit a cost estimate for maintenance, monitoring, remediation and closure of the landfill for the active life of the site and a minimum 25 year post-closure period.
5.2 – The Permittee must submit environmental quarterly reports to the Director within 30 days after the end of each quarter.
5.3 – The Permittee must submit an environmental annual report to the Director no later than March 31st each year.
6.1 – The Permittee must submit a written report to the Director within 30 days of any non-compliance occurrence.
Reporting – MEMPR Permit Q-8-094
16 – Annual reports shall be submitted in a form and containing the information as and if required by the Inspector
8 - Within 1 month of the date of this amendment to Permit Q-8-094 [August 17, 2015 – ed.] , the Manager shall file with the Inspector an approved plan for ensuring compliance with Part 8, sections 8.7.1 to 8.7.4 of the Code
10 - The Manager shall forward to the Inspector a copy of the updated mine plan required by the code. This code section refers to updates every three months.
15(c) - Any row of holes to be blasted within 10 meters of the common boundary between the Quarry and property owned by the CVRD shall be surveyed in by a Licensed Land Surveyor. A copy of the survey shall be forwarded to the Inspector within one week of the blast.
17 - At the completion of each 1 meter (compacted) lift [of soil for encapsulation – ed.] the Manager shall provide the Inspector an as built of the lift signed by a suitable registered professional.
19.2 (a) - Prior to operation of the facility [geotechnical – design and construction], the Permittee shall submit an updated OMS manual and a Mine Emergency Response Plan MERP to the Inspector
19.3 (a) - Annual inspections of the waste storage facility [geotechnical – design and construction] shall be undertaken by a qualified Professional Geotechnical Engineer with a report submitted to the Inspector by March 31 of the year following the inspection.
20 (e) - Prior to receiving fill in any cell the Permittee must provide a signed as built of the construction of the cell to date.
20 (h) - The Manager shall, by March 31 of each year, provide the Inspector a report identifying the volume of water treated through the treatment plant, and shall include all operating costs associated with the operation and maintenance of the treatment plant.
21 - The Manager shall forward to the Inspector a copy of the report submitted to the Minister of Finance in relation to the annual Health and Safety Assessment.

As mentioned previously, the site is subject to daily internal inspection. In addition to receiving notifications and reports, MOE and MEMPR may inspect the site at any time.

The results of internal monitoring and inspection, in combination with MOE and MEMPR observations, will identify issues requiring corrective or preventative measures. Generally, corrective actions and a related implementation schedule will be developed within 30 days (or as directed by MOE or MEMPR) of identifying a deficiency or area for improvement. However, where health, safety or environmental quality are at risk, mitigation actions will begin immediately.

Corrective actions and improvement initiatives will be implemented under the authority of the Mine Manager, in collaboration with the Operations Manager. Where applicable, Qualified Professionals will be retained or consulted to investigate, analyse, plan, implement and/or monitor.

Implemented and planned corrective and preventative measures will be documented in the Annual Environmental Report, which is submitted to MOE, MEMPR and the site's Advisory Committee.

14 REFERENCES

Active Earth Engineering Ltd. (AEEL) 2012. T*echnical Assessment for Authorization to Discharge Waste*. Submitted to BC Ministry of Environment Environmental Management Branch. Prepared for South Island Aggregates Ltd. AEEL file No. 320. 361 pp.

AEEL. 2013a. *Bedrock Integrity Inspection and Risk Assessment, Authorization to Discharge Waste Permit PR-105809*. Letter report to Luc Lachance, P.Eng., BC Ministry of Environment. 640 Stebbings Road, Shawnigan Lake, BC. October 10, 2013. 7 pp.

AEEL. 2013b. *As-Built Summary – Soil Management Area, Authorization to Discharge Waste Permit PR-105809, 640 Stebbings Road, Shawnigan Lake, BC*. Letter report to Luc Lachance, P.Eng., BC Ministry of Environment. October 29, 2013. 7pp.

AEEL. 2013c. *As-Built Summary – Water Management System, Authorization to Discharge Waste Permit PR-105809, 640 Stebbings Road, Shawnigan Lake, BC*. Letter report to Luc Lachance, P.Eng., BC Ministry of Environment. December 6, 2013. 11 pp.

AEEL. 2013d. *Seepage Blanket Details, Authorization to Discharge Waste Permit PR-105809. 640 Stebbings Road, Shawnigan Lake, BC*. Letter report to Luc Lachance, P.Eng., BC Ministry of Environment. December 10, 2013. 4 pp.

AEEL. 2015. *Water Treatment Plant Commissioning Report, Authorization to Discharge Waste Permit PR-105809, 640 Stebbings Road, Shawnigan Lake, BC*. Letter report to Laura Hunse, BC Ministry of Environment. May 1, 2015. 18 pp.

BC Ministry of Energy and Mines (now BC Ministry of Energy, Mines and Petroleum Resources, MEMPR). 2002a. *Aggregate Operators Best Management Practices Handbook for British Columbia, Volume I, Introduction and Planning.* April 2002. 145 pp.

BC Ministry of Energy and Mines (now BC Ministry of Energy, Mines and Petroleum Resources, MEMPR). 2002b. *Aggregate Operators Best Management Practices Handbook for British Columbia, Volume II, Best Management Practices*. April 2002. 89 pp.

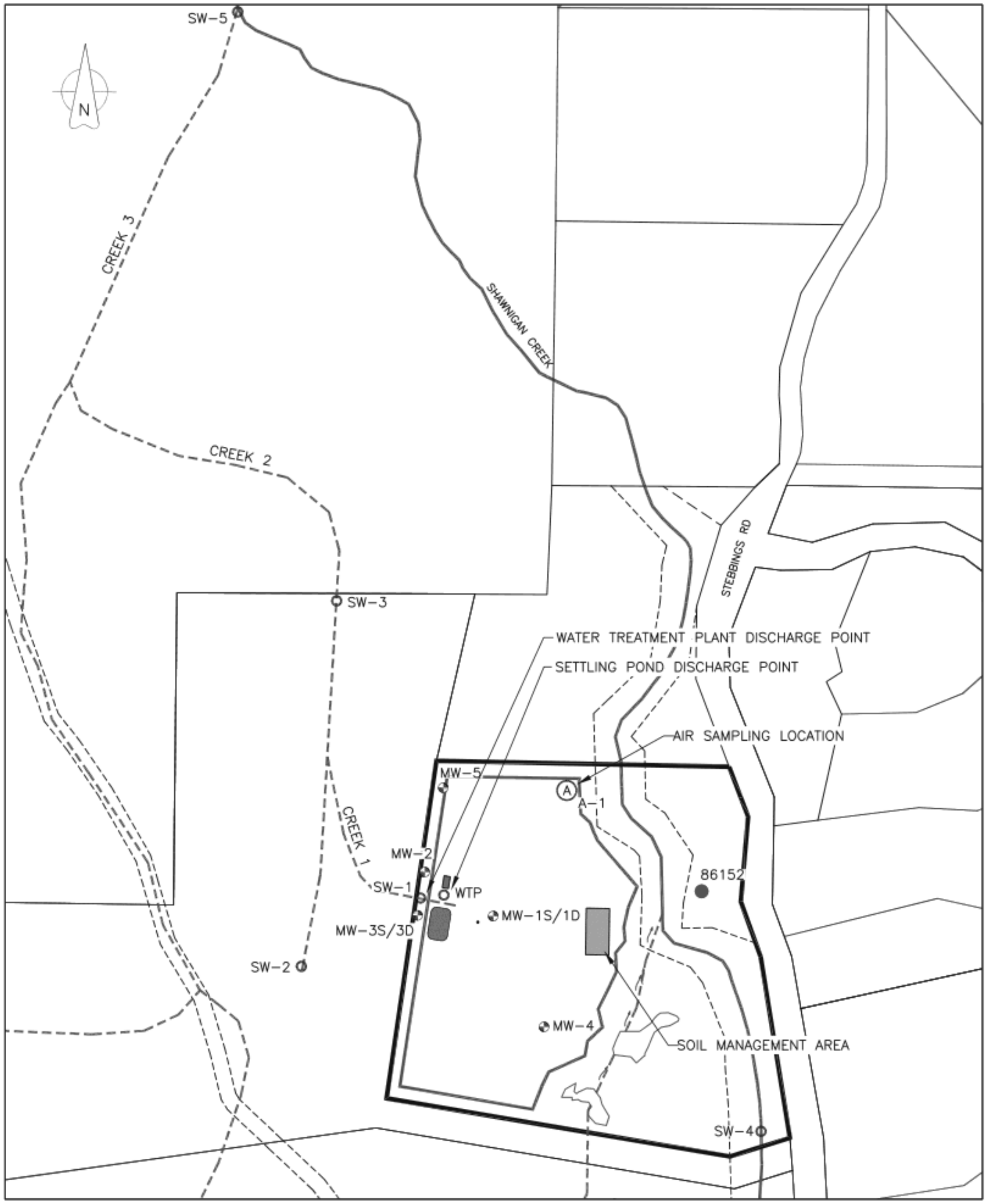
BC Ministry of Energy, Mines and Petroleum Resources. 2008. *Health, Safety and Reclamation Code for Mines in British Columbia*. ISBN 978-0-7726-6011-4. 356 pp.

BC Ministry of Energy, Mines and Petroleum Resources. 2012. *Mine Emergency Response Plan Guidelines for the Mining Industry*. September 2012, V1.2/. 48 pp.

Mining Association of Canada. 2011. *Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities*. ISBN 0-921108-25-7. 52 pp.

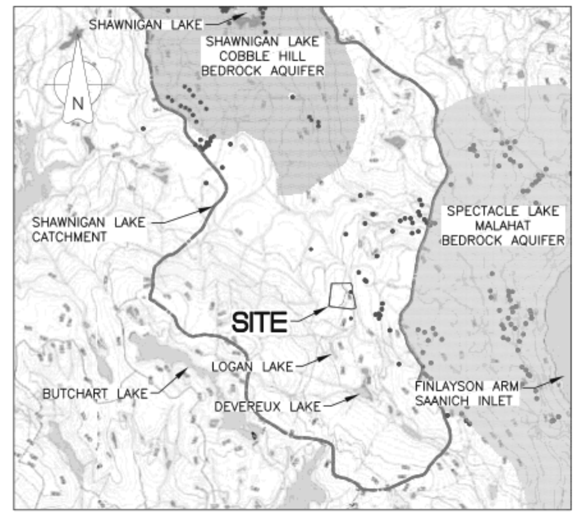
Figure 1

Site Plan



LEGEND

- EXISTING WATER WELLS
  86152 = MOE WELL TAG NUMBER
- EXISTING MONITORING WELL
  (GROUNDWATER SAMPLING POINT) (SECTION 3.3 & 3.6)
- SURFACE WATER MONITORING POINT (SECTION 3.4 & 3.6)
- AIR SAMPLING LOCATION
- SHAWNIGAN LAKE CATCHMENT
- SITE BOUNDARY
- QUARRY BOUNDARY
- WATERCOURSE
- SEASONAL WATERCOURSE



N.T.S.

0 250 500 METRES

SCALE 1:6000

Active Earth Engineering Ltd

CLIENT NAME: SOUTH ISLAND AGGREGATES	PROJECT LOCATION: SHAWNIGAN LAKE, BC

TITLE:

BASEPLAN AND MONITORING LOCATIONS

DWN BY: JJB	DWG NAME: 320-B	DATE: 2013-09-30	FIGURE 1
CHK'D: MP	PLOT:	CADFILE: 320 TAS	

\...\LANDFILL\CADD\320 TAS SEPT 30 2013

Appendix A

BC Ministry of Environment Permit PR-105809

(June 4, 2015, Amendment, Followed by August 21, 2013, Original)

BRITISH COLUMBIA

June 4, 2015

Tracking Number: 338485
Authorization Number: 105809

Cobble Hill Holdings Ltd. (BC0754588)
Herald Street Law
101 - 536 Herald Street
Victoria BC V8W 1S6

Dear Cobble Hill Holdings Ltd. (BC0754588),

Re: Environmental Appeal Board Directions - Amendments to the Permit under the *Environmental Management Act*

On March 20, 2015, the Environmental Appeal Board confirmed the permit subject to directions. A copy of the decision, including directions, is available at the Environmental Appeal Board's website http://www.eab.gov.bc.ca/index.htm.

Pursuant to the *Environmental Management Act*, Permit 105809 is hereby amended:

1. To amend the subject sentence of section **2.14 Advisory Committee** from:

> The Committee must be composed of one representative of each relevant regulatory agency and one representative from the local government.

to:

> The Committee must be composed of one representative of each relevant regulatory agency, one representative from the local government, one representative from the Shawnigan Residents Association and/or other interested community members as chosen by the Director.

2. To add section:

2.4.1 Reuse of Landfill Cell Liners Prohibited

> Reuse of geomembrane landfill cell liners is prohibited. This prohibition must be included in the Environmental Procedures Manual.

3. **Effective March 20, 2016,** to amend section **2.7 <u>Weather Protection</u>** from:

2.7 <u>Weather Protection</u>

The Permittee must cover the soil treatment piles, soil holding area and active landfill areas completely from November to April when not actively worked on and provide sufficient weather protection and containment for nutrients stored at the site for the protection of human health and the environment. The Permittee must cover any soil stored within the holding area at all times.

to:

2.7 <u>Weather Protection</u>

A permanent roof must be placed over, cover, and prevent precipitation from entering the soil management and bio-remediation treatment area including the temporary soil holding area (as described under subsection 2.3), referred to in subsection 1.2.1.

The Permittee must cover the active landfill areas completely from November to April when not actively worked on and provide sufficient weather protection and containment for nutrients stored at the site for the protection of human health and the environment.

4. To add section:

2.7.1 <u>Wheel Rinsing</u>

Before soil transport vehicles leave the site, their wheels must be rinsed to remove all soil and waste. Soil and waste must be managed in accordance with the permit. Rinse water must be directed to the leachate and leak detection reservoir(s). These requirements must be included in the Environmental Procedures Manual.

5. To add to section **3.6 <u>Receiving Environment Sampling</u>**, Table, Row 3 Surface Water, Column 3 Frequency:

Immediately after a 1-in-200 year, 24-hour storm event, at Monitoring Locations (SW-2) Ephemeral Creek 1 and (SW-3) Ephemeral Creek 2.

Please note that although a revised permit has not been produced at this time, a copy of this letter is being placed on the permit file, as an addendum to the permit. Your attention is respectfully directed to the conditions of the permit. An annual fee for the permit will be determined in accordance with the Permit Fees Regulation.

This permit 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 permittee. This permit is issued pursuant to the provisions of the *Environmental Management Act* to ensure compliance with Section 120(3) of that statute, which makes it an offence to discharge waste, from a prescribed industry or activity, without proper authorization. It is also the responsibility of the permittee 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.

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 permit will be carried out by staff from the regional office. Plans, data and reports pertinent to the permit are to be submitted to the Regional Director, at Ministry of Environment, Environmental Protection Division, Authorizations - South, 2080A Labieux Rd, Nanaimo BC V9T 6J9.

Yours truly,

A.J. Downie, M.Sc., P.Ag.
for Director, Environmental Management Act

CC: Environment Canada
Ministry of Energy and Mines

ENCL: None

BRITISH COLUMBIA

August 21, 2013

Tracking Number: 225272
Authorization Number: 105809

REGISTERED MAIL

Cobble Hill Holdings Ltd. (BC0754588)
Herald Street Law
101-536 Herald Street
Victoria BC V8W 1S6

Dear Permittee:

Enclosed is Permit 105809 issued under the provisions of the *Environmental Management Act*. Your attention is respectfully directed to the terms and conditions outlined in the permit. An annual fee will be determined according to the Permit Fees Regulation.

This permit 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 Permittee. This permit is issued pursuant to the provisions of the *Environmental Management Act* to ensure compliance with Section 120(3) of that statute, which makes it an offence to discharge waste, from a prescribed industry or activity, without proper authorization. It is also the responsibility of the Permittee 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.

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.

Ministry of Environment
Environmental Protection Division
2080A Labieux Road
Nanaimo, BC V9T 6J9
West Coast Region
Telephone: (250) 751-3100
Facsimile: (250) 751-3103

Administration of this permit will be carried out by staff from the West Coast Region. Plans, data and reports pertinent to the permit are to be submitted to the Regional Manager, Environmental Protection, at Ministry of Environment, Regional Operations, West Coast Region, 2080A Labieux Road, Nanaimo, BC V9T 6J9.

Yours truly,

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

Enclosure

cc: Environment Canada

BRITISH COLUMBIA

MINISTRY OF ENVIRONMENT

PERMIT

PR-105809

Under the Provisions of the Environmental Management Act

Cobble Hill Holdings Ltd. (BC0754588)

Herald Street Law
101-536 Herald Street
Victoria BC V8W 1S6

is authorized to discharge refuse to ground and effluent to an ephemeral stream from a contaminated soil treatment facility and a landfill facility located at 640 Stebbings Road, Shawnigan Lake, British Columbia, subject to the terms and conditions listed below. Contravention of any of these conditions is a violation of the *Environmental Management Act* and may lead to prosecution.

1. **AUTHORIZED DISCHARGES**

1.1 **Authorized Discharges – General Conditions**

This section applies to the discharge of refuse from a contaminated soil treatment and to the landfill facility.

1.1.1 The combined maximum rate of discharge from the treatment and to the landfill facility is 100000 tonnes per year. The estimated density of soil accepted at the site ranges from 1.5 to 1.8 t/m^3 for the purpose of sampling incoming soil or treated soil for characterization. The above density estimate may be modified at any time with a scientific sampling method approved by the Director.

1.1.2 The authorized discharge period is between 7am and 5pm Monday to Friday.

1.1.3 The characteristics of the discharges must be as described under Subsections 1.2 and 1.3.

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

Soil relocation requirements of the Contaminated Sites Regulation (CSR) apply to all other parameters than those specified in this permit and in the Soil Acceptance Plan referred to under Section 2.2.

Soils meeting facility location background quality in accordance with CSR Protocol 4 may also be discharged.

If land use or site specific factors specified in Column I of Schedule 5 of the CSR change at the permitted site, the Permittee must promptly notify the Director and immediately apply them for the purpose of Subsections 1.2 and 1.3.

1.1.4 The authorized works as defined under Subsections 1.2.1, 1.3.1, 1.4.5 and 1.5.4 must be complete and in operation while discharging.

1.1.5 The location of the facilities and the points of discharge is Lot 23, Plan VIP78459, Blocks 156, 201 and 323, Malahat Land District.

1.2 **Authorized Discharge –Treatment Facility**

This section applies to the discharge of refuse from a soil treatment facility. The site reference number for this discharge is E292169.

1.2.1 The authorized works are a lined asphalt paved soil management and bio-remediation treatment area of approximately 1800 m^2, temporary soil holding area (as described under Subsection 2.3), biocell, berm, primary and secondary containment detection and inspection sumps and associated cleanout ports, catch basins, groundwater monitoring wells (as described under Subsection 3.3), management works and related appurtenances approximately located as shown on Figure A.

1.2.2 The characteristics of the discharge must be equivalent to or better than:

soil suitable for industrial land use, as described by the Generic and Matrix Numerical Soil Standards in Schedule 4, 5, 7 and 10 (Column IV "Commercial, Industrial Soil Standard") of the CSR, including the most stringent applicable site specific factors as defined in the Environmental Procedures Manual (EPM) referred to in Subsection 2.13, considering intake of contaminated soil, toxicity to soil invertebrates and plants and

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

groundwater flow to surface water used by freshwater aquatic life for the authorized soil treatment and discharge parameters as specified in Subsection 1.2.3.

1.2.3 The types of soil that can be bio-remediated at the treatment facility are soils contaminated with hydrocarbons, specifically soils contaminated with Benzene, Toluene, Ethylbenzene, Xylene (BTEX), Styrene, Methyl Tertiary Butyl Ether (MTBE), Volatile Petroleum Hydrocarbons (VPHs), Light and Heavy Extractable Petroleum Hydrocarbons (LEPHs/HEPHs), Polycyclic Aromatic Hydrocarbons (PAHs), Chlorinated Hydrocarbons, Phenolic Substances, Chloride, Sodium and Glycols as defined in Schedules 4 and 5 of the CSR.

Soils co-contaminated with hydrocarbons as described in this section and metals or other contaminants not suitable for bioremediation meeting industrial land use standards as defined in Schedules 4 and 5 of the CSR may also be accepted for treatment at the biocell.

1.3 <u>Authorized Discharge – Landfill Facility</u>

This section applies to the discharge of refuse from a soil treatment facility and from relocated contaminated soil and associated ash. The site reference number for this discharge is E292889.

1.3.1 The authorized works are a landfill, engineered lined landfill cells, perimeter ditches, erosion and sedimentation control infrastructure, primary and secondary containment detection and inspection sumps and associated cleanout ports, catch basins, groundwater monitoring wells, management works and related appurtenances approximately located as shown on Figure A.

1.3.2 The characteristics of the discharge must be better than:

Hazardous waste, as described in the Schedule 1, 1.1, 3 and 4 (Part 3, table 1 – Leachate Quality Standards) of the Hazardous Waste Regulation (HWR) and must be limited to contaminated soils and associated ash. Hazardous waste (as defined in the *Environmental Management Act* and the HWR), liquids, putrescible and other wastes must not be discharged.

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

The Director may specify different standards and other substances in writing for the protection of human health or the environment.

1.3.3 The types of soil that can be discharged at the landfill facility are soils and associated ash contaminated with metals, Dioxins, Furans, BTEX, MTBE, VPHs, LEPHs/HEPHs, PAHs, Styrene, Chlorinated Hydrocarbons, Phenolic Substances, Chloride, Sodium and Glycols as defined in Schedules 4 and 5 of the CSR.

1.4 **Ancillary Discharge – Water Treatment System**

This section applies to the discharge of effluent from the water treatment system (WTS). The site reference number for the WTS discharge is E292170.

1.4.1 The annual average rate of the WTS discharge is 12.1 cubic metres per day.

1.4.2 The maximum rate of the WTS discharge is 274 cubic metres per day.

1.4.3 The authorized discharge period is continuous.

1.4.4 The characteristics of the discharged treated effluent must be equivalent to or better than the most stringent of those British Columbia Approved Water Quality Guidelines (BCAWQG) and A Compendium of Working Water Quality Guidelines for British Columbia (BCWWQG) for Freshwater Aquatic Life (AL) protection and Drinking Water (DW) uses for the parameters of concern: Inorganic Substances including metals, VPHw, LEPHw, VHw_{6-10}, $EPHw_{10-19}$, PAHs, BTEX, Styrene, Chlorinated Hydrocarbons, Phenolic Substances, Chloride, Sodium, Glycols, pH and Oil & Grease.

Dioxins and Furans analysis must be conducted at a laboratory and using an analytical method agreed to by the Director and results must be below detection limit at all times.

The source of the discharge must be limited to site stormwater runoff and water from the primary and secondary containment systems authorized under Subsections 1.2.1, 1.3.1 and 1.4.5.

The Director may specify different standards and other substances in

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

writing for the protection of human health or the environment.

1.4.5 The authorized works are surface runoff collection and diversion ditches associated with the WTS, WTS (including pH control and flocculent injection system, settling tank, bag and activated carbon filters), leachate and leak detection reservoirs, flow measurement device, monitoring and sampling equipment, reservoirs and related appurtenances approximately located as shown on Figure A.

1.4.6 The authorized works must be complete and in operation while discharging.

1.4.7 The location of the facilities from which the discharge originates and the point of discharge is Lot 23, Plan VIP78459, Blocks 156, 201 and 323, Malahat Land District.

1.5 <u>Ancillary Discharge – Settling Pond</u>

This section applies to the discharge of stormwater from the settling pond. The site reference number for the settling pond outlet is E292898.

1.5.1 The rate of the settling pond discharge is 42,500 cubic metres per day for up to 1 in 10 year return period flood event of 24 hour duration.

1.5.2 The authorized discharge period is continuous.

1.5.3 The characteristics of the settling pond discharge effluent (SW-1) must be equivalent to or better than the most stringent of those BCAWQG and BCWWQG for Freshwater Aquatic Life uses and Total Suspended Solids (TSS) must not exceed 25 mg/L for up to 1 in 10 year return period flood event of 24 hour duration.

For flood events greater than 1 in 10 year return period flood event of 24 hour duration, the characteristics of the settling pond discharge must not exceed background concentrations (SW-4).

The source of the discharge must be limited to non contact site stormwater runoff and treated effluent released from the WTS described in Subsection 1.4.

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

The Director may specify different standards and other substances in writing for the protection of human health or the environment.

1.5.4 The authorized works are surface runoff collection and diversion ditches, leachate, surface runoff and leak detection control reservoirs, one surface settling pond, flow measurement device, monitoring and sampling equipment, emergency overflow and related appurtenances approximately located as shown on Figure A.

1.5.5 The authorized works must be complete and in operation while discharging.

1.5.6 Settled solids which have accumulated in the settling pond must be removed as required to maintain a minimum water depth below the pond decant of 0.5 metre. The removed solids must be disposed of in a manner approved by the Director.

1.5.7 The location of the facilities from which the discharge originates and the point of discharge is Lot 23, Plan VIP78459, Blocks 156, 201 and 323, Malahat Land District.

2. GENERAL REQUIREMENTS

2.1 Soils and Associated Ash Unacceptable for Treatment

The following types of waste must not be accepted for treatment at the site:

1) Hazardous waste as defined in the HWR;
2) Soils contaminated with any substances not included in Subsection 1.2 above with concentrations exceeding relevant standards specified in Schedule 4 and 5 of the CSR;
3) Soils and associated ash that cannot be treated or landfilled successfully in the opinion of the Director; and
4) Liquid waste or soil and associated ash with a water content exceeding those described in the Soil Acceptance Plan.
5) Restricted wastes listed in the Soil Acceptance Plan described in Subsection 2.2 of this permit.

2.2 Screening and Acceptance of Soil

The Permittee must submit a Soil Acceptance Plan prepared by a Qualified

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

Professional to the satisfaction of the Director for screening soil and associated ash for all potential contaminants of concern prior to receiving any material at the facility. No changes must be made to the plan without prior approval by the Director. The Director may amend the plan for the protection of human health or the environment.

Those soils suspected to be unacceptable must be either rejected immediately or placed in a holding area (as defined in Subsection 2.3) within the soil management area waiting further re-characterization by a Qualified Professional in accordance with Technical Guidance Document #1 (Site Characterization and Confirmation Testing). If further characterization confirms soils as unacceptable for treatment or landfilling (as defined in Subsections 1.2 and 1.3) the soil must not be mixed with any other soil and must be removed from the facility in accordance with the requirements of the *Environmental Management Act* and of the CSR.

2.3 Holding Area for Soil and Associated Ash Suspected/Determined to be Unacceptable

The Permittee must designate a holding area within the soil management area for short term storage of soil waiting for re-characterization or shipment to an appropriate management site as determined by a Qualified Professional. Short term storage must not exceed 30 days from the day of the delivery or as agreed by the Director. The soil must be kept separate from the soil treatment area and be protected from the weather at all times.

2.4 Bedrock Integrity Inspection and Risk Assessment

A bedrock integrity inspection and risk assessment report must be submitted to the Director prior to the construction of any landfill cells. For any abnormalities (open fractures, presence of water, percolation, etc) identified during the inspection, the Permittee must notify the Director immediately and issue a structural report within 30 days following the inspection. The report must be submitted to the satisfaction of the Director and prepared by a suitably Qualified Professional and must include, but is not limited to:

a) all relevant information collected during the inspection and detailing the abnormality;
b) an explanation and/or interpretation of the abnormality;
c) a risk assessment in regards to the risk to human health and the receiving

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

environment; and

d) remedial action planned and/or taken to control the risks.

2.5 Soil Aeration

a) Where the thickness of contaminated soil within the soil treatment facility is greater than 30 cm, the Permittee must periodically conduct mechanical soil aeration. Soil aeration must only be done under the following conditions to prevent nuisance to potential receptors:

i. Ventilation index for Southern Vancouver Island for the day of soil turning is forecast as "good";
ii. No sooner than three hours after sunrise and no later than two hours before sunset but within the authorized discharge period defined under Subsection 1.1.2;
iii. Favorable weather conditions (considering temperature and wind direction, etc.)

b) Prior to every soil aeration event the Permittee must record the ventilation index forecast, time of sunrise and sunset, time and duration of aeration, and ambient temperature. Records must be tabulated along with soil volumes aerated and chemical characteristics in the biocell at the time of aeration.

2.6 Soil Amendment and Prohibition of Blending

Bioremediation must be undertaken without blending/mixing of contaminated soil with cleaner soils for the purpose of dilution to meet the required standards.

Soil amendments which will enhance remediation potential, including bulking materials such as sawdust or straw, may be added prior to or during treatment. Should water be required to enhance soil treatment, contact water generated at the facility must be used in priority.

2.7 Weather Protection

The Permittee must cover the soil treatment piles, soil holding area and active landfill areas completely from November to April when not actively worked on and provide sufficient weather protection and containment for nutrients stored at the site for the protection of human health and the environment.

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

The Permittee must cover any soil stored within the holding area at all times.

2.8 Erosion and Sedimentation Control

The Permittee must ensure erosion and sedimentation control measures are implemented with the soil management and treatment area and the landfill area, to limit sediment releases to the settling pond, the water treatment system and to the receiving waters. Storm water runoff must be diverted away from the soil management and treatment area and all active landfill areas at all times. Erosion and sedimentation controls must be developed and implemented according to industry best management practices and consider the Aggregate Operators Best Management Practices Handbook prepared by the Ministry of Energy and Mines.

2.9 Odour Control

There must be no objectionable hydrocarbon odour evident outside the property boundaries. The Permitee must, at a minimum, implement contingency measures if the ambient air quality sampling results exceed the air quality standards defined under Subsection 3.5. The contingency measures must be defined in the EPM as documented in Subsection 2.13 and include, but are not limited to, reduced soil aeration times and the covering of soil piles.

The Director may amend the permit to require the implementation of additional control measures to limit odour generation.

2.10 Dust Control

Fugitive dust created within the operation area must be suppressed. Measured dustfall must not exceed the B.C. Ambient Air Quality Residential Objective of 1.7 mg/(dm^2-day) over a two week averaging period at the property boundary. The contingency measures must be documented in the EPM as defined in Subsection 2.13 and include, but not limited to, reduced activities, covering or application of dust suppressant on soil piles and exposed areas.

The Director may amend the permit to require the implementation of additional control measures on fugitive dust sources.

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

2.11 Spill Reporting

All spills to the environment (as defined in the Spill Reporting Regulation) must be reported immediately in accordance with the Spill Reporting Regulation. Notification must be via the Provincial Emergency Program at 1-800-663-3456.

2.12 Maintenance of Works and Emergency Procedures

The Permittee must inspect the authorized works regularly and maintain them in good working order. In the event of an emergency or condition beyond the control of the Permittee which prevents effective operation of the authorized works or leads to unauthorized discharge, the Permittee must comply with all applicable statutory requirements, immediately notify the Director, and take appropriate remedial action for the prevention or mitigation of pollution. The Director may reduce or suspend operations to protect human health or the environment until the authorized works have been restored and/or corrective steps have been taken to prevent unauthorized discharges.

The Permittee must prepare and maintain an Emergency Response Plan (ERP) to the satisfaction of the Director that describes the procedures to be taken to prevent or mitigate any discharge in contravention of the EPM. The ERP must be immediately implemented if there is a discharge, or any risk of a discharge in contravention of the EPM. In addition, an up-dated ERP, including a report on any emergency responses, taken in the previous year, must be kept available, on site for inspection, as defined under Subsection 5.1.

The Permittee must review the ERP at least on an annual basis to determine if any changes are required and submit any revisions to the Director for acceptance.

2.13 Environmental Procedures Manual

An Environmental Procedures Manual (EPM) must be prepared and submitted by the Permittee to the Director. No soil may be received prior to acceptance of the EPM by the Director. The EPM must be kept current and available for use as a guide at all times at the facility. The manual must cover all typical aspects of an Environmental Management Systems (EMS) relevant to the management of the soil treatment, water treatment and landfill facilities including but not limited to, the following items:

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

a) Risk identification and prioritization;
b) Administrative and engineering controls;
c) Roles and responsibilities;
d) Training requirements;
e) A Soil Acceptance Plan;
f) A Water Management Plan;
g) An Environmental Monitoring Plan, including on and off site monitoring locations and the sampling procedures for soil, water, groundwater and air quality, as required;
h) An Emergency Response Plan, including contingency measures.
i) Details on the site preparation and the construction of landfill cells;
j) Operation, inspection and maintenance of the soil management and treatment facility, the landfill facility, the water treatment system, erosion and sediment controls measures, the settling pond and associated appurtenances;
k) Internal and external EMS audits, and;
l) Notification, reporting, investigation and corrective and preventive measures.

The Permittee must review the EPM at least on an annual basis to determine if any changes are required and submit any revisions to the Director for acceptance. Annual reviews and submission of revisions are due on March 31 of each year.

2.14 <u>Advisory Committee</u>

The Permittee must establish an Advisory Committee and develop terms of references to the satisfaction of the Director. The Committee must be composed of one representative of each relevant regulatory agency and one representative from the local government. The Committee must meet annually within 3 months of the submission of the annual report as required under Subsection 5.3 and provide advice to the Director within 30 days of the meeting. Based on advice of the Committee, the Director may revise the monitoring, sampling and reporting requirements in Sections 3 and 5.

2.15 <u>Qualified Professionals</u>

All facilities and information, including works, plans, bedrock integrity and risk assessment, assessments, sampling, monitoring, investigations, surveys, programs and reports, must be conducted and certified by Qualified

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

Professionals.

"Qualified Professional" means a person who

a) is registered to practice 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 permit.

2.16 **Bypasses**

The discharge of contaminants which have bypassed the authorized treatment works is prohibited unless the prior approval of the Director is obtained and confirmed in writing, except those authorized under Subsection 1.2 of this permit.

Temporary storage or accidental deposit of contaminated soil at areas other than the soil management area is considered a bypass.

2.17 **Process Modifications**

The Director must be notified in writing prior to implementing changes to any process that may adversely affect the quality and/or quantity of the discharge.

2.18 **Plans - New Works**

Plans and specifications of the works must be certified by a Qualified Professional registered to practice in the Province of British Columbia, and submitted to the Director. A Qualified Professional must certify that the works have been constructed in accordance with the plans before discharge commences.

2.19 **Notification**

The Director must be notified of a change in ownership of the works a minimum of 10 days prior to an ownership change.

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

2.20 Amended or Additional Requirements

Based on the results of the monitoring programs, the Director may:

a) Amend the monitoring and reporting requirements;
b) Amend the requirements of any of the information required by this permit; including plans, program and studies;
c) Require additional investigations, tests, surveys or studies; or
d) Require additional treatment facilities.

3. MONITORING AND SAMPLING REQUIREMENTS

3.1 Incoming Soil and Associated Ash Sampling and Analysis

The Permittee must follow sampling procedures and frequency specified in the approved Soil Acceptance Plan described under Subsection 2.2 to verify soil and associated ash quality. The contaminants must include, but not be limited to, the parameters of concern listed in Subsection 1.3.3, as determined by a Qualified Professional. The Director may require testing of soil and associated ash for additional parameters.

3.2 Treated Soil Sampling and Analysis

The Permittee must sample and characterize each batch of treated soil in accordance with Technical Guidance #1 Site Characterization and Confirmation Testing or an equivalent sampling protocol approved by the Director. Each batch must be considered to be of suspect waste soil quality. Soil must be analysed prior to disposal as authorised in Subsection 1.2 and 1.3 of this permit. The samples must be analysed for the parameters relevant to the type of contamination for which the soil is undergoing treatment as determined by a Qualified Professional. The appropriate parameters must include, but must not be limited to, the parameters of concern listed in Subsection 1.3.3 as determined by a Qualified Professional.

Confirmation of completion of soil treatment must be obtained in writing from a Qualified Professional prior to discharge, for each stockpile of treated soil.

3.3 Groundwater Sampling and Analysis

The Permittee must install and maintain a minimum of seven groundwater

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

sampling facilities (MW-1(S/D), MW-2, MW-3(S/D), MW-4 and MW-5) as shown on Figure B and obtain groundwater samples once each quarter in a manner satisfactory to the Director. MW-4 and MW-5 must be drilled using a non-destructive method and cores must be logged by a Qualified Professional. The design and location of the wells must be to the satisfaction of the Director. Proper care must be taken in sampling, storing and transporting the samples to adequately control temperature and avoid contamination, breakage, etc.

Groundwater samples must be analysed for all potential contaminants of concern. The contaminants may include, but not be limited to, the parameters of concern listed in Subsection 1.3.3, as determined by a Qualified Professional. The groundwater quality must be compared to the standards described in Schedules 6 and 10 of the CSR or any additional standards specified by the Director in writing.

The Permittee may be required to install additional groundwater sampling facilities upon request. The location and structural details of these sampling facilities are subject to the approval of the Director.

3.4 <u>Surface Water Sampling and Analysis</u>

The Permittee must sample the water treatment system effluent (WTS) and the settling pond discharge point (SW-1) monthly and every 2000 m^3 for the water treatment system discharge effluent in a manner suitable to the Director. Proper care must be taken in sampling, storing and transporting the samples to adequately control temperature and avoid contamination, breakage, etc.

Turbidity of the settling pond discharge effluent (SW-1) must be monitored bi-weekly between November to April and after every event greater than 1 in 10 year return period flood event of 24 hour duration.

Surface water samples must be analysed for all potential contaminants of concern. The contaminants may include, but not be limited to, the parameters of concern listed in Subsection 1.3.3, as determined by a Qualified Professional. The surface water quality results must be compared to the standards set out in Subsection 1.4.4 and 1.4.5.

3.5 <u>Air Quality Monitoring</u>

The Permittee must collect monthly ambient air samples during the active season (i.e. between April and November, inclusive) at the down-wind property line using a Summa® Canister. Ambient air samples must also be collected using a Summa® Canister if and when soils with measurable volatile contaminant concentrations exceeding the established thresholds are being managed or treated at the soil treatment facility at the location and as documented in the EPM.

The ambient air sample must be analysed for the all potential contaminants of concern, as determined by a Qualified Professional, and results must be compared to the CSR Schedule 11 RL standards. In the event that results exceed the standards, the Permittee must follow the requirements stated under Subsection 2.9.

3.6 Receiving Environment Sampling

The Permittee must implement a receiving environment monitoring program for the receiving groundwater and surface water summarized in the table below and as defined under the EPM:

Receiving Waters	Monitoring Locations		Frequency
Groundwater	Up Gradient	(MW-4) Southeast corner of the site	Quarterly
	Down Gradient	(MW-1(S/D)) On site	
		(MW-2) Property boundary	
		(MW-3(S/D)) Property boundary	
		(MW-5) North of the site	
Surface Water	Up Gradient	(SW-4) Shawnigan Creek	5 in 30** (2 times/year, conducted during fall first flush event and in the spring freshet)
		(SW-2) Ephemeral Creek 1	
	Down Gradient	(SW-5) Shawnigan Creek	
		(SW-3) Ephemeral Creek 2	

* 5 in 30 refers to at least 5 weekly samples taken in a period of 30 days. Due to the ephemeral nature of some of the creeks, the first 5 in 30 sample should be collected when the ground has first been saturated.

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

Flow measurements must be collected from all surface water monitoring locations at the time of sampling.
Based on the results from the receiving environment monitoring program, the monitoring requirements may be extended or altered by the Director.

3.7 Sampling Procedures

Sampling is to be carried out 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, 2003 Edition (Permittee)", or most recent edition, or by suitable alternative procedures as authorized by the Director.

A copy of the above manual is available on the Ministry web page at www.env.gov.bc.ca/epd/wamr/labsys/lab_meth_manual.html

3.8 Analytical Procedures

Analyses are to be carried out in accordance with procedures described in the "British Columbia Laboratory Manual (2009 Permittee Edition)", or the most recent edition, or by suitable alternative procedures as authorized by the Director.

A copy of the above manual is available on the Ministry web page at www.env.gov.bc.ca/epd/wamr/labsys/lab_meth_manual.html

3.9 Quality Assurance

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

b) A duplicate sample must be prepared and submitted for analysis for each parameter sampled for each monitoring period.

c) The analytical laboratory (ies) must be registered in accordance with the Canadian Association of Laboratory Accreditation (CALA) unless otherwise instructed by the Director.

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

4. SECURITY REQUIREMENTS

4.1 Closure Plan

The Permittee must submit a closure plan to the satisfaction of the Director in 6 months after the issuance of this permit. Based on monitoring results or changes in the operation, the Director may require amendment of the plan for environmental protection.

The closure plan must include, but may not be limited to investigations of soil, sediments, surface water and groundwater quality and treatment, identification and assessment of any residual contamination. If any residual contamination is identified, the Permittee will be required to remediate the site to meet the applicable soil, surface water and groundwater standards and objectives, as determined by the Director.

The closure plan must be reviewed at least every five (5) years to inform the security adjustment defined in Subsection 4.2.

4.2 Posting of Security and Costs

The Permittee must submit a cost estimate for maintenance, monitoring, remediation and closure of the landfill for the active life of the site and a minimum twenty-five year post-closure period based on the current updated Closure Plan referred to in Subsection 4.1. The cost estimate must be prepared or reviewed by a suitably qualified, independent third party. The cost estimate is subject to the Director's approval.

An updated cost estimate must be reassessed and submitted to the Director for approval at least once every five (5) years and the security adjusted accordingly. The Director has the discretion to require reassessment on a more frequent basis.

The Permittee must provide and maintain security in a form and amount specified by the Director. At the discretion of the Director security may be applied, to any of the following:

- To correct any inadequacy of the works relating to their construction, operation and maintenance;

- To correct any non-compliance with this permit or the *Environmental Management Act*; and remediation.

Any money spent from the posted security must be replenished within sixty (60) days or as otherwise specified by the Director.

The operation of the facility without valid security is not authorized.

The Permittee may request the return of security where the title of the works has been transferred to a municipal authority or where the posted amount exceeds the estimated closure and post-closure costs, including remediation. Granting the request is at the discretion of the Director.

5. REPORTING REQUIREMENTS

5.1 Records

Maintain for inspection by Environmental Protection Division staff, a record of the following logs, suitably tabulated:

1) Landfill cells construction QA/QC results;
2) Maintenance records of pollution control equipments listed as authorized works;
3) Facility inspection log with a record of observations of the soil management and treatment and landfill areas (including but not limited to bedrock integrity, liner, cover, stormwater and effluent collection and treatment works inspections), and preventative and corrective actions identified and implemented;
4) Current soil and associated ash inventory, including volumes and characteristics of soils and associated ash in the soil management and treatment area and landfill area;
5) Tracking ID number linked to soil and associated ash analysis results and the signature of a Qualified Professional who certifies completion of remediation in accordance with the requirements of the CSR and compliance with this permit;
6) Location of each batch of soil and associated ash in the soil management and treatment and landfill area on a map;
7) Analyses of screening of incoming soils and associated ash, and

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

associated QA/QC results, as described in Subsection 2.1 and 2.2 of this permit;

8) Soil treatment activities including turning records and quantities of nutrients, bacteria seed or amendments added by date;
9) Weather conditions during turning events as described in Subsection 2.5 of this permit;
10) Results of the vapour and dust monitoring activities as required;
11) Analyses of treated soil, and associated QA/QC results, as described in Subsection 1.2 of this permit;
12) Quarterly volumes of soil stored in the holding area, awaiting final disposal as described in Subsection 2.3 of this permit;
13) A summary of Emergency Response Plan exercises, and incidents, including effluent/soil spills, requiring the Emergency Response Plan implementation.

The above records of analyses for the re-characterization or characterization of incoming soil or treated soil, respectively, must include batch sizes, number of samples collected and analysed per volume.

Records must be kept on site or at another location acceptable to the Director for at least three years and made available upon request.

5.2 Environmental Quarterly Reports

The Permittee must submit environmental quarterly reports prepared by a Qualified Professional with all monitoring data and associated QA/QC results, interpretations, conclusions and recommendations in a format acceptable to the Director and post the results online and provide a hard copy to the Director no later than 30 days after the end of each quarter.

5.3 Environmental Annual Reports

The Permittee must submit an environmental annual report prepared by a Qualified Professional with monitoring data and associated QA/QC results, interpretations, conclusions and recommendations in a format acceptable to the Director no later than March 31 of each year.

The environmental annual report must include, but is not limited to, the following:

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

1) An executive summary;
2) Quality and quantity (in tonnes and m^3) of soil and associated ash received for treatment, direct landfilling and as direct landfill cover;
3) Quality and quantity (in tonnes and m^3) of soil and associated ash that could not be treated in the soil treatment facility and soil and associated ash rejected and diverted to other facilities for treatment and/or disposal;
4) Updated maps showing the active landfill area, the areas reclaimed and the location of each landfill cells (completed and in progress);
5) Landfill operational plan and remaining landfill life and capacity;
6) Review of the preceding year of operation, plans for the next year and a summary of any new information or changes to the facilities and plans, assessments, programs and reports;
7) Review of any non-compliances with the conditions of this permit, including an action plan and schedule to achieve compliance (as per Subsection 6.1); and
8) Results from the Environmental Monitoring Plan with interpretations, conclusions and recommendations.

The Permittee must post the environmental annual report online and provide a hard copy to the local library by March 31 of each year. The Permittee may omit proprietary information from the publically available environmental annual report in accordance with the Freedom of Information and Protection of Privacy Act, as agreed to by the Director.

6. NON-COMPLIANCE REPORTING

6.1 Non-compliance Reporting

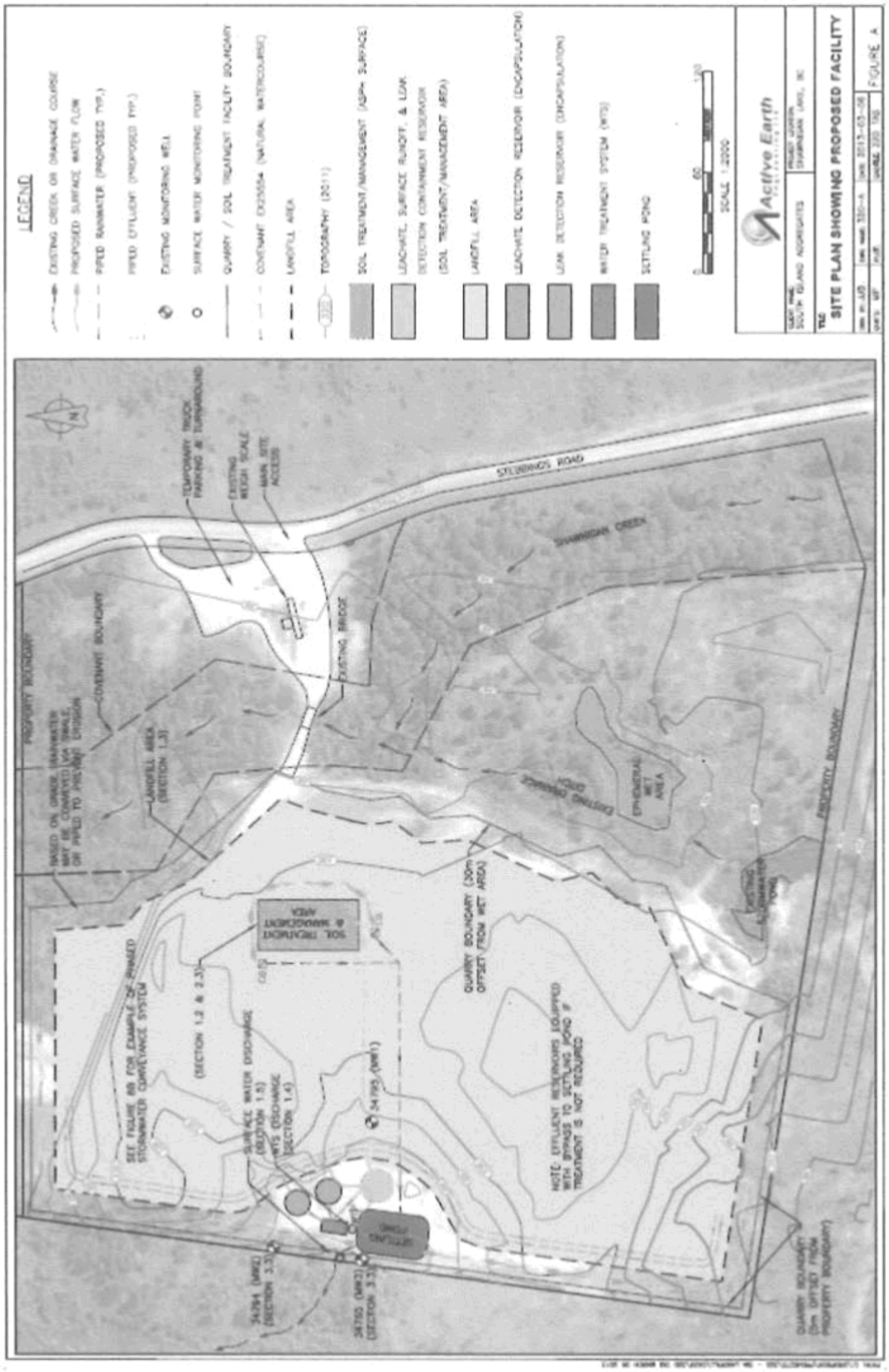
For any non-compliance with the requirements of this permit, the Permittee must submit to the Director, Environmental Protection, a written report within 30 days of the non-compliance occurrence. The report must include, but is not necessarily limited to, the following:

a) all relevant test results related to the non-compliance;
b) an explanation of the most probable cause(s) of the non-compliance; and
c) remedial action planned and/or taken to prevent similar non-compliance(s) in the future.

Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

Figure A – Site Plan

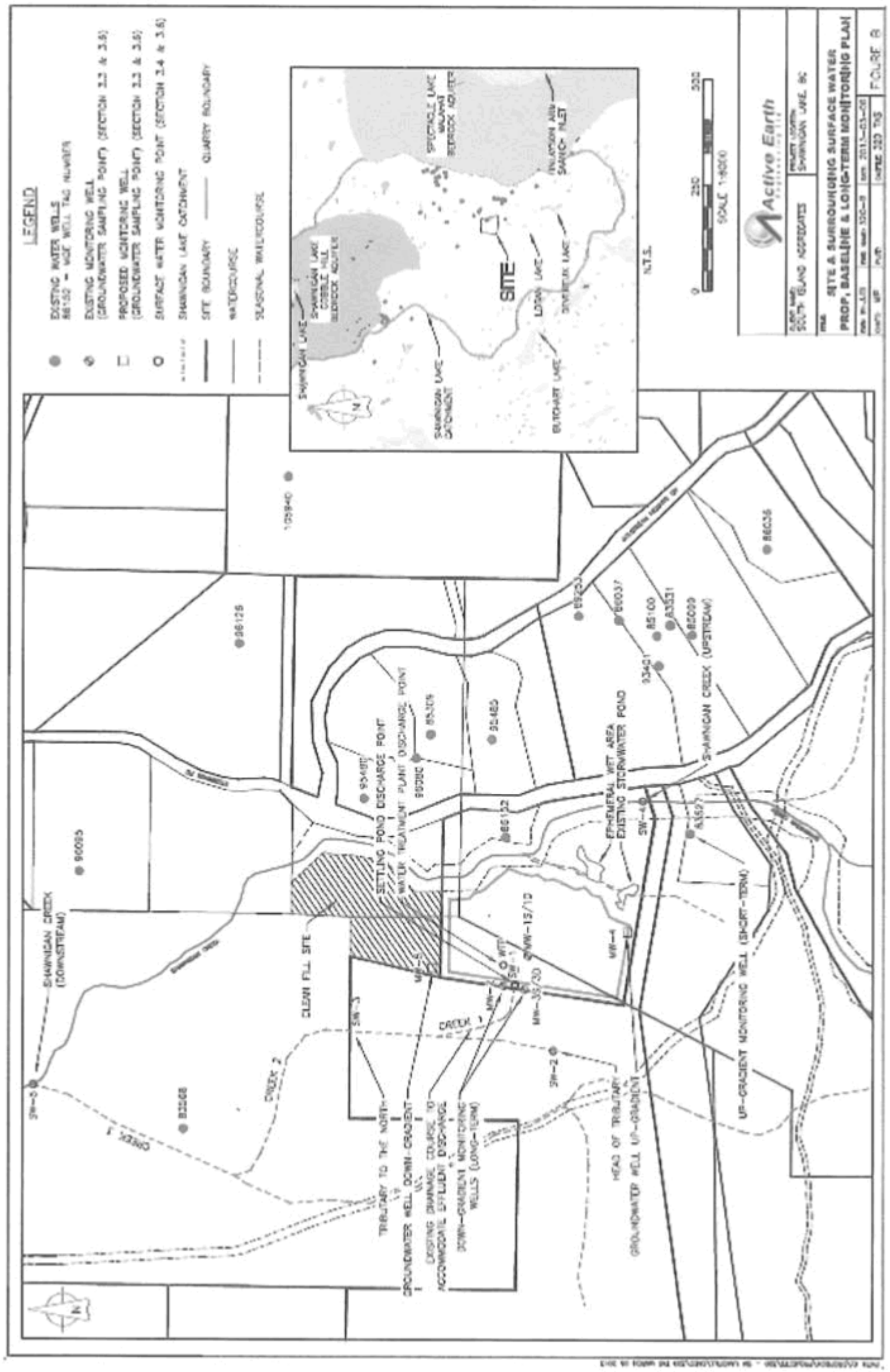


Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

Permit Number: 105809

Figure B – Monitoring Sites



Date issued: August 21, 2013

Hubert Bunce
for Director, *Environmental Management Act*
West Coast Region

Permit Number: 105809

Appendix B

BC Ministry of Energy, Mines and Petroleum Resources Permit Q-8-094

PROVINCE OF BRITISH COLUMBIA
MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES

QUARRY PERMIT
Amendment: April 20 2009

APPROVING WORK SYSTEM AND RECLAMATION PROGRAM
(Issued pursuant to Section 10 of the **Mines Act** R.S.B.C. 1996, C.293)

Permit: **Q-8-094** Mine No.: **1610355**

Issued to: **South Island Aggregates Ltd**
497 A Garbally Road
Victoria BC V8T 2J9

For work located at the following property: **South Island Aggregates Quarry**

Lot 23, Blocks 156, 201 and 323, Malahat District, Plan VIP78459

This approval and permit is subject to the appended conditions.

Issued this 4th day October in the year 2006
Amended this 20th day of April, in the year 2009
Amended this 17th day of July in the year 2015

Al. Hoffman. P. Eng
Chief Inspector

INTRODUCTION

This amendment issued July 17, 2015, replaces all previous permits and subsequent amendments. It incorporates conditions established through previous amendments and, as a result of the meeting with the Chief Inspector of Mines following discussions related to hours of work. In addition, it includes conditions established by the Senior Inspector of Mines to address concerns associated with the operation of this quarry.

This amendment issued July 17, 2015 includes the change of end land use and includes the conditions necessary to construct and operated the Waste Cells in accordance with, and in addition to, the Ministry of Environment Permit “PR-105809”. This amendment includes conditions as required by the ruling of the Environmental Appeal Board Decision Nos. 2013-EMA-15(b) and 2013-EMA-019(c)

PREAMBLE

Notice of intention to commence work on a quarry, including a plan of the proposed work system and a program for the protection and reclamation of the surface of the land and watercourses affected by the work dated August 23, 2006, was filed with the Inspector on August 23, 2006. Notice of such filing was published in The Pictorial on September 3, 2006, and in the BC Gazette on September 7, 2006.

This permit contains the requirements of the Ministry of Energy and Mines for reclamation. It is also compatible, to the extent possible, with the requirements of other provincial ministries for reclamation issues. The amount of security required by this permit, and the manner in which this security may be applied, will also reflect the requirements of those ministries. Nothing in this permit, however, limits the authority of other provincial ministries to set other conditions, or to act independently, under their respective permits and legislation.

This amendment references and includes terms of the following Reports:

1. Active Earth Engineering (AEEL) “Technical Assessment for Authorization to Discharge Waste”, August 2012.
2. Active Earth Engineering, “Geotechnical Assessment”, October 24, 2013.
3. Levelton Consultants Ltd “South Island Aggregates Stebbings Road Quarry”, October 2012.
4. BC Geological Survey “Bedrock Geology of the South Island Aggregates Stebbings Road Quarry” October 28, 2013.
5. Active Earth Engineering, “Summary of Core Drilling and Testing Results”, October 2013.

6. Active Earth Engineering "Environmental Procedures Manual for Waste Discharge Permit PR-105809", October 28, 2013.
7. Leveloton Consultants Ltd follow-up memo "South Island Aggregates Containment Area-640 Stebbings Road, Shawnigan Lake, BC", November 13, 2013.

Unless modified by Permit Q-8-094, or the Ministry of Environment Permit PR-105809, all terms of the referenced report form a part of this permit. Should there be a conflict between this permit and the Ministry of Environment (MOE) permit related to requirements under the terms of the MOE permit related to environmental protection, the terms of the MOE permit shall take precedence.

Decisions made by staff of the Ministry of Energy and Mines will be made in consultation with other ministries.

CONDITIONS

The Chief Inspector of Mines (Chief Inspector) hereby approves the work plan and the program for protection and reclamation of the land surface and watercourses subject to compliance with the following conditions: Unless modified by this amended permit all conditions within the original Notice of Work, dated August 23, 2006, and the subsequent amendment form an integral part of this permit.

1. Reclamation Security

(a) The owner, agent or manager (herein called the Permittee) shall maintain with the Minister of Finance securities in the amount of five thousand dollars ($55,000). The security will be held by the Minister of Finance for the proper performance of the approved program and all the conditions of this permit in a manner satisfactory to the Chief Inspector.

(b) The Permittee shall conform to all forest tenure requirements of the Ministry of Forests. Should the Permittee not conform to these requirements then all or part of the security may be used to cover the costs of these requirements.

(c) The Permittee shall conform to all Ministry of Environment approval, licence and permit conditions, as well as requirements under the **Wildlife Act**. Should the Permittee not conform to these conditions, then all or part of the security may be used to fulfill these requirements.

2. Land Use

The surface of the land and watercourses shall be reclaimed to the following land use: **Industrial Encapsulated Contaminated Soil containment cells**

3. Productivity

The level of land productivity to be achieved on reclaimed areas shall not be less than existed prior to mining on an average property basis unless the Permittee can provide evidence which demonstrates, to the satisfaction of the Chief Inspector, the impracticality of doing so.

4. Revegetation

Land shall be re-vegetated to a self-sustaining state using appropriate plant species.

5. Use of Suitable Growth Medium

(a) On all lands to be revegetated, the growth medium shall satisfy land use, productivity, and water quality objectives. Topsoil and overburden (to rooting depth) shall be removed from operational areas prior to any disturbance of the land and stockpiled separately on the property for use in reclamation programs, unless the Permittee can provide evidence which demonstrates, to the satisfaction of the Chief Inspector, that reclamation objectives can otherwise be achieved.

(b) No topsoil shall be removed from the property without the specific written permission of the Inspector.

6. Buffer Zones and Berms

Buffer zones and/or berms shall be established between the mine and the property boundary unless exempted in writing by the Inspector.

7. Treatment of Structures and Equipment

Prior to abandonment, and unless the Chief Inspector has made a ruling otherwise, such as heritage project consideration or industrial use:

(a) all machinery, equipment and building superstructures shall be removed;

(b) concrete foundations shall be covered and revegetated unless, because of demonstrated impracticality, they have been exempted by the Inspector; and,

(c) all scrap material shall be disposed of in a manner acceptable to the Inspector.

8. Watercourses

(a) Watercourses shall be reclaimed to a condition that ensures:

(1) long-term water quality is maintained to a standard acceptable to the Chief Inspector;

(2) drainage is restored either to original watercourses or to new watercourses which will sustain themselves without maintenance: and,

(3) use and productivity objectives are achieved and the level of productivity shall not be less than existed prior to mining unless the Permittee can provide evidence which demonstrates to the satisfaction of the Chief Inspector the impracticality of doing so.

(b) Water which flows from disturbed areas shall be collected and diverted into settling ponds.

9. Roads

(a) All roads shall be reclaimed in accordance with land use objectives unless permanent access is required to be maintained.

(b) Individual roads will be exempted from the requirement for total reclamation under condition 9(a) if either:

(1) the Permittee can demonstrate that an agency of the Crown has explicitly accepted responsibility for the operation, maintenance and ultimate deactivation and abandonment of the road, or

(2) the Permittee can demonstrate that another private party has explicitly agreed to accept responsibility for the operation, maintenance and ultimate deactivation and abandonment of the road and has, in this regard, agreed to comply with all the terms and conditions, including bonding provisions, of this reclamation permit, and to comply with all other relevant provincial government (and federal government) regulatory requirements.

10. Disposal of Fuels and Toxic Chemicals

Fuels, chemicals or reagents which cannot be returned to the manufacturer/supplier are to be disposed of as directed by the Chief Inspector in compliance with municipal, regional, provincial and federal statutes.

11. Temporary Shutdown

If this quarry ceases operation for a period longer than one year the Permittee shall either continue to carry out the conditions of the permit or apply for an amendment setting out a revised program for approval by the Chief Inspector.

12. Safety Provisions

All safety and other provisions of the ***Mines Act*** shall be complied with to the satisfaction of the Chief Inspector.

13. Monitoring

The Permittee shall undertake monitoring programs, as required by the Inspector, to demonstrate that reclamation objectives are being achieved.

14. Alterations to the Program

Substantial changes to the program must be submitted to the Inspector for approval.

15. Notice of Closure

Pursuant to Part 10.6.1 of the Health, Safety and Reclamation Code for Mines in British Columbia, a Notice of Completion of Work shall be filed with the Inspector not less than seven days prior to cessation of work.

16. Annual Report

Annual reports shall be submitted in a form and containing the information as and if required by the Inspector.

17. Site Stability

a) The inspector shall be advised in writing at the earliest opportunity of any unforeseen conditions that could adversely affect the extraction of materials, site stability, erosion control or the reclamation of the site.

b) The stability of the slopes shall be maintained at all times and erosion shall be controlled at all times.

c) The discovery of any significant subsurface flows of water, seeps, substantial amounts of fine textured, soils, silts and clays, as well as significant adverse geological conditions shall be reported to the inspector as soon as possible and work shall cease until the inspector advises otherwise.

SITE SPECIFIC CONDITIONS:

1. The importation of soil is permitted subject to the following conditions:

a) Soil imported must meet Ministry of Environment Soil Guidelines for the intended end land use, as identified in the Ministry of Environment Permit PR-105809.

b) Importation of material other than defined in 18(a) is prohibited unless approved by the Inspector.

c) The approval as required in 18(b) shall be processed as an amendment to this permit.

d) Documentation identifying the soil condition and suitability for the intended end land use must be maintained at the mine site office and made available to the Inspector on demand.

2. Property boundaries shall be permanently marked and maintained, and pit boundaries (mine footprint) shall be permanently marked and maintained. All

persons working on the property will be instructed as to the meaning of the markings; and,

a) The Permittee shall install a substantial fence along the property boundary.

b) This fence can be installed in stages with completion by September 1, 2016.

c) The portion of the property abutting the lands owned by the Cowichan Valley Regional District (CVRD) shall be fenced by September 2015. This includes lands abutting the restrictive covenant along Shawinigan Creek.

3. An 8-metre wide vegetation buffer shall be maintained on the northeast property boundary. The exiting trees shall not be removed.

4. All blasts shall be electronically monitored.

5. Blast limits are established at 50 millimeters per second peak particle velocity and 120 decibels on the L scale, at the property boundary, and:

a) The electronic monitor unit shall be located such that the air pressure (microphone) sensor has a clear unobstructed line of sight to the centre of the blast. The Inspector may allow or require monitoring at specific locations on a case by case basis as may be required.

b) The Manager shall maintain at the Mine Site Office, a signed copy of the Blast Log for each blast and a copy of the Electronic Monitor Record. Such records shall be made available to the Inspector on request.

c) Residents within 1km of the centre of the Quarry, and the Inspector, shall be given 24 hours notice of each scheduled blast. This 24 hours notice will establish a window of 1.5 hours within which the blast can be fired.

i. If, due to circumstances beyond the control of the Manager, a blast has been loaded and cannot be detonated within the time frame as described above, the Manager shall secure the site, post a watchman, and fire the blast the next day following the issuing of the required 24 hours notice. The Inspector may, at his discretion, allow the blast to be fired outside of the 24 hour notice window or, outside of normal hours of work. In such cases the Inspector shall establish the conditions necessary for firing the blast.

6. For purposes of establishing the 1 km radius, the centre of the quarry is defined as: **W 48* 33.103, N 123* 36.390**

Standard Quarry Blasting Conditions:

7. To the extent practical, all blasts initiated on the quarry shall be videoed, and:

   a) A copy of the video shall be kept at the mine office, and made available to the Inspector on request.

   b) The video file shall include the following identification information as a word document;

      1. the pit name, and mine number
      2. the bench/location identification, including a map showing the location on the mine footprint.
      3. the name of the blaster
      4. the date of the blast
      5. the time of the blast

   c) Other information and records as may be required as conditions of the permit, or directives of the Inspector.

   d) The video shall clearly show the conduct of the blast in sequence of events including.

   e) The free faces prior to the blast, with emphasis placed on the face profile and the rock structure.

   f) The layout of the blast pattern including the tie ins.

   g) The overall site layout of the area within the "danger zone."

8. Within 1 month of the date of this amendment to Permit Q-8-094, the Manager shall file with the Inspector an approved plan for ensuring compliance with Part 8, sections 8.7.1 to 8.7.4 of the Health Safety and Reclamation Code for Mines in British Columbia.

9. Hours of work shall be between 7am and 5pm Monday to Friday. No work, except as defined below, shall occur on weekends or Statutory Holidays:

   a) Light maintenance is permitted on Saturdays between 9am and 4pm. *Light Maintenance is defined as:* work requiring the only the use of hand tools. It does not include air impact tools, air arcing, or any heavy equipment to perform a task.

b) Drilling operations shall be limited to the hours of 8am to 4pm Monday to Friday.

c) Notwithstanding the above, nothing in this condition prevents the Manger from working outside the permitted hours of work should:

i) a safety concern on site is such that a failure to complete necessary work can result in harm or risk to workers, members of the public, or the environment or,

ii) an agency having jurisdiction declares an emergency and product from this operation is required to mitigate or assist in the mitigation of the emergency.

d) Should the provisions of condition 23(c) be implemented the Manager shall advise the Inspector without delay.

e) A sign shall be posted at the entrance to the Quarry clearly indicating the permitted hours of work.

10. The Manager shall forward to the Inspector a copy of the updated mine plan required by the code. This code section refers to updates every three months.

11. The Manager shall schedule truck traffic entering or leaving the Quarry such that the trucks do not conflict with elementary school bus pick-up or drop off times.

12. **Occupational Health and Safety Committee:**

a) The Manager shall establish and maintain an Occupation Health and Safety Committee (HSRC) in accordance with the Health, Safety, and Reclamation Code for Mines in British Columbia 1.6.1(b).

b) HSRC 1.6.8 which requires Occupational Health and Safety Committee members to receive training shall apply to this site.

13. Within six months of the date of issue of this amendment, the Manager shall ensure one supervisor, as defined in the HSRC, is the holder of an Open Pit Shiftboss Certificate.

Permit Conditions related to the Construction, operation, and Maintenance of the Waste Cells as referenced in this Permit.

14. Blasting:

    a) No blasts shall be initiated during the installation of the liner, (geo- tech liner) including the upper liner as required by the approved plan.

    b) Installation includes the completion of any soil cover to a compactness of 0.66 meters thick.

15. Blasting of final walls in the quarry and for the waste cells:

    a) All final walls within the quarry shall be blasted using controlled blasting techniques, commonly referred to as “smooth blasting”.

    b) Following the blast all walls shall be scaled as may be required.

    c) Any row of holes to be blasted within 10 meters of the common boundary between the Quarry and property owned by the CVRD shall be surveyed in by a Licensed Land Surveyor. A copy of the survey shall be forwarded to the Inspector within one week of the blast.

16. Clay placed above the bedrock shall be placed in 250mm lifts, and compacted to 90% standard proctor until the Clay is 1meter compacted thickness.

17. At the completion of each 1 meter (compacted) lift the Manager shall provide the Inspector an as built of the lift signed by a suitable registered professional, registered in the Province of British Columbia.

    a) For soil imported into the cell, not including clay or sand, the Engineer of record shall identify soils where 95 Proctor could not be obtained, and shall identify the type of soil, the maximum compactness the soil can sustain, and the maximum moisture content to attain the compaction.

    b) For purposed of clarity, the engineer of record is not required to provide the above information on soil for every square foot of surface area but can provide the report in accordance with good engineering practice and standards.

18. All surface water shall be drained and controlled such that surface water does not have free access to the waste cell.

    a) Following rainfall, snow melt, or inadvertent flow of water into the waste cell, the Permittee shall take such measures as may be necessary to drain any accumulations of surface water from the cell.

    b) This may require suitable time frames to allow the drying of the soil to the point that the engineer of record is satisfied the moisture content does not compromise the achievement and maintenance of the required compaction as defined in this permit.

19. **Geotechnical**

1. Design and Construction

    a) The construction of the waste storage facility, as described in the application, is approved.

    b) The sediment control pond shall be designed with a minimum 1 metre freeboard during the 200-year flood event.

    c) The Permittee shall ensure the facility is constructed under the supervision of a qualified professional engineer.

    d) Rock cuts and slope design shall be reviewed by a professional geotechnical engineer following blasting and excavation. The requirement for scaling and/or stabilization measures shall be evaluated to ensure the safety of workers working below these slopes.

    e) The facility shall be constructed in accordance with the design and construction specifications outlined in the application and approved by the Engineer of Record. The Engineer of Record shall review the construction drawings and specifications to verify that recommendations are properly incorporated as per design. Any changes to the proposed method of development will require previous approval of the Inspector.

    f) During construction, appropriate Quality Assurance/Quality Control (QAQC) shall be carried out. Within 30 days of completing construction, a construction QAQC report shall be submitted to the Inspector. This report shall include a summary of the liner installation, materials testing and compaction information and the QAQC measures employed during construction.

g) The Permittee shall submit an as-built report with drawings to the Inspector prior to operation of the facility. As-built reports shall be sealed by a professional engineer and shall include a statement indicating that the facility was constructed in "general conformance with the design and specifications." A complete set of As-built drawings shall be kept at the mine site at all times and be provided to any Mines Inspector upon request.

2. Operation and Monitoring

a) Prior to operation of the facility, the Permittee shall submit an updated Operation, Maintenance, and Surveillance (OMS) manual and a Mine Emergency Response Plan (MERP) to the Inspector that outlines procedures for the successful operation, maintenance, and surveillance of the facility and emergency preparedness and response procedures. These documents shall be kept current and updated over time as procedures are modified.

b) All waste materials entering the facility shall meet the specifications as specified by the geotechnical engineer in the stability analyses and design of the facility. No waste materials that are subject to liquefaction (regardless of triggering mechanism) shall be disposed in the facility. Materials not meeting design specifications or operational requirements must be spoiled off-site at an alternate approved location.

c) Instrumentation shall be installed as recommended by the professional geotechnical engineer to monitor conditions related to the stability of the facility. Monitoring frequency, thresholds, and response procedures shall be determined by the geotechnical engineer and be clearly described in the OMS manual.

d) During operations, appropriate Quality Assurance/Quality Control (QA/QC) shall be carried out on the waste materials to ensure material properties meet geotechnical design and compaction requirements. Results of this testing shall be provided to the Inspector upon request. An up-to-date copy of QA/QC procedures, testing results, and inspection logs shall be maintained at site and made available for any Inspector upon request.

3. Reporting

a) Annual inspections of the waste storage facility shall be undertaken by a qualified Professional Geotechnical Engineer with a report submitted to the Inspector by March 31 of the year following the inspection. The report shall include a summary of observations, review of monitoring data including instrumentation, QA/QC procedures, testing results, and recommendations with respect to any necessary changes to operating procedures. Any recommendations relating to health and safety or geotechnical stability shall be followed unless a suitable alternative course of action is approved in writing by the professional undertaking the review, or by a third party qualified Professional Engineer, as may be determined by the Inspector.

20. **Completion of the cell:**

a) The final cover of each cell shall consist of two meters of till or residential classification soil, compacted to the degree necessary to prevent/limit erosion and sustain growth of appropriate vegetation.

b) The permitted shall prior to applying any vegetation cover to the completed cell provide the inspector a plan designed by an appropriate Qualified Person which demonstrates the vegetation cover is suitable for the area, and as cover for the waste cell.

c) Filling of the cells shall be conducted on a one cell at a time basis. Filling of the next cell can only commence upon completion of the cell the previous cell.

d) The previous condition does not prevent the Permittee form doing cell preparation, up to the point of being ready to receive fill material.

e) Prior to receiving fill in any cell the Permittee must provide a signed as built of the construction of the cell to date. This as built, signed by the engineer of record shall state that this construction meets the standards required by this permit and Ministry of Environment Permit PR-105809.

f) Each completed cell shall remain in and be subject ongoing monitoring under the terms of this permit for the life of the mine.

g) Once completed a cell shall not be disturbed unless work is necessary for maintenance or repair, and then only with the written approval of the Inspector.

h) The Manager shall, by March 31 of each year, provide the Inspector a report identifying the volume of water treated through the treatment plant, and shall include all operating costs associated with the operation and maintenance of the treatment plant.

21. The Manager shall forward to the Inspector a copy of the report submitted to the Minister of Finance in relation to the annual Health and Safety Assessment. This report provides a report stating the annual production.

22. Surface water not subject to treatment in the water treatment plant shall be monitored at the discharge point to the receiving environment and suspended solids shall not exceed 25mg/litre. In addition this monitoring shall include analysis for nitrates, and nitrate content shall not exceed the limits specified for drinking water.

23. Production from this quarry is limited to 240,000 tonnes annually.

Appendix C

Example of a Waste Approval Application and Related Documents

SIRM SOUTH ISLAND RESOURCE MANAGEMENT

Waste Approval Application Form

REVISION 0.5

GENERATOR INFORMATION

Generator: ____________________ Generating Site Name: ____________________

Address: ____________________ Generating Site Address: ____________________

Generator Contact: ____________________ Site Contact Name: ____________________

Billing Contact: ____________________ Site Contact Phone #: ____________________

Account/Quote #: ____________________ BCG # (if applicable): ____________________

Phone #: ____________________ Site Reg. ID (if applicable): ____________________

Email Address: ____________________

QUALIFIED ENVIRONMENTAL PROFESSIONAL INFORMATION

Company: ____________________ Phone #: ____________________

Contact Name: ____________________ Title/Registration: ____________________

Address: ____________________ Email Address: ____________________

MATERIAL DETAILS AND ANALYTICAL DATA

Prior Uses of Site*: ____________________

Current Use of Site*: ____________________

Source of Contamination: ____________________

Reason for Soil Removal: ____________________

Contaminating Material (waste oil, plating bath, etc): ____________________

Type of Soils (grain size, FOC, etc): ____________________

Debris in Waste: ____________________

Moisture Content (no free liquid): ____________________

Shipping Date(s) (est.): ____________________

Date/Title of Environmental Consultant's Reports: ____________________

Tonnes (est.) per Soil Class	
	< Schedule 7, Col II
	< BC CSR IL
	IL < soil < HW
	Special/Quoted:

Soil Contaminants

	Hydrocarbons
	Metals
	Salt
	Other:

Consultant (Qualified Professsional) Reports and Laboratory Analytical Reports that sufficiently and accurately characterize the material must be attached

** See BC CSR Schedule 2: Industrial and Commercial Purposes and Activities*

CERTIFICATION (completed by Authorized Representative of Generator)

I hereby certify that the information supplied above and attached is complete and accurate to the best of my knowledge and belief,
that material has been characterized as per BC Ministry of Environment guidelines or equivalent by the indicated qualified environmental professional,
that no deliberate or willful omissions of relevant information have been made,
that all known or suspected hazards or contaminants related to the above waste material have been disclosed,
and that all shipping/receiving is subject to the standard terms of service (attached - initial and date)

____________________ ____________________ ____________________

Name, Title and Organization | Signature | Date

** OFFICE USE ONLY **

Waste Approval #:

SIRM Project #

Max. Tonnage w/o Additional Data:

Notes ____________________

Classification/Destination

M		Modification/Stabilisation
R		Re-Sampling / SHA
D		Direct Placement / PEA
S		SMA
Other		

Date ____________ Name ____________ Title ____________ Signature ____________

Waste Approval Change Order

REVISION 0.1

Waste Approval #:		**Max. Tonnage Authorized:**	
Last Change Order		**Max Tonnage Authorized:**	
NO CHANGE ORDER OR WASTE ACCEPTANCE WITHOUT VALID WASTE APPROVAL			

CERTIFICATION (completed by Authorized Representative of Generator)

I hereby certify that: (1) all information (including generator, site and site history information) supplied for the above-referenced Waste Approval, as well as all information herein and attached, is complete and accurate to the best of my knowledge and belief; (2) waste has been characterized as per BC Ministry of Environment guidelines or equivalent; (3) all known or suspected hazards or contaminants related to the above waste material have been disclosed; (4) no deliberate or willful omissions of relevant information have been made; and (5) all shipping/receiving is subject to the standard terms of service.

Name, Title and Organization ______ Signature ______ Date ______

Generator: ______ Generating Site Name: ______

Generator Contact: ______ Generating Site Address: ______

QUALIFIED ENVIRONMENTAL PROFESSIONAL INFORMATION

Company: ______ Phone #: ______

Contact Name: ______ Title/Registration: ______

Address: ______ Email Address: ______

MATERIAL DETAILS AND ANALYTICAL DATA

Shipping Date(s) (est.):

Date/Title of Environmental Consultant's Reports: ______

Consultant (Qualified Professsional) Reports and Laboratory Analytical Reports that sufficiently and accurately characterize the material must be attached

** See BC CSR Schedule 2: Industrial and Commercial Purposes and Activities*

Tonnes (est.) per Soil Class	
	< Schedule 7, Col II
	< BC CSR IL
	IL < soil < HW
	Special/Quoted:

Soil Contaminants	
	Hydrocarbons
	Metals
	Salt
	Other:

**** OFFICE USE ONLY **** Waste Approval_Change Order #:

SIRM Project #

Max. Tonnage w/o Additional Data:

Notes ______

Classification/Destination

M		Modification/Stabilisation
R		Re-Sampling / SHA
D		Direct Placement / PEA
S		SMA
Other		

Date ______ Name ______ Title ______ Signature ______

460 Stebbings Road
Shawnigan Lake, BC V0R 2W3
250.743.0811
info@SIRM.ca

Terms of Service: Rev 0.3

460 Stebbings Road: Standard Terms of Service

AUTHORITY TO BIND THE COMPANY

1. Client shall ensure that contracts, credit applications, quote acceptance, Waste Approval Applications (WAAs) and Soil Arrival Forms (SAFs) are completed by representatives with capacity to bind the Entity to the terms, conditions and representations therein.

CHARACTERIZATION

2. Generator warrants and represents that material delivered is not a hazardous waste or a waste prohibited from secure disposal under the B.C. Hazardous Waste Regulation (HWR)
3. Generator warrants and represents that material delivered is characterized by a qualified professional to (a) the prevailing standard of care for similar professionals conducting similar work in British Columbia at the time of the characterization; and (b) BC Ministry of Environment Technical Guidance for Contaminated Sites No. 1, "Site Characterization and Confirmation Testing"
4. Characterization data must be unambiguously traceable to the material shipped; such data must not be more than one year old at time of receipt.
5. Definitive analytical data must be accompanied by a signed certificate of analysis from a laboratory certified by Canadian Association for Laboratory Accreditation Inc. (CALA) and approved by the BC Ministry of the Environment for the analytical method used.
6. For soils containing concentrations of LEPH and/or HEPH in excess of BC Contaminated Sites Regulation Industrial Land (CSR IL) standards, submit analysis of PAHs and calculation of PAH TEQ.
7. For soils containing concentrations of contaminants in soil (mg/kg) with a numeric value more than 20 times the numeric value of the related HWR leachate criteria (in mg/L), submit Toxicity Characteristic Leaching Procedure (TCLP) analysis.
8. For soils potentially containing dioxins and/or furans, submit laboratory analysis utilizing a method documented as acceptable to a Director of the BC Ministry of Environment.

RETAINED RESPONSIBILITY

9. SIRM reserves the right to sample and test any material at any time after arrival.
    1. Where such sampling and testing indicates material is consistent with the submitted WAA, SIRM shall bear costs associated with the sampling, testing and data analysis.
    2. Where such sampling and testing indicates material is not consistent with the submitted WAA, the generator shall be liable for the costs of such sampling, testing and analysis
10. The right of SIRM to inspect and/or sample does not reduce, restrict, or otherwise affect the generator's liability for material.
11. If, after acceptance by SIRM, soil/material is discovered to be inconsistent with the WAA, SIRM will notify the generator. If requested, the generator shall, at its own cost, remove the soil/material, and any additional affected material, within twenty-four (24) hours of notification; shall transport and dispose of such material in accordance with applicable law and regulation; and shall compensate SIRM for any reasonably incurred restoration, repair and business interruption costs.

Client Initial/Date: SIRM Initial/Date:

460 Stebbings Road
Shawnigan Lake, BC V0R 2W3
250.743.0811
info@SIRM.ca

GOOD BEHAVIOUR AND HOUSEKEEPING

12. Business hours are 07:00 to 17:00 local time, Monday through Friday, excepting statutory holidays. Trucks shall not arrive earlier than 07:15 and not later than 16:30 during business hours. Trucks shall not use engine brakes anywhere along Stebbings Road.
13. Trucks shall obey all posted speed limits, including the on-site limit of 10 km/hr, and shall behave courteously with respect to local traffic.
14. All vehicles and equipment are to be in good repair, clean, in workmanlike condition, with no leaks, drips, or loose soil. All vehicles must be equipped with readily accessible spill kits and fire extinguishers in good condition.
15. All loads must be properly secured and covered. All loads within the rated capacity of the vehicle.
16. Drivers must follow instructions from site personnel and shall only dump in specifically identified locations.
17. Drivers are responsible for cleaning/shoveling out adhered soil in the soil receiving area to eliminate clumps of soil cast off between the area and the tire wash. Drivers must stop after the tire wash and inspect around their vehicle, using hand tools and/or supplied hose to eliminate drag out beyond the inspection area, including onto public roads.

RECEIVING

18. All incoming loads must be accompanied by a complete Soil Arrival Form (SAF) bearing a valid Waste Approval number for the source site and material class delivered.
19. No split loads (wastes of more than one classification) are allowed in a single truck/trailer shipment without pre-approval by SIRM. Split loads may be subject to additional handling charges.

NO RIGHT TO DELIVER

20. SIRM reserves the right to cancel or suspend a Waste Approval at any time, or to refuse a shipment or shipments of material, for any reason, at any time, without penalty. A Waste Approval, quote, or active account does not in confer a right to deliver material.

BANS AND CHARGE BACKS

21. SIRM reserves the right to remove, without notice, penalty or compensation of any kind, personnel or equipment from the site, and/or to permanently or temporarily bar them from the site, if, in opinion of the SIRM Operations Manager or designate, they are involved in unsafe behaviour, are in breach of the terms of service, are in contravention of any applicable permit or license, compromise environmental quality or could be construed as a nuisance to the community.
22. Where violations of the terms of service require remedial work, including, but not limited to, cleaning of roads, medians and shoulders, SIRM reserves the right to conduct work without prior notice and apply a service charge equivalent to SIRM's full cost plus 10%.

Client Initial/Date: SIRM Initial/Date:

460 Stebbings Road
Shawnigan Lake, BC V0R 2W3
250.743.0811
info@SIRM.ca

INVOICING

23. All accounts are due and payable according to the terms stated on each invoice (net 30 days from the date of the invoice, unless otherwise specified).
24. Interest will be charged on past due accounts at a rate of 1.5% per 30 calendar days, unless otherwise specified.
25. NSF cheques/bounced cheques will be subject to a $150 processing fee, unless otherwise specified.
26. Customer bears all costs incurred in collecting any unpaid amounts including, but not limited to, collection agencies, legal fees and court costs.

INDEMNIFICATION

27. Client agrees to defend, indemnify and hold harmless SIRM, its partners, affiliates, employees, agents, heirs and successors against any and all claims, demands, orders, causes of action, damages, liabilities, losses, expenses, penalties caused by or resulting from the generator's noncompliance with these terms of service or from waste characteristics not disclosed in a WAA.

Client Initial/Date: SIRM Initial/Date:

Appendix D

Example of a Soil Arrival Form

Soil Arrival Form

Revision 0.5

460 Stebbings Road, Shawnigan, BC
Gate: 250.743.0811
receiving@sirm.ca

Waste Approval #:		**[NO SOIL ACCEPTED w/o VALID WASTE APPROVAL #]**
Change Order #:		

GENERATOR & CONTACT INFORMATION

Generator:
Address:
Generator Contact:
Phone #:
Email Address:
Generating Site Name:
Generating Site Address:
Site Contact Phone #:
Billing Contact/Quote#
BCG # (if applicable):
Site Reg. ID (if applicable):

Soil Classification

	< Schedule 7, Col II
	< BC CSR IL
	IL < soil < HW
	Special Per Quote:

No split loads w/o prior approval

Consignor's Signature:

Consignor's name:

Consignment subject to terms of related waste approval

TRANSPORTER INFORMATION

Please Circle: Tandem - w/ Pony w/ Tri-axle w/ Quad-axle Other:

Driver Name:
Company:
Driver Phone:
Signature/Date:
Truck Plate #:
Trailer Plate #:

** OFFICE USE ONLY **

Comment

M		Modification/Stabilisation
R		Re-Sampling / SHA
D		Direct Placement / PEA
S		SMA
Other		

Ticket # Date Time Authorized agent Signature

Appendix E

Sample Collection Methodology

Protocol

Soil Sampling

1.0 INTRODUCTION

A standardized sampling protocol has not been established by the BC Ministry of Environment (MOE) under the Contaminated Sites Regulation (CSR). Active Earth Engineering Ltd. (Active Earth) developed the following protocol with the aid of a variety of references including:

- The Canadian Council of Ministers of the Environment (CCME) – "Guidance Manual on Sampling, Analysis, and Data Management for Contaminated Sites", Volume I: Main Report, December 1993;
- MOE Guidance Document 2 – Statistical Criteria for Characterizing a Volume of Contaminated Material;
- MOE Guidance Document 12 – Technical Guidance on Contaminated Sites Statistics for Contaminated Sites; and,
- British Columbia Field Manual, January 2003.

Active Earth maintains dedicated field operating protocols that are intended to provide consistent and reliable field results. Our protocols are reviewed regularly in light of changing regulatory guidance and emerging issues and technology.

2.0 PROTOCOL OBJECTIVE

The objective of the sampling protocol is to allow collection of soil samples which are consistent, representative, and repeatable and to prevent cross-contamination.

3.0 SAMPLE COLLECTION

Active Earth's sample collection protocol comprises sample collection, handling, storage, labeling, and transport. During the sampling process, equipment and instrument cleaning is important to prevent cross-contamination. Active Earth personnel protect themselves from exposure to contaminants and cross-contamination by wearing new disposable nitrile gloves during all sample collection. Half-face respirators, protective goggles and chemical resistant clothing is selected based on site characteristics and risks. A detailed Health and Safety Plan is developed for each class of chemicals at each site that includes identification of hazards associated with the chemicals, defined exclusion zones, washing parameters, PPE and equipment disposal guidelines and emergency response procedures.

When using a drill rig or excavator, Active Earth protocols call for pressure washing decontamination of downhole equipment to remove all visible residue, and full decontamination of sampling equipment (such as SPT) as described below. In general, more stringent protocols are applied where the risk of cross-contamination is considered significant.

When sampling stockpiles or biocells, hand-held equipment is generally employed. Sample collection equipment and utensils are similarly cleaned between sample locations to prevent cross-contamination.

The following describes the specific protocol for soil sampling. Following the soil sampling protocol is a description of our sample labeling, recording, storage, and transport procedures.

3.1 Soil Sample Collection

Soil samples are collected with a variety of tools such as a stainless steel trowel, spoon, hand auger, or shovel. Active Earth personnel may also collect the sample using their hand always ensuring a new nitrile glove is worn for each sample. Active Earth does not use painted equipment. The equipment is cleaned prior to sample collection using detergent (alconox) and water to remove any visible dirt, followed by a thorough rinse with potable water or isopropanol.

Soil sample collection method depends on the sample type: *ex situ* or *in situ*. As our sampling standard protocol, Active Earth follows the sample collection protocol specified in MOE Guidance Document 1 — *Site Characterization and Confirmation Testing* for the two sample types.

3.1.1 In-Situ Samples

Collection of *in situ* or discrete samples (grab samples) is necessary to characterize worst-case soils or hot spot areas. *In situ* samples are used to identify:

- Contaminant levels with minimal dilution effects.
- *In-situ* contaminant distribution patterns (contaminant delineation).
- Heterogeneities in a soil profile.

For an excavation, Active Earth has established standard sampling protocols to collect two types of *in-situ* samples: base samples sidewall samples.

1. Base Samples (or surface)
   i. Remove the disturbed soil from the top with a trowel (roughly 1cm to 5cm).
   ii. With a clean trowel or a gloved hand, remove the top 1cm from the top of the undisturbed soil to remove any residual contamination.
   iii. With a cleaned trowel, obtain a sample from the top of this soil.
   iv. Log the soil characteristics (see Section 5).
   v. Record sample depth and location.

2. Sidewall Samples
   i. Scrape horizontally with a trowel any residual soils left from the excavator bucket from the sidewalls (roughly 5cm).
   ii. Obtain samples with a clean trowel or by hand (always wearing protective gloves for each sample).
   iii. Log the excavation face/stratigraphy and soil characteristics (see Section 5).
   iv. Record sample depth and location.

3. Borehole Samples
   i. Borehole samples are generally collected by either split spoon or sonic core barrel.
   ii. Slough and material in contact with the sampler is generally discarded before sampling.
   iii. Solid stem auger may be used where the auger can be twisted into the formation without churning to minimize the risk of dilution (typically depths less than 3m).

3.1.2 Ex Situ Stockpile Samples

Ex-situ samples are composite samples obtained to provide a representation of stockpiled soil. Our *ex situ* sampling protocol follows Part II of Guidance Document 1 for aliquot sample sizes and composites for stockpiles with a suspected level of contamination (i.e., suspected to exceed residential or industrial criteria). Also, MOE's *Contaminated Site Statistical Application Guidance Document No. 14 — Stockpiling. March 1995*, is used as a guide in obtaining samples and for statistically applying the results to the criteria.

Generally, stockpiles are sampled with a composite of five discrete samples, collected to represent a single stockpile. Stockpile sizes are based on suspect soil quality as follows:

Sampling Guidance for Suspect Material

	Suspect Hazardous Waste (SHW)	**Suspect Waste (<HW>IL)**	**Suspect Industrial Quality Material (<IL>RL)**
Maximum Stockpile Size	$50m^3$	$150m^3$	$250m^3$
Cell Volume	$10m^3$	$30m^3$	$50m^3$
Number of Representative Cell Samples	5	5	5
Aliquots per representative cell sample	1	3	5
Sampling Method	Collect one representative aliquot for each 10 m3 of cell volume. Each aliquot forms one representative cell sample.	Collect one representative aliquot for each 10 m3 of cell volume. Up to three aliquots are combined by equal volume to form one representative cell sample.	Collect one representative aliquot for each 10 m3 of cell volume. Up to five aliquots are combined by equal volume to form one representative cell sample.

The table above demonstrates what is considered to be a *cell* of material. A cell is a portion of a stockpile. For example, a stockpile containing $250m^3$ of material has five cells, each containing $50m^3$. A standard cell size of 20% of the stockpile volume has been used.

The basic assumption of this suspect material sampling procedure is that all material within a cell volume is sufficiently homogeneous that one sample can represent the characteristics of the cell volume. It is therefore important that a representative cell sample be composed of material collected throughout a cell volume. To ensure this, an aliquot should be collected for each $10m^3$ of stockpiled material.

Multiple specimens from within any $10m^3$ volume may be incorporated into its representative aliquot. Using multiple specimens reduces "nugget" effects often suspected when small sample volumes relative to a cell or stockpile volume are collected and analyzed.

Great care must be exercised to ensure that a representative aliquot is made up of equal parts (equal volumes) of the specimens collected. If it's not, sampling error will be introduced. Rigorous quality control and quality assurance, in part outlined below, is integral to site characterization.

There are obvious practical limits to the number of specimens that can be incorporated into a representative aliquot. Collecting an unbiased representative aliquot becomes more difficult as the number of specimens is increased. An unbiased sample is also more difficult to collect if cell material is not homogeneous.

3.2 Cleaning of Soil Sampling Instruments

The sampling trowels are cleaned for each sample. They are wiped clean with a paper towel between metals sampling. For organic sampling, de-ionized water and paper towels are used to clean the trowels. If any oily or similar residue cannot be removed in this manner, isopropanol is used to clean the trowel instead of the water. If the sample is collected by hand, the sampler always wears a new glove for each sample collection. At any time, if the sampler's gloves become soiled or torn, new gloves are put on.

3.3 Field Screening

In addition to physical screening of samples, samples may also be field screened for volaitles (if present) using a vapour analysis method (compound specific gas tech tubes, FID, catalytic hydrocarbon sensor, etc.). Generally the procedure is as follows:

1. Fill a zipper lock bag roughly 1/3 full and seal.
2. Allow to equilibrate at ambient temperature or above 10 degrees C (whichever is higher) for at least 10 minutes.
3. Insert the probe into the headspace and record the concentration.

Pesticides and PCBs are not volatile. Therefore screening for pesticides using a bioassay methods may be used. Field screening for PCBs may include a simple water test where a suspected dielectric fluid is placed in a jar of water, oils will float to the surface and PCBs will sink, since their specific gravity is heavier than water. A field test kit which identifies the presence of chlorine atoms may also be used to reduce the number of laboratory sample analyses required. However, a certain number of laboratory analyses will be required to calibrate the field screening devices to laboratory detections. Since the makeup of pesticides PCBs and pesticides may differ at each site, calibration will have to be repeated at each location.

3.4 Sample Containers

The sampled material is transferred into an appropriate sample container. In most cases this will be a laboratory supplied jar/container or a re-sealable polyethylene bag for inorganic analyses.

All samples for metals analyses are retained in laboratory-prepared plastic jars. All samples for organic analysis are placed in laboratory-prepared teflon lined glass jars. Headspace in the jars is minimized for samples requiring volatile organic analysis. See Section 6 for sample storage and transport details.

3.5 Sample Labeling

Soil or groundwater samples are labeled before placement into the appropriate container. The containers are labeled with water-resistant ink on the lid and an adhesive label. The information included on the label is as follows;

- Date;
- Project number;
- Site Location;
- Company name;

- Sample descriptor (e.g. TP for Test Pit); and
- A unique sample number.

4.0 SAMPLE RECORDING

The sample information recorded in the field notes includes the:

- Unique sample number (in notes and on the container).
- The depth below ground and the location (i.e., test pit number).
- Location on a drawing or sketch.
- Sampling method (i.e., sample from trowel, auger, or split spoon).
- Sampling type (i.e., whether sample is an aliquot, discrete, or composite).
- Physical, visual, and olfactory characteristics.

Active Earth records the above sample information in a field book or test pit/ borehole/ well log form. Active Earth also takes date-stamped photographs for visual documentation of sample characteristics and contaminant indicators. Sample location is recorded using measurements from permanent site features.

4.1 Recording of Sample Characteristics

Sample characteristics depend on the sample type (water or soil). For groundwater samples, Active Earth records such physical characteristics as colour, staining, sediment content, distinctive odours, sheen, and free product. These characteristics are important in the selection of different parameter analyses.

For soils, physical characteristics include a wide variety of contaminant indicators and soil characteristics. Active Earth records contaminant indicators such as staining, sheen, foreign substances (debris, metal, paint, grit, wood etc.), and distinctive odours. Active Earth also records soil physical characteristics such as colour, grain size, density/ consistency, moisture content, and soil structure. The following provides some details on these physical characteristics.

a. Soil Colour

Soil colour is determined using a freshly exposed or broken sample. Varying soil colour can indicate contamination, soil oxidation (weathering), or historical groundwater levels. Coloured spots or streaks are referred to in the soil description as "mottled."

b. Soil Grain Size

Grain size includes particle sizes and qualitative descriptors of their relative proportions. From larger to smaller soil particles, particle size (diameter) identification includes:

- boulders (>200mm)
- cobbles (60 to 200mm)
- gravel (2 to 60mm)
- sand (0.06 *to* 2mm)

- silt (fine powder, dries quickly, and loses consistency when wet and agitated)
- clay (plastic and cohesive)

Particle sizes for silts and clays arc not visible. Silts can be felt as grainy, where clay cannot

Qualitative proportions for secondary constituents (i.e., sands with an estimated weight percent of silt content) would be as follows:

- trace - up to 10% (e.g., SAND, with trace silt)
- some - 10% to 20% (e.g., SAND, with some silt)
- adjectives for lesser constituent - 20% to 35% (e.g., silty SAND)
- 35% to 50% (e.g., SAND and SILT).

c. Soil Density

Density and consistency is used to describe the stiffness of cohesive soils (clays) and density of incohesive sands and gravels. The consistency of clays can be described as:

- Soft (can be moulded by light finger).
- Firm (can be moulded by strong finger).
- Stiff (indented by thumb).
- Hard (difficult to indent with thumbnail).

The density of incohesive soils can be described as:

- Loose (easily excavated with trowel).
- Compact (difficult to excavate with trowel).
- Dense (hard to loosen even with a pick).

d. Moisture Content

Active Earth records moisture content and seepage to estimate groundwater levels. Quantitative moisture levels include dry, moist, and wet (water seepage).

e. Soil Structure

Soil structure includes soil properties such as homogeneous to heterogeneous, stratification (layered), seams (thin lamination or lenses), pockets (varying and discontinuous thickness), fissures, and cemented particles.

5.0 SAMPLE STORAGE AND TRANSPORT

Sample are transported to the laboratory within 48 hours of collection. The samples are kept cool on ice (<10 degrees C) in an insulated cooler or container, and packed in a manner that prevents breakage during transport.

6.0 CHAIN OF CUSTODY

A Chain of Custody form accompanies the samples to the laboratory. The form includes information regarding the samples and the parameters to be analyzed. The form also includes information regarding the sequence of handling and transport of the samples to the laboratory.

7.0 TRAINING

Active Earth staff are thoroughly trained by qualified and experienced personnel.

8.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

Active Earth follows consistent QA/QC protocols for all sampling and analysis. At a minimum, the QA/QC program will include the following:

- Samples will be collected to prevent cross-contamination of soil samples. Samples will be collected using an appropriate contaminant-free utensil and placed in contaminant-free containers provided by the laboratory specifically designed for such use and appropriate to the subsequent analyses. Decontamination of sampling (trowels, mixing bowls) and drilling equipment (augers, split spoons) between samples and boreholes.
- Chain-of-custody documentation for sample submission includes a coding system used for sample submission to the analytical laboratory to ensure that information concerning location or expected concentration is available to the analyst(s).
- Use of a Canadian Association of Laboratory Accreditation (CALA) accredited laboratory. ALS Laboratories will be used for this project.
- Adherence to laboratory sampling and analysis protocols (e.g., hold times, sample containers, preservatives, detection limits, approved methodology).
- Procedures to confirm accurate transcription of laboratory data into tables.
- Review of laboratory QC performance (standards, spike recoveries etc.) to confirm results are within acceptable limits.
- Analysis of samples in batches of no more than ten (10) samples for organic substances. Batch review of the analytical data produced in concert will be completed with all internal QA data for that batch. Failure to achieve appropriate QA will require additional analysis to rectify the problem on a batch by batch basis.
- Results of the laboratory's internal checks will be included in the analytical report.
- Use of dedicated well development and sampling equipment (bailers, Waterra inertial pumps).
- Submission of field QC samples at a rate of 10% of total samples. Implementation of corrective action plans (CAP) when acceptable limits are exceeded.

Protocol

Groundwater and Surface Water Monitoring and Sampling

1.0 INTRODUCTION

A standardized sampling protocol has not been established by the BC Ministry of Environment (MOE) under the Contaminated Sites Regulation (CSR). Active Earth Engineering Ltd. (Active Earth) developed the following protocol with the aid of a variety of references including:

- The Canadian Council of Ministers of the Environment (CCME) – "Guidance Manual on Sampling, Analysis, and Data Management for Contaminated Sites", Volume I: Main Report, December 1993;
- MOE Guidance Document 2 – Statistical Criteria for Characterizing a Volume of Contaminated Material;
- MOE Guidance Document 12 – Technical Guidance on Contaminated Sites Statistics for Contaminated Sites; and,
- British Columbia Field Manual, January 2003.

Active Earth maintains dedicated field operating protocols that are intended to provide consistent and reliable field results. Our protocols are reviewed regularly in light of changing regulatory guidance and emerging issues and technology.

2.0 PROTOCOL OBJECTIVE

The objective of the groundwater and surface water monitoring and sampling protocol is to allow collection of monitoring data and water samples which are consistent, representative, and repeatable and to prevent cross-contamination.

3.0 SAMPLE COLLECTION

Active Earth's water sample collection protocol comprises sample collection, handling, storage, labeling, and transport. During the sampling process, equipment and instrument cleaning is important to prevent cross-contamination. Active Earth personnel protect themselves from exposure to contaminants and cross-contamination by wearing new disposable nitrile gloves during all sample collection. Half-face respirators, protective goggles and chemical resistant clothing is selected based on site characteristics and risks.

When using a drill rig or excavator, Active Earth protocols call for pressure washing decontamination of downhole equipment to remove all visible residue, and full decontamination of sampling equipment (such as SPT) as described below. In general, more stringent protocols are applied where the risk of cross-contamination is considered significant.

The following describes the specific protocol for soil and groundwater sampling. Following the soil and groundwater protocol is a description of our sample labeling, recording, storage, and transport protocol applicable for both groundwater and surface water.

3.1 Groundwater Sample Collection

Active Earth's protocol for collection of groundwater samples includes developing, purging and sampling steps. Active Earth's standard is to use well-dedicated Waterra menial pump systems for development and peristaltic pumps for sampling all parameters except volatile compounds, which are typically collected with a bailer or Waterra inertia pumps. Well-dedicated polyethylene bailers may be used for slow recharge wells, and stainless steel bailers are sometimes used when high concentrations of solvents are expected. Management of development and purge water depends on site risks. Most often the water is drummed while other times it is disposed of onsite through treatment systems or the sanitary sewer.

3.1.1 Installation

Well installation details are dictated by field conditions, but are generally guided by the following principles:

1. Screens to straddle water table where LNAPL is a concern.
2. Typical screen length is 1.5m, and generally not more than 3m.
3. Longer screen lengths are typically used to maximize the likelihood of straddling the water table and capturing seasonal variability in water levels.

Standard design includes surface seal, sand pack with overlying seal, 5cm nominal ID schedule 40 PVC with screw connections and o-ring seals.

3.1.2 Development

Wells are usually developed at the time they are installed or the next day. They are developed to reduce sediment content (to the extent possible) by surging (usually using surge blocks on a Waterra pump) and purging. We customarily use Waterra or electric centrifugal pumps for well development. Active Earth customarily removes at least three to five well volumes and may monitor purge water for:

Parameter	Objective
Conductivity - mandatory	± 20 uS
Temperature - optional	±0.1°C
pH - mandatory	± 0. 1 pH units

Parameter	Objective
eH - optional	+ 30 mv
Dissolved Oxygen - optional	± 0.2 mg/L
Turbidity - target	< 10 NTUs

The turbidity target is our preferred turbidity, but field conditions sometimes make this impractical. Information on development is collected on standard field forms. An example Water Sampling Field Form is attached.

3.1.3 Purging and Sampling

After development, wells are left to geochemically and physically stabilize as long as practical, usually not less than 24 hours. Longer "relaxation" times are applied when project constraints allow or when non-aqueous phase liquid (NAPL) thickness is at issue. It is our experience that longer intervals result in more consistent (and so likely more representative) results, and -shorter intervals lead to more false positives (high) results.

The sampling tasks are:

- Measure the well headspace (where applicable) for volatile contaminants and methane.
- Measure the water level.
- Check for NAPL using an optical interface probe, bailer, or reactive paste.

When testing the well headspace for volatile contaminants and methane, a combustible gas meter is used. For this test, all well openings are sealed for a minimum of twenty minutes to allow vapours to accumulate before measurements are performed.

Procedures for purging vary depending on whether the well is new, and how quickly it recharges:

- Fast recharging wells that are new are purged a minimum of three standing well volumes before sampling.
- Fast recharging wells that are old are purged to stable chemistry, not less than three well volumes.
- Wells that will not recover sufficiently for sampling requirements during a normal field day are sampled from standing water (no purging).

Stable chemistry objectives/targets are the same as outlined in development.

Following purging, samples are obtained with the peristaltic pump or bailer. Samples are placed directly from these apparatus into the sample container except for metals samples, which are field filtered. Active Earth usually samples for sediment sensitive parameters first, and VOCs (which has low sediment sensitivity) last.

3.1.4 Groundwater Sampling Field Measurements

Field measurements for the following parameters will be performed at each groundwater sampling location:

- Temperature;
- Specific conductivity;
- pH;
- redox potential; and
- dissolved oxygen;

A flow-through cell is used for dissolved oxygen measurements to accurately measure groundwater concentrations without equilibration effects with the atmosphere.

3.2 Surface Water Sample Collection

Active Earth's protocol for collection of surface water samples includes selecting an appropriate sample location, monitoring and field measurements of selected surface water chemical and physical parameters, and appropriate sample collection technique.

Active Earth's personnel will select an appropriate surface water sampling location that will provide a representative and repeatable result and avoids stagnant water. Sample locations will also consider accessibility and will be appropriately marked for future identification. A detailed description of the sampling location including photographs, sketches and measurements to nearby permanent feature(s) is also recorded.

Surface water samples are collected directly into the laboratory supplied sample containers. Samples are collected upstream from the access to the surface water body to avoid turbidity associated with disturbed sediments. New nitrile gloves are worn for each sampling location.

3.2.1 Surface Water Sampling Field Measurements

Surface water measurements for the following parameters will be performed at each surface water sampling location:

- Temperature;
- Specific conductivity;
- pH;
- redox potential; and
- dissolved oxygen;

If applicable, surface water flow velocities may also be measured with a flow meter and cross-sectional measurements of the flow channel.

3.3 Sample Containers

Samples are transferred to laboratory supplied sample containers, preservatives added to the samples when applicable, and stored on ice or cold packs until transported to the laboratory.

Samples for volatile contaminants are collected in zero-headspace septum vials with minimum turbulence and must be initially bubble-free to be acceptable. Since zero-headspace septum vials are vulnerable to breakage during sample handling and transport, vials are collected in duplicate. Samples for dissolved metals analyses are filtered in the field using dedicated filtering equipment (usually inline 0.43um cartridge filters), and preserved using concentrated nitric acid.

4.0 GROUNDWATER AND SURFACE WATER MONITORING

4.1 Digital Water Level Monitoring

Active Earth personnel are familiar with the installation and data recovery procedures for various dataloggers and types of pressure transducers. Data will be digitally downloaded to a field laptop computer and checked against manual readings to confirm proper function of the device including battery condition. The devices will be re-set and batteries replaced if needed to continue operating properly and collecting accurate data.

Similar devices are used for both groundwater (monitoring well) and surface water (ditches).

4.2 Manual Groundwater Level Monitoring

Manual groundwater level monitoring includes measurement of the following parameters at each groundwater monitoring well sampling location:

- Depth to water.
- Depth to bottom.
- Casing stick-up above ground.

All measurements will be made to 3 decimal places using a calibrated, metric water level probe. The measurements are typically made to highest point of the well casing, which is marked and corresponds to the point of measurement for the surveyed elevation of the well casing. Manual field measurements will be used to confirm and calibrate digitally recorded data.

4.3 Surface Water Monitoring

Field measurement of surface water levels typically involves reading a staff gauge installed to firm bearing and surveyed to allow for water elevations to be calculated in addition to depth of water above stream/ditch/lake bottom. Manual field measurements will be used to confirm and calibrate digitally recorded data.

5.0 SAMPLE LABELLING

Groundwater and surface water samples are labeled before placement into the appropriate container. The containers are labeled with water-resistant ink on the lid and an adhesive label. The information included on the label is as follows:

- Date;
- Project number;
- Site Location;
- Company name;
- Sample descriptor (e.g. SW for Surface Water); and
- A unique sample number.

6.0 SAMPLE RECORDING

The sample information recorded in the field notes includes the:

- Unique sample number (in notes and on the container).
- The sample location (i.e., monitoring well ID).
- Location on a drawing or sketch.
- Sampling method (i.e., peristaltic pump, bailer).
- Physical, visual, and olfactory characteristics.

Active Earth records the above sample information in a standard field log form. Active Earth also takes date-stamped photographs for visual documentation of sample characteristics and contaminant indicators. Sample location is recorded using measurements from permanent site features.

Physical characteristics as colour, staining, sediment content, distinctive odours, sheen, and free product are recorded for groundwater and surface water samples. These characteristics are important in the selection of different parameter analyses.

7.0 SAMPLE STORAGE AND TRANSPORT

Samples are transported to the laboratory within 48 hours of collection. The samples are kept cool on ice (<10 degrees C) in an insulated cooler or container, and packed in a manner that prevents breakage during transport.

8.0 CHAIN OF CUSTODY

A Chain of Custody form accompanies the samples to the laboratory. The form includes information regarding the samples and the parameters to be analyzed. The form also includes information regarding the sequence of handling and transport of the samples to the laboratory.

9.0 TRAINING

Active Earth staff are thoroughly trained by qualified and experienced personnel.

10.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

Active Earth follows consistent QA/QC protocols for all sampling and analysis. At a minimum, the QA/QC program will include the following:

- Samples will be collected to prevent cross-contamination of soil samples. Samples will be collected using an appropriate contaminant-free utensil and placed in contaminant-free containers provided by the laboratory specifically designed for such use and appropriate to the subsequent analyses. Decontamination of sampling equipment between samples and boreholes.
- Chain-of-custody documentation for sample submission includes a coding system used for sample submission to the analytical laboratory to ensure that information concerning location or expected concentration is available to the analyst(s).
- Use of a Canadian Association of Laboratory Accreditation (CALA) accredited laboratory.
- Adherence to laboratory sampling and analysis protocols (e.g., hold times, sample containers, preservatives, detection limits, approved methodology).
- Procedures to confirm accurate transcription of laboratory data into tables.
- Review of laboratory QC performance (standards, spike recoveries etc.) to confirm results are within acceptable limits.
- Analysis of samples in batches of no more than ten (10) samples for organic substances. Batch review of the analytical data produced in concert will be completed with all internal QA data for that batch. Failure to achieve appropriate QA will require additional analysis to rectify the problem on a batch by batch basis.
- Results of the laboratory's internal checks will be included in the analytical report.
- Use of dedicated well development and sampling equipment (bailers, Waterra inertial pumps).
- Submission of field QC samples at a rate of 10% of total samples. Implementation of corrective action plans (CAP) when acceptable limits are exceeded.

Protocol

Ambient Air Sampling

1.0 INTRODUCTION

A standardized sampling protocol has not been established by the BC Ministry of Environment (MOE) under the Contaminated Sites Regulation (CSR). Active Earth Engineering Ltd. (Active Earth) developed the following protocol with the aid of a variety of references including:

- The Canadian Council of Ministers of the Environment (CCME) – "Guidance Manual on Sampling, Analysis, and Data Management for Contaminated Sites", Volume I: Main Report, December 1993;
- MOE Guidance Document 12 – Technical Guidance on Contaminated Sites Statistics for Contaminated Sites; and,
- British Columbia Field Manual, January 2003.

Active Earth maintains dedicated field operating protocols that are intended to provide consistent and reliable field results. Our protocols are reviewed regularly in light of changing regulatory guidance and emerging issues and technology.

2.0 PROTOCOL OBJECTIVE

The objective of the sampling protocol is to allow collection of soil samples which are consistent, representative, and repeatable and to prevent cross-contamination.

3.0 SAMPLE COLLECTION

Active Earth's sample collection protocol comprises sample collection, handling, storage, labeling, and transport. During the sampling process, equipment and instrument cleaning is important to prevent cross-contamination. Active Earth personnel protect themselves from exposure to contaminants and cross-contamination by wearing new disposable nitrile gloves during all sample collection. Half-face respirators, protective goggles and chemical resistant clothing is selected based on site characteristics and risks. A detailed Health and Safety Plan is developed for each class of chemicals at each site that includes identification of hazards associated with the chemicals, defined exclusion zones, washing parameters, PPE and equipment disposal guidelines and emergency response procedures.

The following describes the specific protocol for ambient air sampling. Following the sampling protocol is a description of our sample labeling, recording, storage, and transport procedures.

3.1 Ambient Air Sample Collection

Prior to sampling, a hand-held anemometer is to be appropriately calibrated.

Air samples will be collected using laboratory-supplied and calibrated Summa® Canisters. Sampling requires that the canister be opened at the sampling location, recording canister identification, the time and date, as well as climatic conditions including temperature, wind-speed, wind-direction and operational considerations. At the conclusion of sampling, the time, date and same set of climate data must be recorded. The canister is then to be appropriately sealed, and shipped under Chain of Custody to a CALA-certified laboratory.

In order to ensure that sampling apparatus are not tampered with, equipment is to be concealed as necessary. The sampling location is to be free of any potential outside interference such as marking paint.

3.5 Sample Labeling

Samples are labeled before placement into the appropriate container. The containers are labeled with water-resistant ink on the lid and an adhesive label. The information included on the label is as follows;

- Date;
- Project number;
- Site Location;
- Company name;
- Sample descriptor (e.g. TP for Test Pit); and
- A unique sample number.

4.0 SAMPLE RECORDING

The sample information recorded in the field notes includes the:

- Unique sample number (in notes and on the container).

- Location on a drawing or sketch.
- Sampling method (i.e., Summa Cannister).
- Sampling duration.
- Ambient observations.

Active Earth records the above sample information in a field book or designated form. Active Earth also takes date-stamped photographs for visual documentation of sample characteristics and contaminant indicators. Sample location is recorded using measurements from permanent site features.

5.0 SAMPLE STORAGE AND TRANSPORT

Sample are transported to the laboratory within 48 hours of collection. The samples are kept cool on ice (<10 degrees C) in an insulated cooler or container, and packed in a manner that prevents breakage during transport.

6.0 CHAIN OF CUSTODY

A Chain of Custody form accompanies the samples to the laboratory. The form includes information regarding the samples and the parameters to be analyzed. The form also includes information regarding the sequence of handling and transport of the samples to the laboratory.

7.0 TRAINING

Active Earth staff are thoroughly trained by qualified and experienced personnel.

8.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

Active Earth follows consistent QA/QC protocols for all sampling and analysis. At a minimum, the QA/QC program will include the following:

- Samples will be collected to prevent cross-contamination of soil samples. Samples will be collected using an appropriate contaminant-free utensil and placed in contaminant-free containers provided by the laboratory specifically designed for such use and appropriate to the subsequent analyses. Decontamination of sampling (trowels, mixing bowls) and drilling equipment (augers, split spoons) between samples and boreholes.
- Chain-of-custody documentation for sample submission includes a coding system used for sample submission to the analytical laboratory to ensure that information concerning location or expected concentration is available to the analyst(s).
- Use of a Canadian Association of Laboratory Accreditation (CALA) accredited laboratory. ALS Laboratories will be used for this project.
- Adherence to laboratory sampling and analysis protocols (e.g., hold times, sample containers, preservatives, detection limits, approved methodology).
- Procedures to confirm accurate transcription of laboratory data into tables.

- Review of laboratory QC performance (standards, spike recoveries etc.) to confirm results are within acceptable limits.
- Analysis of samples in batches of no more than ten (10) samples for organic substances. Batch review of the analytical data produced in concert will be completed with all internal QA data for that batch. Failure to achieve appropriate QA will require additional analysis to rectify the problem on a batch by batch basis.
- Results of the laboratory's internal checks will be included in the analytical report.
- Use of dedicated well development and sampling equipment (bailers, Waterra inertial pumps).
- Submission of field QC samples at a rate of 10% of total samples. Implementation of corrective action plans (CAP) when acceptable limits are exceeded.

Appendix F

Soil Aeration Form

[NOT CURRENTLY IN USE – NO SOIL AERATION]

Soil Aeration Record

SOIL AERATION REPORT					
DATE:				DATA RECORDER:	
START TIME:				SIA FILE REFERENCE:	
END TIME:				EVENT NO.:	
DURATION:					
AMBIENT TEMPERATURE:					
VENTILATION INDEX FORECAS				(Southern Vancouver Island - must be "good")	
				Reference: http://www.env.gov.bc.ca/epd/epdpa/venting/venting.html	
SUNRISE:				Reference: http://www.nrc-cnrc.gc.ca/eng/services/sunrise/	
SUNSET:					
MACHINERY:					
OPERATOR:					
SOIL GENERATOR SITE(S):					
SOIL VOLUME:					
SOIL MASS:					
SOIL QUALITY:	COC	RL+	IL+	STARTING CONCENTRATIONS	CURRENT CONCENTRATION
	MAH				
	EPH				
	VOC				
REFERENCE LAB REPORT(S)					
PHYSICAL DESCRIPTION					
	include odours, colour, dimensions, rows, relative moisture content, debris,				
NUTRIENTS/ADDITIVES:	DESCRIPTION:				
	QUANTITY:				

FOR REFERENCE ONLY:
SOIL TREATMENT
CAPACITY NOT
CURRENTLY USED

Appendix G

Effluent Monitoring Form

SIRM

Effluent Monitoring and Sampling Record

EFFLUENT MONITORING AND SAMPLING REPORT				
DATE			**DATA RECORDER**	
WEATHER CONDITIONS				
LEAK DETECTION RESERVIOR				
DEPTH TO BOTTOM (m)		A	SAMPLE ID	
DEPTH TO WATER (m)		B	pH	
HEIGHT OF WATER (m)		H=A-B	Conductivity	
VOLUME OF WATER (m^3)		$Vm=3.14*r^2*H$	Temperature	
VOLUME OF WATER (L)		Vl=Vm*1000	Turbidty	
DEPTH OF BOTTOM SLUDGE (m)			VOC / VPH / EPH / Glycols / DF	ORGANICS
SAMPLED?		Y/N	Total Metals / Dissolved Metals (F/P)	INORGANICS
OTHER OBSERVATIONS				
LEACHATE COLLECTION RESERVIOR				
DEPTH TO BOTTOM (m)		A	SAMPLE ID	
DEPTH TO WATER (m)		B	pH	
HEIGHT OF WATER (m)		H=A-B	Conductivity	
VOLUME OF WATER (m^3)		$Vm=3.14*r^2*H$	Temperature	
VOLUME OF WATER (L)		Vl=Vm*1000	Turbidty	
DEPTH OF BOTTOM SLUDGE (m)			VOC / VPH / EPH / Glycols / DF	ORGANICS
SAMPLED?		Y/N	Total Metals / Dissolved Metals (F/P)	INORGANICS
OTHER OBSERVATIONS				
SMA COLLECTION RESERVIOR				
DEPTH TO BOTTOM (m)		A	SAMPLE ID	
DEPTH TO WATER (m)		B	pH	
HEIGHT OF WATER (m)		H=A-B	Conductivity	
VOLUME OF WATER (m^3)		$Vm=3.14*r^2*H$	Temperature	
VOLUME OF WATER (L)		Vl=Vm*1000	Turbidty	
DEPTH OF BOTTOM SLUDGE (m)			VOC / VPH / EPH / Glycols / DF	ORGANICS
SAMPLED?		Y/N	Total Metals / Dissolved Metals (F/P)	INORGANICS
OTHER OBSERVATIONS				
EFFLUENT TREATMENT SYSTEM OUTLET (WTS)				
SAMPLE ID				
pH			Conductivitiy	
Temperature			Turbidity	
VOC / VPH / EPH / Glycols / DF	ORGANICS		Total Metals / Dissolved Metals (F/P)	INORGANICS
OTHER OBSERVATIONS				
SETTLING POND OUTLET (SW-1)				
SAMPLE ID				
pH			Conductivitiy	
Temperature			Turbidity	
VOC / VPH / EPH / Glycols / DF	ORGANICS		Total Metals / Dissolved Metals (F/P)	INORGANICS
OTHER OBSERVATIONS				
SMA CATCH BASIN				
OBSERVATIONS				
SMA LEAK DETECTION PORTS				
OBSERVATIONS				
ENCAPSULATION AREA LEAK DETECTION PORTS				
OBSERVATIONS				

Appendix H

SMA Daily Record

Soil Management Area - Daily Record

SOIL MANAGEMENT AREA				
DATE			DATA RECORDER	
AMBIENT TEMPERATURE			SIRM FILE REFERENCE	
DAILY PRECIPITATION		>1:10?	DAILY PHOTO REFERENCE:	
FORECAST PRECIPITATION			CONFIRM STOCKPILE COVER	Y / N

WAA #	Grid ID	IL- / IL+	Tonnage/Soil Desc./Comments	Contaminants of Concern

ESTIMATED SOIL VOLUME:	
ESTIMATED SOIL MASS:	

M = Metals S = Salt (NaCl)
PAH = Polycyclic Aromatic Hydrocarbons
PHC = Petroleum Hydrocarbons
Other:

DAILY SKETCH

Appendix I

Encapsulation Cell Daily Record

Encapsulation Cell - Daily Record

SOIL MANAGEMENT AREA				
DATE			DATA RECORDER	
AMBIENT TEMPERATURE			SIRM FILE REFERENCE	
DAILY PRECIPITATION		>1:10?	DAILY PHOTO REFERENCE:	
FORECAST PRECIPITATION			CONFIRM DAILY COVER	Y / N
CELL ID:				
Placed Soil (Waste Approval ID)	SMA or Direct Place	Class	Placed Tonnes (Approx)	Notes

ESTIMATED DAILY SOIL VOLUME PLACED (LOOSE):	
ESTIMATED DAILY SOIL MASS PLACED (TONNE)	

DAILY SKETCH

Appendix J

Daily Inspection and Maintenance Log

Daily Inspection and Maintenance Log

DAILY OPERATIONS/MAINTENANCE			
DATE:	TIME:		DATA RECORDER:
SOIL MANAGEMENT AREA			
	INSPECTED		ACTIONS TAKEN / COMMENTS
COMPLETED SMA DAILY REPORT	Y	N	
LEAK DETECTION PORT	Y	N	
WHEEL WASH	Y	N	
COMMENTS:			
CONTAINMENT POND			
FENCING & BERM	Y	N	
PIPING & RELATED INFRASTRUCTURE	Y	N	
VISUAL INSPECTION OF EXPOSED LINER	Y	N	
FLOW TO WATER TREATMENT SYSTEM	Y	N	
COMMENTS:			
PERMANENT ENCAPSULATION AREA			
BERMS & SURROUNDING AREA	Y	N	
LINER & RELATED INFRASTRUCTURE	Y	N	
LEACHATE & LEAK COLLECTION	Y	N	
COMMENTS:			
WATER TREATMENT PLANT			
PIPES & CONNECTIONS	Y	N	
MECHANICAL & SENSOR COMPONENTS	Y	N	
HOLDING TANKS	Y	N	
CHEMICAL/FLOCCULANT STORES	Y	N	
COMMENTS:			
SETTLING POND			
BERMS & FLOW-WAYS	Y	N	
SPILLWAY	Y	N	
FLOW FROM TREATMENT SYSTEM	Y	N	
FLOW FROM NON-CONTACT WATER	Y	N	
FLOW FROM SETTLING POND DISCHARGE	Y	N	
COMMENTS:			
SEDIMENT CONTROL AND DIVERSION WORKS			
SPLASH GUARDS & ASPHALT ON BRIDGE	Y	N	
DITCHING & BERMS	Y	N	
DRAINAGE	Y	N	
COMMENTS:			

Appendix K

Emergency Response Plan/Mine Emergency Response Plan

SOUTH ISLAND RESOURCE MANAGEMENT EMERGENCY RESPONSE PLAN

Emergency Response Plan/Mine Emergency Response Plan

This Emergency Response Plan/Mine Emergency Response Plan defines emergency response procedures, responsibilities and contingency measures for the 460 Stebbings Road Site in compliance with SIRM's health and safety program (maintained under separate cover), which seeks to exceed the requirements of both the BC Occupational Health and Safety Regulation (the "OHS reg") and the Health, Safety and Reclamation Code for Mines in British Columbia (the "HSRC" or simply "Code").

This plan is reviewed, updated and distributed at least annually, in compliance with BC Ministry of Environment Permit PR-105809 Sections 2.12, 2.13 and 5.1; as well as The Health Safety and Reclamation Code for Mines in British Columbia ("HSRC" or "Code") 3.13.1; and Ministry of Energy, Mines and Petroleum Resources Permit Q-8-094, Section 2(a).

SIRM Document Revision History

Revision No.	Date	Revisions	Authorized (SIRM)
1.0	July 28, 2015	Combination of existing ERP and MERP to create new, stand-alone document	RPC

Notes:
(1) Review/revise to keep current and at least annually on or before March 31.
(2) Revisions are not effective/applicable until sign-off by SIRM Mines Manager.
(3) At time of issue, revisions must be submitted concurrently to both BC Ministry of Environment and BC Ministry of Energy, Mines and Petroleum Resources.

Approvals

Revision	Approval	Name	Signature	Date
1.0	SIRM Mines Manager	Doug Harlow		

Distribution

This is a controlled document. The document is the intellectual property of SIRM Ltd., which retains all rights and privileges. Unauthorized alteration or manipulation is strictly prohibited and can endanger life and safety.

When approved, this document must be kept accessible on site in both original (signed) paper and (searchable) electronic forms, with copies posted in conspicuous places. Electronic copies of the document are for information only; electronic files are subject to manipulation or alteration and only signed original hard-copies can be relied upon.

1.0 Introduction

This document outlines Emergency Response Plan (ERP) details specific to the Aggregate Mining Operations and Soil Receiving Site at 460 Stebbings Road, Shawnigan Lake, BC (herein referred to as the "Site"). This document is intended to function as a stand-alone ERP while complimenting the existing South Island Resource Management Occupational Health & Safety Manual (OHSM).

This document addresses the emergency procedures that have been identified during the site design and permit application process. It is anticipated that, moving forward, additional potential risks will be identified and incorporated into this ERP. Like all Health and Safety program components, this ERP will be a continually evolving document.

2.0 REGULATORY FRAMEWORK

This ERP, in conjunction with the OHSM, has been developed to conform generally to the following:

- Health, Safety and Reclamation Code for Mines in British Columbia (2008)
- BC Guidelines for Industry Emergency Response Plans (revised from 1992) prepared by the B.C. Ministry of Environment as the key (lead) provincial agency under *the B.C. Emergency Program Act* and its regulation (Schedule 1) and by mandate. (Updated: July, 2002).

The main purpose of the Guidelines is to promote the development of comprehensive and consistent emergency response plans by industry, in cooperation with the provincial government and local governments. Users have the responsibility of judging the extent the Guidelines suitability to their specific situation.

If deemed necessary, this EPR document may be expanded to fully address all aspects of the Guidelines.

3.0 EMERGENCY CONTACT INFORMATION

The following table summarizes key contact information for key persons and services that may be required in the event of an emergency related to the Soil Treatment Facility:

SERVICE	CONTACT INFORMATION
Fire / Police / Ambulance EMERGENCY	911
RCMP (Shawnigan Lake Detachment)	250-743-5514
Poison Control	1-800-567-8911
Emergency Spill Response (Provincial Emergency Program)	1-800-663-3456
MOE Regional Office	Luc Lachance (File Manager) 250-751-3100
Vancouver Island Health Authority	250-739-6304 (regular office hours) 1-800-204-6166 (evenings and weekends)
WorkSafeBC	1-800-661-2112 1-866-922-4357 (after hours EMERGENCY) 1-604-273-7711 (after hours EMERGENCY)
BC Hydro (Emergency)	1-888-POWERON (1-888-769-3766)
Natural Gas Emergency	1-800-663-9911
Environmental Engineer (Active Earth Engineering Ltd)	1-250-686-9850 (Matt Pye, Victoria) 1-250-588-9244 (Mike Achtem, Victoria) 1-604-856-5119 (Head Office, Langley) 1-604-312-3891 (David Kneale, Langley)
McRae's Environmental Services (Vacuum Truck)	250-479-3205

4.0 EMERGENCY RESPONSE PROCEDURES

THE FOLLOWING IS TO ENSURE THE SAFE EVACUATION OF ALL WORKERS FROM THE SITE OF AN EMERGENCY:

Contact your Supervisor and do a head count to make sure everyone who was working in your area is accounted for.

- Standby for communication of procedures and be prepared to be first aid responders.

Once everyone is accounted for Supervisor's will give direction for further evacuation. When outside assistance and further direction is required the Provincial Emergency Program will be contacted at:

1-800-663-3456.

- The ultimate goal in an emergency procedure is to successfully keep all employees and individuals safe. REMAINING CALM is the key factor in an emergency.

4.1 EVACUATION PROCEDURE

The following evacuation procedure will be used in the event of an emergency:

- The evacuation alarm is three long blasts with an air horn. Sound alarm to initiate evacuation order. The air horns will be located at well identified locations on the worksite.
- Evacuate the building or work site.
- Notify appropriate Emergency Services through the appropriate telephone number (at the site safety board) and notify Shift boss
- All employees will assemble in the muster area and will remain there until ordered to move by the Shift boss.
- Each contractor supervisor will muster his/her workers, perform a head count, and report to the South Island Resource Management representative.
- Some employees may elect to use emergency equipment to control and/or extinguish flames, spills, etc., but at no time is any employee to remain on the work site, if further exposure will increase the risk to the employees.
- No employee will attempt to control an emergency situation without first ensuring the Shift boss is made aware of what the employee is doing. If the Shift boss cannot be advised, any attempt to control the problem is to be abandoned and left to Emergency Services.
- Render first aid to any workers requiring attention.
- No employee will enter the workplace until a return to the building, or work site, has been authorized by Shift boss and the Emergency Services.

First Aid Emergencies

- Notify First Aid Attendant on Company Radio or by contacting the scale shack or Contact 911
- Person closest to injured person:
  - Ensure the accident scene is safe and that there is no further danger to you or the injured person.
  - Do not move the injured worker unless they are in immediate danger.
  - Keep calm. Do not leave the worker unattended.
- Obtain as much information as possible regarding the injury and the patient.
  - What happened?
  - Number of patients?
  - Exact location of patient?
  - Type of Transportation required?
  - Is a Billy Pugh required?
  - Is a First Aid Attendant required?
  - Is a spine board or stretcher required?
  - Do you need help, oxygen, first aid equipment?
  - What are the weather conditions at the scene?
- Provide the following information to the first aid attendant/Emergency Services:
  - What happened
  - Exact location of accident
  - Number of workers involved (DO NOT mention names)
  - Wait for and allow First Aid to ask any questions
  - Return to the injured worker

  Provide care for injured worker(s) to the level of training in which you are trained.

4.2 FATALITIES

In the event of a fatality the Supervisor must:

- Secure the area
- Notify WorkSafeBC
- RCMP
- Coroner's Office
- Next of Kin

Advise employees regarding flow of information until all appropriate notifications have been completed.

During times of high emotion such as in an event of this magnitude the assistance

4.3 FIRE RESPONSE

In case of fire call Supervisor - IMMEDIATELY!

If You Discover a Fire

- Immediately shout "Fire" (on radio)
- For Fire Emergencies, Call 911...State location and nature of the emergency or have someone else do it and report back to you.
- If trained and safe to do so, attempt to extinguish or control fire with appropriate firefighting equipment.
- If not safe to do so or if you cannot extinguish or control the fire, then try to contain it, if possible.
- Sound emergency evacuation, and proceed to assembly area.
    - Supervisor, check all the workers are accounted for.
    - Do not leave the assembly area until instructed to do so by Supervisor.
    - Do not re-enter the building/area for any reason until the evacuation area is said to be safe to return by your Supervisor.

Fire Information to Report:

- How big is the fire? Bathtub Backyard, Ball Field
- Fire location and type of fuel
- Fire Character - Note wind direction and strength
- Slope (aspect, position, steepness)
- Are people at risk!
- Take Action if SAFE to do so
- Be aware of and follow the emergency evacuation procedures when required

General Fire Safety Tips:

- One of the safest spots is a burned-over area.
- When there is no access to a burned-over area, remember that you can travel faster downhill or along the hill.
- Do not travel ahead of the fire in the direction of the spread. It is almost impossible to out-run a fire.
- In any brush fire, when working in advance with a cat, build a safety strip for retreat.
- In timber, sharp ridges are the best bet.
- When working in extreme conditions, maintain radio contact with the base at all times.

"WATCH OUT" Guidelines:

1. Weather - Dominates fire behavior, so keep informed.
2. Action - Must be based on current and expected fire behavior.
3. Try out - At least two safe escape routes.
4. Communications - Maintained with crew, boss and adjoining forces.
5. Hazards - Watch for flash fuels, chimneys and snags.
6. Observe - Changes in wind direction, velocity, humidity, and clouds.
7. Understand - Your instructions and make sure yours are understood
8. Think - Clearly, be alert, and act decisively before situation becomes critical.

4.4 NATURAL DISASTERS

Earthquake

Earthquakes occur without warning, so there will be no opportunity to evacuate areas in advance. All employees must be prepared to respond appropriately in the event of an earthquake.

During an earthquake the ground will shake and buildings may sway. Sometimes there is a sudden grinding noise or roar. The extent of movement will depend on the severity of the quake. An earthquake of magnitude greater than 6.0 on the Richter scale has potential to be very destructive.

An orderly evacuation is to be conducted after the first shocks have subsided. Strong earthquakes will have aftershocks and may generate a Tsunami. It is therefore important to wait until the entire event has been declared over before employees are allowed back to work.

Immediate Actions

If you are inside during an earthquake:

- Immediately take cover under a table or desk, or stand in a doorway. In areas where cover is not available, kneel at the base of an interior wall, facing the wall with head down and covered by your arms.
- Turn your body away from windows and mirrors.
- Be alert for falling objects and stay away from overhead fixtures, filing cabinets, bookcases, and electrical equipment.

If you are outside during an earthquake:

- Stay away from danger zones around log and pole decks
- Move to an open area away from buildings, trees, and powerlines.

- If unable to move to an open area, watch for falling objects.

If you are in an automobile or machine during an earthquake:

- Stop your vehicle in the nearest open area.
- Stay in the vehicle until the shaking stops.
- Stay away from overpasses, bridges, and powerlines.

If you are trapped under debris during an earthquake:

- Do not light a match.
- Do not move about or kick up dust.
- Cover your mouth with a handkerchief or clothing.
- Tap on a pipe or wall so rescuers can locate you. Use a whistle is one is available. Shout only as a last resort. Shouting can cause you to inhale dangerous amounts of dust.

After an Earthquake

1. Remain Calm
2. Be aware of the possibility of further earthquakes, and be prepared to again take emergency shelter and action.
3. Stay at least 10 meters from downed powerlines.
4. Stay away from damaged areas.
5. If possible, and if it is safe to do so, evacuate buildings as soon as the shaking has stopped.
6. Do not move seriously injured persons unless they are in obvious or immediate danger from fire, building collapse, etc.
7. Open all doors carefully, and watch for falling objects.
8. At no time should any open flames, around buildings, be allowed (such as matches or lighters)
9. Limit phone calls to emergency assistance requests, as this may tie up lines needed by emergency personnel.
10. Each building and work area should have a muster area or 'safe area' established, in a previously designated area that is away from known dangers.

11. Conduct a head count and ensure that all personnel are accounted for. Missing personnel are to be reported to Supervisors & emergency response personnel.

12. Do NOT drink tap water, stream/river water, or use the toilets until you know if water and sewer lines are intact and no contamination has occurred.

Do not attempt to drive. Roads may be congested, logging roads and bridges may be down or unstable, and streets may be impassable. Site surveys will need to be conducted by qualified individuals prior to evacuation

After an earthquake, and once the Site has been deemed safe, the following protocols should be followed at the site regarding the contaminated soil areas:

- A qualified engineer should inspect all Site infrastructure and note any areas of damage, highlighting damage areas that may pose immediate risks of contaminant release to the environment. In particular, inspection should occur at:
  - All slopes and embankments within the Permanent Encapsulation Area, including the active face of the encapsulation areas;
  - The storm water pond and associated piping and infrastructure;
  - The Soil Management Area (asphalt and infrastructure conditions);
  - All runoff and leachate collection and containment infrastructure;
  - The Water Treatment Facility; and,
  - All groundwater monitoring wells.
- If it is suspected that the earthquake could have altered sub-surface conditions at the Site, the installation of additional groundwater monitoring wells may be required to confirm that the groundwater flow regime has not changed, and to ensure no contaminant impacts to the deep underlying bedrock aquifer.
- Following any earthquake where Site infrastructure has been impacted and/or sub-surface conditions may have been affected, no additional soils should be accepted at the site until all necessary repairs have been made, and a full environmental

Tsunami

Although highly unlikely in this area it is important to have an understanding of this potential natural disaster

- A tsunami could lead to damages and losses similar to a hurricane and possibly have a greater impact in destruction. Tsunamis are typically generated by vertical disturbances of the ocean floor that are caused by earthquakes. A tsunami is a series of undersea waves that can be as much as an hour apart if it comes from a considerable distance. A severe tsunami that is generated from afar may not have much of a noticeable result in the first or second wave, but in the waves following after may be devastating, as the water will push farther inland.

Follow evacuation procedure for a Hurricane

Hurricane

Although highly unlikely in this area it is important to have an understanding of this potential natural disaster

- A Hurricane: Unlike tsunamis, no specific time of arrival will be available. Depending on their location and strength, tropical cyclones are referred to by various other names, such as hurricane, typhoon, tropical storm, cyclonic storm, and tropical depression. While tropical cyclones can produce extremely powerful winds and torrential rain, they are also able to produce high waves and damaging storm surge. They develop over large bodies of warm water, and lose their strength if they move over land. This is the reason coastal regions can receive significant damage from a tropical cyclone, while inland regions are relatively safe from receiving strong winds. Heavy rains, however, can produce significant flooding inland, and storm surges can produce extensive coastal flooding up to 25 mi (40 km) from the coastline.

- The first person to receive a tsunami/hurricane warning should transmit the warning on the company radio frequency and inform the office and supervisors.
- Move to 'safe area' with all crewmen in your area - do a head count to ensure everyone is present.
- Power Down - If the potential for tsunami is present shut down all electrical power.
- Pack small equipment and move all mobile equipment if safe to do so and without delay. Be sure to take any water bottles, food, & first aid kits and supplies with you.
- Standby for communication for procedures and be prepared to be first aid responders.
- Remain Calm.
- Do not attempt to drive. Roads may be congested, logging road and bridges may be down or unstable, and streets may be impassable.

Check in with Supervisors/office and prepare to wait for further evacuation instructions.

4.5 EXCESSIVE CONTAMINANT EXPOSURE

Through the regular operation of the site, on-Site personnel will be working regularly near contaminated soils. Prevention is the key to mitigating risks associated with potential contaminant exposure, and as such the Site Health and Safety programs and procedures should be followed at all time. All personnel working within the site must wear standard Site PPE as stipulated in the OHSM, as well as any additional PPE required to mitigate the risks of exposure to contaminants, including:

- Disposable Nitrile Gloves;
- Safety Glasses; and,
- A half-mask respirator fitted with organic cartridges (on hand, to be used as needed).

The symptoms for all types of poisoning, including excessive contaminant exposure, may be difficult to recognize.

Exposure to contamination may occur through inhalation of contaminated dust/vapours, through the skin, or through the mouth.

As a rule of thumb, if a worker feels ill and may have been exposed to excessive contamination, the following procedure should be followed to stabilize the situation:

- Notify First Aid Attendant on Company Radio or Contact 911.
- Notify Poison Control (1-800-567-8911). Have a bystander assist you.
- Person closest to injured person:
  - Ensure the accident scene is safe and that there is no further danger to you or the injured person.
  - Remove the potential source of contaminant exposure. If this requires moving the worker, do so only if this poses no additional risk. Keep calm. Do not leave the worker unattended.
- Provide care for injured worker(s) to the level of training in which you are trained.
- Continue by following the First Aid Emergency procedure laid out in the OHSM.

An Incident Investigation and assessment of any corrective/preventative actions should be conducted following closure of any first aid emergency. The Incident Investigation forms included in of the OHSM should be used.

4.6 CONTAMINATED SOIL RELEASE INTO SHAWNIGAN CREEK

The scenario of a truck tipping over and discharging its contents into Shawnigan Creek is considered extremely unlikely given the Site layout, posted speed limits, design and condition of the on-Site bridge and other infrastructure, and the standard engineering of all commercial dump trucks and associated trailers.

The following procedure should be followed in the event that contaminated soil is released into Shawnigan Creek due to a truck/trailer-related accident, or other incident:

1. <u>Ensure the Safety of all on-Site personnel</u>
   - Notify First Aid Attendant on Company Radio, and Contact 911 if required
   - Person closest to accident:
     - Ensure the accident scene is safe to enter. Do not provide assistance if there is an imminent danger to your personal safety. Check for the following:
       - No Fire
       - No Wires (no risk of electrical shock)
       - No Glass (no risk of cuts)
       - No Gas (no risk of explosion or fire)
     - If it is safe to do so, assist any injuring individuals. Do not move any individual unless leaving them in place presents an immediate risk to their health.
   - Keep calm. Do not leave the worker unattended.
   - Provide care for injured worker(s) to the level of training in which you are trained.
   - Continue by following the First Aid Emergency procedure laid out in the OHSM.

2. <u>Manage Risks Associated with Soil Release</u>
   - Notify the Site Environmental Engineer (Active Earth Engineering) – see contact table above.
   - Environmental Engineer to contact Emergency Spill Response (PEP), MOE Regional Office and Vancouver Island Health Authority as required – see contact table above.

- Deploy spill containment booms immediately downstream of the soil release. Deploy sorption pads across the spill area as necessary where any oily sheen is observed. Booms and pads will be located in a water-tight spill kit near the on-Site bridge over Shawnigan Creek.
- Deploy additional spill containment booms further downstream, as directed by the Environmental Engineer.

- Using on-Site equipment, remove any spilled contaminated soils and transport them to the Soil Management Area. Given the regular availability of staff and equipment, spilled soils should be removed within minutes to hours of the spill occurring, depending on access and safety conditions.
- Environmental Engineer to collect samples of the underlying soil/sediment to ensure that all contamination has been removed. Sampling spacing/frequency to adhere to BC MOE Technical Guidance Document 1.
- Environmental Engineer to collect samples of the water within Shawnigan Creek at locations upstream and downstream of the accident location, to ensure that no impacts to surface water persist.
- Samples to be analyzed at a third-party laboratory accredited by the Canadian Association for Laboratory Accreditation (CALA), for all Potential Contaminants of Concern (PCOCs) associated with the spilled soils.

All personnel involved in cleanup activities should wear standard Site PPE as stipulated in the OHSM, as well as any additional PPE required to mitigate the risks of exposure to contaminants.

4.7 WATER TREATMENT SYSTEM FAILURE/BREACH

The risks associated with a failure of the water treatment system will be mitigated by an automated shut off in the event of a loss in pressure. Should this occur after hours, the storm water detention pond will provide sufficient storage in the short term? In addition, any leakage to ground will report by overland flow to the Settling Pond prior to discharge.

The following procedure should be followed in the event of a failure/breach of the water treatment system:

1. <u>Ensure the Safety of all on-Site personnel</u>

    - Notify First Aid Attendant on Company Radio, and Contact 911 if required

- Follow the First Aid Emergency procedure laid out in the OHSM

2. Manage Risks Associated with Treatment System Failure
    - Notify the Site Environmental Engineer (Active Earth Engineering) – see contact table above.
    - Shut off power to the treatment system.
    - Environmental Engineer to contact Emergency Spill Response (PEP), MOE Regional Office and Vancouver Island Health Authority as required – see contact table above.
    - Deploy spill containment booms/pads if a leak is ongoing. Booms and pads will be located in a water-tight spill kit near the Treatment System.
    - Deploy additional spill containment booms further downstream, as directed by the Environmental Engineer.
    - Environmental Engineer to collect samples of the water within the overland drainage course, downstream of the accident location, to ensure that no impacts to surface water persist.
    - Samples to be analyzed at a third-party laboratory accredited by the Canadian Association for Laboratory Accreditation (CALA), for all Potential Contaminants of Concern (PCOCs) associated with the spilled water.
    - Conduct repairs as necessary to the Treatment System. If necessary, a mobile emergency treatment system or vacuum truck may be required to manage water while repairs are underway.
    - Restart treatment system, and pump/treat all untreated water held within the secondary containment berm.

All personnel involved in the repair work should wear standard Site PPE as stipulated in the OHSM, as well as any additional PPE required to mitigate the risks of exposure to contaminants.

4.8 BEDROCK FRACTURES / SEEPAGE ENCOUNTERED

The risks associated with a significant fracture encountered during construction of Permanent Encapsulation Cells will be evaluated during the requisite, pre-construction inspections. In accordance with Permit Clause 2.4, if abnormalities are encountered (open fractures, presence of water, percolation, etc.) the Director must be notified immediately.

The following procedure should be followed in the event of encountering bedrock abnormalities:

1. Notify the Director

   - Contact the MOE Regional Office – see contact table above.

2. Prepare a Structural Report
   - A structural report is required within 30 days of inspection
   - The report is to be prepared by a suitably Qualified Professional.
   - The report should include all relevant information collected during the inspection and detailing the abnormality; an explanation and/or interpretation of the abnormality; a risk assessment in regards to the risk to human health and the receiving environment; and, remedial action planned and/or taken to control the risks.

4.9 UNAUTHORIZED DISCHARGE

In accordance with Permit Clause 2.12, in the event of an emergency or condition beyond the control of the Permittee which prevents effective operation of the site or leads to unauthorized discharge, the Permittee mush comply with all applicable statutory requirements, immediately notify the Director and take appropriate remedial action for the prevention or mitigation of pollution.

The following procedure should be followed in the event of an unauthorized discharge to ground or water:

1. Ensure the Safety of all on-Site personnel

   - Notify First Aid Attendant on Company Radio, and Contact 911 if required
   - Follow the First Aid Emergency procedure laid out in the OHSM

2. Manage Risks Associated with Discharge
   - Notify the Site Environmental Engineer (Active Earth Engineering) – see contact table above.
   - Shut off power to the treatment system as required.
   - Environmental Engineer to contact Emergency Spill Response (PEP), MOE Regional Office and Vancouver Island Health Authority as required – see contact table above.
   - Deploy spill containment booms/pads as required.
   - Deploy additional spill containment booms further downstream, as directed

by the Environmental Engineer.

- Environmental Engineer to collect samples of the water within the overland drainage course, downstream of the accident location, to ensure that no impacts to surface water persist.
- Samples to be analyzed at a third-party laboratory accredited by the Canadian Association for Laboratory Accreditation (CALA), for all Potential Contaminants of Concern (PCOCs) associated with the spilled water.
- Conduct repairs as necessary to the failed aspect of the system. If necessary, a mobile emergency treatment system or vacuum truck may be required to manage water while repairs are underway.

All personnel involved in the repair work should wear standard Site PPE as stipulated in the OHSM, as well as any additional PPE required to mitigate the risks of exposure to contaminants