

# APPENDIX

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PRELIMINARY ASSET  
MAINTANCE PLAN

**Vancouver Fraser Port Authority Road and Utilities Cost Estimates for 20 Year Operations, Maintenance and Renewal Forecast**

<b>Key Statistics / Assumptions</b>	<b>Centreline Length (km)</b>	5	<b>AC Depth</b>	50	<b>Lane Length (km)</b>	15	Based on the new road being a 3 lane collector
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Category	Activity	Example Jurisdiction Cost Estimate					Calculations				Comments / Assumptions	Review Comments
		Cambridge	Kitchener	Waterloo	Alberta	BCMOTI	Average Unit Cost Estimate	Unit of Measure	Estimated Quantity	Total Cost Estimate		
Pavement Maintenance (for 3.5 centreline km of 4 lane industrial road)	Annual Winter Maintenance Cost Per Lane Km (including snow removal, de-icing, sanding)	\$ 4,080	\$ 4,743	\$ 4,195	\$ 4,000		\$ 4,816	\$/ lane km / annum	15	\$ 72,250.00	Unit Rate is an average cost sourced from KPMG Report (2015) and CPI to reflect 2019 dollars. (Does not account for pavement markings, traffic signals, or traffic signs)	Could be significantly lower than this if a local operator with a utility mounted plow and small hopper on the back is used. They do not have the same IOC's that a larger Muni would have, and they would be distributed across a much larger customer base.
	Annual Summer Routine Maintenance Cost Per Lane Km (including debris removal, pothole repairs, vegetation control, litter removal, minor landscaping, post winter sweeping)	\$ 1,655	\$ 1,487	\$ 1,779	\$ 1,500		\$ 2,500	\$/ lane km / annum	15	\$ 37,500.00	Unit Rate is an average cost sourced from KPMG Report (2015) and CPI to reflect 2019 dollars. (Does not account for pavement markings, traffic signals, or traffic signs)	
	Line Painting - Centreline (Single) (includes 1 annual repaint of all single centrelines and lane lines - approx 80% of all markings)				\$ 250	\$ 700	\$ 475	\$/ lane km / annum	15	\$ 7,130.00	Cost from BC MoTI Construction Guide 2013 and Increased using CPI to 2019 dollars and recently tendered Alberta Transportation Highway Maintenance Contracts	
	Line Painting - Centreline (Double) (includes 1 annual repaint of all single centrelines and lane lines - approx 20% of all line markings)				\$ 300	\$ 740	\$ 520	\$/ lane km / annum	15	\$ 7,800.00	Cost from BC MoTI Construction Guide 2013 and Increased using CPI to 2019 dollars and recently tendered Alberta Transportation Highway Maintenance Contracts	
	Line Painting - Intersection and Rail Crossing Limit Lines and Wording (includes 1 annual repaint of all limit lines at controlled intersections with high durability paint)				\$ 250		\$ 250	LS / Intersection / annum	15	\$ 3,750.00	Based on tendered rates from 2019 bids for Alberta Transportation highway maintenance contracts.	
Sign Maintenance (sign inventory approx 20 signs per km = 100)	Sign Replacements (includes replacement of 5% of sign stock per annum due to damage, vandalism or deterioration)				\$ 180	\$ 110	\$ 145	Each / annum	5.0	\$ 730.00	Based on tendered rates from 2019 bids for Alberta Transportation highway maintenance contracts.	
	Annual Sign Cleaning (includes cleaning of signs)							LS / annum	0.0	\$ -	Included in Routine Summer Maintenance	
	Sign Posts Replacement (includes replacement of 2.5% of sign post stock per annum due to damage, vandalism or deterioration)				\$ 185		\$ 185	Each / annum	3.0	\$ 560.00	Based on tendered rates from 2019 bids for Alberta Transportation highway maintenance contracts.	
Pavement Renewal and Cyclical Maintenance	Asphalt Paving (including milling existing asphalt surface to a depth of 30mm and repaving. Required once every 15 years)				\$ 20		\$ 20	\$/ sq. m / cycle	61600.0	\$ 1,232,000	Based on tendered rates from 2019 bids for Alberta Transportation highway maintenance contracts.	
	Crack Sealing (including establishment of crews and equipment to undertake crack sealing repairs on 20% of the network every 5 years except in Year 15. One cycle = 4m / CL m = 20,000m)				\$ 1		\$ 1	\$/ m / cycle	15000.0	\$ 10,500	Based on tendered rates from 2019 bids for Alberta Transportation highway maintenance contracts.	
	Major Pavement Repairs (including milling existing failed areas to a depth of 30mm and repaving. 100 tonnes of repairs required once at 8 years after paving and again at 12 years after paving)				\$ 150		\$ 200	\$/ tonne / cycle	100.0	\$ 20,000	Based on tendered rates from 2019 bids for Alberta Transportation highway maintenance contracts.	
4 signalized intersections every	Urban Traffic Signals (including summer and winter cabinet maintenance, responding to outages, bulb replacement)				\$ 1,750		\$ 1,750	\$/ intersection / annum	4.0	\$ 7,000.0	Based on tendered rates from 2019 bids for Alberta Transportation highway maintenance contracts with 250W HPS Luminaires. If LED, cost would be less.	

Traffic Signals and Lighting (including 7 intersections, 4 ped crossings, and 150m both sides)	Railway Signals (including bulb replacement and other minor maintenance as and when required)				\$ 500	\$ 2,220	\$/ crossing / annum	4.0	\$ 8,880.0	Cost from BC MoTI Construction Guide 2013 and Increased using CPI to 2019 dollars
	Street Lighting (including monthly inspections and bulb changes / ballast cleaning / post winter pole washing)				\$ 200	\$ 200	\$/ light / annum	66.7	\$ 13,340.0	Based on tendered rates from 2019 bids for Alberta Transportation highway maintenance contracts with 250W HPS Luminaires. If LED, cost would be less.
	Power Costs for Signals, Pedestrian Signals and Lighting					\$ 250	\$/ month	12.0	\$ 3,000.0	Cost from BC MoTI Construction Guide 2013 and Increased using CPI to 2019 dollars
Curb and Gutter Repairs (2 lineal km of Curb and Gutter)	Curb & Gutter Maintenance (including small concrete repairs less than 1m in length in cracked sections of curb and gutter every 10 years)					\$ 200	\$/ lin m / cycle	50.0	\$ 10,000.00	Cost from Class D Estimate. Only 2.5% of the total curb and gutter length is affected
	Curb & Gutter Replacement (including replacement of heavily damaged sections up to 20m in length every 15 years in conjunction with pavement renewal)					\$ 250	\$/ lin m / cycle	50.0	\$ 12,500.00	Cost from Class D Estimate. Only 2.5% of the total curb and gutter length is affected
Electrical Replacements	Replace No.6 Electrical Cable					\$ 6	\$/ lin m / cycle	5000	\$ 28,250.00	
	Replace No.10 Electrical Cable					\$ 3	\$/ lin m / cycle	5000	\$ 15,800.00	
	Replace 48C Fibre Optic Cable					\$ 16	\$/ lin m / cycle	5000	\$ 78,500.00	
Watermain (PVC) - 200mm (per metre)	Watermain (PVC) - 200mm (per metre)					\$ 850				Cost from Class D Estimate. No maintenance required in 20 year forecast
	Valve - 150mm					\$ 3,000				Cost from Oakville 2019 dollars. No maintenance required in 20 year forecast
	Connection to Ex. 150mm dia. Watermain including trench and asphalt restoration, including chamber & valves					\$ 15,000	LS			Cost from Class D Estimate. No maintenance required in 20 year forecast
	Flushing, Chlorination, Pressure Testing & Final Connection					\$ 2,000	LS			Cost from Class D Estimate. No maintenance required in 20 year forecast
	Storm Sewer (PVC) - 250mm (per metre) (Including 1 inspection after 15 years - CCTV)					\$ 850	LS			Cost from Class D Estimate. No maintenance required in 20 year forecast

Utilities (catch basins every 75m of road on both sides of road with equal distribution of single and double catch basins)	Storm Sewer (PVC) -675mm (per metre) (Including 1 inspection after 15 years - CCTV)						\$ 1,500	\$/ LS / Cycle	0.1	\$ 150.00	Cost from Class D Estimate. Maintenance costs at 10% of asset Value	
	Storm Sewer (Concrete) - 1050mm (per metre) (including 1 inspection after 15 years - CCTV)						\$ 1,950	\$/ LS / Cycle	0.1	\$ 200.00	Cost from Class D Estimate. Maintenance costs at 10% of asset Value	
	Storm Sewer (PVC) - 250mm (per metre)						\$ 850				Cost from Class D Estimate. No maintenance required in 20 year forecast	
	Storm Sewer (PVC) - 675mm (per metre)						\$ 1,500				Cost from Class D Estimate. No maintenance required in 20 year forecast	
	Storm Sewer (Concrete) - 1050mm (per metre)						\$ 1,950				Cost from Class D Estimate. No maintenance required in 20 year forecast	
	Storm Sewer Manhole 1050mm						\$ 9,000				Cost from Class D Estimate. No maintenance required in 20 year forecast	
	Storm Sewer Manhole 1350mm						\$ 12,000				Cost from Class D Estimate. No maintenance required in 20 year forecast	
	Storm Sewer Manhole 1500mm						\$ 15,000				Cost from Class D Estimate. No maintenance required in 20 year forecast	
	Connection to Existing Storm Sewer including trench and asphalt restoration						\$ 10,000	LS				Cost from Class D Estimate. No maintenance required in 20 year forecast
	Flush and Video						\$ 5,000	LS				Cost from Local Municipality. No maintenance required in 20 year forecast
	Catch Basin Maintenance - 600mm x 600mm (including pumping out every settling chamber every 3 years with suction truck)						\$ 4,000	\$/ item / cycle	0.1	\$ 400.00	Cost from Class D Estimate. Maintenance costs at 10% of asset Value	
	Oil/Grit Separator - STC 300 - (including annual cleaning of oil grit selectors given site is contaminated)						\$ 50,000	LS / annum	0.1	\$ 5,000.00	Cost from Class D Estimate. Maintenance costs at 10% of asset Value	