Goodrich Terminals
Environmental Air Assessment for Port of Vancouver

PRESENTED TO

Pacific Land Group

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ISSUED FOR REVIEW
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EXECUTIVE SUMMARY

This air assessment report is part of Goodrich Terminals' application to the Port of Vancouver for a proposed lumber storage facility located at civic address 21480, 21832, 21780 South Westminster Shore & 10880 Dyke Rd, Surrey. The assessment follows guidance provided by Port of Vancouver in 'Project & Environmental Review: Guidelines – Environmental Air Assessment.'

Proposed facility-related emissions consist of diesel-combustion by-products contained in the exhaust of transport trucks and support forklifts on site. Supply chain emissions, consisting of the Metro Vancouver road network between the facility and Deltaport, i.e. South Fraser Perimeter Road (SFPR), also consist of dust entrainment from travel over paved roads. Supply chain emissions are only indirectly related to the facility in that operations will not necessarily result in additional Goodrich fleet trucks on Metro Vancouver roads, rather this transport will occur along the SFPR corridor up to 60 times a day.

Air contaminant emissions from facility activities are insignificant compared to Metro Vancouver's emissions inventory and would not be expected to contribute to adverse air quality impacts in the area adjacent to the site nor along the supply chain route.

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ACRONYMS & ABBREVIATIONS

Acronyms/Abbreviations	Definition
BC	Black Carbon
CAC	Criteria Air Contaminants
CO	Carbon Monoxide
DPM	Diesel Particulate Matter
HC	Hydrocarbons
hp	Horsepower
LPG	Liquefied Petroleum Gas (e.g. propane)
MOVES 2014b	Motor Vehicle Emissions Simulator (USEPA)
MV	Metro Vancouver
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen
O_3	(Ground-level) Ozone
PAH	Polycyclic Aromatic Hydrocarbons
$PM_{2.5}$	Particulate Matter smaller than 2.5 microns
PM_{10}	Particulate Matter smaller than 10 microns
SFPR	South Fraser Perimiter Road
SO_2	Sulphur Dioxide
TSP	Total Suspended Particulate Matter (also TPM)
USEPA	United States Environmental Protection Agency (also EPA)
VOC	Volatile Organic Compounds

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1.0 INTRODUCTION

Tetra Tech Inc. (Tetra Tech) was retained by Pacific Land Group, on behalf of their Client, Goodrich Terminals (Goodrich), to conduct an air assessment for a proposed lumber storage site (herein referred to as '*the property*', or '*the site*') located along the Fraser River foreshore with civic address 21480, 21832, 21780 South Westminster Shore & 10880 Dyke Rd, Surrey. Pacific Land Group is completing a Project & Environmental Review Application for Goodrich Terminals to be submitted to Port of Vancouver. The methodology for the assessment follows guidance provided by Port of Vancouver in '*Project & Environmental Review Guidelines – Environmental Air Assessment*'.

1.1 Facility Overview

The proposed site is located along the southern Fraser River foreshore in South Westminster, Surrey immediately downriver from the Skybridge (Sky Train bridge) and the Pattullo Bridge, near other industrial/commercial properties (see Figure 3.1). Goodrich Terminals is proposing to use the lease area exclusively for lumber storage and is also proposing a rail spur connection to the existing CN rail line.

The site's primary operation will be the storage and handling of untreated lumber for transport by truck to Deltaport. The transport of lumber to the yard will occur approximately 60% via rail and 40% via trucks. Transport trucks accessing the property will be part of the current Goodrich Transport vehicle fleet. Approximately 60 Super B and container trucks will access the property daily. Goodrich expects to transport approximately 1000 containers a month. Transport trucks will access the property from Dyke Rd., likely via Tannery Rd. from South Fraser Perimeter Road (SFPR, Hwy 17) although other access routes (e.g. via Robson Rd.) could be used.

Activities on the proposed rail spur will be fully controlled by CN and will occur during the site's operating hours. Approximately 12 center beam railcars will attend the site per day.

Ancillary support equipment on site includes a fleet of seven diesel-powered forklifts and two propane-powered forklifts.

The facility will be operational weekdays, between 6 am and 6 pm with trucks accessing the site between 7 am and 3:30 pm. Currently unpaved portions of the vacant lot will be paved to accommodate the lumber storage operations.

2.0 PROJECT DESCRIPTION

2.1 Project Overview

As described in Section 1.1, the primary site operation will be the unloading/loading and storage of untreated lumber for transport via truck to Deltaport. Lumber will be received at the property approximately 60% via rail and 40% via truck. The lease area is currently vacant.

2.2 Baseline Case

The lease area is the former location of Smallwood Sawmill Ltd. which is currently vacant. The baseline case represents the lot being vacant and is described by measured ambient air quality markers as described in Section 5.1.

2.3 Project Case

Approximately 60 Super B and container trucks and 12 center beam railcars controlled by a switcher locomotive will access the property daily. Untreated lumber will be offloaded/loaded/handled on the ground using a fleet of seven diesel-powered forklifts with ancillary support provided by two smaller propane-powered forklifts:

- (4) Hyundai 110D-7E 24000 lbs capacity (diesel)
- (3) Hyundai 110D-7A 24000 lbs capacity (diesel)
- (2) Hyster H90 8000 lbs capacity (propane)

The facility will be operational Monday to Friday. Truck access will occur between 7 am to 3:30 pm. Site operations including the handling and stacking of lumber may occur during the entirety of the operational hours between 6 am and 6 pm.

The existing single-tier building on the property will be used as general warehouse space and will make use of the existing electrical system. No retrofitting of heaters or other combustion-gas emitting equipment is planned.

2.4 No Project Case

The lease area is currently vacant, therefore the No Project case, with respect to the local air quality, is described by the existing baseline conditions.

3.0 GEOGRAPHIC SCOPE

3.1 Facility

The geographic extent of the facility is considered to be the area within the lease area property boundary (Fraser River foreshore with civic address 21480, 21832, 21780 South Westminster Shore & 10880 Dyke Rd, Surrey. The facility boundary is shown as a blue shaded area in Figure 3.1.

3.2 Supply Chain

The supply chain takes into account the reasonable extent of off-property emissions related to transport trucking that will serve the facility. The geographic extent of the supply chain consists of South Fraser Perimeter Road between Tannery Rd. and Deltaport and the local secondary roads used to access the property. Trucks will access the property from Dyke Rd., likely via Tannery Rd. from the South Fraser Perimeter Road (Hwy 17) although other access routes (e.g. via Robson Rd.) could be used.

The geographic extent of the supply chain boundaries is shown in Figure 3.1 as a yellow line.

3.3 Receiver Identification and Proximity

The facility will be located in an industrial area of South Westminster on the southern bank of the Fraser River, approximately 100 m south of the Skybridge adjacent to several other industrial properties (lumber, auto wreckers, soil and aggregate). The nearest residential areas are the Brownsville RV Park, located immediately adjacent the property to the east, and two properties along Timberland Rd., approximately 300 m southeast of the property. The nearest high-density residential areas are apartment complexes located along Columbia St. in New Westminster,

the nearest of which is approximately 650 m from the property, across the Fraser River, which would not be expected to experience adverse air quality impacts from facility operations.

Table 3.1 summarizes the distance and direction from the proposed facility to nearby public areas and locations of interest. Figure 3.2 shows the location of the identified sites of interest relative to the proposed facility.

Table 3.1: Summary of Locations of Interest near Proposed Facility

Public Area/Location of Interest	Type	Distance from Proposed Facility	Direction
Brownsville Pub & RV Park	Park	60 m	E
Brownsville Bar Park	Residences	75 m (park entrance)	NE
Residences along Timberland Rd.	Residences	300 m	SE
Westminster Pier Park	Park	550 m	NW
Albert Crescent Park	Park	640 m	NW
Holy Trinity Romanian Orthodox Church	Church	750 m	NW
CDI College	School	750 m	E
Columbia St. Skytrain Station	Train Station	750	WNW
Holy Trinity Cathedral	Church	800 m	WNW
Christian Life Assembly	Church	800 m	E
Five Stones Church	Church	800 m	W
Al-Hidayah School	School	850 m	WNW
Fraser River Discovery Center	Museum	875 m	W
Samson V Maritime Museum	Museum	1000 m	W

4.0 EMISSION SOURCES

4.1 Primary Sources

Emission sources from facility-related activities are summarized as follows:

- on-road transport vehicle exhaust emissions.
- diesel-powered forklift exhaust emissions.
- propane-powered forklift emissions.
- switcher locomotive (rail).
- road-generated dust from within the facility (paved with medium silt content).
- road-generated dust from travel on secondary access roads to/from facility and South Fraser Perimeter Road to Deltaport (paved with low silt content).

Facility-generated emissions are quantitatively described in Section 7.0.

4.2 Emission Variability

The facility will be operational Monday through Friday. Site hours are 6 am to 6 pm with trucks accessing the property between 7 am and 3:30 pm. Daily operations are expected to be relatively consistent throughout the year. Dust entrainment from travel on paved road surfaces will be naturally mitigated with precipitation events, with higher emissions occurring during the drier period of the year (late spring to early autumn).

4.3 Air Contaminants of Concern

The main air contaminants released due to site activities are diesel combustion by-products contained in the exhaust of transport trucks, diesel-powered ancillary support forklifts and the switcher locomotive. The main contaminants emitted in diesel engine exhaust include criteria air contaminants (CACs) - oxides of nitrogen (NO_x), carbon monoxide (CO) and smaller fraction fine particulate matter ($PM_{2.5}$), consisting largely of diesel particulate matter (DPM), as well as volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs). DPM consists of a variety of organic chemicals which can cause health issues with repeated exposure to significant concentrations. Sulphur dioxide (SO_2), another CAC, is also a common constituent of diesel exhaust, however with ultra low sulphur diesel fuel regulation, SO_2 emissions from diesel-powered vehicle engines are becoming less and less prevalent.

Liquefied petroleum gas (LPG), e.g. propane, which powers two of the support forklifts, is a much cleaner burning fuel than diesel, however incomplete combustion leads to similar emitted species, albeit in much lesser quantities.

Road-generated dust, or particulate matter, is defined in terms of size-fractions: TPM – total particulate matter, PM_{10} – defined as particles smaller than 10 microns, and $PM_{2.5}$ – defined as particles smaller than 2.5 microns. PM_{10} and $PM_{2.5}$ are respirable and long-term exposure to elevated concentrations can potentially lead to respiratory and other health issues. Particulate matter entrained in the air deposits on vegetation and can clog stomatal openings. Larger fraction particulate matter, or dust, falls out of suspension close to the source. Smaller-fraction particulate matter can become entrained in the wind and transport hundreds of metres to kilometres away from the source.

Overall, the anticipated operational activity metrics are not expected to create significant air quality impacts. Emission estimates are further quantified in Section 7.0.

5.0 CURRENT CONDITION

5.1 Local Ambient Air Quality

The proposed facility is located in an industrial area of South Westminster, Surrey. The surrounding properties consist of similar shipping operations, auto wreckers, recycling operations and soil and aggregate operations consisting of various on-site heavy equipment and commercial truck calls.

Ambient air quality can be inferred from measurements taken at Metro Vancouver (MV) air quality monitoring network stations, the locations of which are shown in Figure 5.1. The stations used in the analysis, the parameters measured and the available data over the last five years are listed in Table 5.1.

Table 5.1: Metro Vancouver Air Quality Monitoring Stations Relevant to Proposed Site

Station Name	ID	Criteria Parameters	Influences	Distance
New Westminster Sapperton Park	T046	NO_2, $PM_{2.5}$, ground-level O_3	Residential, traffic	2.5 km N
North Delta	T013	NO_2, $PM_{2.5}$, ground-level O3	Residential	4.5 km S
Burnaby South	T018	SO_2, NO_2, CO, PM_{10}, $PM_{2.5}$, ground-level O_3, black carbon (BC)	Residential, traffic, industry	6.5 km W

Regional air quality is presented in Table 5.2 for the period 2014 to 2018, along with the relevant Metro Vancouver Ambient Air Quality Objective for each contaminant/averaging period where applicable. For one-hour readings, both the maximum and average values are presented. Maximum one-hour values typically represent atypical conditions, such as during periods of transient wildfire smoke (e.g. elevated PM_{10} and $PM_{2.5}$).

Table 5.2: Metro Vancouver Ambient Air Quality Objectives and Local Air Quality (2014 – 2018)

Contaminant	Avg. Period	MV Air Quality Objective ug/m³	Concentration ug/m³ (or ppb)					
			New Westminster		North Delta		Burnaby South	
			Max	Avg.	Max	Avg.	Max	Avg.
CO	1-hour	30,000	-	-	-	-	1410	196
	8-hour	10,000	-	-	-	-	1330	-
NO_2	1-hour	200	142.6	30.8	150.7	25.2	69.6	13.4
	Annual	40	32.6	-	14.1	-	14.5	-
SO_2	1-hour	196	-	-	-	-	21.7	0.4
	24-hour	125	-	-	-	-	4.4	-
	Annual	30	-	-	-	-	0.5	
Ground Level O_3	1-hour	161	151.4	26.7	148.6	34.9	180.0	40.7
	8-hour	128	124.0	-	124.6	-	153.7	-
PM_{10}	24-hour	50	-	-	-	-	106	13.4
	Annual	20	-	-	-	-	15	-
$PM_{2.5}$	24-hour	25	128	7.1	131	6.1	130	6.3
	Annual	8	7.8	-	6.9	-	7.3	-
Black Carbon	1-hour	n/a	-	-	-	-	9.9	-
	24-hour	n/a	-	-	-	-	4.3	-
	Annual	n/a	-	-	-	-	0.6	-

Notes: Metro Vancouver objectives are “not to be exceeded”, meaning the objective is achieved if 100% of the validated measurements are at or below the objective level. The 8-hour and 24-hour objectives are calculated as a rolling average.

The main emission sources contributing to adverse air quality through Metro Vancouver are described for the contaminants listed in Table 5.1 as follows along with relevance of the local readings to the air quality in the vicinity of the property:

- The principal sources of CO emissions in Metro Vancouver are motor vehicles and non-road engines. As such, higher concentrations of CO are generally measured during the daytime in more densely trafficked areas, such as the arterial roads of New Westminster, North Delta and Surrey. SFPR is 400 m from the proposed site and the Pattullo Bridge is an elevated source. Municipal roads in and around the proposed site are not heavily trafficked with the exception of commercial vehicle calls at local businesses. The area of South Westminster is industrial with frequent heavy on- and off-road vehicle operation and is bordered by the Fraser River to the north. It would be expected that maximum CO concentrations in the vicinity of the property would likely be similar or slightly higher than those recorded at South Burnaby. Note the highest 8-hour CO concentration measured at Burnaby South is nearly ten times less than of Metro Vancouver air quality objective.

- Emissions of NO_2 (the reported form of NO_x) is dominated by mobile sources, namely cars and on-road trucks, non-road equipment and marine vessels. Natural gas use in homes, offices and industry also plays a role in NO_2 emissions. Regionally, NO_2 concentrations are highest in the most populated areas of Metro Vancouver with the highest amount of vehicle and marine traffic (Vancouver and Richmond) and decrease to the east. Concentrations measured at the Metro Vancouver stations would be representative of conditions at the proposed site.

- Ocean-going vessels are the largest source of SO_2 emissions in Metro Vancouver, hence the highest concentrations regionally are observed around Burrard Inlet. SO_2 levels in the vicinity of the proposed site would be much lower in comparison and would be expected to be similar to or lower than Burnaby South.

- Ozone (O_3) is a major pollutant formed when NO_X and reactive VOCs react chemically in the presence of heat and sunlight. The highest levels generally occur in the eastern parts of Metro Vancouver and the Fraser Valley, downwind of major precursor emissions. Local concentrations would be expected to be similar to nearby stations.

- PM_{10} is emitted from a variety of localized sources with the largest contribution from road dust. Other major contributors to PM_{10} are transportation, construction and demolition, agriculture and industry. Natural sources of PM_{10} include wind-blown soil and wildfires. With respect to the area around the proposed site, activities at neighboring lots consist of earth moving activities and fugitive sources of PM_{10} which may result in slightly higher levels compared to typical concentrations measured at Burnaby South, however the major contributor to elevated PM_{10} in recent years is periodic intrusion of migratory wildfire smoke during the summer.

- Emissions of $PM_{2.5}$ are dominated by heating, transportation and industrial sources and non-road diesel engines. $PM_{2.5}$ can be transported long distances in the air from natural sources such as wildfires. Secondary $PM_{2.5}$ is formed by reactions of NO_X and SO_2 with ammonia in the air - mainly from agricultural sources - and accounts for a significant percentage of $PM_{2.5}$ in summer. Local $PM_{2.5}$ levels would be expected to be similar to nearby station readings however the major contributor to elevated $PM_{2.5}$ in recent years is periodic intrusion of migratory wildfire smoke during the summer.

- Black carbon (BC) is formed by the incomplete combustion of fossil fuels, biofuels, and biomass, and is emitted directly in the form of fine particulate matter ($PM_{2.5}$). Mobile sources contribute 80% of BC emissions in Metro Vancouver. Diesel fuelled non-road engines, heavy duty vehicles and marine vessels are other significant sources. Black carbon concentrations are generally greater on weekdays. There are no provincial, federal or Metro Vancouver objectives for black carbon. Local readings would be expected to be slightly higher than nearby stations due to the general industrial nature of the area and the greater number of diesel-powered vehicles and equipment.

5.2 Meteorological Influences

Winds representative of conditions in the vicinity of the proposed site are best illustrated by hourly wind data recorded at Metro Vancouver air quality network instrument testing station at Annacis Island (T038) (49.1657º N, 122.9607º W, Figure 5.1). Data was analyzed for the period January 2009 to October 2012 (based on available data).

Figure 5.2 shows the period of record wind rose at Annacis Island. Annually, predominant winds are from the east-northeast, aligned with the orientation of the Fraser River with south-southeasterly (typically synoptic) and westerly (typically seabreeze) winds occurring with secondary prevalence.

At the proposed site, the Fraser River is aligned more northeast-southwest than at Annacis Island. Annacis Island is also more exposed to southerly flows through the Strait of Georgia due to the flat, sea-level terrain of the Fraser River delta compared to South Westminster which lies below the elevated terrain of Surrey/Delta.

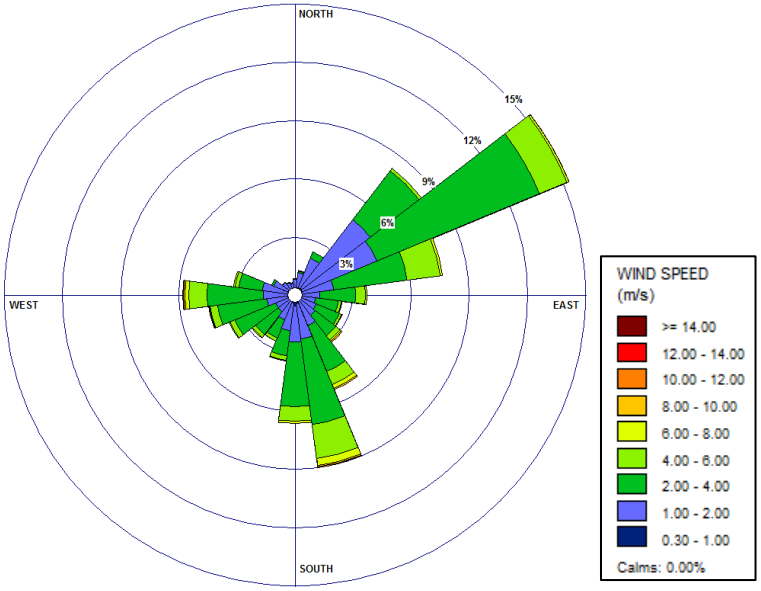

Figure 5.2: Wind Rose - Metro Vancouver Annacis Island Station T38

Figure 5.3 illustrates wind seasonality as wind roses for winter (December, January and February) and summer (June, July and August) recorded at Annacis Island. The winter figure, left, shows a much higher frequency of occurrence of northeasterly winds, most commonly associated with Fraser Valley outflows which are the common flow pattern for the region. The summer figure, right, shows a higher prevalence of southerly winds which are most commonly associated with offshore high pressure, and westerly winds, associated with the sea breeze, both typical summer patterns for Metro Vancouver.

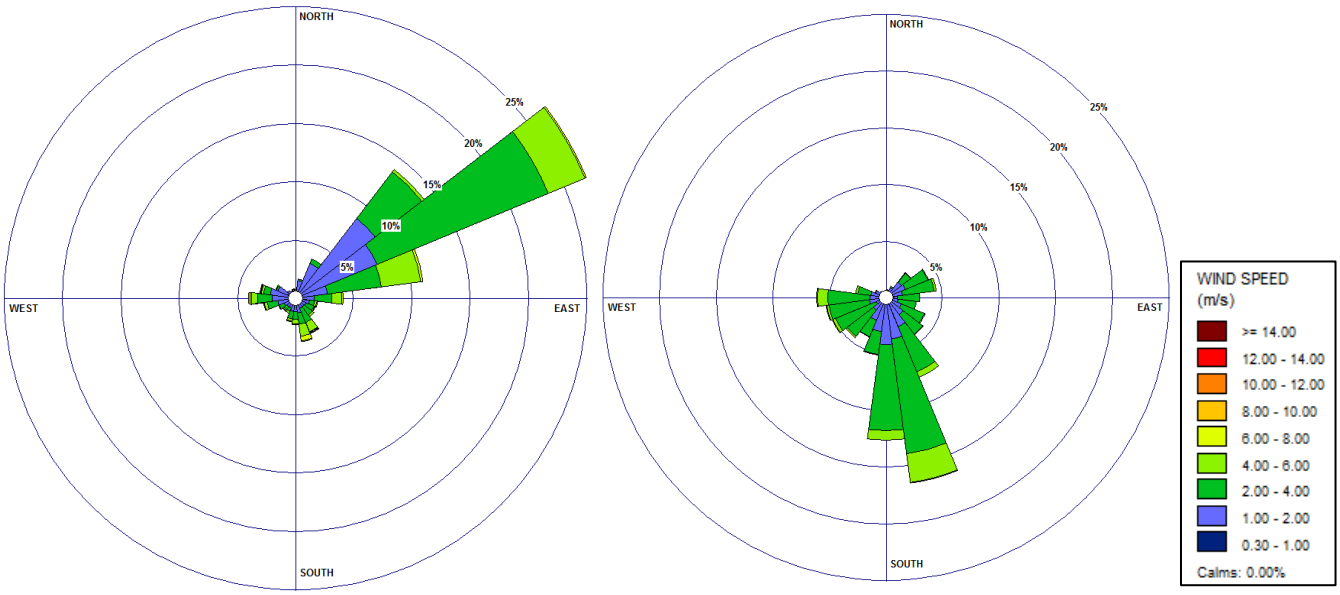

Figure 5.3: Winter (DJF) Wind Rose (left) Summer (JJA) Wind Rose (right)

The predominant winds indicate that the proposed site would be most subjected to the downwind transport of air contaminants from industrial/commercial areas along the Fraser River further upriver, north of the South Fraser Perimeter Road and the Fraser Mills area along United Blvd in Coquitlam. Winds also indicate that any air contaminant emissions generated from site activities would most commonly be transported to areas down-river (southwest) of the proposed site and potentially across the Fraser River to the Front St. area of New Westminster depending on the frequency of southerly winds.

5.3 Historical Throughput

The proposed lot is currently vacant. The previous tenants of the lot were Smallwood Sawmill, a division of Mill & Timber Products Ltd. which conducted activities related to the milling of logs. Operational details of the former tenants are not available and there are no reported facility emissions above National Pollutant Release Inventory (NPRI) reporting thresholds. Flavelle Sawmill Company Limited, another Mill and Timber Products Ltd. division located in Port Moody, has reported an annual average of 2.8 tonnes of PM_{10} and 0.65 tonnes of $PM_{2.5}$ emissions to the air. Assuming compliance with the NPRI, particulate matter emissions from Smallwood Sawmill would be expected to be below the reporting thresholds of 0.5 tonnes of PM_{10} and 0.25 tonnes of $PM_{2.5}$ annually.

6.0 FUTURE CONDITION

6.1 Horizon Year

It is expected that the throughput estimates provided by Goodrich Terminals would remain constant through the life of the lease and the emission estimates described in Section 7.0 would be representative of future years.

6.2 Design Capacity Limitation

The capacity for lumber storage on the property is restricted by the square area of the lot. The number of transport trucks frequenting the property, and thus transporting lumber to Deltaport, are restricted by the facility throughput and the availability of fleet vehicles. Lumber throughput is limited by the number of on-site support forklifts.

7.0 EMISSION ESTIMATES

7.1 Baseline Case

The site is currently vacant, therefore current facility-related emissions are zero. Baseline air quality is described in Section 5.1.

7.2 Project Case

Emission estimates are generally calculated for all facility-related activities as follows:

Emission Rate = Emission Factor x Activity Rate

Emission factors are empirically-derived values or equations which describe anticipated emissions of relevant air contaminants for a variety of industrial activities. Emission factors for diesel and propane powered vehicles and equipment were taken from the United States Environmental Protection Agency's (USEPA) Motor Vehicle Emission Simulator (MOVES2014b) emissions model. Emission factors for the switch locomotive are provided in '*Locomotive Emissions Monitoring Program 2015*', Railway Association of Canada. Emission factors for fugitive dust emitted from travel on paved roads were taken from USEPA AP-42, 'Compilation of Air Emissions Factors'.

Activity rates are metrics which describe, for example, the operational hours of a piece of equipment or the vehicle distance travelled. Table 7.1 lists the anticipated facility emission sources, the expected contaminants emitted and relevant activity metrics associated with the source. Each source type is further described along with a quantitative estimate of annual emissions (in tonnes per year) in the following sub-sections. Emission factors referenced for each source type are contained in Appendix A.

Table 7.1: Emission Sources and Activity Metrics

Source Type	Specific Emission Source	Contaminants Emitted	Activity Metric
Equipment/Vehicle Exhaust	Super B and container trucks	SO_2, NO_X, CO, VOC, PAH, PM_{10}, $PM_{2.5}$ (DPM), BC	▪ 60 trucks daily (~15,000 annually) ▪ between 7 am to 3:30 pm ▪ average of 7 trucks per hour ▪ assume per truck on-site idling time ½ hour ▪ 33.1 km supply chain road (SFPR + property access roads) ▪ 100 m travel on site roads
	on-site support forklifts (diesel)		▪ Four (4) Hyundai 110D-7E – 162 hp ▪ Three (3) Hyundai 110D-7A – 123 hp ▪ 1800 annual op. hours per forklift per year
	on-site support forklifts (propane)		▪ Two (2) Hyster H90 – 78 hp ▪ Average 750 op. hours per forklift per year
Rail	Switch locomotive	SO2, NO_X, CO, VOC, PM_{10}, $PM_{2.5}$ (DPM), BC	▪ 12 center beam cars per day during operational hours ▪ 1 switcher locomotive engine ▪ assume < ½ op. hours per train ▪ assume one train per day, 260 per year ▪ assume 26 L/h fuel consumption (WSP 2017) ▪ <130 operational hours per year ▪ <3,380 L annual diesel fuel consumption
Paved Road Dust	Within facility Secondary access roads Supply chain segment (SFPR)	TPM, PM_{10}, $PM_{2.5}$	▪ 60 trucks daily ▪ Trucks travel approx. 100 m on site ▪ 800 m of access roads from SFPR to facility ▪ SFPR 31.5 km from facility to Deltaport

7.2.1 Equipment/Vehicle Exhaust

Combustion emissions arising from vehicle and equipment used in facility operations includes the Super B and 53' container trucks transporting lumber from the facility to Deltaport and support forklifts (diesel and LPG) working on site. Note combustion emissions from the switcher locomotive are described in Section 7.2. A variety of air contaminants are released in the exhaust of combustion engines, including CACs, volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs). Equipment-specific emission factors for these contaminants are provided in USEPA's MOVES emissions model (MOVES2014b). MOVES emission factors are distance (e.g. vehicle kilometres travelled), power (e.g. engine horsepower rating) or time (e.g. operational hours) based. SO_2 emissions are also dependent on the sulfur content in the diesel fuel. The emission factors used in this assessment represents an average across all model years, defined based on United States emission standards (Tier 1, Tier 2, Tier 3, etc.) for various engine capacity ranges.

The emission factors contained in MOVES were converted to annual emissions (in tonnes) using the operational activity metrics described in Table 7.1. Road segment lengths are shown in Figure 7.1 and were defined for the purpose of the air assessment as follows:

Within the facility boundary:

- Approximately 100 m travelled on paved site surface

Within the supply chain boundary:

- 800 m of secondary municipal roads to access the property from SFPR
- 31.5 km along SFPR between Tannery Rd. and Deltaport

Table 7.2 summarizes the annual emission estimates for air contaminants due to diesel combustion engines from facility vehicles and equipment. Table 7.3 summarizes annual emission estimates for prevalent air toxics contained in diesel exhaust from the facility. Emission factors and relevant activity metrics for equipment and vehicle exhaust are shown in Section A.1 of Appendix A.

Table 7.2: Vehicle/Equipment Combustion Exhaust Emission Estimates

Vehicle Type	Emissions (tonnes/year)								
	CO	NO_x	PM_{10}	$PM_{2.5}$	BC [1]	SO_2	VOC	NH_3	PAH
FACILITY EMISSIONS									
Commercial Trucking	0.13	0.31	0.004	0.003	0.002	0.0001	0.058	0.0009	0.0009
Diesel-powered Forklifts	0.50	1.63	0.12	0.12	0.092	0.004	0.41	0.004	0.0007
Propane-powered Forklifts	0.28	0.04	0.002	0.002	0.0002	0.0001	0.01	-	~0
SUPPLY CHAIN EMISSIONS									
Commercial Trucking	1.42	5.42	0.42	0.23	0.14	0.01	0.30	0.018	0.004
TOTAL EXHAUST EMISSIONS	**2.33**	**7.40**	**0.55**	**0.36**	**0.23**	**0.01**	**0.78**	**0.02**	**0.006**

Source: USEPA Motor Vehicle Emissions Simulator (MOVES 2014b)
[1] Canada's Black Carbon Inventory 2018, Environment and Climate Change Canada

Table 7.3: Vehicle/Equipment Combustion Exhaust Emission Estimates – Air Toxics

Source Area	Emissions (tonnes/year)				
	Benzene	Toluene	Ethylbenzene	Xylene	Formaldehyde
Facility	4.5E-03	3.6E-03	5.6E-04	1.8E-03	2.9E-02
Supply Chain	2.5E-03	2.1E-03	9.3E-04	2.2E-03	2.8E-02
TOTAL	**7.0E-03**	**5.6E-03**	**1.5E-03**	**4.0E-03**	**5.7E-02**
	1,3 Butadiene	**Acrolein**	**Acetaldehyde**	**Styrene**	**Naphthalene**
Facility	2.6E-04	1.9E-03	1.0E-02	4.7E-05	6.8E-04
Supply Chain	8.2E-04	2.1E-03	1.1E-02	3.5E-04	2.9E-03
TOTAL	**1.1E-03**	**3.9E-03**	**2.2E-02**	**4.0E-04**	**3.6E-03**

Source: USEPA Motor Vehicle Emissions Simulator (MOVES 2014b)

7.2.2 Rail

To facilitate shipping of the stored lumber, Goodrich Terminals, is proposing a rail spur connection to the existing CN rail line. 60% of received lumber is estimated to occur via rail. Activities on the proposed rail spur will be fully controlled by CN and will occur during the site's operating hours. Approximately 12 center-beam cars will attend the site per day. All rail equipment will be the property of CN.

Rail emissions from the facility will be generated from the combustion of diesel fuel from switcher locomotives maneuvering the rail cars for unloading. Emission factors and activity metrics for switcher locomotives are described in Section A.2 in Appendix A. Annual emissions estimates are shown in Table 7.4.

Table 7.4: Estimated Facility Emissions from Yard Switching Locomotive

Source	Emissions (tonnes/yr)						
	CO	NO_x	PM_{10} [1]	$PM_{2.5}$ [1]	BC^2	SO_2	HC
Yard Switching	0.02	0.23	0.01	0.01	0.004	0.0001	0.013

Source: Locomotive Emissions Monitoring Program 2015, Railway Association of Canada
[1] Assumes 100% of TPM emissions are $PM_{2.5}$
[2] Canada's Black Carbon Inventory 2018, Environment and Climate Change Canada

7.2.3 Road Dust from Travel on Paved Roads

Particulate matter emissions occur whenever vehicles travel over a paved surface such as a road or parking lot due to resuspension of loose material on the road surface. Emissions from paved roads vary with the silt loading present on the road surface along with the average vehicle weight and speed of vehicles traveling the road.

Table 7.5 summarizes estimates of annual emissions for entrainment of road dust due to facility-related vehicle traffic. Estimates have been provided for both the facility and the supply chain, defined for the purpose of the air assessment as the secondary access roads into the property and the South Fraser Perimeter Road from Tannery Road to GCT Deltaport (and back). Particulate matter emission factors for travel on paved roads and a description of the parameters used in the equation are described in Section A.3 of Appendix A. Road segment lengths are shown in Figure 7.1.

Table 7.5: Estimated Road Dust Emissions from Shipping (tonnes/yr)

Activity	Emissions (tonnes/year)		
	TSP	PM_{10}	$PM_{2.5}$
Site Roads	2.9	0.56	0.14
Facility Access Roads	3.4	0.65	0.16
Supply Chain Roads (SFPR)	16.5	3.2	0.77
TOTAL PAVED ROAD DUST EMISSIONS ESTIMATE	**22.9**	**4.4**	**1.1**

Source: USEPA AP-42 Section 13.2.1 'Paved Roads'

7.2.4 Summary of Anticipated Facility-Based Emissions

Annual estimated facility emissions from all combined sources are summarized for criteria air contaminants in Table 7.6.

Table 7.6: Summary of Facility-Related Emissions (Annual Tonnes)

	Fugitive Dust			Combustion Exhaust							
	TSP	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	NH_3	PAH
Annual Emissions	22.9	4.4	1.1	0.35	0.25	1.64	4.92	0.014	0.64	0.014	0.004

7.3 No-Project Case

The facility does not currently exist and the lot is currently vacant, therefore the no-Project case is the same as the baseline case (Section 7.1).

8.0 LEVEL 2 – DISPERSION MODELLING

Not currently applicable pending direction from Port of Vancouver.

9.0 MITIGATION POTENTIAL

9.1 Application of Best Available Procedures

Emissions due to facility operations can be reduced through the application of best practice mitigation techniques as follows:

- conduct regular maintenance of the fleet to reduce emissions;
- use newer-model equipment and vehicles within reason with more stringent emission controls;
- eliminate unnecessary idling by shutting off engines during extended downtime, queuing or loading;
- minimize the time trucks are on site with engines running or queuing by maintaining a schedule, efficient scale procedures etc.;
- use ultra low-sulfur diesel fuel for on-site equipment.

10.0 IMPACT POTENTIAL

10.1 Baseline Case to Project Case

Estimated emissions for the Project case represents an inconsequential increase in combustion emissions over the current baseline and would not result in discernable degradation of air quality in the immediate area. Considering the majority of emissions occur away from the facility along the supply chain route, the increase is regionally insignificant. Metro Vancouver's '*2015 Lower Fraser Valley Air Emissions Inventory and Forecast*' (MV 2018) provides a regional summary of emissions by pollutant for 2015, listed in Table 10.1.

Table 10.1: 2015 Emissions Inventory for the Lower Fraser Valley (thousand tonnes annual)

	CO	NO_x	$PM_{2.5}$	DPM	SO_2	VOC	NH_3
LFV Emissions (thousand tonnes) [1]	258.9	59.2	7.5	1.3	7.1	89.8	14.6
Project Emissions (thousand tonnes)	0.001	0.005	0.003	0.0003	0.00001	0.0006	0.00001

[1] Source: 2015 Lower Fraser Valley Air Emissions Inventory and Forecast (Metro Vancouver 2018)

Project-related emissions are less than 0.001% of the annual emissions inventory in the airshed.

10.2 Project Case to No-Project Case

The facility does not currently exist and the lot is vacant. The project to no-project case impact potential is therefore the reverse of the baseline case to project case described in Section 10.1.

10.3 Project Case to Best Available Technique

The majority of the mitigation measures described in Section 9.1 will generally be followed as standard best practice procedures. The applied best practices will have an overall reduction of combustion-related emissions.

10.4 Conclusion

The estimated contaminant emissions from facility-related sources are insignificant with respect to air quality impacts on the surrounding area. The majority of emissions are from combustion exhaust and entrainment of road dust from truck transportation of lumber along the SFPR between the storage facility and Deltaport. These emissions can be considered as indirect in that the operation of the facility will not result in an increase in the number of transport vehicles, which are part of the Goodrich Group fleet, on Metro Vancouver roads. Rather, these vehicles would be operating in a different part of Metro Vancouver.

11.0 CLOSURE

This report and its contents are intended for the sole use of Goodrich Terminals and their agents. Tetra Tech Canada Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Goodrich Terminals, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Tetra Tech's Limitations on the Use of this Document are provided in Appendix B of this report.

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully Submitted,
Tetra Tech Canada Inc.

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TM/JAS/tak

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EC 2018. Canada's Black Carbon Inventory 2018 Edition. Environment and Climate Change Canada 2018.

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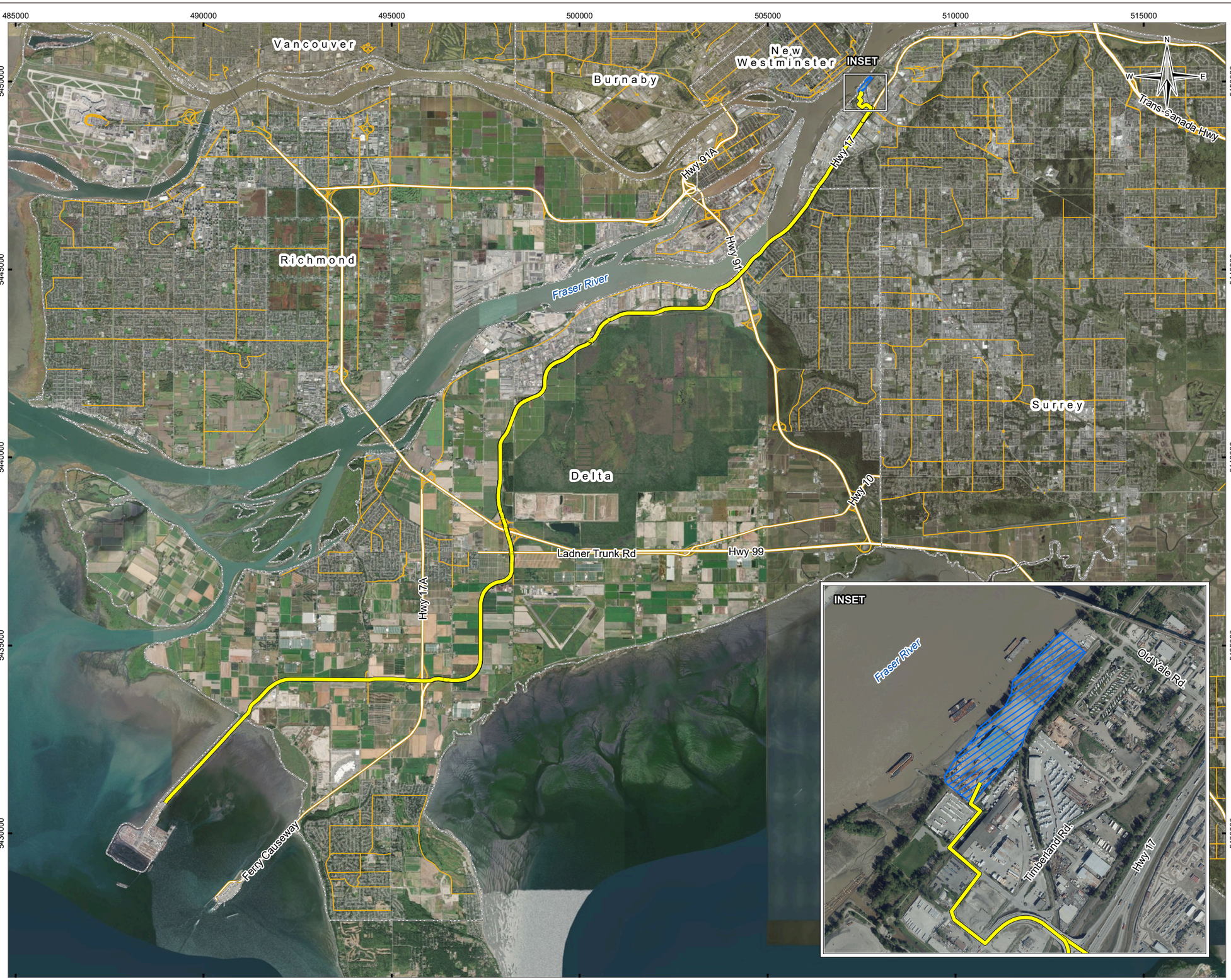
MV 2018. 2015 Lower Fraser Valley Air Emissions Inventory and Forecast - Final Report and Summarized Results. Metro Vancouver Air Quality and Climate Change Division. March 2018.

WSP 2018. Fraser Grain Terminal Export Facility: Environmental Air Assessment. Fraser Grain Terminal Ltd. WSP Canada Inc.

FIGURES



LEGEND

- Facility Boundary
- Supply Chain
- Major Road
- Minor Road
- Municipal Boundary

NOTES
Base data source:
Canvec (2018)
City of Surrey (2018)

Imagery source:
ESRI - Surrey (2017), DigitalGlobe (2017)

STATUS
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GOODRICH TERMINALS ENVIRONMENTAL AIR ASSESSMENT FOR PORT OF VANCOUVER

Facility and Supply Chain Boundaries

PROJECTION UTM Zone 10		**DATUM** NAD83			**CLIENT**
Scale: 1:100,000 2 1 0 2 Kilometres					
FILE NO. WTRM03154-01_FIG03_1.mxd					TETRA TECH
OFFICE Tt-CAL	**DWN** RG	**CKD** SL	**APVD** TM	**REV** 0	**Figure 3.1**
DATE May 27, 2019	**PROJECT NO.** TRN.WTRM03154-01				

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LEGEND

- (#) Public Area / Location of Interest
- 1 Km Buffer
- Facility Boundary
- Major Road
- Municipal Boundary

No.	Name	Distance From Site (m)
1	Brownsville Park and Sandbar	220
2	Olsen House	190
3	Samson V Museum	988
4	Fraser River Discovery Centre	858
5	Anvil Centre/Museum and Archives	953
6	Irving House	926
7	Historical Museum	943
8	Hyack Square	948
9	Begbie Square	961
10	Westminster Pier Park	526
11	Albert Crescent Park	702
12	Qayqayt Elementary	884
13	Saint Mary's Park	860
14	Clinton Place Park	988
15	Queens Park	962
16	The Great Lawn	939
17	Sapperton Landing Park	959
18	Five Stones Church	760
19	Al-Hidayah School	722
20	Columbia St. Skytraine Station	734
21	Holy Trinity Cathedral	812
22	Residences Along Timberland Rd.	324
23	Holy Trinity Romanian Orthodox Church	719
24	Brownsville Pub & RV Park	88
25	CDI College	745
26	Christian Life Assembly	867

NOTES
Base data source:
Canvec (2018)
City of Surrey (2018)
City of New Westminster (2019)

Imagery source:
ESRI - Surrey (2017), DigitalGlobe (2017)

STATUS
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GOODRICH TERMINALS ENVIRONMENTAL AIR ASSESSMENT FOR PORT OF VANCOUVER

Locations of Interest and Distance from Site

PROJECTION UTM Zone 10		**DATUM** NAD83		**CLIENT**
Scale: 1:10,000 200 100 0 200 Metres				
FILE NO. WTRM03154-01_FIG03_2.mxd				TETRA TECH
OFFICE Tt-CAL	**DWN** RG	**CKD** SL	**APVD** TM	**REV** 0
DATE May 27, 2019	**PROJECT NO.** TRN.WTRM03154-01			**Figure 3.2**

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LEGEND

- Site
- Air Quality Station
- Meteorological Station
- Major Road
- Minor Road
- Municipal Boundary

NOTES
Base data source:
Canvec (2018)
City of Surrey (2018)

Imagery source:
ESRI - Surrey (2017), DigitalGlobe (2017)

STATUS
ISSUED FOR REVIEW

GOODRICH TERMINALS ENVIRONMENTAL AIR ASSESSMENT FOR PORT OF VANCOUVER

Metro Vancouver Air Quality and Meteorological Monitoring Stations

PROJECTION UTM Zone 10		**DATUM** NAD83			**CLIENT**
Scale: 1:40,000 500 250 0 500 Metres					
FILE NO. WTRM03154-01_FIG05_1.mxd					TETRA TECH
OFFICE Tt-CAL	**DWN** RG	**CKD** SL	**APVD** TM	**REV** 0	**Figure 5.1**
DATE May 27, 2019	**PROJECT NO.** TRN.WTRM03154-01				

APPENDIX A

ESTIMATION METHODOLOGIES

APPENDIX A – EMISSION ESTIMATION METHODOLOGIES

A.1 EQUIPMENT/VEHICLE EXHAUST

Table A.1-1 lists the vehicles and equipment operating at the facility and specifications/metrics relevant to air emissions.

Table A.1-1: Vehicle/Equipment Details and Activity Metrics

Vehicle/Equipment Type	Model	Power (hp)	Units	Per Unit Operational Hours (Annual, Estimated)	Per Vehicle Distance Travelled (km)
Heavy Duty Shipping Trucks	Super B / Container	-	60 per day	7,800 [1]	33 [2]
On-site support forklifts (diesel)	Hyundai 110D-7E	162	4	1,800	-
	Hyundai 110D-7A	123	3		-
On-site support forklifts (propane)	Hyster H90	78	2	750	-

[1] Assumes ½ hour idling time per truck on site, includes start up and idling exhaust
[2] SFPR from facility to Deltaport plus facility access roads – see Table A.3-1

Air emissions from on-road commercial trucking result from running exhaust (all contaminants), brakewear (PM_{10} and $PM_{2.5}$), tirewear (PM_{10} and $PM_{2.5}$) and evaporative vapour leaks (VOCs, PAHs). Emission factors for commercial trucking on public roads (roadtypeID 5: Urban Unrestricted Access Roads) were provided by USEPA Motor Vehicle Emissions Simulator (MOVES 2014b). The distance-based emission factors listed in Table A.1-2 and Table A.1-3 represent an average of source categories 'Diesel Fuel – Combination Long-haul Truck' and 'Diesel Fuel – Single Unit Long-haul Truck' for the closest county to Metro Vancouver, Whatcom County, WA.

Table A.1-2: On-Road Emission Factors for Commercial Trucking (g/km)

Source	Emission Factors (g/km)							
	CO	NO_x	PM_{10} [1]	$PM_{2.5}$ [1]	SO_2	VOC	NH_3	PAH
Commercial Trucking (Diesel)	1.38	5.26	0.41	0.22	0.01	0.29	0.017	0.004

Source: USEPA Motor Vehicle Emissions Simulator (MOVES 2014b) - based on average emission factors for Whatcom County, WA for source year 2016 on urban unrestricted access roads
[1] Inclusive of vehicle exhaust, breakwear and tirewear

Table A.1-3: On-Road Air Toxics Emission Factors for Commercial Trucking (g/km)

Source	Emission Factors (g/km)				
	Benzene	Toluene	Ethylbenzene	Xylene	Formaldehyde
Commercial Trucking (Diesel)	0.0024	0.0020	0.0009	0.0021	0.027
	1,3 Butadiene	Acrolein	Acetaldehyde	Styrene	Naphthalene
	0.0008	0.0020	0.011	0.00034	0.0028

Source: USEPA Motor Vehicle Emissions Simulator (MOVES 2014b) - based on average emission factors for Whatcom County, WA for source year 2016

Off-road commercial truck emissions result from start/idling exhaust and evaporative vapour leaks. Average emission factors for commercial trucking on off-network roads (roadtypeID 1: Off-network) were provided by MOVES 2014b. The operational hour-based emission factors listed in Table A.1-4 and Table A.1-5 represent an average of source categories 'Diesel Fuel – Combination Long-haul Truck' and 'Diesel Fuel – Single Unit Long-haul Truck' for Whatcom County, WA.

Table A.1-4: Off-Network Emission Factors for Commercial Trucking (g/hr)

Source	Emission Factors (g/hr)							
	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC	NH_3	PAH
Commercial Trucking (Diesel)	16.6	39.4	0.46	0.43	0.017	7.4	0.11	0.11

Source: USEPA Motor Vehicle Emissions Simulator (MOVES 2014b) - based on average emission factors for Whatcom County, WA for source year 2016

Table A.1-5: Off-Network Air Toxics Emission Factors for Commercial Trucking (g/hr)

Source	Emission Factors (g/hr)				
	Benzene	Toluene	Ethylbenzene	Xylene	Formaldehyde
Commercial Trucking (Diesel)	0.072	0.10	0.030	0.12	0.97
	1,3 Butadiene	Acrolein	Acetaldehyde	Styrene	Naphthalene
	0.016	0.058	0.36	0.0060	0.087

Source: USEPA Motor Vehicle Emissions Simulator (MOVES 2014b) - based on average emission factors for Whatcom County, WA for source year 2016

Tables A.1-6 and A.1-7 lists emission factors for the support forklifts operating on-site. Emission factors are provided by MOVES2014b NONROAD model for source categories: 'Liquified Petroleum Gas – Industrial' and 'Nonroad Diesel Fuel – Industrial'.

Table A.1-6: Emission Factors for Forklifts (g/hr)

Source	Emission Factors (g/hr)							
	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC	NH_3	PAH
Diesel Forklifts (100 – 175 hp)	39.4	129.0	9.7	9.5	0.32	32.6	0.35	0.057
LPG Forklifts (75 - 100 hp)	189.3	29.6	1.4	1.4	0.07	4.6	-	0.00029

Source: USEPA Motor Vehicle Emissions Simulator (MOVES 2014b) - based on average emission factors for Whatcom County, WA for source year 2016

Table A.1-7: Air Toxics Emission Factors from Forklifts (g/hr)

Source	Emission Factors (g/hr)				
	Benzene	Toluene	Ethylbenzene	Xylene	Formaldehyde
Diesel Forklifts (100 – 175 hp)	0.31	0.22	0.026	0.073	1.70
LPG Forklifts (75 - 100 hp)	-	-	-	-	0.11
	1,3 Butadiene	Acrolein	Acetaldehyde	Styrene	Naphthalene
Diesel Forklifts (100 – 175 hp)	0.011	0.11	0.61	-	0.000000068
LPG Forklifts (75 - 100 hp)	0.0016	0.023	0.021	-	0.000016

Source: USEPA Motor Vehicle Emissions Simulator (MOVES 2014b) - based on average emission factors for Whatcom County, WA for source year 2016

A.2 RAIL

Emissions from the switcher locomotive are calculated using the equation:

$$E_{CAC} = EF \cdot FC$$

where:

- E_{CAC} is the total emissions of a given air contaminant from operation of a switcher locomotive (tonnes per year).
- EF is the diesel fuel consumption-based emission factor for a given contaminant for switcher locomotives (g/L).
- FC is the estimated annual fuel consumption for the switcher locomotive (L/y).

Published fuel-based emission factors from the Railway Association of Canada's (RAC) Locomotive Emissions Monitoring (LEM) Program 2015 were used to estimate emissions from the switcher locomotive at the Goodrich Terminals facility. These factors are shown in Table A-3. The EFs to calculate emissions of SO_2 are based on the 15 ppm sulphur content of ULSD used in locomotives as per 2013 regulations.

The estimated fuel consumption for switch locomotives is 25.95 litres/hour, referenced from switcher locomotive metrics contained in '*Fraser Grain Terminal Export Facility: Environmental Air Assessment*' (WSP 2017).

Table A.2-1: Emission Factors for Switch Locomotives

Source	Emission Factors (g/L)					
	CO	NO_x	PM_{10} [1]	$PM_{2.5}$ [1]	SO_2	HC
Yard Switching	7.35	68.38	1.48	1.48	0.02	3.96

Source: Locomotive Emissions Monitoring Program 2015, Railway Association of Canada

[1] Assume 100% of TPM emissions are $PM_{2.5}$

A.3 TRAVEL ON PAVED ROADS

Particulate emissions occur whenever vehicles travel over a paved surface such as a road or parking lot. Particulate emissions from paved roads are due to direct emissions from vehicles in the form of exhaust, brake wear and tire wear emissions and resuspension of loose material on the road surface.

The emission factor for re-suspension of loose material on the road surface due to truck traffic is provided in USEPA AP-42 Section 13.2.1 '*Paved Roads*'. Fine particulate matter emissions from vehicle exhaust, brake wear, and tire wear are estimated separately using EPA's MOVES2014b model and are described in Section A.1.

Emissions from paved roads have been found to vary with what is termed the "silt loading" present on the road surface. In addition, the average weight and speed of vehicles traveling the road influence road dust emissions. The quantity of particulate emissions from resuspension of loose material on the road surface due to vehicle travel on a paved road may be estimated using the following equation:

$$EF\ (g/VKT) = [k \cdot (sL)^{0.91} \cdot W^{1.02}]\left(1 - \frac{P}{(4 \cdot 365)}\right)$$

Where:

- k is the particle size multiplier (3.23 for TSP, 0.62 for PM_{10} and 0.15 for $PM_{2.5}$)
- sL is the road surface silt loading (in g/m^2)
- W is the average weight of vehicles travelling on the road (in U.S. tons – conversion factor of 1.102 from tonnes)
- P is the number of days with at least 0.254 mm of precipitation (169, taken from Environment Canada's 1981 – 2010 Climate Normals for Vancouver International Airport)

USEPA AP-42 Section 13.2.1 Table 13.2.1.2 - *Ubiquitous Silt Loading Default Values with Hot Spot Contributions from Anti-Skid Abrasives (g/m^2)* - provides a baseline silt loading value of 0.06 g/m^2 for high volume roads (5,000 – 10,000 vehicles per day - e.g. South Fraser Perimeter Road) and 0.6 g/m^2 for low volume roads (< 500 vehicles per day - e.g. property access roads. An estimate of the silt loading within the property was taken from values presented in USEPA AP-42 Table 13.2.1-3 – Typical Silt Content and Loading Values for Paved Roads at Industrial Facilities. A mean silt loading value for the property of 5 g/m^2 was assumed based on the range of test values provided in AP-42 obtained from various facility types. This is likely a conservative value for the activities occurring on the property.

The maximum gross vehicle weight for an 8-axle Super B as per British Columbia Commercial Transport Procedures Manual is 63.5 tonnes (70 tons). Road segments distances are delineated as follows:

Table A.3-1: Paved Road Segment Lengths

Road Segment	Type	Segment Length (km)
Site	Facility	0.1
Property Access (Local Roads)	Supply Chain	0.8
SFPR to Deltaport	Supply Chain	31.5

A.4 BLACK CARBON

Black carbon (BC) is a short-lived, small aerosol (or airborne) particle linked to both climate warming and adverse health effects. Black carbon is not emitted on its own, but as a component of emitted particulate matter less than or equal to 2.5 micrometres in diameter ($PM_{2.5}$). BC emissions are determined for various sources using empirically derived or estimated BC to $PM_{2.5}$ ratios for various source categories relevant, listed in Table A-5.

Table A.4-1: Black Carbon Ratios

Source	BC to PM2.5 Ratio
On-Road Transport (Diesel)	0.63[1]
Off-Road Transport (Diesel) [2]	0.77
Off-Road Transport (LPG) [3]	0.12
Rail Transportation [4]	0.77

Source: Canada's Black Carbon Inventory 2018, Environment and Climate Change Canada

[1] Values are variable according to model input and vehicle class, average of 2013 – 2016

[2] Off-road vehicles and mobile equipment using diesel fuel in mining, construction, agriculture, commercial purposes, logging, railway maintenance, airport ground support, and lawn and garden equipment, along with recreational vehicles.

[3] Emissions from off-road vehicles using gasoline, liquid petroleum gas and compressed natural gas, including 2- and 4-stroke mining, construction, recreational, agricultural, commercial, logging, railway maintenance, airport ground support, and lawn and garden equipment

[4] Emissions from freight and passenger trains, including yard-switching activities

APPENDIX B

TETRA TECH'S LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

GEOENVIRONMENTAL

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While TETRA TECH endeavours to verify the accuracy of such information, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

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The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this report, at or on the development proposed as of the date of the Professional Document requires a supplementary exploration, investigation, and assessment.

TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by TETRA TECH in its reasonably exercised discretion.