



Fugitive Emissions Management Plan for Construction: Burnaby Terminal

Fugitive Emissions Management Plan (FEMP): Construction at Burnaby Terminal



- Objectives of the FEMP are to:
 - minimize emissions of particulate matter (PM) from construction activities to the air
 - ensure that construction emissions meet applicable standards
 - control construction activities that produce dust and PM from combustion and site disturbance
- Examples of fugitive vapour controls from construction will also be addressed in this plan

Examples of Proposed Controls for Fugitive Dust During Construction



| Activity | Emission Control |
|--|--|
| Site Preparation | Grade the construction site in phases |
| | Stabilize surfaces of completed earthworks with vegetation |
| | Compact distributed soil |
| | Eliminate open burning |
| Storage Piles and Material Handling | Schedule deliveries to minimize the length of time soil piles are present, when feasible |
| | Use tarps or other acceptable means of retaining soils on stock piles |
| | Maintain a suitable moisture content/dust suppression on roads and on surface material for handling |
| | Avoid creating steep faces on soil piles |
| | Minimize drop heights and transfer points whenever practical |
| | Cover loads when hauling fine-grained materials when legal haul transport trucks are used |
| Road Surfaces | Regular street sweeping and cleaning of construction sites and access roads to remove construction-caused debris and dust |
| | Dust suppression using water on unpaved haul roads and other traffic areas susceptible to dust |
| | Street sweeping and cleaning of paved streets/roads where tracking of soil, mud or dust has occurred once per day |
| | Tire washes and other methods to prevent trucks and other vehicles from tracking soil, mud or dust onto paved streets or roads |
| | Implement vehicle restrictions that limit the speed and weight |
| Construction Processes | Apply water sprays in conjunction with cutting operations |
| | Use diamond bladed floor saws with water pumped through the system when cutting roadways, pavements, or blocks |
| | Whenever practical, conduct cutting, grinding, drilling, and sand or grit blasting in enclosures or partial enclosures |
| Demolition and Deconstruction | Whenever practical, apply deconstruction techniques rather than demolition; and, |
| | Minimize drop height for debris. |



Examples of Proposed Control Measures for Fugitive Vapours When Dispensing Fuel



- All dispensing or transferring of fuel will be attended for the duration of the operation
- The attendant must be aware of proper fuel handling procedures to minimize the risk of a spill and shall continuously scan the area adjacent to the fuelling operation for possible leaks or spills
- Delivery may be into on-site mobile refueling tanks or directly into the equipment
- On site fueling will be done with on-site single axle or tandem axle fuel trucks (not on highway). In some cases, on site fueling may be completed by a pick-up truck with a tidy tank in the back.
- The transferring and dispensing of fuel will be done with pumping equipment, an approved hose and top-fill nozzle

Examples of Proposed Control Measures for Fugitive Vapours When Dispensing Fuel



- Ensure that a site-appropriate spill containment kit is readily available
- When unreeling the fuel transfer hose and nozzle, the nozzle must be in the upright position. The nozzle shall be kept clear of the ground when returned to the reel or storage position
- The transfer of fuel must be stopped prior to overflowing, leaving room for expansion
- Maintain regular inspections of fuel systems and their components



Fugitive Emissions Management Plan for Operations: Burnaby Terminal

Fugitive Emissions Management Plan, Burnaby Terminal: Overview



- What:
 - The purpose of this FEMP is to manage and reduce fugitive emissions from the construction and operations at Burnaby Terminal
- When:
 - Managing fugitive emissions from construction would take place September 2017 through Q4 2019
 - Monitoring fugitive emissions from in service operations would be after Project commissioning, Q4 2019
- Related Information:
 - NEB Condition 79 – Air Emissions Management Plan

Potential Fugitive Emissions, Burnaby Terminal Operations



- Fugitive emission sources may include minute vapour losses of volatile organic compounds (VOCs) from piping, storage tanks and potential equipment leaks
- Tank Vapour Adsorption Units (TVAU) will be used to remove VOC vapours that could include reduced sulphurs like H_2S and mercaptans created by product working and standing losses in the storage tanks (i.e., changing fluid levels and temperature effects)



Proposed Emission Controls for Fugitive Vapours, Standing and Working Losses from Storage Tanks



- All new tanks include a steel cone roof over a steel pontoon floating roof (these are inherently VOC and odour emission controls) and TVAUs (controls for collected H₂S and mercaptans).
- Vapours leaving the space above the floating roof in each storage tank routed through interconnecting piping to a TVAU. A vapour blower on the TVAU will provide the motive force to transfer the vapours from the tank to a vessel on the TVAU filled with catalytic grade granular activated carbon. The reaction is a combination of catalytic oxidation and adsorption of the odour causing compounds.
- The removal efficiency of odour containing compounds such as mercaptans and H₂S are 99.7% and 99.9%, respectively.
- Based on the preliminary design, the collection efficiency of VOC vapours is 99.5%.
- Therefore, the total efficiency for removal of mercaptans and H₂S will be 99.2% and 99.4%, respectively.

Proposed Leak Checks for Fugitive Vapours, from Storage Tanks



- The TVAUs will be subject to leak tests using portable organic vapour and H₂S analyzers
- Infrared camera technology will scan all external tank components (i.e., external shell of fixed roof and vapour handling system of the TVAU) to detect any vapour leaks on an annual basis
- Detected leaks will be promptly assessed and components found to be leaking materially significant quantities of vapour will be repaired as soon as reasonably practical
- Daily, weekly, monthly and annual duties required by the Terminal Operating Technician, as outlined in the *Burnaby Terminal Operating Manual*. Preventative inspection and maintenance will limit the potential for leaks from equipment and piping.

Proposed Leak Checks for Fugitive Vapours, from Non-Storage Tank Equipment



- Infrared camera technology will scan all components to detect vapour leaks annually
- Detected leaks will be promptly assessed and components found to be leaking materially significant quantities of vapour will be repaired as soon as reasonably practical
- Daily, weekly, monthly and annual duties required by the Terminal Operating Technician, as outlined in the Burnaby Terminal Operating Manual. Preventative inspection and maintenance will limit the potential for leaks from equipment and piping.

Verifying and Quantifying Fugitive Emissions: Burnaby Terminal

- Piping - Any piping fugitive emissions will be determined as part of leak detection procedures (*see examples of portable units on right*)
- TVAUs – inlet and exhaust gases will be continuously monitored in a stack testing survey to confirm removal efficiencies
- An H₂S vent monitor will be included on each TVAU exhaust stack to detect any breakthrough and inform the need for replacement of the adsorptive medium
- Annual emissions will be estimated as required for National Pollutant Release Inventory (NPRI) reporting using the US Environmental Protection Act (EPA) TANKS emission software with the verified removal efficiencies for the TVAUs



Portable units: for illustrative purposes

Verifying and Quantifying Fugitive Emissions: Burnaby Terminal



The final verification procedures for the TVAUs are expected to be complex and these measurements may be subject to change:

- Flow rate (based on US EPA Method 2)
- Semi-continuous measurement (15-minute cycle) of H₂S concentration (based on US EPA Method 15)
- Continuous measurement of mercaptans, in terms of Total Reduced Sulphur (TRS) (based on modified US EPA Method 16C)
- Canisters of gas samples will be taken for analysis of the individual mercaptan species by an outside laboratory

Additional Mitigation Measures: Burnaby Terminal



Additional mitigation measures that could be implemented:

- Repairing leaks as soon as reasonably practical
- Implementing continuous source emission monitoring systems
- Allocating highly odourous crude oils to tanks with TVAUs and/or tanks that are further from the adjacent properties
- Replacing tank floating roof seals
- Installing aluminum dome roofs on one or more existing (pre-TMEP) tanks
- Installing portable or fixed air emissions “scrubbers”
- Installing TVAUs on tanks that have been retrofitted with aluminum dome roofs



Air Emissions Management Plan for Operations: Burnaby Terminal

Air Emissions Management Plan, Burnaby Terminal: Overview



- Objectives of this Air Emissions Management Plan (AEMP) are to:
 - provide an air quality monitoring plan that would be implemented to measure ambient levels related to storage terminal operations
 - assess compliance with target levels
- Baseline monitoring would begin in Q3 2019 which is three months prior to commencing in service operations.
- Monitoring of Project-related emissions from operations and regional pollutants would be continuous thereafter
- Related Information:
 - NEB Condition 54 – Fugitive Emissions Management Plan

Ambient Air Quality Monitoring Commitment and Emissions Tracking, Burnaby Terminal



Commitment made to comply with applicable ambient air quality objectives (AAQO) during operations that are taken from several regulatory authorities:

- Metro Vancouver Regional District
- BC Ministry of the Environment
- Alberta Environment and Parks
- National

Annual emissions from point sources will be tracked, monitored and reported to the National Pollutant Release Inventory, if thresholds are triggered

Annual greenhouse gas emissions will also be tracked, monitored and reported if they exceed the reporting thresholds for either the National Greenhouse Gas Reporting Program and/or the BC Reporting Regulation

Monitored Contaminants of Interest and Ambient Air Quality Objectives (in $\mu\text{g}/\text{m}^3$)



| Contaminant | Averaging Period | BC MOE | Metro Vancouver | National |
|--|-------------------------|----------------------|------------------------------|-----------------------------|
| PM _{2.5} | 24-hour | 25 ^[1] | 25 | 27 to 28 ^[4] |
| | Annual | 8 | 8 | 8.8 to 10 ^[5] |
| NO ₂ | 1-hour | n/a | 200 | 400 |
| | 1-hour 98 th | 188 ^[2] | n/a | n/a |
| | 24-hour | n/a | n/a | 200 |
| | Annual | n/a | 40 | 60 |
| SO ₂ | 1-hour | n/a | 196 | 170 to 183 ^[6] |
| | 1-hour 99 th | 200 ^[3] | n/a | n/a |
| | 24-hour | n/a | 125 | n/a |
| | Annual | 25 | 30 | 10.5 to 13.1 ^[7] |
| Benzene | 1-hour | 30 ^[8] | n/a | n/a |
| | Annual | 3 ^[8] | n/a | n/a |
| Ethyl benzene | 1-hour | 2,000 ^[8] | n/a | n/a |
| Toluene | 1-hour | 1,880 ^[8] | n/a | n/a |
| | 24-hour | 400 ^[8] | n/a | n/a |
| Xylenes | 1-hour | 2,300 ^[8] | n/a | n/a |
| | 24-hour | 700 ^[8] | n/a | n/a |
| Total Reduced Sulphurs (H ₂ S and mercaptans) | 1-hour | 7 | 14 acceptable 7 desirable | n/a |
| | 24-hour | 3 | n/a | n/a |

Also ozone and reduced visibility which are regional air shed initiatives

Existing Ambient Air Quality Conditions: Burnaby Terminal

- A description of the pre-construction ambient air quality conditions was based on modelling and existing measurements
- Dispersion model results for benzene, toluene, ethyl benzene, xylenes, H₂S and mercaptans were below relevant Ambient Air Quality Objectives (AAQO)
- Existing local ambient measurements at Burnaby Terminal showed concentrations of H₂S, SO₂ and VOCs below the Metro Vancouver or BC AAQOs



Top photo: Exterior view of proposed air monitoring station

Bottom photo: Interior view of proposed air monitoring station

Example of Web-Based Reporting Platform



RWDI

Envision
The Environmental Data Platform

Projects

Current Conditions Alerts History Reports Views Project Configuration

— MDT (UTC-6)

| Station | Most Recent Record | Status |
|-------------------------|---------------------|--------|
| Michel Residence | Oct 13/15 16:00 MDT | |
| Downtown Air Monitor | Oct 13/15 15:00 MDT | |
| Whispering Trailer Park | Oct 13/15 16:00 MDT | |
| Gas Station | Oct 13/15 15:00 MDT | |
| Plant By-Products | Oct 13/15 16:00 MDT | |

Oct 13/15 10:12 MDT

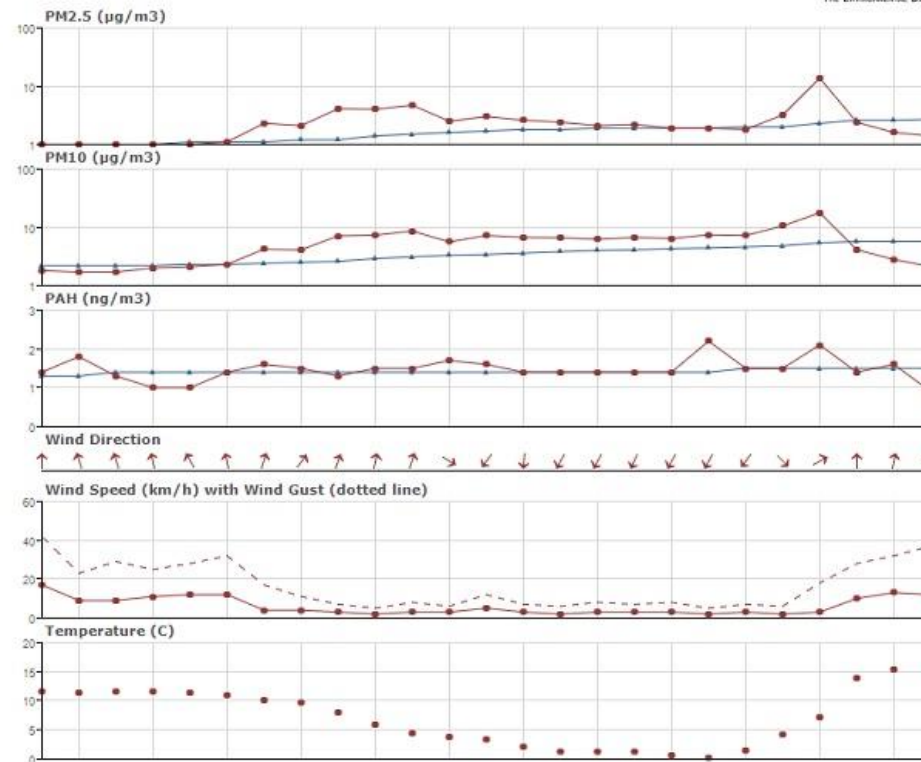


Downtown Air Monitor

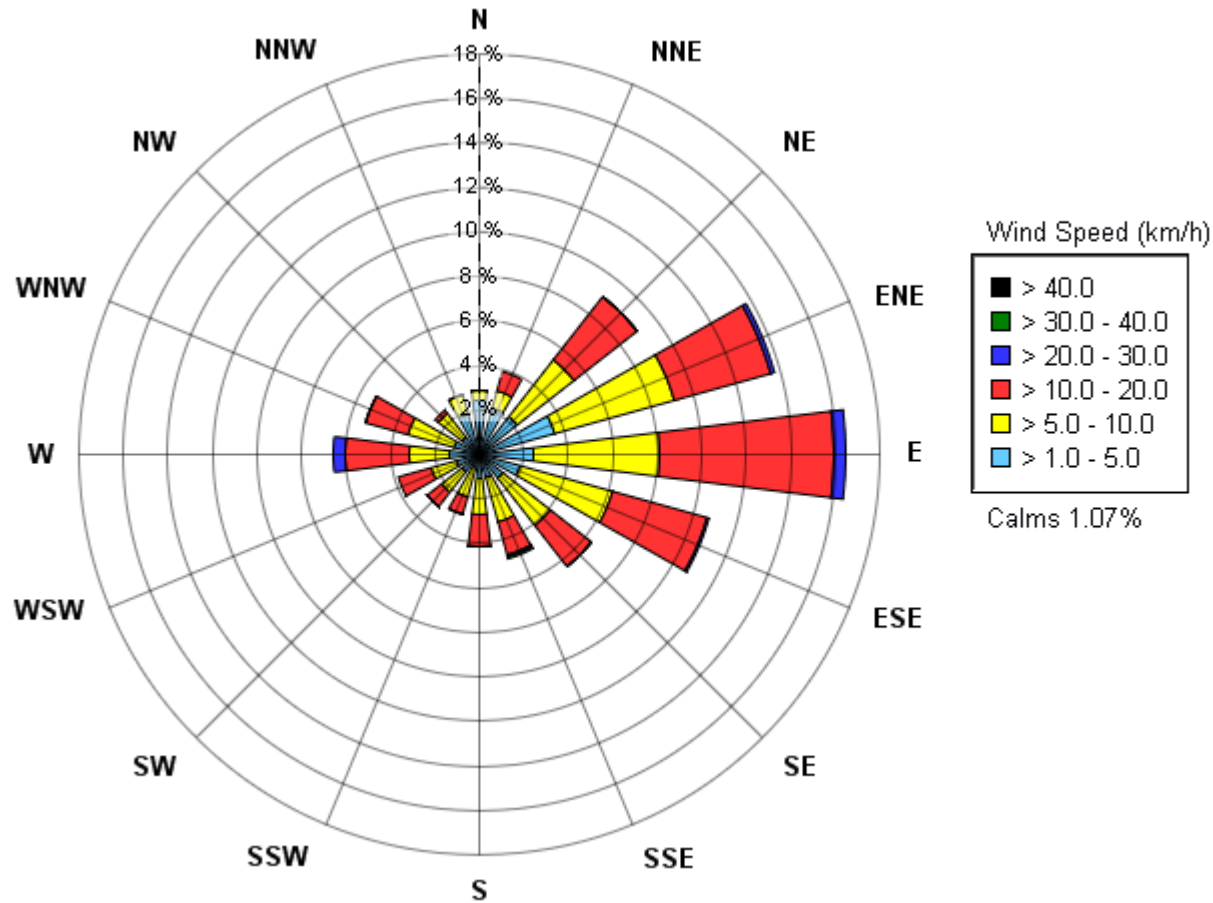
← Back Print Save Display as Table

Downtown Air Monitor Data Summary

— 60 minutes — 24 hours updated every hour



Wind Rose for Burnaby Terminal



Locations of Existing and Proposed Ambient Stations, Burnaby Terminal

