Keystone Environmental
Knowledge-Driven Results

Stormwater Pollution Prevention Plan

Derwent Way Soil Transfer and Barge Facility

Prepared for: Summit Earthworks Inc.

Project No. 12943
Revision No. 11
July 2019

Environmental Consulting • Engineering Solutions • Environmental Planning

Suite 320
4400 Dominion Street
Burnaby, British Columbia
Canada V5G 4G3

Telephone: 604 430 0671
Facsimile: 604 430 0672
info@keystoneenvironmental.ca

PREFACE

This Stormwater Pollution Prevention Plan is designed to conform to the Port Metro Vancouver's July 2015 *Project and Environmental Review Guidelines: Developing Your Stormwater Pollution Prevention Plan* in support of the conditions outlined in the Project & Environmental Review (PER No. 16-022) Application Submission Requirements dated February 16, 2015. Revision 10 addresses modifications to the design with a conveyor system in place of barge ramps to improve work efficiencies and minimize spill risks.

The Barge Loading Facility is a transfer facility for soils that have concentrations less than BC Hazardous Waste Regulation criteria. The transfer station facilitates delivery of contaminated soil to soil treatment facilities in the Lower Mainland and Fraser Valley.

Trucks bring soil to the facility where it is temporarily stored before being transferred to a barge for transport to an approved treatment facility in Mission BC.

Summit Earthworks Inc. (Summit) minimizes any possible impact of its operations by utilizing best available control technologies and operating procedures.

The purpose of this document is to provide stormwater management planning in conjunction with overall site planning, design, and future construction, beginning at the outset of the Project (operation of a Barge Loading Facility at this location by Summit Earthworks Inc.).

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1. INTRODUCTION

Stormwater originates from precipitation events (such as rainfall) and from snow and ice melt. Stormwater remains on the ground surface through ponding, is soaked into the ground, or becomes stormwater runoff, which ultimately enters nearby bodies of water. Stormwater runoff flows over land (vegetated or bare soil areas, impervious surfaces such as parking lots and roadways); as it flows it accumulates debris, soil and sediment, and contaminants that could negatively impact water quality.

This Stormwater Pollution Prevention Plan (SPPP) has been developed for a proposed Barge Loading Facility on Derwent Way in New Westminster, BC, on the northern bank of the Fraser River ("the Site"). The Site is located in an unimproved industrial area.

The purpose of the SPPP is to develop a pollutant control strategy to minimize the discharge of pollutants by stormwater runoff. The Site runoff shall be contained and treated to levels acceptable to federal and provincial regulations prior to being discharged to the municipal drainage system. Following site development, the stormwater will be captured such that there will not be a discharge to the adjacent Fraser River from the parcel. Best Management Practices (BMPs) are those practices that are considered sound, relatively low in cost, and applicable to a broad category of industries and types of pollutants. Advanced BMPs are defined as those that are specific to a type of industry or pollutant. The BMPs discussed in this plan have been designed to improve the quality of stormwater discharged from the facility and to aid in the development, implementation and evaluation of the SPPP.

2. OVERVIEW

2.1 Background

The Barge Loading Facility will accept contaminated soils that have been confirmed not to be hazardous waste. The transfer station will facilitate delivery of contaminated soil to soil treatment facilities in the Lower Mainland and Fraser Valley. Trucks will bring soil to the facility where it will be temporarily stored in a 'Waste Storage Area' before being transferred to a barge and transported to an approved treatment facility.

The Site will be self-contained and will have emergency procedures in place. A Spill Response Plan is available for this site and should be reviewed in the context of this SPPP.

2.2 Location

The Barge Loading Facility is to be located on Derwent Way in New Westminster, BC, on the northern bank of the Fraser River. The upland portion of the project Site is bounded to the north by a rail right-of-way and paved access road from Salter Street, a paved shipping container storage lot to the east, the Fraser River to the south, and a rail right-of-way and Derwent Way to the west (see Drawing No. 17-12943-01). The area is largely industrial, with residential housing on the western side of Derwent Way. The project Site area (upland and water lease lot) is approximately 7,100 m^2, and approximately 100 m wide along the Fraser River bank.

3. SITE INVENTORY

3.1 Activities

Over the lifecycle of the Project, the Barge Loading Facility is expected to engage in the activities listed below that have the potential to expose stormwater runoff to contaminants. Drawing No. 17-12943-01 shows the proposed facility plan.

- Soil off-loading
- Barge loading
- Refuelling of site equipment

3.2 Materials

The significant materials expected to be exposed to stormwater at the Barge Loading Facility include the following:

- Waste and Industrial Land Use Classified Soils
- Petroleum fuels and oils associated with refuelling and maintaining onsite equipment

3.3 Desktop Hydrologic Assessment and Design Basis

A desktop hydrologic assessment was conducted based on the proposed final design of the Project in order to estimate the stormwater runoff response, including peak flow rates and runoff volumes for various rainfall events. The design of the site stormwater management system will take into account the results of the hydrological assessment to provide adequate stormwater infrastructure for the Site.

For the purpose of the desktop hydrologic assessment, the Site was divided into sub-catchment areas as follows:

- Covered Waste Storage Area – 2,020 m^2 (0.20 hectares)
- Remaining Site Area – 4,080 m^2 (0.3780 hectares)

Trucks hauling soils will enter the Site via the Site Entry Approach on Salter Street near Derwent Way. Trucks will travel via the designated truck routing path, through the weigh scale, to the north, then east of the Waste Storage Area, and deposit the soil inside the Waste Storage Area. Finally, trucks will drive through the Wheel and Truck Wash, through the weigh scale, and off-Site.

The Waste Storage Area (refer to Drawing No. 18-12943-01) will be contained by lock-block walls and a high-density polyethylene (HDPE) liner, and covered with a parabolic roof to prevent the majority of precipitation during heavy storm events from coming into contact with the soils temporarily stored on Site. This roof covers the Waste Storage Area and the road immediately south of the Waste Storage Area, minimizing stormwater contact with the stored material and

the area before the truck wash where contaminated soils could potentially be tracked. Stormwater and runoff that is generated inside the Waste Storage Area will be collected in a collection sump that will flow by gravity to a pumping station to be pumped to the water storage tank and treatment system. Roof runoff will not come into contact with the stored material, and will infiltrate to the ground via underground infiltration pits to the north and south of the Waste Storage Area.

The Site area outside of these areas is referred to as the Remaining Site Area. It is noted that this area contains several small sub-catchments (the small asphalt road area at the northernmost edge of the site that drains northwards, the asphalt road area along the western edge of the Site that drains to ditches/swales to the east, and the unpaved areas surrounding the Waste Storage Areas that drain to ditches/swales to the north). These sub-catchments within the Remaining Site Area do not experience traffic from trucks that have recently unloaded soils or entered the Waste Storage Area without having passed through the Wheel Wash. Trucks that move through this area will be exiting with washed wheels or will be entering the Site with 'clean' wheels. Site areas excluded by the offset buffer zones (from the railway right-of-way to the west, and the Fraser River to the south) were also included in the Remaining Site Area as they will similarly not experience any traffic or materials impacts from Project operations, and pose a low risk for pollutant entrainment into stormwater.

The Waste Storage Area has the potential to generate a higher concentration of solids and contaminant runoff while soil is being loaded and/or unloaded during a storm event. Following Port Metro Vancouver's July 2015 *Project and Environmental Review Guidelines: Developing Your Stormwater Pollution Prevention Plan,* SPPPs should address two types of rainfall events: Water Quality Events and Storm Drainage Events. Runoff as a result of the first rain after a dry period mobilizes a greater concentration of contaminants in a short period of time. This initial surface water runoff is known as the "first flush" and represents a Water Quality Event. A Storm Drainage Event is defined as a design storm event used to size on Site infrastructure and environmental responses – in this case, storage tank, pumps, treatment system capacity, and containment berms.

Storm Drainage Events are mitigated by selecting an appropriate design frequency to develop a stormwater system that can manage variable storm runoff rates and volumes. Design frequencies must be appropriate for the type of structures in question, and should consider the impacts and risk factors associated with flooding or overflow or bypass. The proposed stormwater system at this Site falls under "Minor Systems" listed in the City of New Westminster's Design Criteria; therefore a 1-in-10 year design storm is sufficient design frequency. Given the industrial nature of the Site and the proposed Project works involving runoff coming into contact with stored soils, a 1-in-25 year storm event has conservatively been selected as the design basis for this SPPP.

3.3.1 Waste Storage Area

The following hydrological parameters were used to model hydrological properties of the proposed design with respect to the Waste Storage Area:

- Waste Storage Area – 0.202 hectares

- Impervious area – 100%
- Average slope – 0.2%
- Time of concentration – 9 min
- Metro Vancouver Regional IDF Curve Zone 3

Results above are estimated using the City of New Westminster's Design Criteria for Stormwater Drainage Systems, which is based on the Rational Method proposed in Port Metro Vancouver's PER Guidelines for Developing Your Stormwater Pollution Prevention Plan.

As the Waste Storage Area has a parabolic roof structure to cover its entire surface area, it is assumed that only 20% of precipitation comes into contact with the waste material (based on approximate estimates of driving rain as a proportion of rainfall) – the remainder drains off the roof to infiltrate to ground via two 40 m by 3 m underground gravel trenches.

Waste Storage Area – Stormwater to Collection Sump

The peak flow for the Storm Drainage Event was calculated to determine sizing for pumps, tanks, equipment, and piping. The peak flow for the Water Quality Event was calculated to determine runoff volumes requiring retention and treatment on a regular basis. A peak flow of approximately 4.2 L/s (67 GPM) is expected for a Storm Drainage Event. The accumulated rainfall within the first hour of a 1 in 25 year design storm is 7.3 m^3 based on a 1 hour, 1-in-25 year design storm.

Waste Storage Area – Roof Runoff to Infiltration Trenches

A peak flow of approximately 17 L/s (269 GPM) is expected for a Storm Drainage Event. The rainfall directed to the infiltration trenches during the first hour of a 1-in-25 year storm event is 31.5 m^3. The surface area of the infiltration trenches was selected to be able to accommodate the entire flow from the roof during a 1-in-25 year storm event.

3.3.2 Remaining Site Area

The following hydrological parameters were used to model hydrological properties of the proposed design with respect to the Remaining Site Area:

- Remaining Site Area (excluding offsets) – 0.3780 hectares
- Impervious area – 35%
- Average slope – 2.7%
- Time of concentration – 10 min
- Metro Vancouver Regional IDF Curve Zone 3

A peak flow of approximately 26.4 L/s (418 GPM) is expected for a Storm Drainage Event. The total volume received within the first hour of precipitation during a 1 in 25 year design storm is 45.2 m^3. This flow is not being directed to the on-Site treatment system, but will be directed to swales to the east and west of the Site.

4. ISSUES IDENTIFICATION AND RISK ANALYSIS

4.1 Applicable Standards, Acts and Regulations

The following relevant legislation and standards are applicable given the potential pollutant sources listed above.

- Canada *Fisheries Act* regarding the deposition of deleterious substance in water frequented by fish
- Canada *Shipping Act*, National Spill Response Protocol regarding the release of pollutants to the marine environment
- Canada *Environmental Protection Act* regarding pollution prevention
- Canadian Council of Ministers of the Environment (CCME) Guidelines relating to water quality standards
- BC Approved and Working Water Quality Guidelines
- BC *Environmental Management Act*, regarding pollution prevention
- Corporation of the City of New Westminster Sewerage and Drainage Regulation (Bylaw No. 7746, 2015)
- Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites (FIGQG) under the Federal Contaminated Sites Action Plan (FCSAP)

4.2 Potential Pollutant Sources

An assessment was conducted to identify materials and practices that may reasonably be expected to add significant levels of pollutants to stormwater or that may result in the discharge of pollutants during dry weather from separate storm sewers draining from the facility. This section will provide a description of potential sources that may contribute to the presence of contaminants in stormwater runoff.

- Soil receiving, handling, transferring, storage, and ship loading could result in soil being spilled onto the ground.
- Dust from the temporary soil piles could spread across the Site during dry weather periods.
- Fuel, oil, or coolant from service vehicles or barges could leak due to damage, normal wear and tear or during fuelling or preventative maintenance.

4.3 Potential Sensitive Receptors

The Fraser River provides habitat for fish and is a potential sensitive receptor.

4.4 Identified Issues

No outstanding issues have been identified at this time. Section 5.1 outlines the management strategy to address prevention, containment, reduction, and treatment measures.

4.5 Identified Pollutant Pathways

Pollutant pathways identified in the preparation of this SPPP include:

1. Runoff coming in contact with soils stored in the Waste Storage Area
2. Runoff coming in contact with soils tracked outside the Waste Storage Area by trucks or equipment
3. Runoff in contact with fuel or oil from equipment maintenance or refuelling

The Waste Storage will be isolated from the rest of the Site by a 1.5m high concrete curb, lined with an HDPE liner under an asphalt cover. This design will prevent runoff water from this area from infiltrating into the ground and will inhibit the ability of stormwater runoff from either running into or out of the Waste Storage Area via overland flow. The Waste Storage Area will have a roof over the entire containment area (including the asphalt road directly south of the Waste Storage Area, where trucks unload material), to prevent excess precipitation from coming into contact with the stored soils. The roof is a parabolic roof structure that will drain to the north and south ends of the building and will be directed to ground to infiltrate via two 40 m by 3 m underground infiltration trenches. The infiltration trenches are to be installed below grade along the northern and southern edges of the Waste Storage Area. The south infiltration trench will be paved at surface and have a liner present over it to prevent potential runoff from the waste storage area entering the trench.

Rainfall and snowmelt that is windblown under the roof structure and falls within the Waste Storage Area will be captured by the containment wall and collected in the collection sump. The pumping station will be arranged such that the first flush water from the Waste Storage Area will be captured and pumped to the onsite water storage tank, upstream of the treatment process.

Trucks and site equipment must manoeuvre around the Site in order to move soil to and from the Waste Storage Area. Trucks are expected to enter the Site with ‘clean’ wheels – construction/excavation sites in Metro Vancouver (typical generating sites for the type of material accepted) would be equipped with a truck wheel wash. Once trucks have offloaded materials to the Waste Storage Area, they must pass through the truck wheel wash before proceeding through the rest of the site to the exit approach. Loaders will transfer the soil from the containment facility to the hopper that feeds the conveyor system. The conveyor surface will be covered with a stainless steel casing, with stainless steel spill tray underneath the system sloped back to shore for capture and containment.

The areas between where the trucks offload and the wheel wash, and the paths taken by the loaders to move materials onto the conveyor hopper have the potential to contain tracked soils and contaminants from the Waste Storage Area. This area will be covered with an overhead

roof and contained to minimize stormwater contact with stored soils and prevent water pollution on Site. Catch basins will capture runoff from these areas during storm events, and convey stormwater to the on-Site treatment system. Effluent from the truck wash will also be pumped to the water treatment storage tank.

A 2,500 litre, above-ground storage tank (AST) is planned to be present on Site for fuelling of site equipment. This storage tank will be a double-walled vacuum-monitored tank with corrosion protection and will be placed on a concrete pad. The concrete pad will provide an impervious surface for small drips and leaks during filling and refuelling. The tank and concrete pad will be protected with bollards to provide a visual barrier and prevent impact from trucks and on-Site equipment. The concrete pad will slope away from the tank base toward the collection sump for treatment at a slope greater than 1%. Engineered drawings and as-built drawings will be produced for the tank and the design will be registered with the Petroleum and Allied Petroleum Products Storage Tanks Regulations. Fuelling will be completed at a minimum distance of 30 m from the high water mark.

Water will be conveyed to the water storage tank from the Waste Storage Area Collection Sump and the Barge Loading Area via the pumping station indicated on Drawing No. 17-12943-01. Water in the storage tank will be treated as described in Section 5.1.3, prior to discharge to ground. The storage tank is designed to contain the 25 year design storm when used in concert with operation of the water treatment plant. A level-switch within the water storage tank will trigger the treatment system to begin operating. The treatment system will continuously treat water from the tank. Even during periods of inactivity on Site or dry periods, stored water will continue to be processed through the treatment system and discharged to allow space to collect stormwater runoff during the next storm event.

Runoff from the Remaining Site Area will be directed to the swales to the east and west of the Site.

5. STORMWATER POLLUTION PREVENTION PLAN

5.1 Management Strategy

The Barge Loading Facility stormwater pollution prevention strategy is to implement a set of BMPs to target the potential pollutant sources identified in Section 4.2 of this plan. These practices will encompass prevention, containment/reduction, and treatment.

5.1.1 Prevention

Maintenance of work areas that may contribute pollutants to stormwater will be the most effective management practice for this Site. Good housekeeping practices are not only beneficial in terms of limiting exposure of materials to stormwater, but they also improve worker safety and often contribute to reducing losses of products, thereby lowering operational or capital costs.

The Barge Loading Facility will employ a preventive maintenance program that includes inspections, testing, maintenance, and repairs of facility equipment and systems, the failure of which could result in the discharge of sediment-laden stormwater.

Leachable toxic wastes will not be accepted at this facility and thus rainfall is not expected to generate significant contaminants in the stockpile runoff. Accumulated sediment and oil will be directed to on site catchbasins and will be captured for treatment. The site will be swept regularly during dry periods to minimize interaction between the soil and rainfall runoff.

The Waste Storage Area will be constructed such that stormwater generated in this area is completely contained within a separate drainage network to the surface water runoff generated from the remaining Site area. This includes lining the containment floor with an HDPE liner to prevent infiltration into the underlying subgrade.

Discharge from the water storage tank will be continuous with water sampling occurring within permitting guidelines. Where the water quality is determined to be unsuitable for discharge with respect to the permit criteria, the water will be treated a second time, or until the water quality is within permitting guidelines.

The AST will be double-walled and stored over a concrete pad. No barge or truck refuelling will take place on-Site or within the water lot; only Site equipment will be refuelled, and fuelling will be contained within the designated refuelling area. The nozzle will be complete with an automatic shutoff valve and a spill kit will be located within 10 m of the refuelling area compound.

5.1.2 Containment / Reduction

Trucks and cars parked on Site for more than one day will be parked within a designated area with a drip tray underneath the motor to prevent potential oil leaks.

Trucks arriving on Site are considered ‘clean’ and will travel to the Waste Storage Area on a paved Site road. They will deposit their load in the Waste Storage Area and continue in a clockwise direction on the paved road through the wheel and truck wash station, before exiting the Site.

A loader will remain on Site as permanent Site equipment and will be used to move soil from the Waste Storage Area to the conveyor hopper. The loader will be limited to the Site and will travel between the Waste Storage Area and the hopper except when it requires refuelling or maintenance, both activities taking place on Site. The quality of the storm water runoff will not be impacted by the loader movement as soils that are lost during transfer from the Waste Storage Area to the hopper will be addressed by dry cleaning of Site roadways during dry periods and first flush runoff will be captured by the treatment system.

The barges used for offloading to receiving facilities will not be covered barges, but following placement of the soil on the barge during inclement weather, rainfall or heavy winds, the soil pile will be covered with a poly liner. In addition, the scuppers will be covered with a geotextile to prevent runoff containing soil from draining from the deck of the barge during loading.

The truck unloading area south of the Waste Storage Area will have 30 cm high concrete containment berms to the east and south to prevent excess runoff from exiting the site. These berms provide containment of the areas experiencing truck traffic that has recently unloaded contaminated soils.

5.1.3 Treatment

One 15,200 litre (4,000 gallon) water storage tank will be required on Site in order to provide sufficient storage for precipitation collected within the Waste Storage Area. The tank will be designed to manage the entirety of storm water generated during a 1-hour, 1-in-25 year storm event, with additional capacity to manage wash water from the on-site truck and wheel washing station, if necessary. One tank provides a total of 15 m^3 of equalization and storage capacity; Storm Drainage Event calculations indicate that 7.3 m^3 are required to contain the entirety of the 1-hour, 1-in-25 year storm event.

The storage tank will provide storage and equalization prior to the treatment system, such that the treatment system can be sized for lower flows (which will be encountered more often). The treatment system will be designed to treat 2.5 L/s (40 USgpm).

The water collected within the Waste Storage Area will be directed to the water storage tank and continuously processed through the treatment system. As the treatment system is designed for the 2.5 L/s peak flow, the water storage tank when full can be drained in approximately 2 hours, allowing for additional storage capacity for ongoing rain events. Stormwater will continuously be directed to the storage tank for subsequent treatment during any rain event (Water Quality Event or otherwise) as long as the storage tank has capacity.

Given that the majority of annual rainfall events in Metro Vancouver are below 10 mm/day (Canadian Climate Normals 1981–2010 for Vancouver indicate that, on average, 86% of days with precipitation experience less than or equal to 10 mm/day, and 98% of days with precipitation experience less than 25 mm/day), the storage provided by the storage tank and treatment capacity of the treatment system is considered sufficient, as the design basis accounts for a 22 mm storm occurring in 1 hour.

Stormwater within the water storage tank will be directed to the water treatment system. The system will include solids settling, flocculent injection to enhance settling, sand filtration, and a granular activated carbon filter. Flocculants designed for environmentally sensitive environments (i.e., polymer-based formulations) will be exclusively used. The dose rate and treatment chemical will be adjusted regularly, and will be based on the different contaminants of potential concern associated with each different delivery of soil material to Site. As required, secondary and tertiary treatment of this collected water will be completed until such time as the water is of a suitable quality such that it can be discharged. Effluent water will be tested prior to discharge for the contaminants of potential concern associated with each delivery of soil. The treated water will be discharged to ground via an infiltration system to the north of the Waste Storage Area.

Details of the infiltration system can be found in Drawing No. 17-12943-02, appended to this plan.

Sludge from the treatment process will be collected in by a vacuum truck and disposed of at an accredited soil treatment facility.

Runoff water from the Remaining Site Area will be collected in the swales to the east and west of the property and flow north. The swales will be designed to passively treat or convey the 1-in-25 year peak flow scenario of 14.1 L/s (divided amongst the 2 swales to the east and west), which exceeds design storm flow for this catchment area.

All trucks exiting the Site will go through the truck and wheel wash. The proposed truck and wheel wash model for this facility is Model TW750, capable of 47 L/s (750 GPM), and washing 400 trucks per day. This model includes capacity for two complete tire revolutions as trucks pass through, providing ample space and time for removal of sediments from truck wheels. Water within the wheel and truck wash will be recycled until sediment load becomes significant, or regular maintenance procedures require discharge of the wash water (at a minimum on a daily basis). Discharged wash water will be sent to the water storage tank. Discharge would not occur during first flush or a heavy storm event, though the tank has been sized with additional capacity in case of extreme storm events. Sediment collected within the truck and wheel wash will be collected by a vacuum truck and sent to a permitted soil treatment facility. The source of clean water for the truck wash during winter months will primarily consist of rainwater collected from the roof structure.

Other measures that will be put in place are:

- Sediment barriers such as silt fencing or fiber rolls (as needed based on on-Site observations, these will be available on Site to be used if required)
- Good housekeeping practices and regular Site cleanup and maintenance

6. IMPLEMENTATION AND MONITORING

6.1 Implementation

The Barge Loading Facility Site manager will be responsible for the implementation of this plan. The manager will possess the knowledge and skills to assess conditions and activities that could impact stormwater quality at the facility, and who can also evaluate the effectiveness of the management practices. They shall educate other Site personnel in the application of this plan and the importance of adhering to each BMP as described in this document.

All Site staff involved in regular site operations and activities will receive training on the contents of this plan at hire orientation and annually. The training will clearly indicate that it is the responsibility of all staff to be able to recognize ineffective stormwater management practices and to report them to the Site manager.

6.2 Site Monitoring

Regular site and effluent inspections shall be conducted by the manager to confirm that stormwater BMPs outlined in this plan are being implemented effectively and to identify possible concerns related to the quality of stormwater effluent. During winter months when average rainfall is high (October to March), site and effluent inspections will focus on maintenance and operation of the stormwater infrastructure (swales, pumps, catch basins, treatment system, truck and wheel wash, and containment berms) and monitoring of effluent. During summer months when average rainfall is low (April to September), site and effluent inspections will focus on good housekeeping practices (site sweeping and equipment maintenance).

At a minimum, the manager will conduct weekly inspections of all areas of the facility where industrial materials or activities are exposed to stormwater and/or where the potential for exposure to stormwater exists. Such areas specifically include the soil receiving areas, soil storage areas, and soil load-out areas.

In addition to the weekly inspections, the manager will monitor local weather reports for upcoming storm events and conduct inspections before, during, and after significant storm events (predicted rainfall exceeding 15 mm/day).

The water quality of stormwater within the water storage tank will be tested during discharge. Water will be tested for a specific analytical suite (determined by a qualified environmental professional) based on the contaminants of potential concern associated with the soils stored on Site. Each soil load will be delivered with a soil quality report completed by a qualified environmental professional or certified laboratory. The soil quality report will help to determine the analytical suite for the discharge water which will typically include pH, total suspended solids, heavy metals and hydrocarbons. In addition to the chemical composition of the discharge water, visual signs of contamination such as foam, discoloration, sediment or an oily sheen will be assessed.

Discharge would be stopped if parameters exceed the Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites (FIGQG), CCME surface water guidelines with a 10x dilution, and the BC Contaminated Sites Regulation standards for the protection of drinking water and aquatic life (BC CSR AW_{FW}, DW) for discharge to ground.

All weekly and storm event inspections, as well as water quality sampling events will be documented along with repairs/maintenance of the existing stormwater management works and new stormwater management works proposed. The documentation will include the personnel responsible for maintenance or installation and a timeline for completion of the recommended maintenance or installation.

Triggers for substantial replacement or upgrade of the stormwater infrastructure will be as follows:

- Discharge analytical results above the applicable standards will trigger recirculation of the effluent through the treatment system, backwash of the sand filters, and replacement of the granular activated carbon.
- Treatment chemical levels below 30% will trigger ordering replacement chemicals.
- Heavy sedimentation of the pumping station, catch basins, or collection sump will trigger cleanout via vacuum truck. At a minimum this will be conducted annually.
- Erosion or sedimentation of swales will trigger swale upgrade or maintenance within one month’s notice of the damage.
- Cracks, leaks, or otherwise failing infrastructure will be replaced upon documentation of the defects.
- Good housekeeping practice and BMP enforcement procedures will be developed if these practices are not followed on three consecutive weekly inspections.

6.3 Adaptive Management and Continuous Improvement

A key process in the effective implementation of the SPPP is the ability to change mitigation measures or actions as site conditions warrant in order to protect stormwater quality. This approach, generally termed as 'adaptive management', is a planned and systematic process for continuously improving environmental management practices by learning about their outcomes.

The Barge Loading Facility manager will review the contents of this plan on an annual basis to ensure continuous improvement for the stormwater system, that all potential stormwater exposures have been identified, and that the management practices are appropriate and adequate. The inspection reports will be reviewed for trends in effective and ineffective mitigation actions and measures. The results of these reviews may determine that current stormwater management procedures are working effectively or additional mitigation efforts are needed.

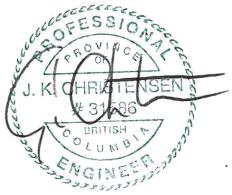
7. LIMITATIONS

Findings presented in this plan are based upon (i) a desktop review of client-provided drawings for the proposed works on the subject site, (ii) a desktop review of publicly-available rainfall and climate data, and (iii) a literature review of applicable values for hydrological parameters. Calculations and estimations reflect conditions expected at the specific site location at the time the work was conducted. Site conditions may vary from that extrapolated from the data collected during this investigation. Consequently, while findings and conclusions documented in this plan have been prepared in a manner consistent with that level of skill and care normally exercised by other members of the environmental science and engineering profession practising under similar circumstances in the area at the time of the performance of the work, this plan is not intended, nor is it able, to provide a totally comprehensive review of past, present, or future site environmental conditions. This plan must be read and used in its entirety.

We trust this information meets your requirements at this time. Please contact us if you have any questions.

Sincerely,

Keystone Environmental Ltd.



July 19 2019

Jason Christensen, P.Eng.
Senior Engineer

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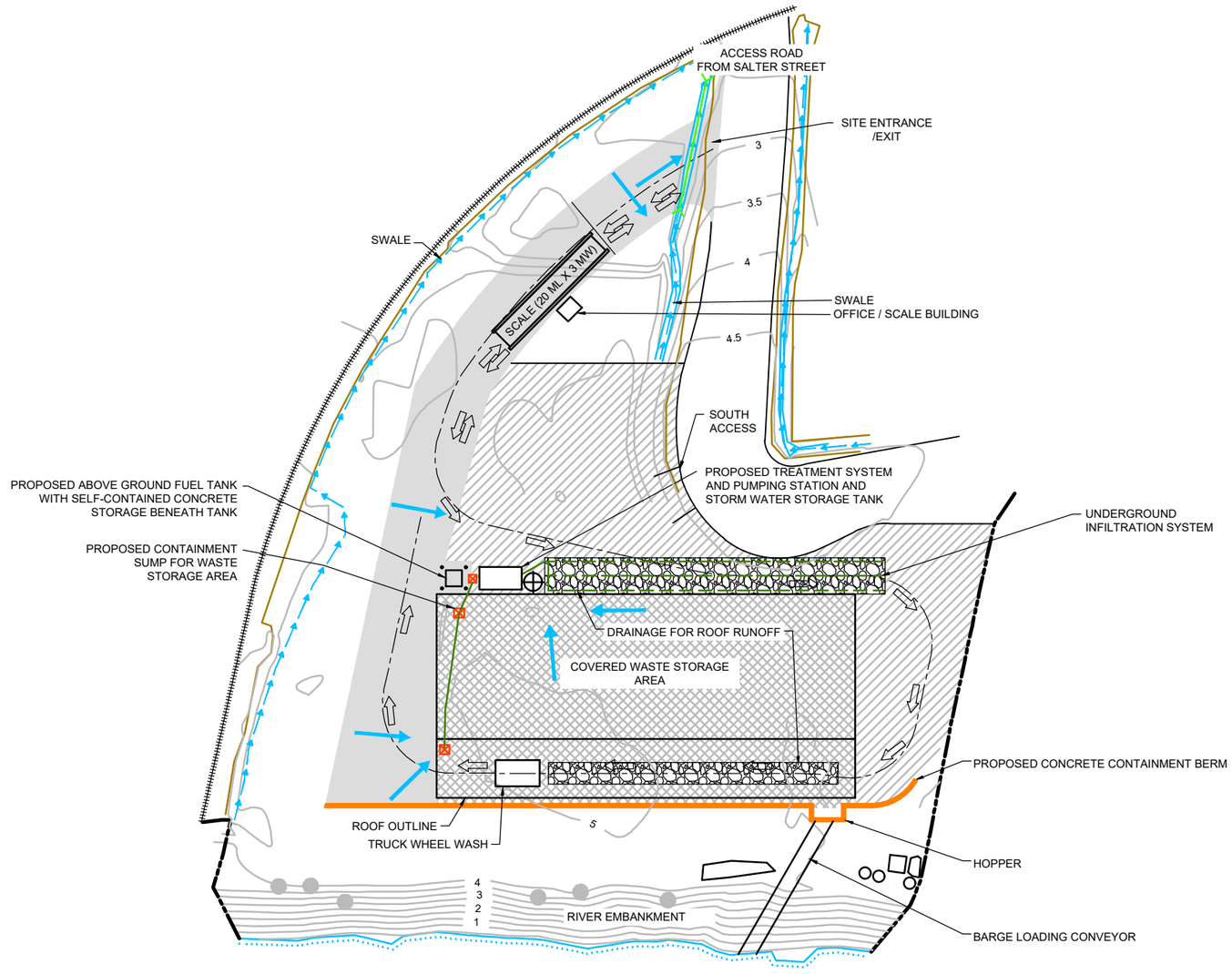
APPENDIX A

SITE DRAINAGE PLAN



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LEGEND

- SITE
- PROPOSED ROAD CENTER LINE
- UNDERGROUND STORMWATER NETWORK
- UNDERGROUND INFILTRATION SYSTEM
- SWALE
- SHORELINE
- RUNOFF FLOW DIRECTION
- TRAFFIC DIRECTION
- TOP OF BANK
- RAIL LINE
- PROPOSED CATCH BASIN
- CULVERT
- PROPOSED CONTAINMENT BERM
- PAVED AREA
- GRAVEL ACCESS ROAD
- CONTAINED AREA UNDER ROOF

No.	DATE	DESCRIPTION	BY	APPROVED
		REVISIONS		
04	7/17/19	Issued for Submission	T.L.	
03	7/10/19	Issued for Submission	A.B.	
02	2/26/19	Issued for Submission	T.L.	
01	11/07/17	Issued for Client Review	T.L.	
00	10/02/17	Issued for Client Review	A.B.	

NOTES:
1. THIS DRAWING IS FOR GENERAL INFORMATION ONLY. LOT BOUNDARIES AND FEATURES ARE APPROXIMATE.

Keystone Environmental

Keystone Environmental Ltd.
Ste. 320 4400 Dominion Street
Burnaby, British Columbia

Derwent Way

New Westminister, B C

DESIGN: ARK	APPROVED:
DRAWN: SG/HL	CHECKED: ARK

SCALE: 1:750(approx.)

CLIENT: Summit Earthworks Inc.

Derwent Way Barge Loading Facility
Storm Runoff Drainage Plan

DATE	10/02/17
SHEET No.	1 of 3
PROJECT No.	12943-109
REVISION No.	04
DRAWING No.	17-12943-01

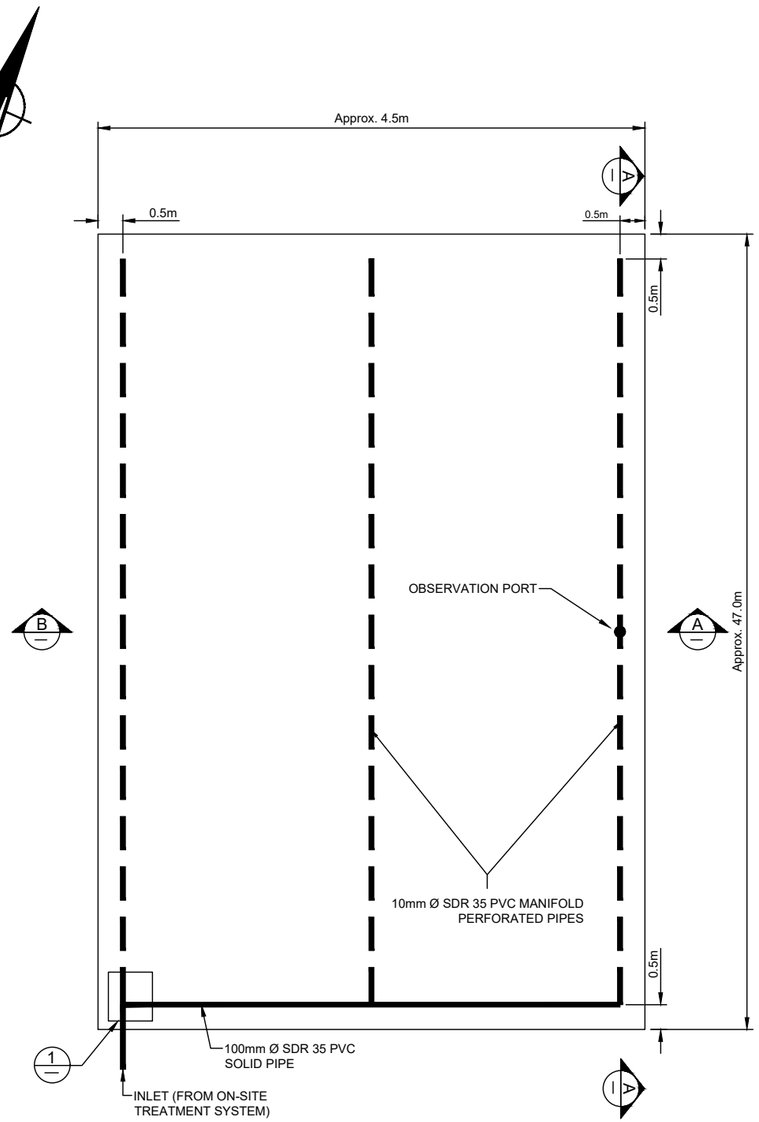
PLOT SCALE: 1:1

CADD FILE NO. I:\12900-12999\12943\Figs\2019_July_07\17-12943-01-R4.dwg

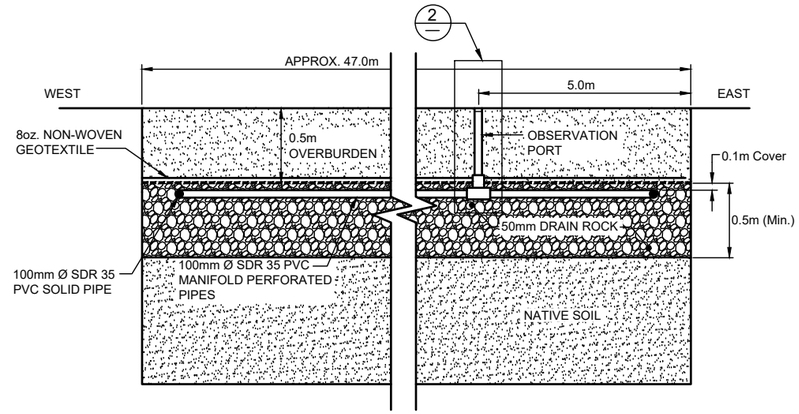
APPENDIX B

INFILTRATION SYSTEM DESIGN

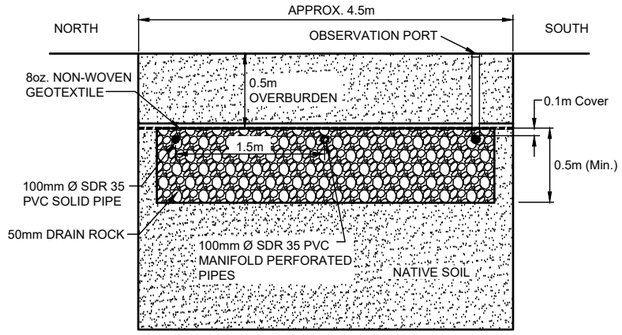
Keystone Environmental
Knowledge-Driven Results



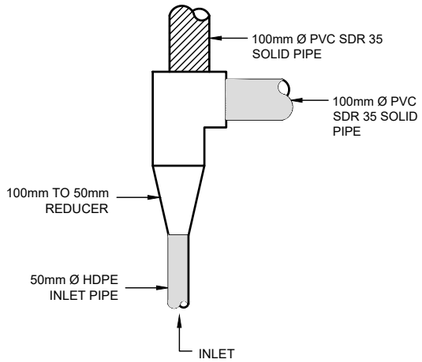
PROPOSED INFILTRATION SYSTEM PLAN
NTS



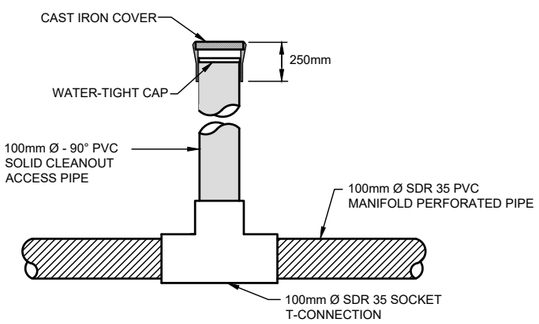
AA INFILTRATION SYSTEM TYPICAL SECTION
NTS



BB INFILTRATION SYSTEM TYPICAL SECTION
NTS



1 PLAN VIEW CONNECTION AT PIPE INLET
NTS



2 SECTION OBSERVATION PORT
NTS

CADD FILE NO. I:\12900-12999\12943\Fig\Nov. 2017\Rev02\17-12943-02-R2.dwg

PLOT SCALE: 1:0.5

No.	DATE	DESCRIPTION	BY	APPROVED
02	2/26/19	Issued for Submission	T.L.	
01	11/07/17	Issued for Client Review	T.L.	
00	10/02/17	Issued for Client Review	A.B.	

REVISIONS

Keystone Environmental

Keystone Environmental Ltd.
Ste. 320 4400 Dominion Street
Burnaby, British Columbia

Derwent Way
New Westminster, B C

DESIGN	APPROVED
ARK	
DRAWN	CHECKED
S.M./S/G	ARK

SCALE: NOT TO SCALE

CLIENT: Summit Earthworks Inc.

Derwent Way Barge Loading Facility
Proposed Infiltration System Plan Sections and Details

DATE	2/26/19
SHEET No.	2 of 3
PROJECT No.	12943-109
REVISION No.	02
DRAWING No.	17-12943-02

APPENDIX C

STORMWATER DESIGN CALCULATIONS

DERWENT WAY BARGE LOADING FACILITY STORMWATER RUNOFF FLOW

Using the Rational Method, City of New Westminster Design Criteria, Port Metro Vancouver PER Guidelines for SPPPs

Keystone Environmental Ltd. Project 12943

July 11, 2019

Catchment	Area (m^2)	Area (hectares)	L (m)	% Packed Gravel	% Coarse Vegetation	% Paved / Impermeable	H (m)	s (%)	C Weighted Rational Coef.	Tc (min)	Event Type	Design Storm	Volume (m^3)	Duration	Intensity* (mm/hr)	Q (m^3/s)	Q (L/s)	Q (GPM)
Waste Storage Area Sump**	2,020	0.2020	60	0%	0%	100%	0.1	0.2	0.90	9	*Storm Drainage*	*1-in-25 year*	2.5	*10 min*	42.0	0.004	4.2	67
												1-in-25 year	5.2	*30 min*	28.4	0.003	2.9	46
												1-in-25 year	7.3	*1 hour*	20.0	0.002	2.0	32
												1-in-25 year	10.3	*2 hour*	14.1	0.001	1.4	23
												1-in-25 year	17.7	*6 hour*	8.1	0.001	0.8	13
Treated Stormwater Total											*Storm Drainage*	*1-in-25 year*	7.3	*1 hour*		0.002	2.0	32
Waste Storage Area Roof Runoff**	2,020	0.2020	60	0%	0%	100%	0.1	0.2	0.90	9	*Storm Drainage*	*1-in-25 year*	11.0	*10 min*	42.0	0.017	17.0	269
												1-in-25 year	31.5	*1 hour*	20.0	0.008	8.1	128
Infiltrated Stormwater Total											*Storm Drainage*	*1-in-25 year*	31.5	*1 hour*		0.008	8.1	128
Remaining Site Area	4,080	0.4080	75	35%	30%	35%	2	2.7	0.60	10	*Storm Drainage*	*1-in-25 year*	17.1	*15 min*	42.0	0.028	28.5	451
												1-in-25 year	48.8	*1 hour*	20.0	0.014	13.6	215
Ditch/Swale Stormwater Total											*Storm Drainage*	*1-in-25 year*	48.8	*1 hour*		0.014	13.6	215

Definitions:

- **L** flow path length
- **H** vertical drop from top of watershed to discharge point
- **s** slope
- **Tc** time of concentration
- **C** runoff coefficient
- **Q** runoff flow

Common Rational Equation Runoff Coefficients for Urban Watersheds (ref: TXDOT)

Type of drainage area	Runoff coefficient
Business:	
Downtown	0.70-0.95
Neighborhood	0.30-0.70
Residential:	
Single-family areas	0.30-0.50
Multi-units, detached	0.40-0.60
Multi-units, attached	0.60-0.75
Suburban	0.35-0.40
Apartment dwelling areas	0.30-0.70

Type of drainage area	Runoff coefficient
Streets:	
Asphaltic	0.85-0.95
Concrete	0.90-0.95
Brick	0.70-0.85
Drives and walks	0.75-0.95
Roofs	0.75-0.95
Industrial:	
Light areas	0.30-0.80
Heavy areas	0.60-0.90
Parks, cemeteries	0.10-0.25
Playgrounds	0.30-0.40
Railroad yards	0.30-0.40

Water Treatment Equipment Sizing for Waste Storage Area

Treatment System Processing Rate 2.5 L/s 39.5 Usgpm

Storage Tank Capacity Required

Storm Event	Flow Rate		Volume Required to Contain	
15 minutes	4.2	L/s	1,570.9 L	413.4 Gallon
1 hour	2.9	L/s	1,334.5 L	351.2 Gallon
2 hour	2.0	L/s	-3,444.4 L	Treatment Rate is higher than precip rate
6 hour	1.4	L/s	-23,214.8 L	

Selected storage tank volume 15,200 L 4,000 Gallons

Time to drain tank from full 101.3 minutes

Reference: Standard Handbook of Environmental Engineering
McGraw-Hill 1990
(used for Tc equation, applying FAA formula, and confirming runoff coefficients)

***IDF Curve:** MetroVancouver Regional IDF Curve Zone 3

Time of concentration: FAA equation: $T_c = G\ (1.1 - c)\ L^{0.5} / (100\ S)^{1/3}$

City of New Westminster: Tc follows FAA equation

Tc (lot size ≤2000 m^2) = 10 min

Tc (lot size >2000 m^2) = 15 min or as calculated

**** Waste Storage Area has roof to prevent infiltration of precipitation to the waste material stored within. Conservatively assume 20% of precipitation reaches waste material based on estimates of driving rain intensity as a proportion of rainfall intensity.**