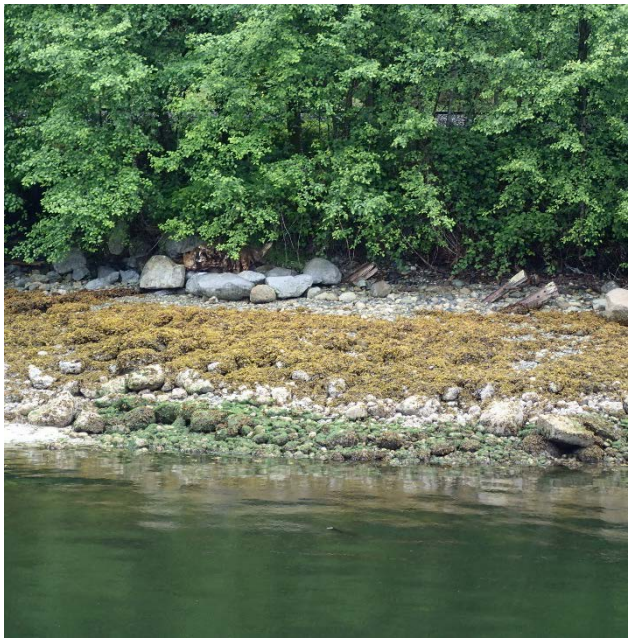
WESTRIDGE MARINE TERMINAL STORMWATER POLLUTION PREVENTION PLAN

WESTRIDGE MARINE TERMINAL UPGRADE AND EXPANSION PROJECT APPLICATION TO VANCOUVER FRASER PORT AUTHORITY

Trans Mountain Pipeline ULC
Kinder Morgan Canada Inc.
Suite 2700, 300 – 5 Avenue S.W.
Calgary, Alberta T2P 5J2
Ph: 403-514-6400



May 2017

Contents

Section Page

Tables

Plates and Figures

Acronyms and Abbreviations

AB	Alberta
Bbl	Barrel
BC	British Columbia
BC MFLNRO	British Columbia Ministry of Forests, Lands and Natural Resource Operations
BC MoE	British Columbia Ministry of Environment
BIEAP	Burrard Inlet Environmental Action Program
BMP	Best Management Practice
BPD	Barrels Per Day
CCME	Canadian Council of Ministers of the Environment
CH2M	CH2M HILL Energy Canada, Ltd.
CP	Canadian Pacific
CoB	City of Burnaby
EHS	Environment, Health and Safety
ERP	Emergency Response Plan
ESB	Electrical Serves Building
ESD	Emergency Shut Down
ESV	Emergency Shutdown Valves
DSU	Dock Safety Unit
FEED	Front End Engineering Design
FIMP	Facilities Integrity Management Plan
HC	Hydrocarbon
IBA	Important Bird Area
ICS	Incident Command System
ISGOTT	International Safety Guide for Oil Tankers and Terminals
KMC	Kinder Morgan Canada Inc.
96-h LC50	50% fish mortality in 100% (undiluted) effluent within 96 hours
MOV	Motor Operated Valve
MSDS	Material Safety Data Sheets
NEB	National Energy Board
NPS	Nominal Pipe Size
the Project	Trans Mountain Expansion Project
ppmv	Parts per Million by Volume
QA/QC	Quality Assurance/Quality Control

sdwt	Summer Deadweight Tonnes
SPI	Solidification Products International
SPPP	Stormwater Pollution Prevention Plan
TMEP	Trans Mountain Expansion Project
TMPL	Trans Mountain Pipeline
TO	Terminal Operator
Trans Mountain	Trans Mountain Pipeline ULC
VCU	Vapour Combustion Unit
VFPA	Vancouver Fraser Port Authority
VRU	Vapour Recovery Unit
WMT	Westridge Marine Terminal

SECTION 1

Introduction

The Trans Mountain Expansion Project (TMEP or the Project) is a proposal to expand the existing Trans Mountain Pipeline (TMPL) system between Edmonton Terminal, located in Sherwood Park, Alberta (AB), and the Burnaby, and Westridge Marine Terminals, both located in Burnaby, British Columbia (BC).

The expansion works at the Westridge Marine Terminal (WMT) includes an expanded water lot and foreshore area, adding a three-berth dock complex, associated process and ancillary infrastructure, Canada Pacific (CP) rail crossing, and a derailment protection barrier and an updated Stormwater Management System.

Stormwater is water that originates from precipitation events that remains on the ground surface and becomes stormwater runoff to ultimately end up in nearby bodies of water. As the stormwater runoff flows over the land it collects debris and contaminants that could negatively impact water quality.

This Stormwater Pollution Prevention Plan (SPPP) has been prepared based on guidance provided by Vancouver Fraser Port Authority (VFPA) and summarizes information gathered to date as part of the National Energy Board (NEB) Facilities Application (the Application) filed to the NEB on December 16, 2013.

The purpose of this SPPP report is to describe updates to stormwaterpollution prevention associated with the expansion works at the WMT. This report further summarizes the hydrologic analysis for the existing stormwater drainage system at WMT which is the basis for sizing the stormwater drainage systems associated with the SPPP.

This SPPP is also intended to provide guidance to Kinder Morgan Canada Inc. (KMC) for the management of stormwater discharge, and for the implementation of Best Management Practices (BMPs) for pollution prevention and response. In addition, it is expected that the current British Columbia Ministry of Environment (BC MoE) Permit will be revised to include the expanded facility operations.

SECTION 2

Overview

2.1 Background

Trans Mountain received official authorization from the Government of Canada allowing the Project to proceed effective on December 1, 2016.

The TMEP will increase TMPL's ability to deliver unrefined product from the Edmonton Terminal to the Burnaby and Westridge Marine Terminals by twinning the existing pipeline system through the addition of Nominal Pipe Size (NPS) 36 and NPS 42 Mainline segments and various infrastructure upgrades and by adding three NPS 30 delivery lines (via a tunnel) between Burnaby and Westridge.

The associated expansion at WMT includes construction of a three berth dock complex, as well as a utility dock for tugs, boom deployment vessels, emergency response vessels, and equipment. The single existing berth will be decommissioned once construction has been completed. In addition to the expanded water lot at WMT within Burrard Inlet, for this complex the foreshore area at the WMT will also be expanded to accommodate the associated equipment and infrastructure.

2.1.1 Project Scope - Westridge Marine Terminal

The scope of work for the WMT facilities includes:

- Existing piping relocates to accommodate the expansion.
- Implementation of various temporary systems to allow continued operation of the current facility during construction. These systems include:
  - Temporary piping relocates
  - Temporary Fire and Foam Systems
  - Temporary Vapour Combustion Unit (VCU)
- Construction of three new incoming NPS 30 delivery lines from the Burnaby Terminal.
  - The existing NPS 24 delivery line from the Burnaby Terminal will remain in operation until the new NPS 30 delivery lines are commissioned.
- Construction of the expanded foreshore area to accommodate the additional equipment and infrastructure.
  - New simplified pigging system for the delivery and dock lines.
  - New valve manifold allowing flow from all three incoming lines to be directed to any berth.
  - New Leak detection and custody transfer metering equipment including a meter prover.
  - Vapour recovery piping from berths to the onshore Marine Vapour Control System (MVCS) including three new Dock Safety Units (DSUs), two new Vapour Recovery Units (VRUs) and a VCU.
- Addition of derailment protection barriers on north (VFPA property) and south side (non-VFPA property) of existing railway.
- Construction of the Westridge dock complex structures, dock civil works, loading arms, and dock electrical systems.
  - Dock piping and support structures.
  - Provision of new spill boom reels

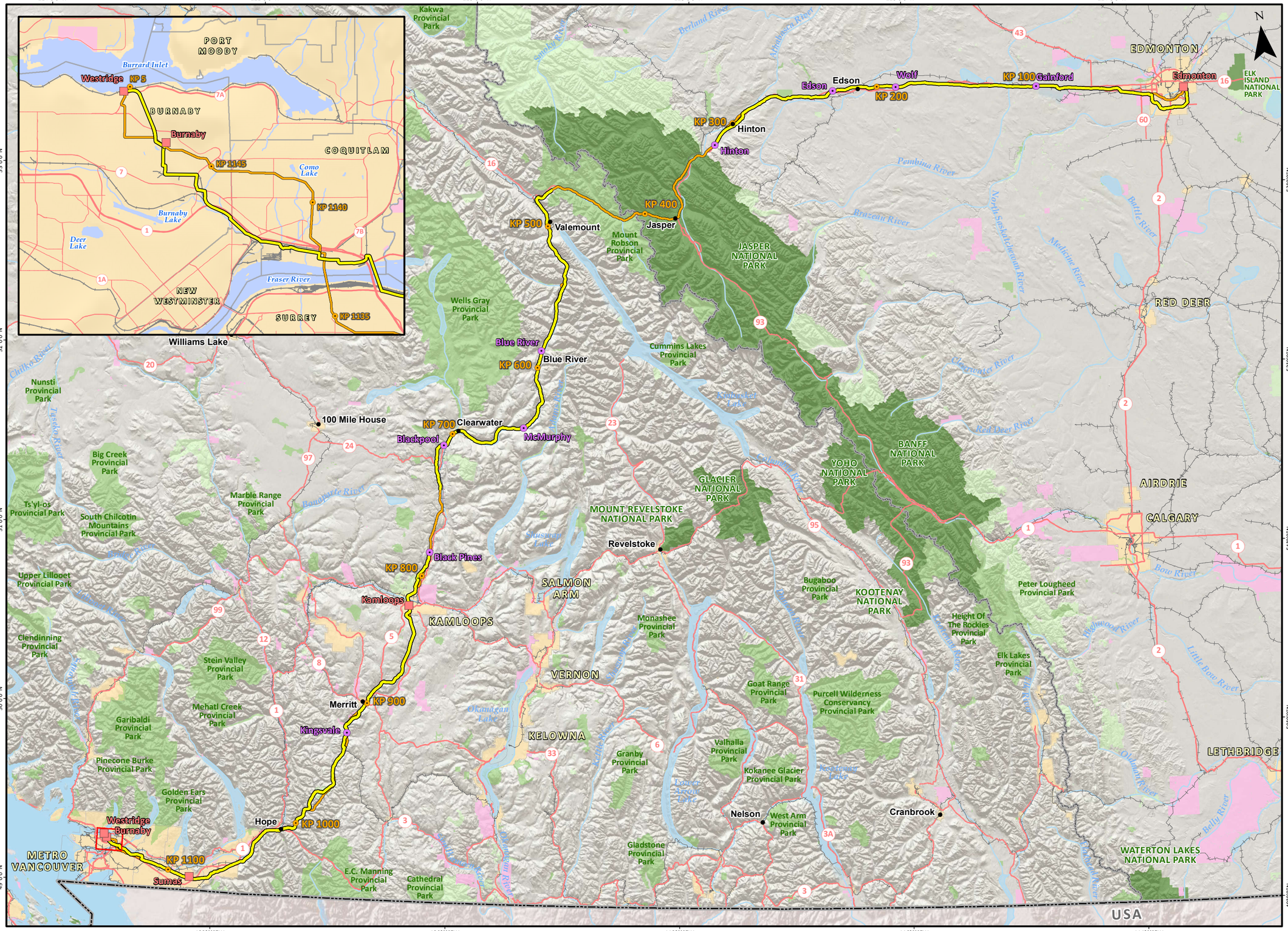
- Addition of a secondary substation and overhead power lines to the foreshore electrical services building.
- Addition of new control systems.
- Addition of new buildings:
  - New Control Room building housing the control and communications equipment.
  - New electrical service buildings (ESBs).
  - New flammables storage building (New Fire Protection System)
- Provision of the following utilities to the new berths.:
  - Utility water wash down
  - Storm water receipt, dock-to-shore facilities
  - Vapour recovery piping from vessels to the Vapour Recovery System located on shore
  - Liquid nitrogen system for vapour piping blanketing and purging
  - VCU fuel supply from a new propane vessel and vaporizer system
  - Fire water and foam systems
  - Process piping and pipe support structures
- A new storm water collection and treatment system to collect and treat potentially contaminated water from housekeeping pads around process areas.
  - This new system replaces any existing storm water management plans at the Westridge Facility.
  - The existing drainage in the Upland areas (south of CP Railway) currently discharge via five outfalls on the Foreshore. This existing drainage will be remain unchanged by the TMEP expansion and the existing five outfalls will be extended to discharge through the new Bulkhead wall.

2.2 Location

The WMT is located in and on the south side of Burrard Inlet within VFPA jurisdiction in Burnaby, British Columbia off the Barnett Highway. The Canadian National Railway runs through the facility.

An artistic image of the expanded WMT is provided in Plate 1 and an overview of the location is provided as Figures 1 and 2.

Plate 1. WMT Artistic Image



TRANS MOUNTAIN

FIGURE 1

REGIONAL OVERVIEW OF THE WESTRIDGE MARINE TERMINAL

TRANS MOUNTAIN EXPANSION PROJECT

- TMPL Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline (TMEP)
- Existing Pump Station
- Terminal
- Highway
- Railway
- City / Town / District Municipality
- Indian Reserve / Métis Settlement
- National Park
- Provincial Park
- Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
- Provincial Boundary
- International Boundary

Projection: Modified LCC.
Proposed Centreline SSEID005, provided by UPI Jan 10, 2017; Baseline TMPL Route Revision 0, provided by KMC, May 2012.
Transportation: IHS Inc., 2016, BC MFLNRO, 2012 & NRCan, 2012; Geopolitical Boundaries: NRCan, 2003, AltaLIS, 2016, IHS Inc., 2015, BC MFLNRO 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2016, AltaLIS, 2010 & IHS Inc., 2015; Hydrology: NRCan, 2010, ESRI, 2005, IHS Inc., 2004 & BC MFLNRO, 2008; Parks and Protected Areas: NRCan, 2015, AltaLIS, 2012, ATPR, 2012 & BC MFLNRO, 2008; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: Copyright: © 2014 Esri.

This document is provided by Kinder Morgan Canada Inc. (KMC) for use by the intended recipient only. This information is confidential and proprietary to KMC and is not to be provided to any other recipient without the written consent of KMC. It is not to be used for legal, engineering or surveying purposes, nor for doing any work on or around KMC's pipelines and facilities, all of which require KMC's prior written approval.

ch2m SM
Suite 1100, 815 8th Avenue SW, Calgary, AB. T2P 3P2

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

MAP NUMBER		PAGE
201701_MAP_CH2M_GEN_00990_REVA		SHEET 1 OF 1
DATE: January 2017	TERA REF.: 687945	REVISION: A
SCALE: 1:2,250,000	PAGE SIZE: 11x17	DISCIPLINE: GEN
DRAWN: CMR	CHECKED: DJN	DESIGN: TGG

0 25 50 75 100 km

ALL LOCATIONS APPROXIMATE

201701_MAP_CH2M_GEN_00990_RevA.mxd

TRANS MOUNTAIN

FIGURE 2

WESTRIDGE MARINE TERMINAL LOCATION

STORMWATER POLLUTION PROTECTION PLAN FOR THE TRANS MOUNTAIN PIPELINE ULC TRANS MOUNTAIN EXPANSION PROJECT

- Trans Mountain Expansion Project Kilometre Post (KP)
- Trans Mountain Expansion Project 100m Marker
- Trans Mountain Expansion Project (TMEP) Proposed Pipeline Centreline
- Road
- Highway
- Railway
- Facility Property Boundary
- Easement
- Extra Temporary Workspace
- TMEP Proposed Pipeline Corridor
- Area to be Cleared for Tunnel Portal Development

This document is provided by Kinder Morgan Canada Inc. (KMC) for use by the intended recipient only. This information is confidential and proprietary to KMC and is not to be provided to any other recipient without the written consent of KMC. It is not to be used for legal, engineering or surveying purposes, nor for doing any work on or around KMC's pipelines and facilities, all of which require KMC's prior written approval.

Projection: NAD 1983 UTM Zone 10N.
Proposed Routing, KPs - SSEID005: UPI, Jan. 10, 2017; Corridor (V11): KMC, April 29, 2016; Facilities: KMC, Dec. 2, 2016; Tunnel Portal Development Area: KMC, Nov 1, 2016; Transportation: BC FLNRO 2012; Geopolitical Boundaries: BC MFLNRO 2007, BC MCSCD 2016; Imagery: KMC 2016.

ch2m SM

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

MAP NUMBER		PAGE
201612_MAP_CH2M_FAC_00966_REVB		SHEET 1 OF 1
DATE January 2017	CH2M REF. 664818	REVISION B
SCALE 1:2,500	PAGE SIZE 11x17	DISCIPLINE FAC
DRAWN DJN	CHECKED JRO	DESIGN DR

0 25 50 75 100 m

ALL LOCATIONS APPROXIMATE

201612_MAP_CH2M_FAC_00966_RevB.mxd

2.3 Methods

- The development of the SPPP was based on input from the following reference documents:
  - WMT Design Basis Memorandum Front End Engineering Design (FEED) Phase.
  - WMT Storm Water Management and Spill Containment Philosophy.
  - TMEP Westridge Marine Terminal Hydrology Report for Stormwater Drainage rev B (14 Dec 2016).
  - Volume 7 of the Application, Appendix E – Hazard Risk Assessment Technical Report (Filing ID A3S4W7).
  - WMT Environmental Protection Plan.
- The stormwater drainage design aspect of the SPPP is based on information from the hydrologic analysis as detailed in Section 3.3.

SECTION 3

Site Inventory

3.1 Activities

3.1.1 Current Operating Activities

The WMT currently has one dock with one berth. In addition to the dock, WMT has three storage tanks, with a total volume of 62,800 m^3 (395,000 bbl), currently being used to store jet fuel for delivery to the Vancouver International Airport.

Typically, five tankers and three barges are loaded with crude oil each month and jet fuel is unloaded from one or two barges each month. The number of vessels handled each month fluctuates based on market conditions and has been somewhat lower than average in 2015 and 2016.

Primary Operating Activities include:

- Loading Operations
- Ship to ship transfers
- Pigging Operations
- Jet Fuel Unloading and storage

Secondary Activities include:

- Fueling and servicing of equipment.
- Repair and maintenance activities:
  - Cleaning
  - Painting
  - Replacement of equipment and piping

Current on-site activities require small amounts of gasoline, diesel, oil, lubricant, and grease for fueling and maintaining on site equipment. All chemicals are stored in accordance with applicable regulations or Material Safety Data Sheets (MSDS) in appropriate storage buildings.

Vehicles are driven and parked on-site; however, all vehicles will be fueled off-site. No engine or vessel maintenance is conducted on-site including boat washing, sanding, blasting, welding, or metal fabrication.

No waste, other than domestic, is generated on-site. Waste oil from moored vessels is removed by a third-party and disposed of off-site.

3.1.2 Expansion Activities

The proposed construction and demolition activities associated with the expansion at the WMT will occur over at least two years during both summer and winter seasons.

A Construction Work Plan will be developed and submitted by the Construction Contractor, prior to start of construction, which will address the following construction and demolition activities:

- Excavation, infilling, and regrading:
  - Of existing shoreline habitat to accommodate new onshore infrastructure.
- Construction of a new three berths loading dock.

- On-site fueling and servicing of construction equipment.
- Concrete forming, pouring, and curing
- On-site material preparation, including cutting, cleaning, welding, and painting
- On-site material and waste storage
- Testing for contaminants (soil and water)
- Off-site disposal of material

3.1.3 Future Operational Activities at the Expanded Facility

The type of operational activities at the expanded facility will remain the same as current operations, however the frequency of loading operations will increase. The number of barge loadings is not expected to change and the number of barge unloadings is expected to decrease once the Vancouver Airport Fuel Delivery Project is commissioned.

On-site activities will continue as detailed in Section 3.1.1, Current Operating Activities.

3.2 Materials

Piping, valves and equipment at WMT have low probability potential to leak hydrocarbons onto land or water. Stored materials could act as pollutants if leaks or spills onto land or water are not prevented.

Toxic or hazardous materials to be stored and/or used on site (in low volume for localized use) may include:

- Petroleum fuels (for example, diesel and gasoline, unrefined product)
- Hydraulic and lubricating oils
- Cleaning supplies
- Facility maintenance supplies (for example wood preservative, spray paint, corrosion inhibitor)
- Solid waste/garbage

Pollution prevention associated with the storage of these materials will be achieved using the BMPs and mitigation measures described in Section 5.1.1.

3.3 Hydrologic Assessment

A hydrologic assessment was conducted for the design of the WMT to estimate the runoff response, including flow rates and runoff volumes for various rainfall events. The design of the WMT stormwater management system will take into account the results of the hydrologic assessment. The following subsections describe the information considered in the hydrologic assessment

3.3.1 Sub-Catchment Areas

The WMT footprint is divided into two catchment areas:

- Process Areas
- Non-process Areas

Details of the stormwater management strategy for these areas is provided in Section 5.1, Management Strategy.

3.3.1.1 Process Areas

Process areas refer to the local curbed containment (housekeeping pads) around areas in the facility that contain flanges, valves, pumps, pig traps and others that have the low probability potential for hydrocarbon leaks. These areas of the facility will be installed within local curbed containment areas (housekeeping pads) to avoid discharge to the marine environment.

Water from these contained areas, including on the new docks, will be drained to the new water treatment system on shore.

Housekeeping pads are provided for the following process areas:

- Uplands Area – south of the CP Railway
  - Receiving Trap and Valve Manifold Area
- Foreshore Area – north of the CP Railway
  - Metering and Sending Trap Area
  - Vapour Recovery Unit Area
  - Emergency Shut Down (ESD) Valve Area
- Loading Berths 1, 2, and 3

3.3.1.2 Non-process Areas

Non-process areas are any areas outside of housekeeping pads. The runoff from these areas is considered to be clean. The areas of the WMT developed in this Project will be graded to allow all clean surface run-off to be directed to existing site drainage locations. Selected non-process runoff will be directed through specialized filter packages (SPI Petrobarriers) prior to discharge to existing drainage. These SPI filters allow water to pass through, but retain all hydrocarbon, and plug when saturated.

Site grading will occur in non-process areas. The rough or finished grading will not reduce depth of cover over existing buried facilities, such that damage due to frost or live loads will occur. The finished grade will provide positive drainage away from structures, building foundations, and other foundations.

The surface finishing will be gravel in yard areas except asphalt paving on site roads, and curbed concrete at selected facilities, and hydro-seeded grass on restored hillside slopes.

3.3.2 Runoff Analysis

The Rational Method uses empirical linear equations to compute the peak runoff rate from a selected period of uniform rainfall intensity. Originally developed more than 100 years ago, it continues to be useful in estimating runoff from simple, relatively small drainage areas. This method is limited to drainage areas with generally uniform surface cover and topography which is the case of WMT.

3.3.3 Sub-Catchment Delineation

AutoCAD Civil 3D tools were used to delineate the sub-catchments based on the proposed site layout. Appendix A shows the sub-catchments, area, and potential flow path.

3.3.4 Runoff Coefficient

The runoff coefficient used in the analysis was based on the 2016 City of Burnaby (CoB) Design Criteria Manual. Table 3-1 shows the CoB proposed values for Industrial Areas.

Table 3-1 Runoff Coefficient

Land Use	Percent Impervious	Runoff Coefficient 10 yr Storm*	Runoff Coefficient 100 yr Storm
Industrial	90	0.8	0.95

* To compute the 100-year flows, increase above runoff coefficient by 20%, up to a maximum, of 0.95.

SECTION 4

Issues Identification and Risk Analysis

4.1 Applicable Standards, Acts and Regulations

The applicable standards, acts, and regulations for stormwater management include the following:

- Port of Vancouver Authority – Environment Policy
- BC Regulation 168/94, 10 June 1994 – *Environmental Management Act* – Petroleum Storage and Distribution Facilities – Storm Water Regulation
- BC *Environmental Management Act* - Contaminated Site Regulation
- BC *Environmental Management Act* – regulations regarding the unauthorized release of substances into the environment
- BC *Environmental Management Act* – regulations regarding the storage, handling, and disposal of hazardous materials and waste.
- *Fisheries Act*
- *Shipping Act*
- *Canadian Environmental Protection Act, 1999*
- *Transportation of Dangerous Good Act*
- *Canada Marine Act* – Port Authorities Management Regulations
- *Canada Marine Act* – Port Authorities Operations Regulations
- *Canadian Environmental Assessment Act, 2012*
- Canadian Council of Ministers of the Environment (CCME) Environmental Quality Guidelines
- Health Canada Contaminated Sites Guidelines

4.2 Potential Pollutant Sources

Potential stormwater contamination exists due to a range of products being transferred or stored in the WMT and the associated infrastructure that facilitate loading operations.

The following is a list of piping and equipment that could potentially leak or discharge hydrocarbon products or chemicals into the environment during normal operation:

- Pipelines
- Handling facilities (such as pig receiving and sending traps, prover and metering equipment).
- Pumps and manifold piping, valves, flanges, fittings
- Components of the dock complex requiring hydraulic oil such as, loading arms.
- Above ground jet fuel storage tanks
- Foam system equipment (foam concentrate tank and foam pumps)
- Diesel engine driven equipment and generators
- Oil-filled transformers
- On-site staff and maintenance vehicles

4.3 Potential Sensitive Receptors

4.3.1 Environmental

The WMT is located within an area designated as "Port Terminal" as defined by the Port Metro Vancouver Land Use Plan (Port Metro Vancouver, 2014). While the WMT is located within the Port Terminal land use area, the south boundary is directly adjacent to Burrard Inlet. Burrard Inlet is considered a sensitive habitat feature, providing habitat for marine fish and mammals, wildlife, and marine birds. Additionally, Burrard Inlet is part of the English Bay and Burrard Inlet IBA (IBA020) (Bird Studies Canada and Nature Canada 2013, BirdLife International 2013). The Project Description of the VFPA Permit Application identifies potential environmental effects related to expansion and operations of WMT and includes a summary of proposed mitigation measures.

The stormwater management strategy for WMT has been designed to ensure that stormwater quality released off-site meets applicable permitting requirements.

4.3.2 Public and Aboriginal

WMT is located in the vicinity of residential use land in the CoB. The closest residences, elementary schools, assisted living complexes, and parks were identified as part of the Human Health Risk Assessment (HHRA) of WMT Technical Report (Intrinsik Environmental Sciences Inc. June 2014) that was completed for the NEB Application (NEB Filing IDs A3Y1F4, A3Y1F5). In total, 52 locations were identified as part of the assessment of potential health risks. These locations are summarized in Table 4-1.

Table 4-1. Selected Locations near WMT at which People Would Reside or Visit[1]

Description	Count	Rationale
Aboriginal Communities	2	The nearest Aboriginal community is the Tsleil-Waututh Nation (Burrard Inlet Indian Reserve 3), which is located near Indian Arm on the north shore of Burrard Inlet, approximately 2 km northwest of WMT. Although further removed from WMT at a distance of approximately 5 km, the Aboriginal community of the Squamish Nation (Seymour Creek 2) also is located on the north shore of Burrard Inlet.[2]
Closest Residences	3	Includes closest residences identified in the Terrestrial Noise and Vibration Technical Report (Volume 5D of the NEB Application [NEB Filing ID A3S1T7, A3S1T8, A3S1T9]). The nearest residence lies approximately 100 m south of the terminal (Section 6 in Volume 5B of the NEB Application (NEB Filing ID A3S1S5]).
Closest Elementary Schools	8	Includes closest elementary schools identified within the Board of Education Burnaby School District 41 (Burnaby School District 2013) and North Vancouver School District 44 (2013). The nearest elementary school lies approximately 1 km southwest of the terminal.
Closest Assisted-living Complexes	2	Includes closest assisted-living facilities reported by the Fraser Health Authority (2011).
Non-Aboriginal Communities	22	Includes all communities identified by the Village of Belcarra (2014), City of Burnaby (2014), City of Coquitlam (2013), the District of North Vancouver (2014) and the City of Port Moody (2014).
Closest Provincial and Municipal Parks	10	Includes closest parks identified by the City of Burnaby (2014) and District of North Vancouver (2013). The nearest park is the Burnaby Mountain Conservation Area which is located adjacent to WMT.
Closest Recreational Areas	5	Includes closest recreational areas (i.e., golf courses identified in the Socio-Economic Technical Report (see Volume 5D of the NEB Application).

Notes:

Table 4-1. Selected Locations near WMT at which People Would Reside or Visit[1]

Description	Count	Rationale

[1] Information excerpted from NEB Application (Exhibit B107-1, Human Health Risk Assessment of Westridge Marine Terminal Technical Report, Table 3.5 [NEB Filing ID A3Y1F4]).

[2] WMT is located in the traditional territories of Semiahmoo First Nation, Katzie First Nation, Kwikwetlem First Nation, Qayqayt First Nation, Squamish Nation, Tsleil-Waututh Nation, Musqueam First Nation, Tsawwassen First Nation, Métis Nation British Columbia, and Peters Band (Table 5.2-1, Volume 5A of the Facilities Application [NEB Filing ID A3S1L5).

4.4 Identified Issues

Process areas contain flanges, valves, pumps, pig traps and other equipment that have the low probability potential for hydrocarbon leaks as a result of a flange leaks from causes such as gasket failures in valves and piping connections.

Risk assessments will be completed as part of the Trans Mountain Facilities Integrity Management Plan (FIMP) to match those that are done for existing facilities.

The Facility Qualitative Risk Assessment Procedure is an element of the FIMP. The intent of the procedure is to examine facility components to identify high risk elements or scenarios within the facility. The process includes a review of control measures to prevent or minimize the impact from identified hazards. Associated facility assets that require inspection, testing and maintenance are tracked through the company's computerized maintenance management system (CMMS) using a work order process. All facility integrity related work orders are tagged in the CMMS so that completion status can be monitored and compliance reports generated. The CMMS is used to confirm that mitigation measures are appropriately implemented and that assets are inspected, tested and maintained to ensure safe operation of the facility.

The current list of hazards and scenarios that are considered along with potential prevention and consequence reduction measures are included as Volume 7 of the Application, Appendix E – Hazard Risk Assessment Technical Report (Filing ID A3S4W7).

4.5 Identified Pollutant Pathways

Clean stormwater runoff from non-process areas, where it will not have the potential to be contaminated, will be directed to existing site drainage locations. The existing drainage currently discharges via five outfalls on the foreshore which will be extended to discharge through the new Bulkhead wall.

During normal operating, the only pollutant pathway for the site is via the storm water drainage system which is associated with process areas where it is at a low probablity risk for hydrocarbon contamination. Stormwater from these areas is carefully monitored, collected and routed through a stormwater collection and treatment system before being discharged to the Inlet. For these process areas, housekeeping pads with curbs and hydrocarbon detection will be provided for localized containment of stormwater and early detection of possible hydrocarbon leaks.

Selected non-process runoff will be directed through SPI filter packages prior to discharge to existing drainage. In the event of a larger hydrocarbon release, the SPI filter packages will form a seal that will prevent any hydrocarbons from entering the environment and the contaminated stormwater runoff will be diverted to the Stormwater Treatment System on the foreshore. Further details of the stormwater management plan are provided in Section 5.1.

SECTION 5

Stormwater Pollution Prevention Plan

5.1 Management Strategy

The stormwater management strategy involves strategic site grading and stormwater collection systems which together with water treatment equipment and pollution detection instruments is designed to ensure that the quality of stormwater that is released off-site meets the applicable permitting requirement of less than 5 ppmv total hydrocarbon concentration in the outlet stream.

Under all normal operating circumstances and under foreseeable spill circumstances (where individual containment system controls function as designed), hydrocarbon contamination is expected to be < 5 ppmv in the outlet stream to the Burrard Inlet.

The stormwater management strategy is as follows (shown in Figure 5).

5.1.1.1 Stormwater from Non Process areas (Clean Runoff, Area A)

- The stormwater drainage design will include construction of catch basins, where feasible, to route stormwater runoff to a non-process storm water collection sump before discharge to local clean drainage (Uplands Area, south of the railway) or to the Burrard Inlet (Foreshore).
- Stormwater runoff from the Foreshore and Dock road surfaces will either drain to surrounding gravel surfaces and infiltrate or sheet flow to the Burrard Inlet.

5.1.1.2 Stormwater from Non Process Areas (West End of Foreshore Areas and Uplands Area, Non-housekeeping Pad Area, Area B)

- Stormwater from sub-catchments on the west side of the Foreshore and adjacent to the Receiving Trap and Valve Manifold Area of the Uplands Area have increased potential to be contaminated from nearby Process Areas. These sub-catchments will have two drainage options:
  - Option 1: If the stormwater runoff is clean, it will be routed to SPI PetroBarrier filters before discharging to the Burrard Inlet (Foreshore) and local clean drainage (Uplands).
  - Option 2: If the stormwater runoff is contaminated, it will be routed to treatment before being discharged.

5.1.1.3 Stormwater from Process Areas (Housekeeping Pad Areas, Potentially Contaminated Runoff, Area C)

- A new stormwater collection and treatment system will be installed to collect and treat stormwater from housekeeping pads around newly constructed process areas where it will have the potential to be contaminated by hydrocarbons.
- Inside each housekeeping pad, the stormwater will be collected in stormwater collection sumps equipped with hydrocarbon (HC) detection and isolation valves. Outlet Motor Operated Valves (MOVs) will be “Normally Open” with interlocks to the HC detectors to close on the detection of hydrocarbons, allowing the opportunity for localized clean-up, should it be required.
- Stormwater flow from each housekeeping pad will flow by gravity. Stormwater runoff from the dock loading berths will be collected in a stormwater sump tank on each berth and pumped to the Foreshore.
- Stormwater from potentially contaminated areas will be routed to treatment.

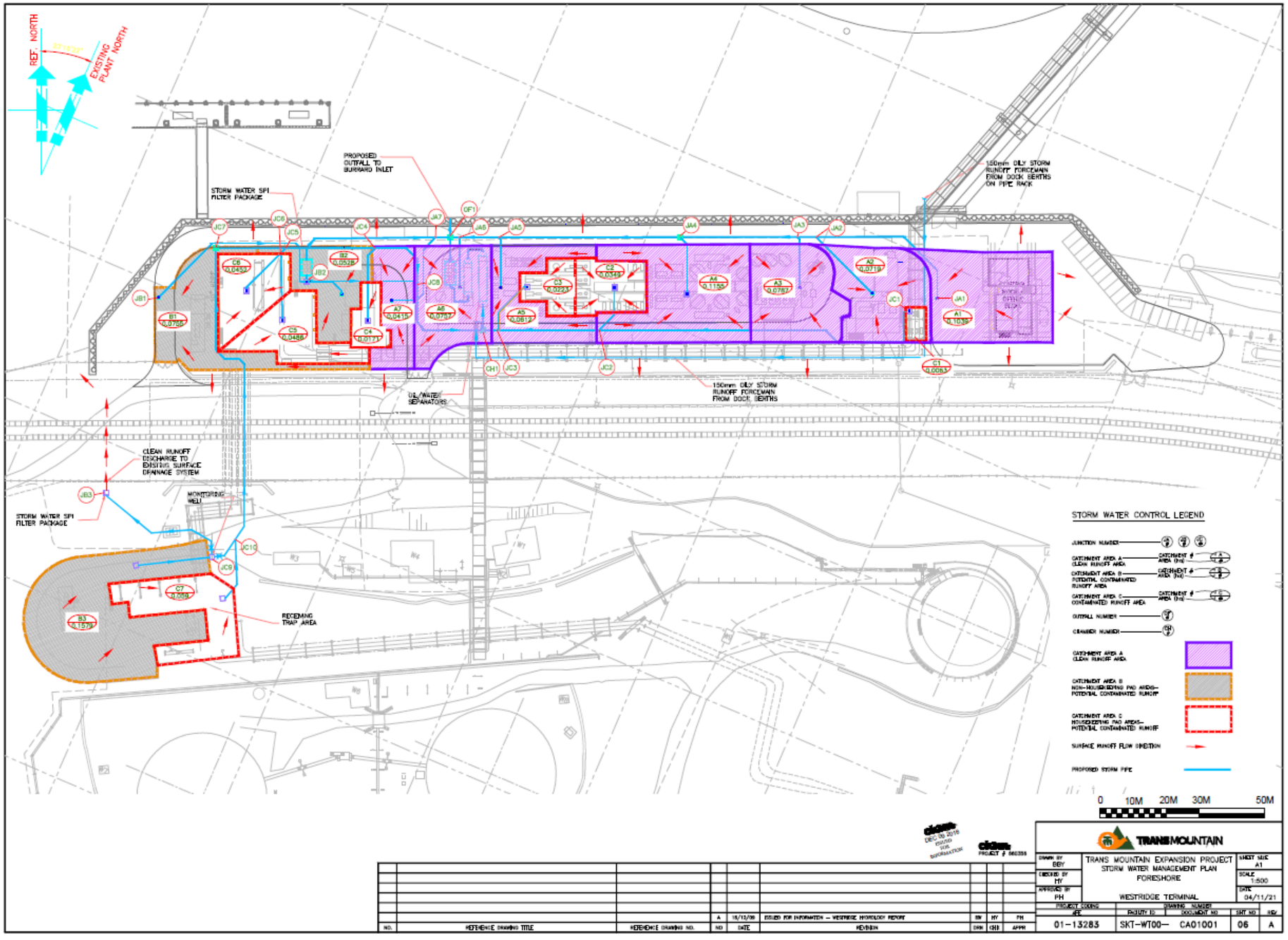


Figure 3. Westridge Marine Terminal – Stormwater Management Plan - Foreshore

5.1.2 Treatment

5.1.2.1 Process Areas

Inside each process area housekeeping pad, the storm water will be collected in a Storm Water Collection Sump equipped with hydrocarbon (HC) detection and isolation valves. Outlet MOVs will be "Normally Open" with interlocks to the hydrocarbon detectors to close on detection of hydrocarbons, allowing the opportunity for localized clean-up, should it be required.

Overflow from the collection sump spills into the housekeeping pad as additional capacity to the collection sump and an overflow pipe is provided in the containment sump to discharge water into Storm Water Treatment System to prevent the housekeeping pad from overflowing.

Storm water flow from each housekeeping pad is by gravity except for the dock loading berths where the storm water runoff is collected in a Storm Water Sump Tank on each berth and pumped to the foreshore.

Collected stormwater from all curbed process areas will be directed to a 3-stage Stormwater Treatment System which comprises the following equipment:

1. Gravity Oil Water Separator (~ 40 ppmv oil in outlet stream)
2. High Efficiency Oil Water Separator (10 to 15 ppmv oil in outlet stream)
3. SPI as a final polishing step prior to discharge to Burrard Inlet via the single new outfall (< 5 ppmv oil in the outlet stream)

The SPI will be implemented to ensure oil is removed to < 5 ppmv levels and will form a seal in the event of a larger release that will prevent any oil from entering the environment. The hydrocarbon will be contained upstream of the SPI filter in the two oil water separators for recovery by vacuum truck.

Terminal stormwater discharge treatment system will be evaluated and upgraded as required to meet new permit requirements at the expanded terminal.

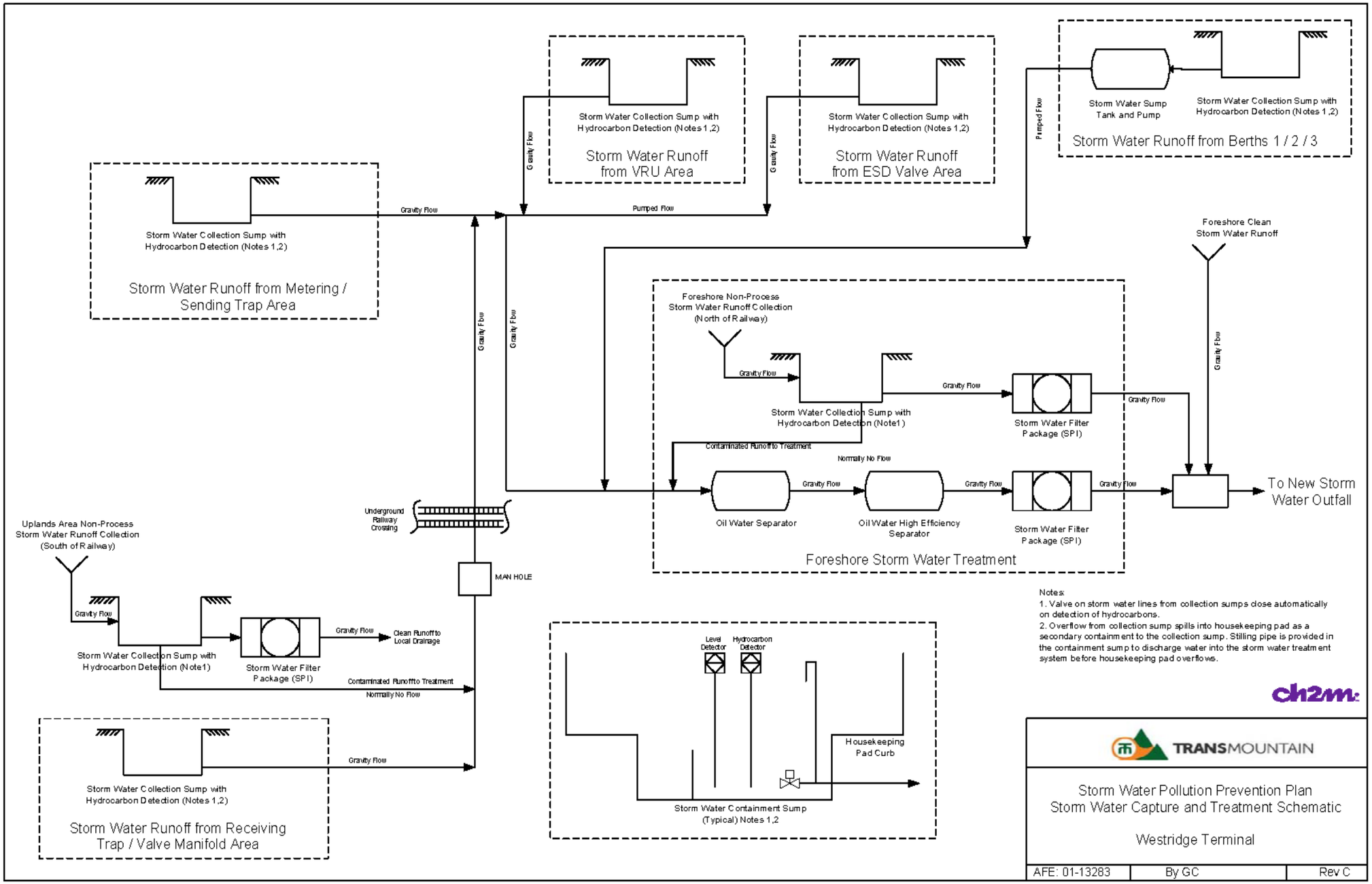
5.1.2.2 Non-process Areas

Directly outside of the process areas, civil drainage design will include construction of catch basins where feasible, to direct stormwater runoff to a non-process Stormwater Collection Sump before flowing through an additional SPI to filter and clean the stormwater before discharging to local clean drainage (uplands area, south of the railway) or to the Burrard Inlet (foreshore).

In the event of a larger release, the SPI will form a seal that will prevent any hydrocarbon from entering the environment and the stormwater runoff will be diverted to the Stormwater Treatment System located on the foreshore.

Isolation valves will be provided on all discharge lines at the bulkhead wall upstream of the new outfall as a final means to prevent any discharge to the Inlet if necessary.

Figure 4. Westridge Marine Terminal - Stormwater Capture and Treatment Schematic



5.1.3 Containment/Reduction

There are a number of levels of protection incorporated in the design of the WMT expansion to substantially reduce the likelihood of contaminated stormwater runoff being discharged to the Burrard Inlet:

- Hydrocarbon detectors alert operators to the presence of hydrocarbons. Automated valves close on detection of hydrocarbon to contain contaminated stormwater within stormwater collection sumps located inside each housekeeping pad. These containment sumps together with the overflow capacity in the housekeeping pad containment, provides sufficient retention time for operators to initiate a shutdown and isolate the system if required. Once isolated the sumps also facilitate localized clean-up by vacuum trucks, if required.
- An overflow pipe is provided in the containment sump to discharge water into the Stormwater Treatment System to prevent the housekeeping pad from overflowing to the environment.
- Isolation valves will be provided on all stormwater discharge lines at the bulkhead wall as a final means to prevent any discharge to the Inlet if necessary.

5.1.3.1 Housekeeping Pads

Housekeeping pads with curbs and hydrocarbon detection will be located around the following process areas for localized containment of stormwater and any possible hydrocarbon leaks. The spill containment philosophy for the process containment areas is based on the following:

- Estimated Spill Containment Volume:
  - Berths and process areas associated with Emergency Shutdown Valves (ESV): Full design flow of the pipeline(s) for 30 seconds which is the maximum allowable closing time of the ESVs = 729 bbl.
  - Other process areas: 10% of one pipeline flow at design flow rate of 700,000 BPD for 15 minutes = 729 bbl.

Housekeeping pads will extend at least 1 m outside of any flange or mechanical break in the process area. Housekeeping pads will be sized to provide the minimal design spill volume utilizing minimum 8 inch (200 mm) curb heights. In some areas, where necessary, the curb height may be increased to achieve the required containment capacity. This design is currently under review.

In addition to the housekeeping pads, portable catch basins will be used under pig traps when opening trap closures to install or remove pigs during a pigging operation.

5.1.4 Quality Assurance/Quality Control Program

The existing WMT currently maintains a water quality Quality Assurance/Quality Control (QA/QC) Program. During each monitoring period, a field duplicate and a field blank sample are submitted for analysis. Test frequency and tested parameters are:

- Monthly testing for total extractable HC (mg/L)
- Annual testing for toxicity (96-h LC50)

The relative percent difference (RPD) for total extractable hydrocarbons is calculated for concentrations above detectable limits; however, all testing completed in 2015 yielded results below laboratory reportable detection limits. Laboratory results of the field blanks were also compliant with the recommended limits. For this same test period, all water quality parameters were found to be within the permitted limits. Water quality monitoring results are reported annually to the BC MoE as per a requirement of current permitting conditions. These procedures will continue during construction and operations of the expanded WMT.

5.1.5 Prevention

WMT is an established operating oil handling facility and already has a well-tested and comprehensive Emergency Response Plan (ERP) available for the current operations. This ERP is a flexible document that provides the operators of WMT to address various types of hazards. The ERP will be updated prior to operation of the WMT to cover the expanded facilities.

KMC's priority is the prevention of incidents. This is achieved through various means, including standards for site management; risk assessment and management; formal internal audits; training and procedures; and preventative and predictive maintenance.

In the case of preventing potential spills from the WMT, a comprehensive Spill Prevention Plan comprises the following:

- Operator training
- Remote ESD capability
- Pre-booming of vessels
- Numerous requirements of vessels
- Ship-Shore Safety Conference

5.1.5.1 Remote Emergency Shut Down

KMC has installed a remotely-controlled motorized ESD for all dock line valves. In the event of an emergency, the Terminal Operator (TO) can remotely activate the system from either the Terminal Control Room or the Dock Area. See Section 5.1.3.3 for more information. Examples of when the ESD may be employed include:

- Vessel requirements/limitations
- Mooring line standards
  - Barges under 6,500 sdwt require a minimum of 6 lines
  - Barges over 6,500 sdwt require a minimum of 8 lines
  - Tankers require a minimum of 10 lines
- Wind loads
  - 30 knots – stop cargo transfers
  - 35 knots – disconnect hoses
  - 40 knots – the vessel will be asked to sail from the dock

5.1.5.2 Transfer Operations

The loading and discharging of vessels at the WMT shall be in accordance with the International Safety Guide for Oil Tankers and Terminals (ISGOTT). A ship/shore safety checklist and a ship/shore Cargo Handling Plan are used to control all transfer operations/procedures.

5.1.5.3 Halting Operations

Transfer operations will immediately be halted in the event of any of the following conditions:

- Fire or explosion on the vessel or dock regardless of size
- Spillage (or suspected spillage) of cargo
- Marine incident in the vicinity of the WMT (including excessive speed of passing vessels)
- Adverse weather, winds or electrical storms
- The presence of potentially-dangerous vapour levels
- Failure of the communications system
- Inadequate mooring

- At the request of either the vessel or the WMT
- Either the shore or vessel person-in-charge is absent without relief
- Any other unsafe condition exists

5.1.5.4 Ship-Shore Safety Checklist

The Ship-Shore Safety Checklist is completed and signed by the ship representative and KMC personnel before transfers are initiated. The Ship Shore Safety Checklist includes:

- Is the vessel securely moored?
- Is there safe access between vessel and shore?
- Are adequate insulating means in place in the ship/shore connection?
- Are fire hoses and firefighting equipment on board and ashore positioned for immediate use?
- Are there sufficient personnel on board and ashore to deal with an emergency?
- Is self-contained breathing apparatus available?
- Are the sea chest valves isolated and sealed?
- Are all cargo tank lids closed?
- Are scuppers effectively plugged and drip trays in position both on board and ashore?
- Are the cargo arms properly rigged?
- Is radar switched off? AIS on low power?
- Is main tug/engine propulsion available at all times (no engine repairs)?
- Has the agreed tank venting system been discussed?
- Are ship/shore communications operative and of the approved type?
- Has a cargo detail sheet been issued (i.e. volume, density, temperature, etc.)?
- Has a Material Safety Data Sheet been issued?
- Has the ship/shore stop been agreed to?
- Have procedures for loading/unloading (i.e. start-up rate, normal rate, topping rate) been discussed?
- Have emergency shutdown procedures been agreed to?
- Have smoking requirements been discussed?

SECTION 6

Implementation and Monitoring

6.1 Implementation and Monitoring

The SPPP will be included in construction contract documents as they apply to all contractors, subcontractors and vendors working on site during construction phase activities. KMC will enforce the Plan to prevent any non-compliances. The Plan will be reviewed on a regular basis during construction to ensure its effectiveness and identify required revisions.

Stormwater will be monitored on a regular basis during operations by conducting a visual inspection and collecting samples. Automated hydrocarbon detectors located in the stormwater collection sump inside each housekeeping pad and in strategic areas in non-process areas, will notify Operators of the presence of hydrocarbons in the stormwater. In addition, the effluent will be inspected for the presence of odor, foam, discoloration, sediment and/or an oily sheen. If stormwater effluent is found to be abnormal, the cause of the abnormality will be investigated and appropriate mitigating action will be taken to return the quality of the stormwater effluent to normal and prevent future reoccurrences. KMC operators will monitor local weather reports for upcoming storm events and conduct inspections during a period when a stormwater discharge is occurring.

In compliance with requirements and recognized BMPs, KMC has developed an integrated approach to emergency management, which includes:

- A documented Environment, Health and Safety (EHS) Management System
- A comprehensive Emergency Management Program, which includes:
  - Emergency vulnerability identification
  - Goals, objectives and targets
  - Incident Command System (ICS) guide
  - ERPs
  - Control point manuals
  - Field guide manuals
  - Training/exercise program
  - Post incident evaluations
  - Continuing education and consultation with first responders, municipalities, and the public

6.2 Adaptive Management and Continuous Improvement

KMC will review the contents of the Plan on an annual basis, to ensure all potential stormwater exposures have been identified and that the management practices are appropriate and adequate. SPPP inspection reports will be reviewed for trends in effective and ineffective mitigation actions and measures. KMC has established procedures to monitor and measure performance on a regular basis. These checking and corrective actions include:

- Both qualitative and quantitative measures, appropriate to the needs of the organization
- Monitoring such that the objectives and targets identified in the policy and planning activities are met
- Monitoring the effectiveness of the controls put in place with measures that validate the performance of the system
- Reporting and investigating incidents to identify root cause(s) and ensure that any preventative and corrective actions are fully implemented.

SECTION 7

References

7.1 Literature Cited

Bird Studies Canada and Nature Canada. 2012. Important Bird Areas. Website: http://www.ibacanada.com/. Accessed: May 2013.

District of North Vancouver. 2014. Available at: http://www.district.north-van.bc.ca/

Port Metro Vancouver. 2014. Land Use Plan. Website: http://www.portvancouver.com/wp-content/uploads/2015/06/port-metro-vancouver-land-use-plan-english.pdf. Accessed January 27, 2017.

7.2 GIS Data and Mapping References

B/W & Colour Imagery: 2008-2015: provided by KMC 2016.

BC MFLNRO. 2007. Tantalis Regional Districts (digital file). Victoria, BC. Available: https://apps.gov.bc.ca/pub/dwds/home.so. Acquired: March 2011. Last Update Check: May 16, 2014.

BC Ministry of Forests, Lands and Natural Resource Operations. 2012. Digital Road Atlas (DRA) - Master Partially Attributed Road Data (digital file). Victoria, BC. Available: https://apps.gov.bc.ca/pub/dwds/home.so. Acquired: December 2015. Last Update Check: December 15, 2015.

Kinder Morgan Canada. 2015. Facility Property (digital file). Calgary, AB. Received via FTP. Acquired: May 6, 2015. Last Update Check: N/A.

UPI. 2016. Proposed KPs, Centerline, Project Footprint SSEID005 (digital files). Calgary, AB. Received via FTP. Acquired: April 15, 2016. Last Update Check: N/A.