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Ministry of Transportation and Infrastructure

FINAL REPORT

PREPARED FOR THE
BC MINISTRY OF HIGHWAYS AND INFRASTRUCTURE

HIGHWAY 1 CORRIDOR WIDENING (216 Street to 264 Street) & TRUCK PARKING AREA

BUSINESS CASE

February 2017

URBAN systems

File: 1961.0379.06

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Executive Summary

Highway 1 is the primary east-west corridor serving and connecting the Lower Mainland to the rest of British Columbia and Canada. Between the Cassiar Tunnel and 216 Street, the Ministry of Transportation and Infrastructure (MoTI) invested in widening Highway 1 and replacing the Port Mann Bridge. East of the Bridge, the highway generally supports three travel lanes in each direction through to the soon to be constructed 216 Street interchange. East of 216 Street, Highway 1 is four travel lanes with the exception of the segment between 232 Street (Highway 10) and 264 Street (Highway 13) interchanges where there is a third eastbound lane.

Several segments of Highway 1 east of 216 Street currently operate at the lower end of acceptable service levels for a major highway facility during the weekday peak periods and the peak periods on the weekends. Some sections experience lower than free flow speeds, relatively high vehicle density, limited freedom to maneuver, and nonrecurring congestion resulting from minor incidents / disruptions in the traffic stream. In the short and long term future, the majority of this section of highway is projected to have insufficient capacity to meet the forecasted travel demands. These mobility, safety and reliability issues affect provincial travel between Lower Mainland communities and the rest of the province and impact the movement of goods and services.

In support of accommodating the movement of people, goods and services in British Columbia, the provincial government's ***BC On the Move – 10 Year Transportation Plan*** identified the commitment to improve highway capacity and reliability with the widening of Highway 1 between Langley and Abbotsford. Consistent with this priority, *BC On the Move* also identified a commitment to work with industry to identify and construct at least two new truck parking areas nearby key highway corridors in the Lower Mainland. Truck parking facilities support mobility and reliability investments on BC's highways by providing convenient and accessible areas to enable commercial vehicles to park and access appropriate amenities.

This Business Case describes the key issues and challenges on the Highway 1 corridor segment between 216 Street in Langley and Highway 11 in Abbotsford as well as the difficulties the trucking industry faces accessing truck parking and impacts on the network and environment. The options considered and recommendations for the initial stages of investment in widening Highway 1 (216 Street to 264 Street) and truck parking areas (off Highway 17 east of the Port Mann Bridge in the City of Surrey) to support *BC On the Move* are described.

The Highway 1 widening issues, options and recommendations were identified in a report prepared by Parsons and attached to this Business Case – ***Highway 1 Widening (216 Street to Highway 11) Business Case.*** The recommended truck parking facility reviewed by Stantec included an assessment of alternative truck parking locations near the Highway 1 corridor in the north Surrey and Langley areas. The content from the former document and reviews are slightly modified and incorporated into this overall Business Case.

Problem Definition

Between 216 Street and Highway 11, several segments on Highway 1 currently operate with moderate delays (or levels of service) during both weekday and weekend peak periods. These problematic highway

segments are characterized by lower than free flow speeds, relatively high vehicle density, limited freedom to maneuver, and nonrecurring congestion resulting from minor incidents / disruptions in the traffic stream. In the short and long term future, the majority of this section of highway is projected to have insufficient capacity to meet the forecasted travel demands.

Additionally, this section of Highway 1 has a collision rate that is higher than the average for similar facilities around the province. In addition to the direct collision costs are significant delay costs that occur when the highway lanes are blocked due to an incident. With approximately 180 collisions reported to police every year, this means there is a reportable collision every two days along this section of the Highway 1 corridor.

In addition to the mobility and reliability challenges through this section of Highway 1, most structures along the corridor do not meet current clearance standards of 5.0m for large structures and 5.5m for lightweight structures. In particular, those structures which are at risk of impact include the Glover Road underpass (4.46m); Roberts Bank Rail Corridor underpass Tunnel portals (4.4m); 232 Street underpass (4.62m); 264 Street underpass (4.6m); and Peardonville Road underpass (4.92m). Further, the design of the 232 Street and 264 Street interchanges with Highway 1 are no longer considered best practices. With increasing highway traffic as well as those entering and leaving the corridor, the existing configurations contribute to short weaving and merging distances which in turn will reduce safety in the long-term.

With a growing economy and trade across British Columbia, and with other provinces, the United States and Asia Pacific Gateway regions, the Highway 1 corridor and connecting roadways are moving larger volumes of goods and services. Although investments are being made in the highway network, trucks delivering goods to and from the Lower Mainland are unable to find adequate daytime and overnight parking (Stantec estimates indicate that 35 truck parking facilities supply 2,700 heavy truck parking stalls in Surrey). Within the City of Surrey and other nearby communities south of the Fraser River, there is very little overnight parking available for trucks and residential street restrictions prohibit truck parking. The result is that truck drivers must spend significant time and expense searching for available parking which in turn impacts mobility and congestion on the Lower Mainland highway and municipal street system and increases the potential for collisions and vehicle emissions with increasing volumes. Through work undertaken by the City of Surrey, it was estimated that an additional 2,000 parking stalls are required to meet truck demands within the community.

Improvement Possibilities Considered

As part of the Highway 1 widening, the median area is generally wide enough across the corridor to provide the additional eastbound and westbound lanes. Beyond that, the method of widening for either general purpose traffic or high-occupant vehicles (HOVs) were considered. The fundamental consideration was the safety and efficiency for the transitions at either end. The study considered 4 options:

1. One new general purpose lane in each direction between 202 and Highway 11;
2. One new HOV lane in each direction between 202 and Highway 11;
3. s.13

4. One new general purpose lane in each direction between Glover Road and Highway 11, and extend existing HOV lanes to Highway 10;

Considering highway usage, capacity and operational performance s.13,s.17
s.13,s.17

The truck parking review considered 13 potential sites within Surrey as well as others in adjacent municipalities as illustrated in **Figure ES-0.1**. Pre-screening was completed to filter the sites down to the top four areas identifying three sites for further option analysis.

Figure ES-0.1 – Candidate Truck Parking Sites

s.13,s.17

Source: Stantec Consulting

Recommended Improvements

At this stage, the Ministry has worked with the City of Surrey and Township of Langley on the Highway 1 widening and truck parking facility requirements and potential partnerships for investing in each project. Assuming suitable cost sharing arrangements and affordability, the Highway 1 widening and area improvements could extend from east of the soon to be built 216 Street interchange to the 264 Street interchange. This would include the following sequence of improvements as summarized below:

- 232 Street Interchange which involves reconfiguring the existing 232 Street Interchange and replacing the existing underpass structure as well as constructing a new 72 Avenue underpass structure.

- 2.1 km widening between the recently constructed interchange at 216 Street and the 232 Street Interchange as previously described. This widening would involve the removal and construction of a new CP Rail crossing and Glover Road overpass structures.
- Widening in the westbound direction for approximately 5.8km between 264 Street to 232 Street. Three eastbound general purpose lanes are already provided between 232 Street and 264 Street. No new structures or modifications to existing structures are required as part of this project.

The limits of the widening in both the eastbound and westbound directions are illustrated in **Figure ES-0.2**. Beyond these project limits, the Ministry will widen Highway 1 from four to six lanes in both directions through to Highway 11 as financial resources become available in future.

Conceptual cost estimates have been prepared by Parsons for all Highway 1 six laning project components. The above capital improvements are estimated at **$205.5 M** (Class C). All improvements are to take place on lands that are provincially owned.

Figure ES-0.2: Project Limits for Highway 1 Widening & Area Improvements

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The site illustrated below in **Figure ES-0.3** would support 158 pull through truck and 44 passenger vehicle parking stalls. The site would also be connected to Highway 17 through a new full movement intersection with left turn and right turn lanes. A protected-T partial signal at the truck parking access would signalize the westbound approach while the eastbound through movement would remain unsignalized.

Class D cost estimates have been prepared by Stantec for all Truck Parking facility and related improvements. The above capital improvements are estimated at **$29.9M**. The project will require the s.13,s.17

Figure ES-0.3: Propose Truck Parking Area (off Highway 17, east of the Port Mann Bridge)

s.13

Multiple Account Evaluation Highlights

Table ES-0.1 provides a Multiple Account Evaluation summary of Highway 1 Six Laning Improvements as well as an assessment of the Highway 17 Truck Parking Facility. Projects are assessed over a 25 year term. A 6% discount rate is assumed.

Widening Highway 1 between the new 216 Street interchange and the 264 Street interchange, including a full interchange reconfiguration at 232 St and all associated overpass improvements, results in a **Net Present Value of $32.6 M and a benefit/cost ratio of 1.2,** which is considered very impressive due to the overall scale of the project. The project will improve mobility and safety performance along the corridor and update clearance standards at the Glover Road, CP Rail, and 232 Street underpasses. The project is anticipated to result in significant GHG reduction benefits as a result of improved operating conditions and modest sustainable transportation benefits because the improvements incorporate a 6 km extension of the s.13 . The project directly aligns with the stated *BC on the Move* priority to six lane Highway 1 between from Langley to Abbotsford.

Constructing the proposed truck parking facility s.13,s.17 results in a **Net Present Value of $2.6 M and a benefit/cost ratio of 1.1.** The project will provide 158 additional truck parking spaces, modestly reducing incidence of illegal parking in North Surrey. The project is anticipated to result in modest GHG reduction benefits resulting from fewer trucks travelling further distances in search of parking. The project directly aligns with the stated *BC on the Move* priority to construct at least two new truck parking areas in the Lower Mainland.

The project as a whole is anticipated to result in GHG benefits resulting from a reduction in vehicle idling on Highway 1 and overall truck travel related to searching for parking. MoTI Responses to Infrastructure Canada Annex D – Environmental and Aboriginal Consultation Information Requirements as it pertains to Highway 1 six laning is included in Appendix C of the original Parsons *Highway 1 Widening (216 Street to Highway 11) Business Case* found in **Appendix A** of this report. MoTI Responses to Infrastructure Canada Annex D as it relates to the truck parking facility is included in **Appendix B** of this report.

Table ES-0.1: Multiple Account Evaluation Summary

Discount Rate = 6%		
	Highway 1 Widening & Overpass/Interchange Improvements (1)	Truck Parking Facility (Highway 17 east of Port Mann Bridge) (2)
FINANCIAL ACCOUNT		
PV Revenue	-	$4.4 M
PV Expenses	-	-$4.4 M
Capital Cost	$205.5 M	$29.9 M
Property Cost	-	$0.1 M
Capital Cost (PV)	$179.5 M	$27.0 M
Property Cost (PV)	-	s.13,s.17
Maintenance (PV)	$2.0 M	$0.3 M
Salvage Value (PV)	-$24.3 M	-$1.6 M
Total Incremental Cost	s.13,s.17	
CUSTOMER SERVICE ACCOUNT		
Travel Time Savings (PV)	$172.2 M	$23.8 M
Vehicle Operating Savings (PV)	$11.1 M	$7.0 M
Hwy 17 / Truck Access Signal Travel Time Costs (PV)		-$2.2 M
Hwy 17 / Truck Access Signal Veh. Operating Costs (PV)		-$0.2 M
Safety (PV)	$6.5 M	N/A
Total Incremental Benefits (PV)	*$189.8 M*	*$28.4 M*
SOCIAL/COMMUNITY ACCOUNT		
Noise and Visual Impacts	◑	◑
Community Displacement	◑	◑
Community Severance	●	◑
Reduction in Illegal Truck Parking	N/A	◕
Sustainable Transportation	◕	◑
Consistency with Provincial Plans	●	●
ENVIRONMENTAL ACCOUNT		
Terrestrial	◑	Unknown
Aquatic	◑	◔
Archaeological / Historical	◑	Unknown
GHG Reduction	●	◕
KEY ECONOMIC INDICATORS		
Net Present Value	**$32.6**	**$2.6 M**
Benefit-Cost	**1.2**	**1.1**

(1) MAE evaluation from the Highway 1 Widening (216 Street to highway 11) Business Case, Parsons, 2016. Customer service assessment extrapolated from the 15 year evaluation provided in background business case (including Class C estimates).

(2) MAE evaluation from Stantec assessment of the proposed truck parking area, 2016 (including Class D cost estimates).

● Significant Benefit ◕ Modest Benefit ◑ Neutral ◔ Modest Impact ○ Significant Impact

Cost Sharing and Cash Flow Options

The proposed improvements will be delivered by BC MoTI through Traditional Competitive Tendering and will be completed by way of a Major Works Contract set out by MoTI. Today, the Highway 1 widening and truck parking area have been developed to a conceptual level of design. The functional designs for each would begin in 2017-18, and the delivery for the truck parking area would be substantially complete by the end of fiscal 2019-20, and by 2021-22 for the Highway 1 widening project as highlighted in **Table ES-0.2**.

Table ES-0.2: Estimated Project Schedule by Fiscal Year

Activity	2017 - 18	2018 - 19	2019 - 20	2020 - 21	2021 - 22
Truck Parking					
Project Design and Surveying	■				
Environmental Assessment	■				
Construction Permit		■			
Tender		■			
Start of on-site Construction		■			
Substantial Completion			■		
Project Completion				■	
Final Report				■	
Highway 1					
Project Design and Surveying	■				
Environmental Assessment	■	■			
Construction Permit			■		
Tender			■		
Start of on-site Construction			■	■	
Substantial Completion					■
Project Completion					■
Final Report					■

The proposed improvements for the 232 Street interchange is expected to have significant municipal benefits in addition to the highway. Consistent with previous discussions with local agencies, the Township of Langley will be requested to fund s.13,s.17 of the project costs. **Table ES-0.3** below summarizes the allocations between agencies assuming s.13, s.17 federal contributions toward eligible costs for the Highway 1 improvements (s.13, s.17 for the 232 Street interchange) and truck parking facility. **Table ES-0.4** summarizes the anticipated cash flow for each item and agency based on the delivery timeframe.

Table ES-0.3: Cost Allocations by Project Segment and Eligibility

Costs	Truck Parking	Highway 1 - 232nd Street Interchange	Highway 1 - 216th Street to 232nd Street Widening	Highway 1 - Widening WB East of 248 Overpass to 72nd Overpass	Highway 1 - Widening WB East 264th St Overpass to East of 248 St Overpass	Highway 1 Total Only	Highway 1 & Parking Area Total
A: Non-Eligible Costs							
Pre-development Activities	$ 718,000	$ 636,000	$ 636,000	$ 159,000	$ 159,000	$ 1,590,000	$ 2,308,000
Property Acquisition	$ s.13,s	$ -					$ s.13,s
Administration & Other	$ 3,352,000	$ 5,214,000	$ 4,694,000	$ 1,271,000	$ 660,000	$ 11,839,000	$ 15,191,000
Non-Eligible Costs Sub-Total	*$ s.13,s.*	*$ 5,850,000*	*$ 5,330,000*	*$ 1,430,000*	*$ 819,000*	$ 13,429,000	*$ s.13,s.1*
B: Eligible Costs							
Construction	$ 20,160,000	$ 55,500,000	$ 54,100,000	$ 13,287,000	$ 7,757,000	$ 130,644,000	$ 150,804,000
Engineering	$ 2,500,000	$ 6,500,000	$ 5,900,000	$ 1,800,000	$ 1,000,000	$ 15,200,000	$ 17,700,000
Environmental Mitigation	$ 700,000	$ -				$ -	$ 700,000
First Nations Consultation	$ 350,000	$ 800,000	$ 800,000	$ 600,000	$ 300,000	$ 2,500,000	$ 2,850,000
Contingency	$ 2,120,000	$ 18,600,000	$ 18,000,000	$ 4,526,100	$ 2,627,000	$ 43,753,100	$ 45,873,100
Eligible Costs Sub-Total	*$ 25,830,000*	*$ 81,400,000*	*$ 78,800,000*	*$ 20,213,100*	*$ 11,684,000*	$ 192,097,100	*$ 217,927,100*
Project Total	$ 30,000,000	$ 87,250,000	$ 84,130,000	$ 21,643,100	$ 12,503,000	$ 205,526,100	$ 235,526,100
Level of Contribution							

s.13,s.17

Table ES-0.4: Project Cash Flow by Fiscal Year

Costs	Previous Expenditures	2017 / 2018	2018 / 2019	2019 / 2020	2020 / 2021	2021 / 2022	TOTAL ALLOCATIONS
A: Non-Eligible Costs							
Pre-development Activities	$ 2,138,000	$ 85,000	$ 85,000	$ -	$ -	$ -	$ 2,308,000
Property Acquisition	$ -	$ s.13,s.	$ -	$ -	$ -	$ -	$ s.13,s.
Administration & Other	$ -	$ -	$ 1,713,200	$ 4,751,400	$ 6,076,400	$ 2,650,000	$ 15,191,000
Non-Eligible Costs Sub-Total	*$ 2,138,000*	*$ s.13,s.*	*$ 1,798,200*	*$ 4,751,400*	*$ 6,076,400*	*$ 2,650,000*	$ s.13,s.1
B: Eligible Costs							
Construction	$ -	$ -	$ 30,264,000	$ 60,321,600	$ 45,189,600	$ 15,028,800	$ 150,804,000
Engineering	$ -	$ 2,700,000	$ 5,310,000	$ 5,310,000	$ 3,510,000	$ 870,000	$ 17,700,000
Environmental Mitigation	$ -	$ -	$ 350,000	$ 350,000	$ -	$ -	$ 700,000
First Nations Consultation	$ -	$ 460,000	$ 910,000	$ 570,000	$ 570,000	$ 340,000	$ 2,850,000
Contingency	$ -	$ 2,072,000	$ 8,731,310	$ 13,761,930	$ 13,761,930	$ 7,545,930	$ 45,873,100
Eligible Costs Sub-Total	$ -	$ 5,232,000	$ 45,565,310	$ 80,313,530	$ 63,031,530	$ 23,784,730	$ 217,927,100
Project Total	$ 2,138,000	$ 5,417,000	$ 47,363,510	$ 85,064,930	$ 69,107,930	$ 26,434,730	$ 235,526,100
Level of Contribution							

s.13,s.17

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Appendix C	Highway 17 / Truck Access Synchro / SimTraffic Reports

1.0 Introduction

Highway 1 is the primary east-west corridor serving and connecting the Lower Mainland to the rest of British Columbia and Canada. Between the Cassiar Tunnel and 216th Street, the Ministry of Transportation and Infrastructure (MoTI) invested in widening Highway 1 and replacing the Port Mann Bridge. East of the Bridge, the highway generally supports three travel lanes in each direction through to the soon to be constructed 216th Street interchange. East of 216 Street, Highway 1 is four travel lanes with the exception of the segment between 232 Street (Highway 10) and 264 Street (Highway 13) interchanges where there is a third eastbound lane.

Several segments of Highway 1 east of 216 Street currently operate at the lower end of acceptable service levels for a major highway facility during the weekday peak periods and the peak periods on the weekends. Some sections experience lower recurring as well as non-recurring delays and congestion resulting from minor incidents / disruptions in the traffic stream. In the short and long term future, the majority of this section of highway is projected to have insufficient capacity to meet the forecasted travel demands. These mobility, safety and reliability issues affect provincial travel between Lower Mainland communities and the rest of the province and impact the movement of goods and services.

In support of accommodating the movement of people, goods and services in British Columbia, the provincial government's ***BC On the Move – 10 Year Transportation Plan*** identified the commitment to improve highway capacity and reliability with the widening of Highway 1 between Langley and Abbotsford. Consistent with this priority, *BC On the Move* also identified a commitment to work with industry to identify and construct at least two new truck parking areas nearby key highway corridors in the Lower Mainland. Truck parking facilities support mobility and reliability investments on BC's highways by providing convenient and accessible areas to enable commercial vehicles to park and access appropriate amenities.

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The Highway 1 widening issues, options and recommendations were identified in a report prepared by Parsons and attached to this Business Case in **Appendix A** – ***Highway 1 Widening (216 Street to Highway 11) Business Case.*** The recommended truck parking facility reviewed by Stantec included an assessment of alternative truck parking locations near the Highway 1 corridor in the north Surrey and Langley areas. The content from the former document and reviews are slightly modified and incorporated into this overall Business Case.

2.0 Summary of Existing Conditions

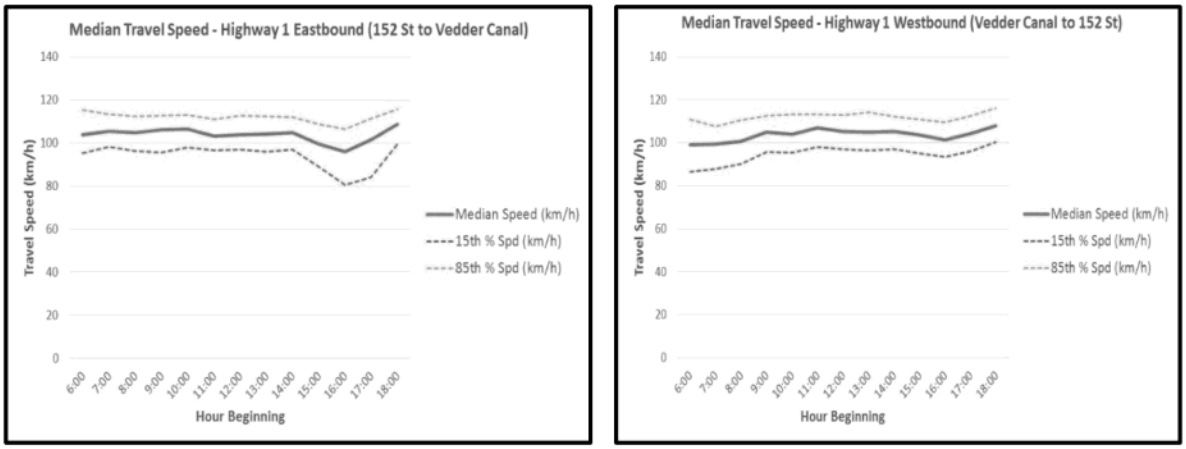
2.1 Highway 1

Mobility Highlights

Highway 1 between 216 Street and 264 Street services approximately 80,000 vehicles per day, including over 9,500 trucks, which make up about 12% of total corridor traffic.[1] Approximately 430,000 truck hours are spent travelling the corridor each year, equalling about $50M in truck travel and operating costs annually. The corridor has historically experienced continual but gradual growth, with compound annual growth rates in annual average daily traffic (AADT) near 1.2% per year.

Today, average travel speeds and times across Highway 1 east of the Port Mann Bridge through to the Vedder Canal are generally consistent for much of the day at median speeds around 100 km/h, with slight variances in the morning and afternoon peak period directions as summarized below in **Figure 2.1.**

Figure 2.1: Highway 1 (152 Street to Vedder Canal) 2015 EB and WB Median Travel Speeds



Source: 2015 Lower Mainland Highway Assessment, Urban Systems

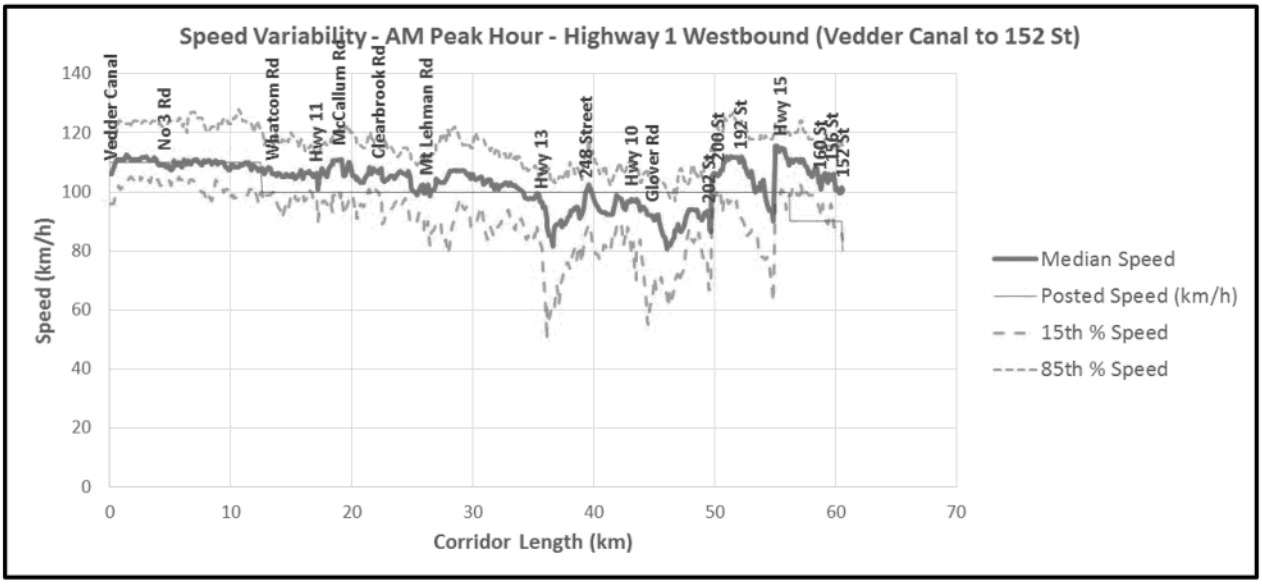
During the morning peak hour when the westbound direction accommodates approximately 2,700 vehicles per hour or about 1,350 vehicles per lane, westbound average travel speeds operate below the posted speed and are most variable between Highway 13 and 200th Street as illustrated in **Figure 2.2** below. Noticeable drops in median speed are observed near the Highway 13 and Highway 10 interchanges. These drops correspond with wider ranges of speed variability.

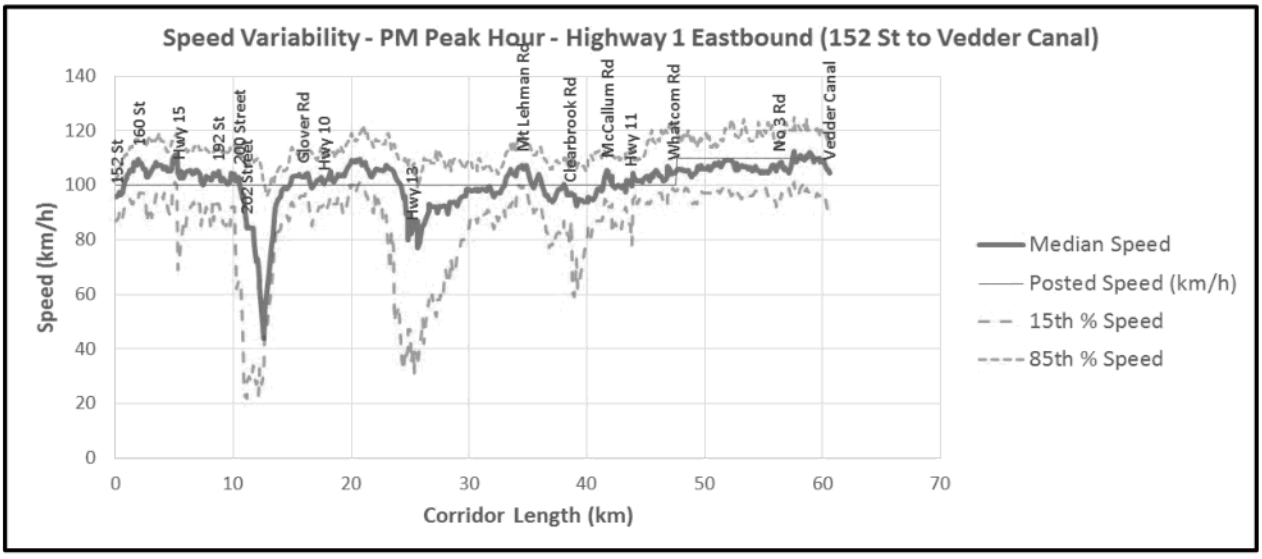
During the afternoon peak hour when the eastbound direction accommodates approximately 3,600 vehicles per hour or about 1,800 vehicles per lane, travel speeds are well below the posted speed east of 200 Street through to almost Mount Lehman Interchange in Abbotsford as illustrated below in **Figure 2.2.** As indicated, median travel speeds on the corridor decline to almost 40km/hr at the merge point east of 202 Street and to 80 km/h near the Highway 13 interchange. The corridor experiences significant levels of speed variability

[1] 2015 annualized statistics at traffic count station P-17-4EW (Hwy 1, E of Bradner Road)

in the PM peak extending back 2.5 km from the HOV merge point east of 202 Street and separately near the Highway 13 interchange.

Figure 2.2: Highway 1 (152 Street to Vedder Canal) 2015 Peak Direction Median and Variable Speeds





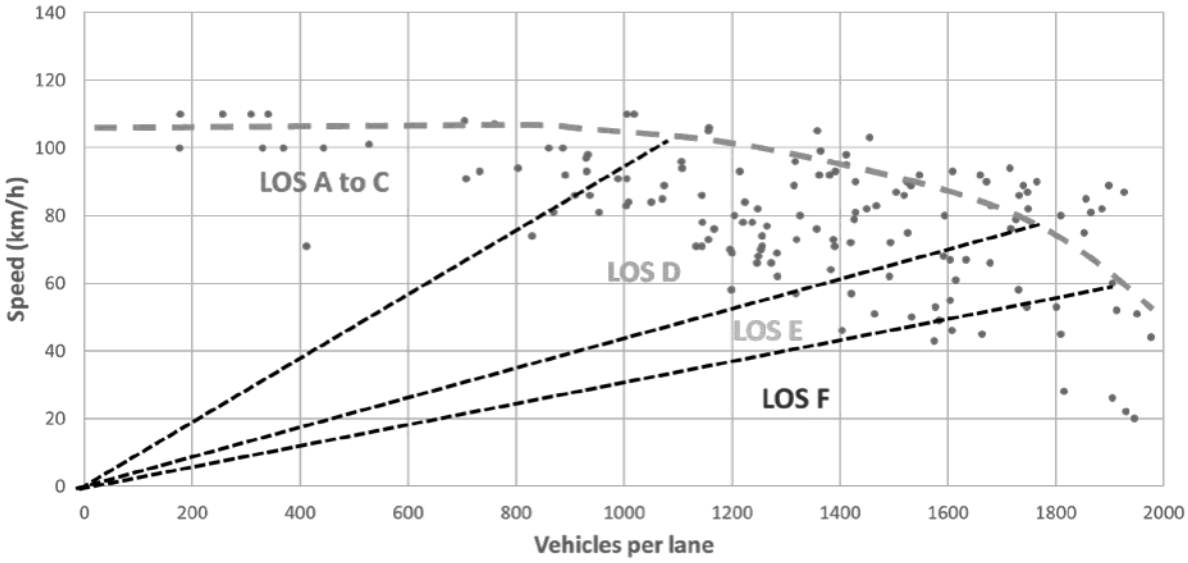
Source: 2015 Lower Mainland Highway Assessment, Urban Systems

As summarized in the *Highway 1 Widening (216 Street to Highway 11) Business Case (2016)*, a number of highway segments along the section of Highway 1 between 216 Street and Highway 11 currently operate at the lower end of acceptable service levels for a major highway facility during the weekday peak periods and the peak periods on the weekends. These problematic highway segments are characterized by lower than free flow speeds, relatively high vehicle density, limited freedom to maneuver, and nonrecurring congestion resulting from minor incidents / disruptions in the traffic stream. In the short and long term future, the majority of this section of highway is projected to have insufficient capacity to meet the forecasted travel demands.

Figure 2.3 displays the observed relationship of traffic volumes to highway speeds on Lower Mainland freeways as gathered at MoTI permanent and short count sites in 2014. Speeds begin to be affected by traffic volumes at around 1,400 vehicles per lane per hour, though impacts are relatively minor until volumes approach 1,700-1,800 vehicles per lane per hour. Above this threshold, additional volume pressure results in flow breakdown and a steep reduction of travel speeds (i.e. congestion).

Currently, peak directional traffic volumes along the segment are near or at the theoretical maximum for limited access freeways. If traffic volumes continue to grow at the established historic compound growth rate of 1.2% per year, AM and PM peak directional volumes will approach 1,950 and 2,600 vehicles per hour per lane at the end of the planning horizon, respectively. These volumes significantly exceed theoretical maximums and will likely result in dramatic reductions in travel speeds along the corridor.

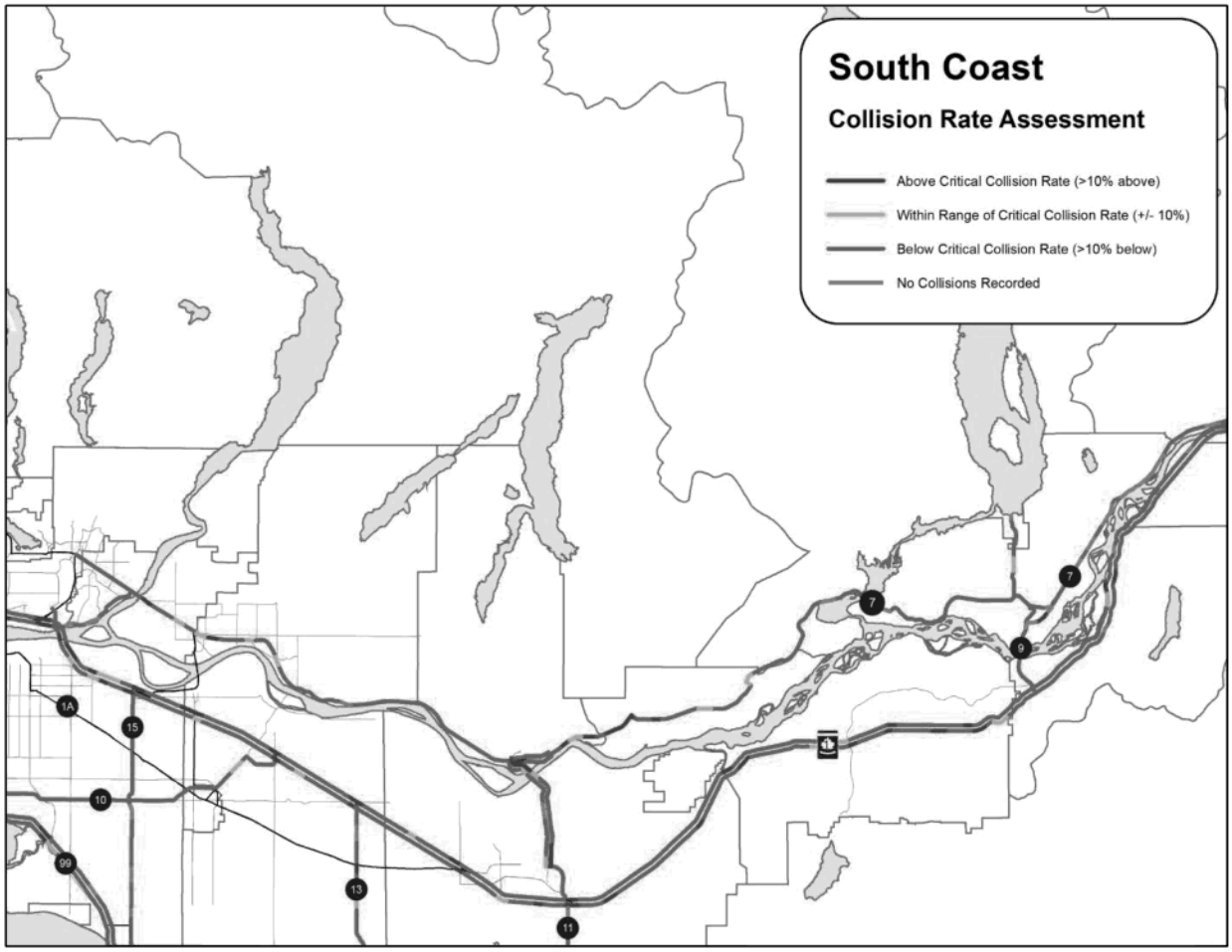
Figure 2.3: Volume / Speed Relationship on Limited Access BC Highways



Safety Overview

Highway 1 between 216 Street and Highway 11 has a collision rate that is higher than the average for similar facilities around the province. **Figure 2.4** illustrates the historical collision rates on Highway 1 per 1 km LKI segment. While most corridor segments fall below or within range of the critical collision rate, eastbound and westbound Highway 1 near the Highway 10, Highway 13, and Mount Lehman Road interchanges experience collision rates greater than 10% above critical rates.

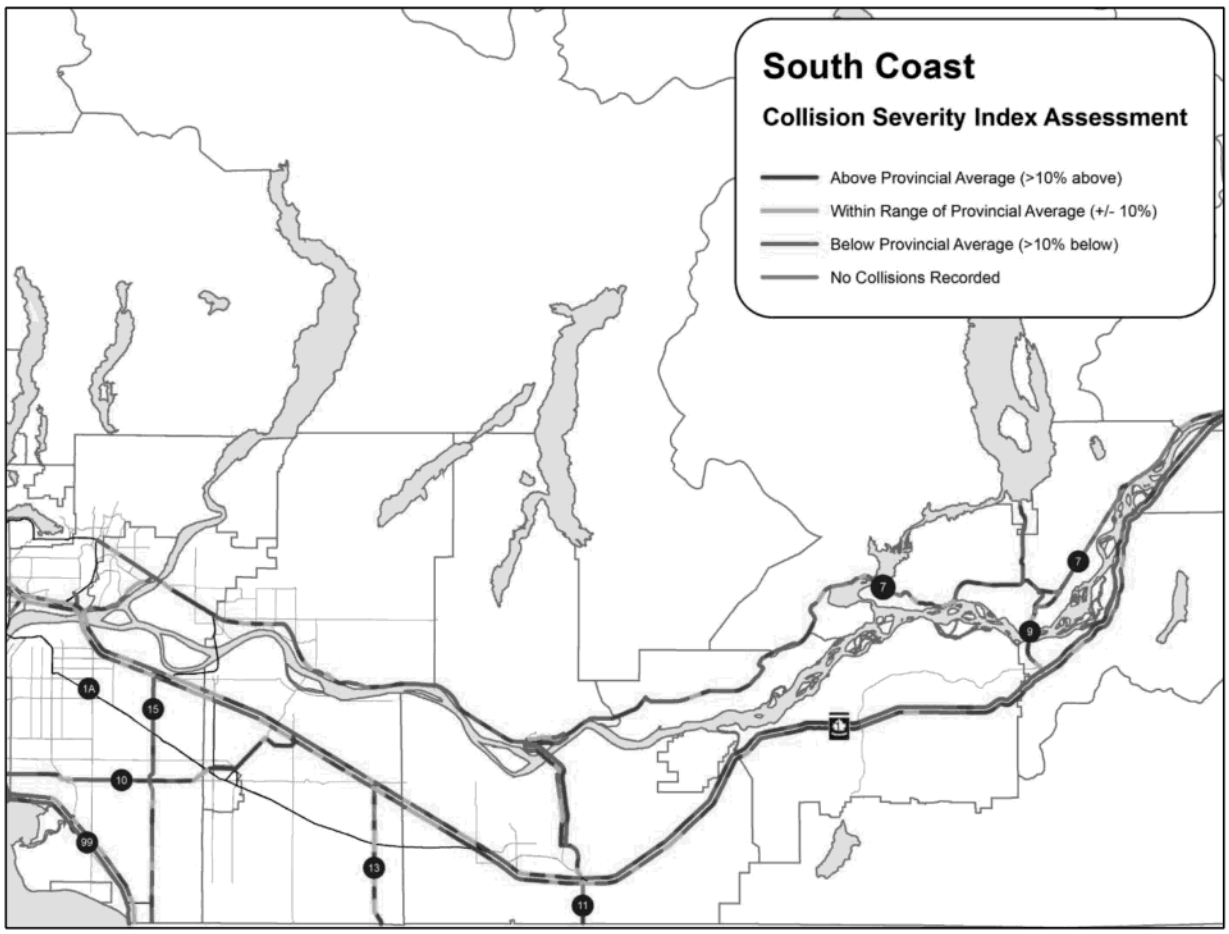
Figure 2.4 - Historical Collision Rates (2009-2012)



Source: 2015 Lower Mainland Highway Assessment, Urban Systems

While most collision prone segments experience collision severities below or within the range of provincial averages, as displayed in **Figure 2.5,** the collision prone segments of Eastbound Highway 1 near Highway 10 and Mount Lehman Road interchanges record collision severities well above provincial averages.

Figure 2.5 - Historical Collision Severity (2009 – 2012)



Common collision types include rear end collisions and off road collisions, with contributing factors such as driver inattention, following too closely, alcohol involvement and fatigue. In addition to the direct collision costs are significant delay costs that occur when the highway lanes are blocked due to an incident. With approximately 180 collisions reported to police every year, this means there is collision at least every two days along this section of the Highway 1 corridor between 216 Street and Highway 11.

Geometric Deficiencies

In addition to the mobility and reliability challenges through this section of Highway 1, the background Business Case for Highway 1 widening indicated that most structures along the corridor do not meet current clearance standards of 5.0m for large structures and 5.5m for lightweight structures. In particular, those structures which are at risk of impact include the Glover Road underpass (4.46m); Roberts Bank Rail Corridor underpass Tunnel portals (4.4m); 232 Street underpass (4.62m); 264 Street underpass (4.6m); and Peardonville Road underpass (4.92m). Further, the design of the 232 Street and 264 Street interchanges with Highway 1 are no longer considered best practices. With increasing highway traffic as

well as those entering and leaving the corridor, the existing configurations contribute to short weaving and merging distances which in turn will reduce safety in the long-term.

In summary, the following issues are currently found or are forecast to occur within this section of Highway 1:

- Limited or insufficient capacity during the weekday AM and PM peak periods along most segments of the Highway 1 section between 216 Street and Highway 11;
- Anticipated increases in vehicle delays over time corresponding with volume growth along the corridor
- High collisions rates that exceed other similar provincial facilities;
- Vertical clearance issues at a number of existing structures including Glover Road, CP Rail overpass / portal, 232 Street, 264 Street, and Peardonville Road; and,
- Interchange configurations that no longer operate well under the higher traffic volumes experienced today or forecasted in the future planning horizon.

2.2 Truck Parking[2]

Stantec Consulting worked with MoTI on Truck Parking Site Investigations in 2016. Based on this work, several patterns of goods movement were highlighted, and the challenges affecting Lower Mainland communities regarding truck parking and overall impacts on the economy were examined and summarized.

The trucking sector is essential to supporting communities and the economy by delivering consumer goods, moving products from manufacturers to intermodal connections and markets, and facilitating the movement of goods for interprovincial and international trade. There are four distinct segments of the trucking industry:

- **Local Trucking** involves 18% of the trucking market moving goods within a 25 kilometre radius;
- **Drayage Trucking** involves 47% of the trucking market moving goods between ports and intermodal/warehouse facilities;
- **Trans-Border Trucking** involves 17% of the trucking market moving goods to and from the United States; and,
- **Interprovincial Trucking** involves 18% of the trucking market moving goods between provinces.

According to the British Columbia Trucking Association, the for-hire trucking sector (excluding private company transport fleets) creates $2 billion of annual provincial GDP and employs over 33,500 people in British Columbia and the Territories. There are 23,274 trucking companies in the province with 90% having six or fewer trucks. There are an estimated 40,000 trucks hauling more than $3 billion worth of goods between the province's gateway ports and other parts of Canada and there are over a million truck trips crossing at the three Lower Mainland commercial border crossings.

Between 2004 and 2009, the number of heavy trucks in BC grew at a rate of 1.3% per year and the total number of vehicle kilometres increased by 2.7% per year. The number of trucks is estimated to grow in the Lower Mainland by 10.0% between 2015 and 2020 with the Drayage segment growing the fastest at an estimated rate of 3.0% per year.

[2] Stantec, Truck Parking Site Investigations, 2016.

The Local and Drayage segments are considered short haul trucking which is increasingly being centralized in Surrey in close proximity to numbered highways, ports, intermodal and warehouse facilities, manufacturers and suppliers. As of December 2012, of the 4,998 registered truck companies in Greater Vancouver, 2,661 (53.2%) were located in Surrey with the next highest being Langley with 475 companies (9.5%). In 2011, 19,950 (29.1%) of the 68,595 experienced transportation and warehouse workers within Greater Vancouver lived in Surrey. The net increase in the number of workers in this sector from 2006 to 2011 within Greater Vancouver (2,990) was accounted for in large part by those living in Surrey (2,590).

A major generator of commercial truck traffic on Highway 1, Highway 17 and along major streets within Surrey and other municipalities south of the Fraser is the Port of Vancouver which is the third largest port in North America handling one-fifth of Canada's total value of foreign goods trade. The Port of Vancouver includes 27 major marine terminals handling automobiles, bulk and breakbulk cargo, containers and cruise ships.

In addition to becoming a trucking central hub, Surrey is also one of the fastest growing communities in British Columbia. The population of Surrey grew by 9.0% from 2011 to 2015 which is significantly higher than the Greater Vancouver Regional District and more than double the rate of growth for the province as a whole during this time. In 2015, the population of Surrey was 526,024 which represented 11.2% of the entire provincial population.

With increased population growth and development, Surrey must balance residential, commercial and industrial development with environmental goals and retention of agricultural lands. One of the important values for the municipality is to maintain quiet conditions within residential neighbourhoods and agricultural areas. Truck drivers can start their day early in the morning and the sound of a truck engine can be very loud and disruptive. As a result, heavy trucks with a gross vehicle weights of 5,000 kilograms are banned by bylaw from parking or being stored within Surrey residential and agricultural areas. The City of Surrey permits a maximum of one heavy truck within an agricultural property.

In response to the truck parking challenges, the City of Survey has initiated a truck parking facility permitting process. Currently there are 35 truck parking facilities within different phases of the permitting process:

- 5 sites have Permanent Use Permits;
- 5 sites have Temporary Use Permits; and
- 25 sites are in the Temporary Use Permit Process.

It is estimated that the 35 truck parking facilities supply approximately 2,700 heavy truck parking stalls within Surrey but that an additional 2,000 truck stalls are required to meet truck demands within the community. In 2015, the City of Surrey estimated that 1,000 of the 6,000 registered trucks were illegally parking in the city. A potential private sector development within South Campbell Heights (near 16th Avenue and 192nd Street) could supply 900 to 1,200 additional stalls, but as of the date that the Stantec Truck Study was drafted, the City of Surrey had not received a formal application for development of this property.

North Surrey is one of the areas that truck drivers see a need for additional overnight truck parking. The City of Surrey has also long indicated a need for overnight truck parking along what is now the South Fraser Perimeter Road (Highway 17). Trucks are required to travel on designated truck routes within Surrey and there is limited opportunity to leave Highway 17 and stay on truck routes

Truck drivers that do not have overnight parking would need to take time and travel significant distances through heavy traffic during peak periods to find potential parking areas further away from the Highway 1 and 17 corridors. The truckers that would benefit the most from new parking near Highway 17 would likely be those that are the most unfamiliar with the Surrey road network, take the longest long time to find parking at night and travel well away from the highway corridors. Conversely parking near Highway 17 is likely to appeal less to those that already have or use parking facilities near this highway corridor. Based on this information, it is quite likely that truckers passing through Surrey could, like their United States counterparts, incur over an hour of time to find suitable parking each night.

Passenger vehicle stalls are also in demand at truck parking facilities. The expectation is that local truckers will drive to the parking facility, leave the passenger vehicle parked and drive away in the heavy truck. This is in response to a long standing need in Surrey for local truck drivers to park their passenger vehicles at the same lot as their heavy truck is parked and avoid the need to have a third party drop them off and pick them up at the site on a daily basis.

There are few overnight truck parking facilities located near residential areas and Surrey bylaws state that parking within residential areas is not allowed. Therefore, the current situation requires local truckers to park their trucks well away from their residence and either drive themselves to the truck parking location, use public transit (which would add increased time for the driver), or travel by taxi (at an increased cost) or with a third party.

In the absence of a new truck parking development, there is a risk that trucks will park illegally within municipalities creating potential safety risks along roadways and noise issues within residential and agricultural areas. Environmental damage from oil leaking from trucks is also a concern.

Suggestions provided during the stakeholder consultation included the need for truck parking with asphalt surfaces, fencing, lighting, security cameras and sanitation features (sani-dump, plumbed toilets and waste/recycling receptacles). The need for parking to accommodate long combination vehicles, long haul vehicles and shorter vehicles at affordable prices was also recommended by stakeholders.

3.0 Concept Development & Cost Estimates

This section of the Business Case highlights the options considered and the preferred concepts developed for widening Highway 1 and supplying a new truck parking facility.

3.1 Highway 1

a. Mainline Capacity

As part of the Highway 1 widening, the median area is generally wide enough across the corridor to provide the additional eastbound and westbound lanes. Beyond that, the method of widening for either general purpose traffic or high-occupant vehicles (HOVs) were considered. The fundamental consideration was the safety and efficiency for the transitions at either end. Parsons' original Highway 1 Widening study considered four options, as displayed in **Figure 3.1.** These include:

1. One general purpose lane in each direction between 202 Street and Highway 11;
2. New HOV lane in each direction between 202 Street and Highway 11;
3. s.13

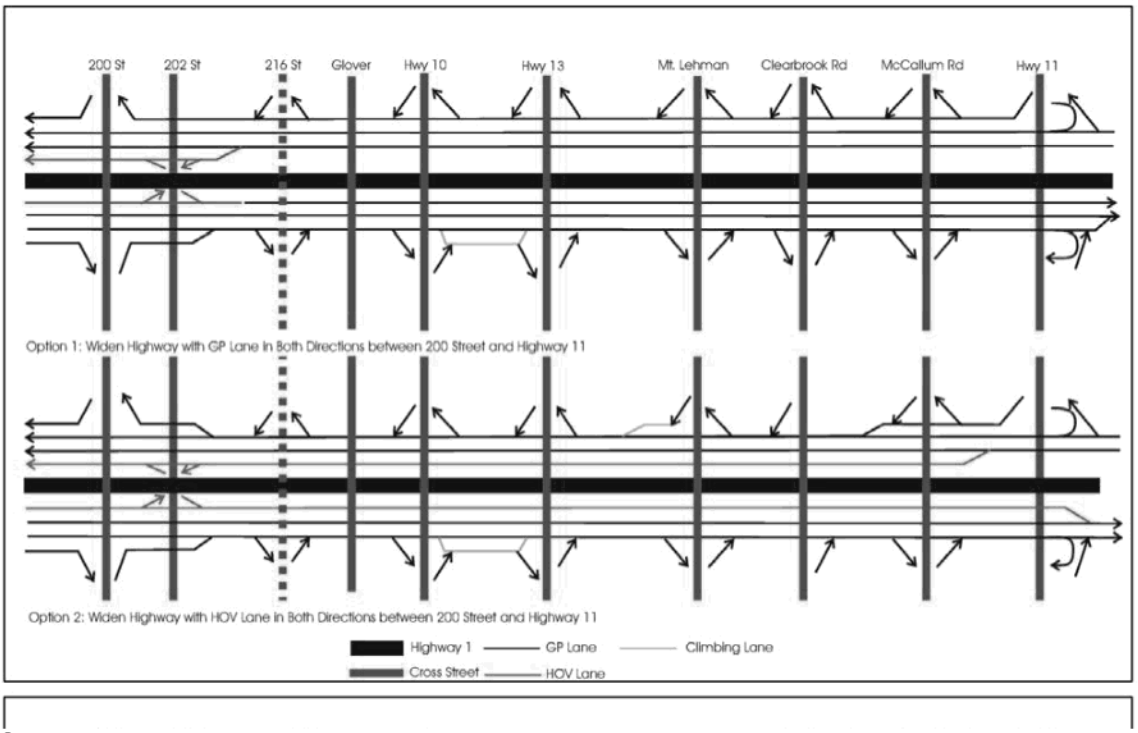
4. New general purpose lane in each direction between Glover Road and Highway 11, and extend existing HOV lanes to Highway 10;

Considering highway usage, capacity and operational performance, ***Option 3 was selected as the preferred lane designation in each direction***. s.13

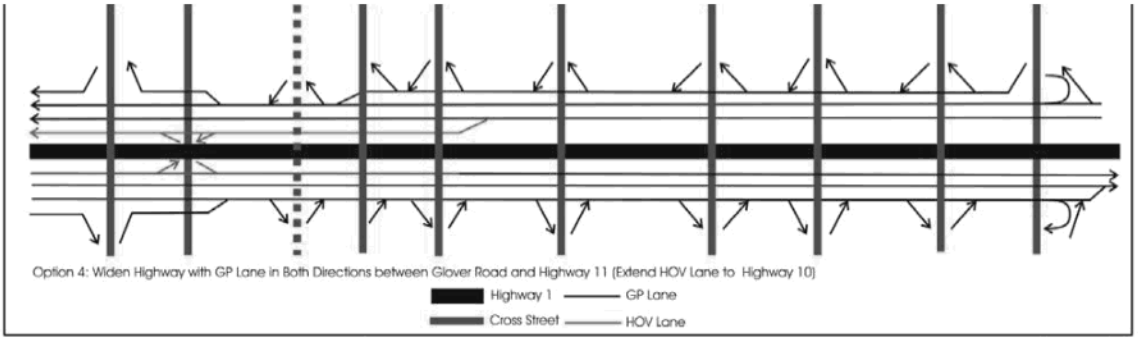
s.13

s.13 This option was considered to offer the most appropriate balance between providing corridor capacity, accommodating special purpose lanes, as well as adding / removing lanes in a safe and efficient manner that is consistent with driver expectations.

Figure 3.1 - Mainline Capacity Improvement Option Concepts



s.13



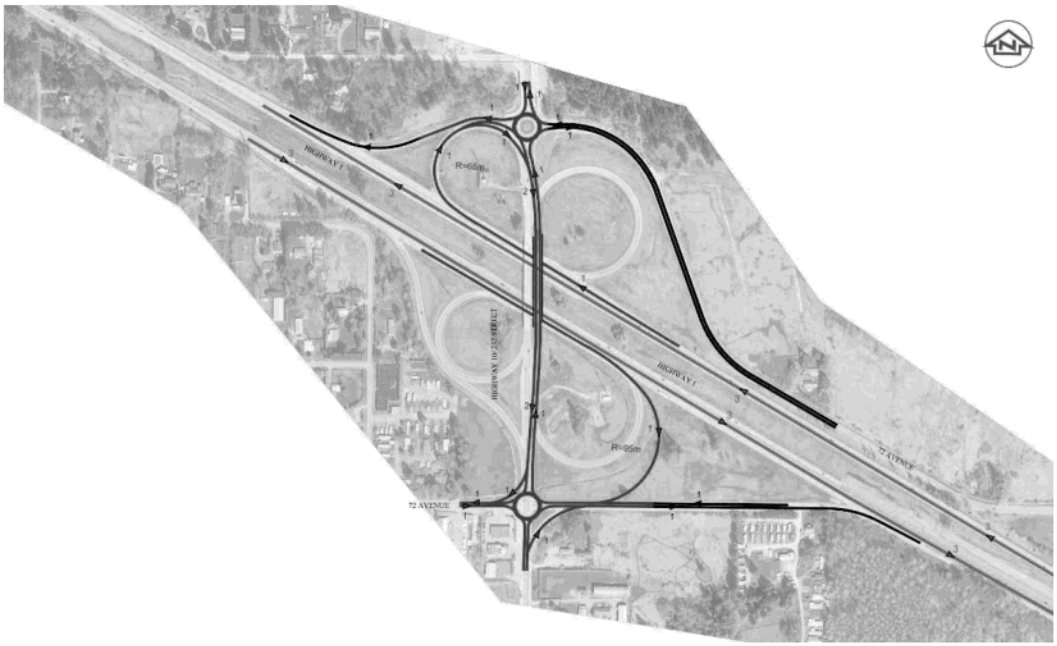
Source: Highway 1 Widening (216 Street to Highway 11) Business Case, Parsons (2016)

b. Interchange Reconfiguration

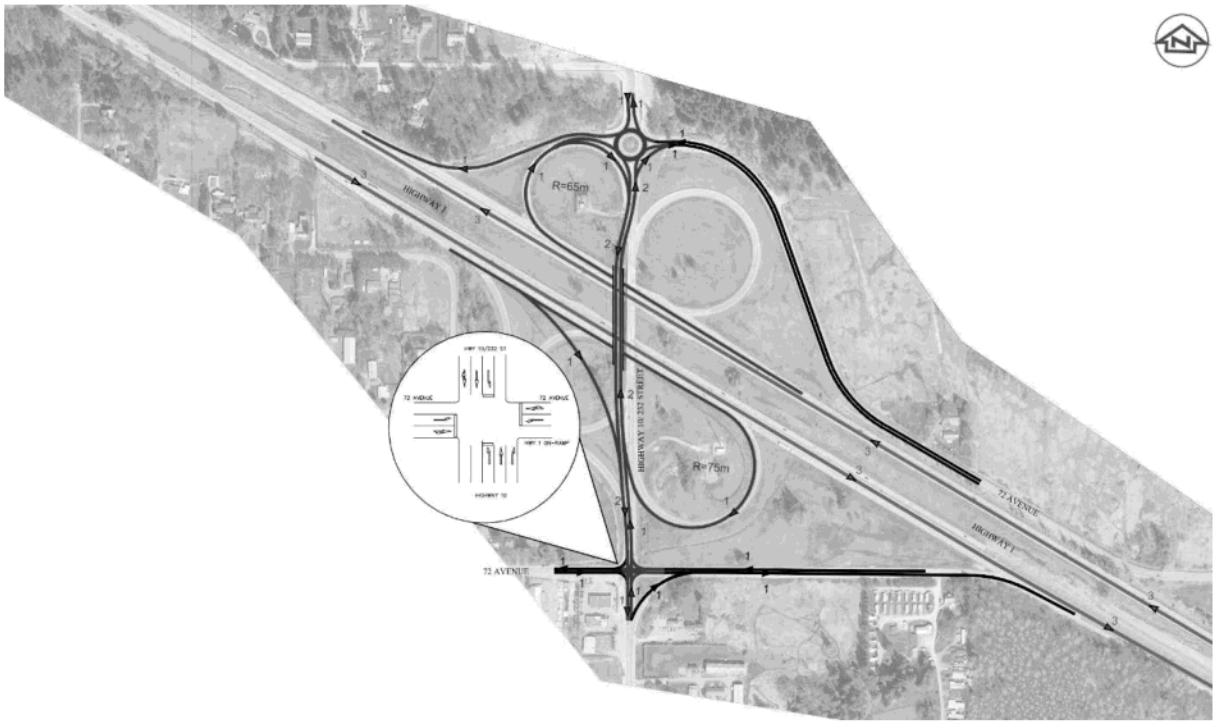
To accommodate the additional lane in each direction of travel along the mainline, the existing overpass structures at the 232 Street and 264 Street interchanges require replacement as the current horizontal and vertical clearances are insufficient or substandard. Noting that the existing interchange configurations do not reflect current best practices given the high traffic volumes to be accommodated, and that the existing structures need to be replaced given the constraints mentioned above, a number of interchange reconfiguration options were developed. The preferred options would then form part of the Highway 1 widening project scope.

For the purpose of this Business Case, only the 232 Street Interchange options are highlighted for discussion. Several configurations were developed to improve upon the deficient geometry associated with the existing cloverleaf interchange configuration as well as to accommodate future travel demand. A total of four improvement options were developed for the 232 Street interchange and are described as follows:

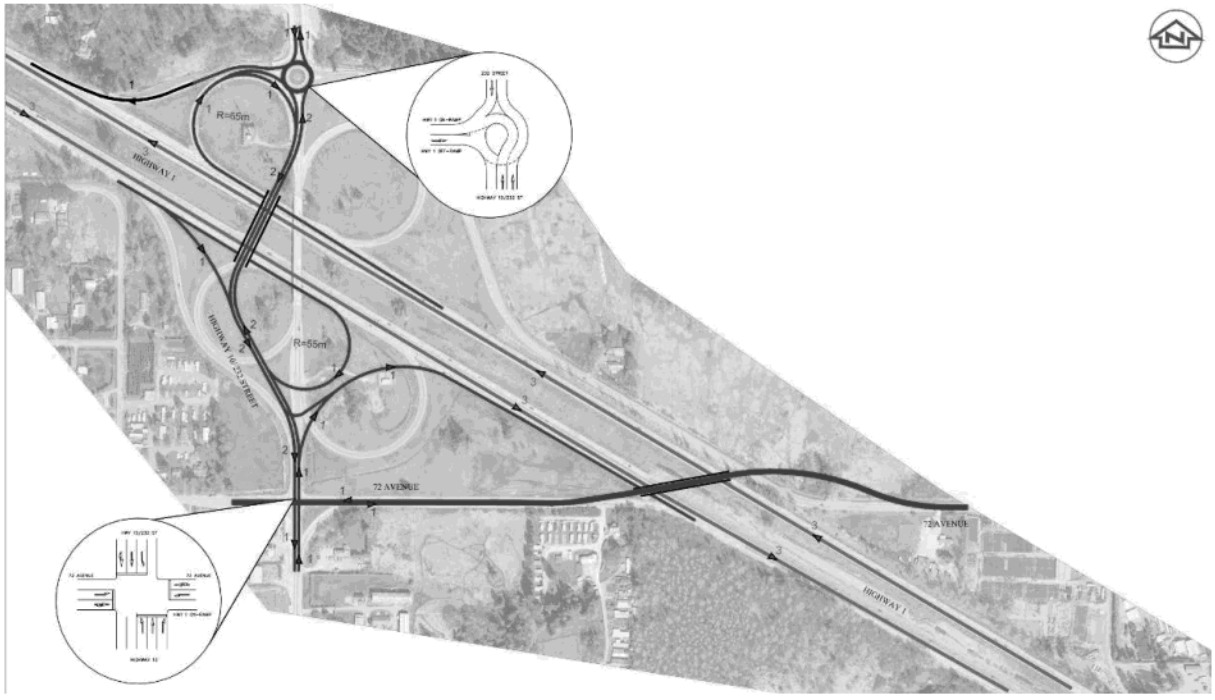
- **Option 1**: Parclo B Interchange Configuration with Roundabouts



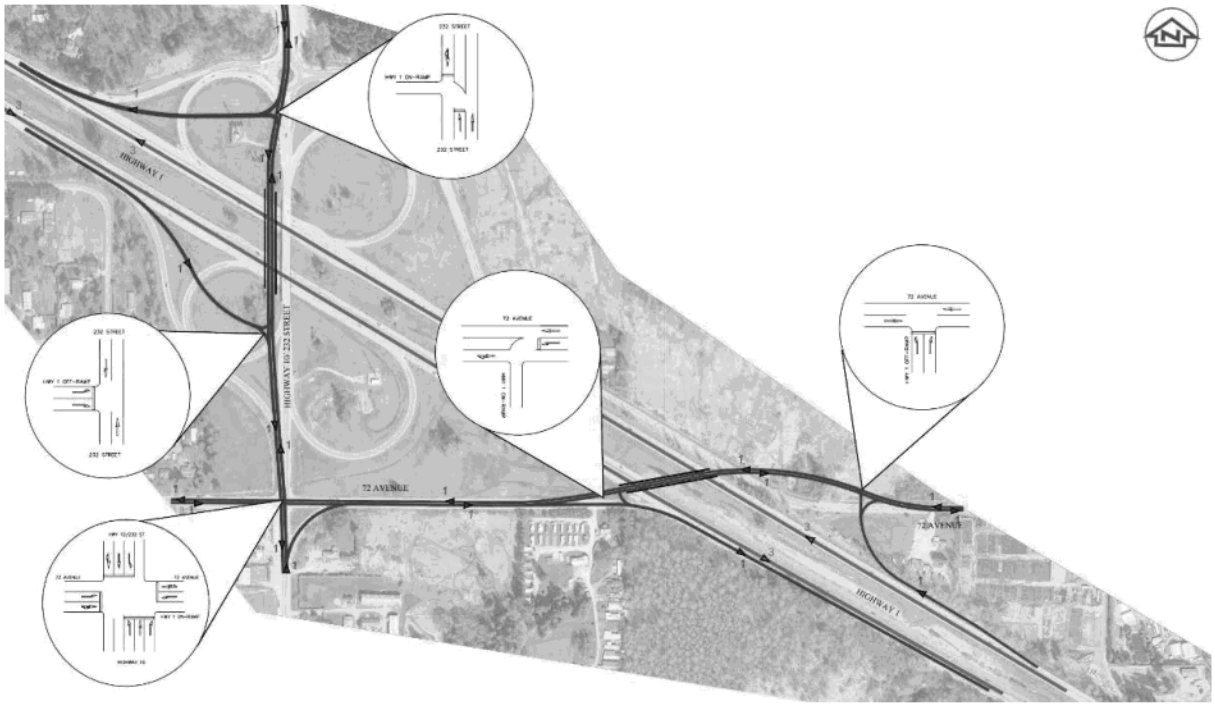
- **Option 2:** Parclo B Interchange Configuration



- **Option 3:** Parclo B Interchange Configuration with 72 Avenue Flyover



- **Option 4:** Split Diamond Interchange Configuration



Focused traffic analysis, cost estimating, and other measurements were conducted to assess interchange options with respect to the evaluation criteria. As displayed in **Table 3.1, Option 3 is preferred** as it provides significant improvements in network connectivity compared to the base case at comparable benefit-cost ratios. Option 3 includes a new bridge structure across Highway 1 along 72 Avenue, removing east-west local traffic from the interchange.

Table 3.1: Highway 10 / 232 Street Interchange Evaluation Summary

Criteria	Option 1	Option 2	Option 3	Option 4
Travel Time Savings	0 hrs AM peak period (2014) -20 hrs PM peak period (2014) 0 hrs AM Peak Period (2045) 20 hrs PM Peak Period (2045) -$0.4 M Travel Time Savings (25 years)	20 hrs AM peak period (2014) 0 hrs PM peak period (2014) 30 hrs AM Peak Period (2045) 30 hrs PM Peak Period (2045) $2.4 M Travel Time Savings (25 years)	0 hrs AM peak period (2014) -20 hrs PM peak period (2014) 10 hrs AM Peak Period (2045) 10 hrs PM Peak Period (2045) -$0.8 M Travel Time Savings (25 years)	-10 hrs AM peak period (2014) -20 hrs PM peak period (2014) -20 hrs AM Peak Period (2045) 40 hrs PM Peak Period (2045) -$1.2 M Travel Time Savings (25 years)
Implementation Costs	**$40 M**	**$45 M**	**$57 M**	**$54 M**
Property Impacts	0.0 Ha – Property Impacts 5.0 Ha – Potential Surplus	0.0 Ha – Property Impacts 10.3 Ha – Potential Surplus	0.0 Ha – Property Impacts 5.0 Ha – Potential Surplus	0.0 Ha – Property Impacts 8.4 Ha – Potential Surplus
Network Connectivity	No improvement as compared to the base case.	No improvement as compared to the base case.	Significant improvement compared to base case.	Moderate improvement compared to base case.
Provincial Movements	The proposed configuration, as compared to the base case, does not provide any improvements for the provincial movements between Highway 1 and Highway 10 and may even cause some reduction in mobility for these key movements.	The proposed configuration, as compared to the base case, does not provide any improvements for the provincial movements between Highway 1 and Highway 10 and may even cause some minor reduction in mobility for one movement.	The proposed configuration, as compared to the base case, provides some improvements to the provincial movements between Highway 1 and Highway 10.	The proposed configuration, as compared to the base case, is detrimental to some provincial movements between Highway 1 and Highway 10.
Benefit / Cost and NPV	B/C = 0.2 NPV= -$30 M	B/C = 0.3 NPV= -$31 M	B/C = 0.2 NPV= -$42 M	B/C = 0.2 NPV= -$41 M
Overall	Possible	Possible	**Preferred**	Not Preferred

Source: Highway 1 Widening (216 Street to Highway 11) Business Case, Parsons (2016)

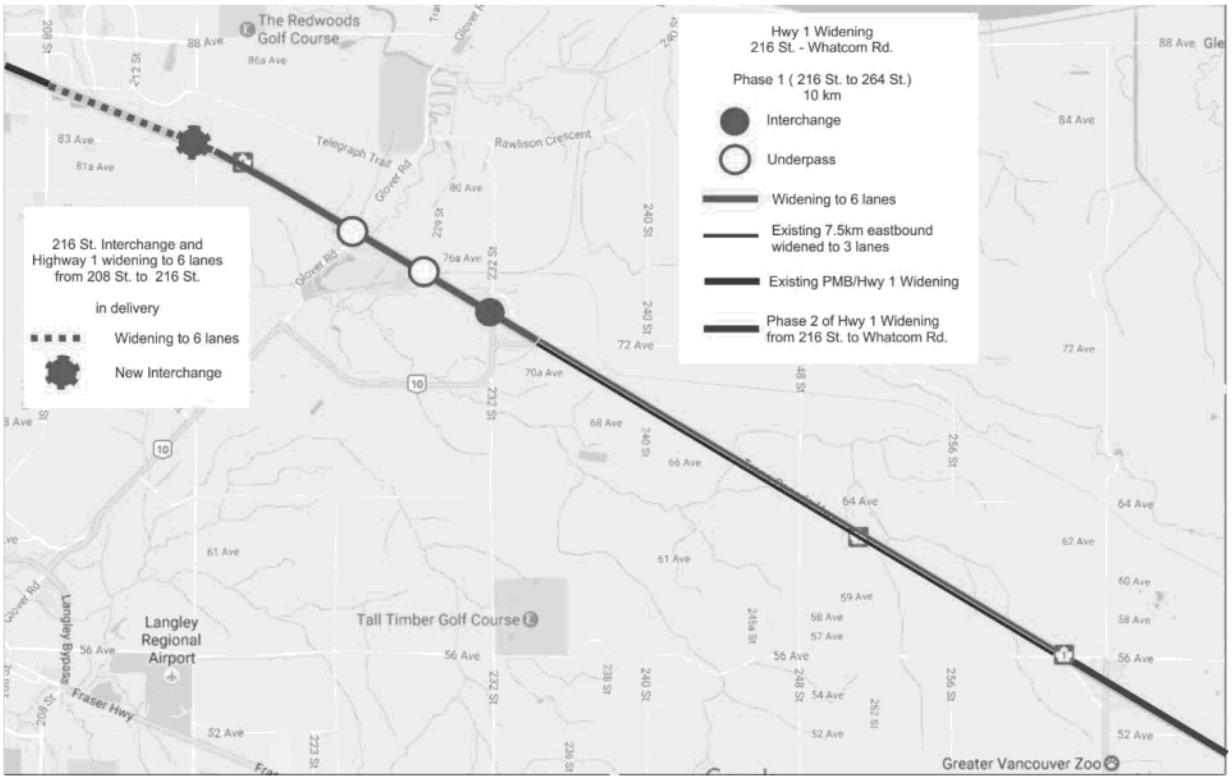
c. Overall Project Scope & Cost Estimate

At this stage, the Highway 1 widening and area improvements would extend from east of the soon to be built 216 Street interchange up to but not including the 264 Street interchange. This would include the following sequence of improvements as summarized below:

- 232 Street Interchange which involves reconfiguring the existing interchange, replacing the existing underpass structure and constructing a new 72 Avenue underpass structure.
- 2.1km widening between the soon to be constructed interchange at 216 Street and the 232 Street Interchange as previously described. This widening would involve the removal and construction of a new CP Rail crossing and Glover Road underpass structure.
- Widening in the westbound direction for approximately 5.8km between 264 Street to 232 Street. Three eastbound general purpose lanes are already provided between 232 Street and 264 Street. No new structures or modifications to existing structures are required as part of this project.

The limits of the widening in both the eastbound and westbound directions are illustrated in **Figure 3.2**. Beyond these project limits, the Ministry will widen Highway 1 from four to six lanes in both directions through to Highway 11 as financial resources become available in future.

Figure 3.2 - Project Limits for Highway 1 Widening & Area Improvements



Conceptual cost estimates have been prepared by Parsons for all Highway 1 six laning project components and summarized in **Table 3.2**. The recommended capital improvements are estimated at **$205.5 M** (Class C, 2016 $). All improvements are to take place within the rights-of-way that are provincially owned.

Table 3.2: Highway 1 Widening Cost Estimates (2016 $)

Costs	Highway 1 - 232nd Street Interchange	Highway 1 - 216th Street to 232nd Street Widening	Highway 1 - Widening WB East of 248 Overpass to 72nd Overpass	Highway 1 - Widening WB East 264th St Overpass to East of 248 St Overpass	Highway 1 Total Only
A: Non-Eligible Costs					
Pre-development Activities	$ -				
Property Acquisition	$ -				
Administration & Other	$ 5,850,000	$ 5,330,000	$ 1,430,000	$ 819,000	$ 13,429,000
Non-Eligible Costs Sub-Total	***$ 5,850,000***	***$ 5,330,000***	***$ 1,430,000***	***$ 819,000***	**$ 13,429,000**
B: Eligible Costs					
Construction	$ 55,500,000	$ 54,100,000	$ 13,287,000	$ 7,757,000	$ 130,644,000
Engineering	$ 6,500,000	$ 5,900,000	$ 1,800,000	$ 1,000,000	$ 15,200,000
Environmental Mitigation	$ -				$ -
First Nations Consultation	$ 800,000	$ 800,000	$ 600,000	$ 300,000	$ 2,500,000
Contingency	$ 18,600,000	$ 18,000,000	$ 4,526,100	$ 2,627,000	$ 43,753,100
Eligible Costs Sub-Total	***$ 81,400,000***	***$ 78,800,000***	***$ 20,213,100***	***$ 11,684,000***	**$ 192,097,100**
Project Total	$ 87,250,000	$ 84,130,000	$ 21,643,100	$ 12,503,000	$ 205,526,100

Source: Parsons, Class C estimates, 2016

3.2 Truck Parking

The truck parking review considered thirteen potential sites within Surrey as well as others in adjacent municipalities as illustrated in **Figure 3.3**. Pre-screening was completed to filter the sites down to the top four areas identifying two sites for further option analysis.

Figure 3.3: Candidate Truck Parking Sites

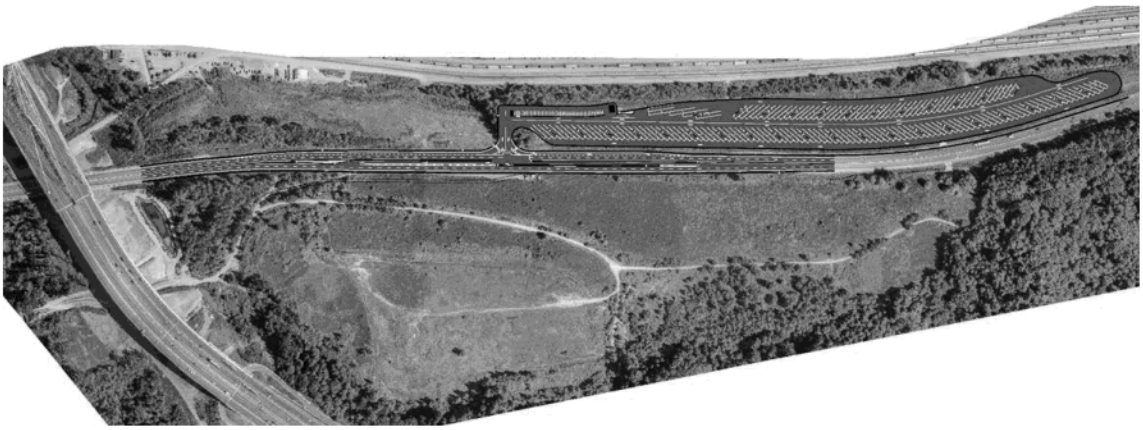
s.13,s.17

Source: Stantec Consulting, 2016

Conceptual layouts were developed to determine drive-through stall capacity and other site related environmental issues. The areas were also reviewed to determine if passenger vehicle parking could be accommodated to support the storage of trucks for local truck drivers that live within the Lower Mainland. Although staging could be a potential use for these sites, the analysis did not consider any additional factors or design modifications to support commercial truck staging relating to DeltaPort.

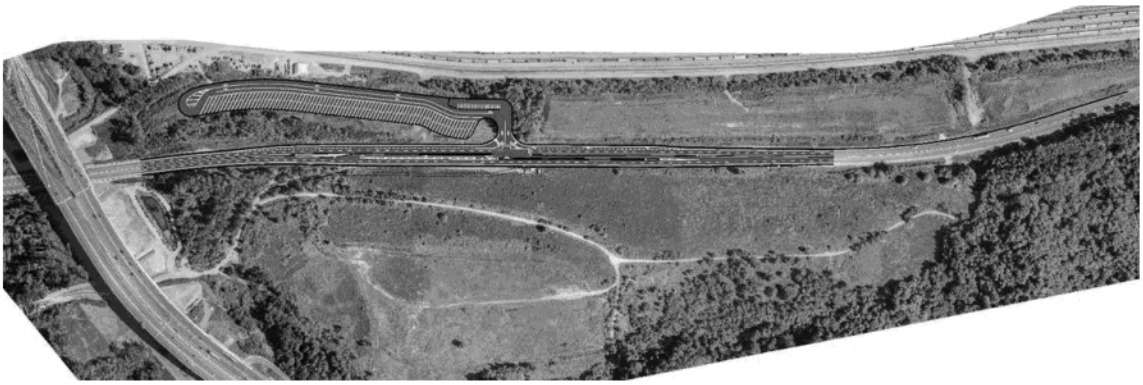
The evaluation resulted in the following shortlisted top ranked sites that include:

- **Option 1:** 11688 Highway 1 (accessed via Highway 17), east of Port Mann Bridge, south of CN Rail – Large Site



Source: Stantec Consulting

- **Option 2:** 11688 Highway 1 (accessed via Highway 17), east of Port Mann Bridge, south of CN Rail – Small Site



Source: Stantec Consulting

s.13,s.16,s.17

Source: Stantec Consulting

It must be noted that, although Option 1 and 2 could be combined as a single site with 220 trucking stalls, it was decided to separate these into a large area with 158 truck stalls (Option 1) and a smaller area with 62 truck stalls (Option 2) for phasing purposes. A summary of the key attributes of the short-listed site options is displayed in **Table 3.3.**

Table 3.3 - Site Information Summary

Option #	Location	Features	# of Stalls	Significant Issues Identified/Risks	Estimated Cost
1	**11688 Highway 1 north of SFPR, east of Port Mann Bridge, south of CN Rail**	• Washroom/ Showers • Sani-dump • Lighting with standard lamps • Security fence around parameter • 5 parking spots for B-Trains • Protected T intersection with half signal along SFPR • Security Gatehouse	158 Pull Through Heavy Truck 44 Passenger Vehicle	• Near Bon Accord Creek (salmon habitat) and two small watercourses run through) • High potential for Japanese Knotweed • High archaeological potential at original ground elevation (under fill) • Adjacent to railway • Fill placed may present geotechnical settlement issues • Requires water line extension works • Parking area may be reduced if “no disturbance” zones are found • Expandable to include Option 2 Site)	$30,000,000 OR $189,900 / Truck Stall
2	11688 Highway 1 north of SFPR, east of Port Mann Bridge, south of CN Rail	• Washroom/ Showers • Sani-dump • Lighting with standard lamps • Security fence around parameter • Protected T intersection with half signal along SFPR • Security Gatehouse	62 Back-in Heavy Truck	• Near Bon Accord Creek (salmon habitat) and two small watercourses run through) • High potential for Japanese Knotweed • High archaeological potential at original ground elevation (under fill) • Adjacent to railway • Fill placed may present geotechnical settlement issues • Requires water line extension works • Parking area may be reduced if “no disturbance” zones are found • Expandable to include Option 1 Site)	$17,000,000 OR $274,200 / Truck Stall

Option #	Location	Features	# of Stalls	Significant Issues Identified/Risks	Estimated Cost
3	s.13,s.16,s.17				

Source: Stantec Consulting, 2016

Option 1 was selected as the recommended truck parking area as it results in the greatest additional number of truck parking stalls constructed and is the least expensive to construct on a per-stall basis. The site would support 158 pull through truck and 44 passenger vehicle parking stalls. The site would be connected to Highway 17 through a new signalized protected T-intersection with left-turn and right-turn lanes.

As displayed in **Table 3.4** below, Stantec estimates the total cost of the preferred option at $30 M (Class D, 2016 $). This estimate includes $29.9 M for capital works and s.13,s.17 for property acquisition.

Table 3.4: Truck Parking Area **Cost Estimates (2016 $)**

Costs	Truck Parking	
A: Non-Eligible Costs		
Pre-development Activities	$	170,000
Property Acquisition	$	s.13,s.17
Administration & Other	$	3,900,000
Non-Eligible Costs Sub-Total	$	s.13,s.17
B: Eligible Costs		
Construction	$	20,160,000
Engineering	$	2,500,000
Environmental Mitigation	$	700,000
First Nations Consultation	$	350,000
Contingency	$	2,120,000
Eligible Costs Sub-Total	$	***25,830,000***
Project Total	$	30,000,000

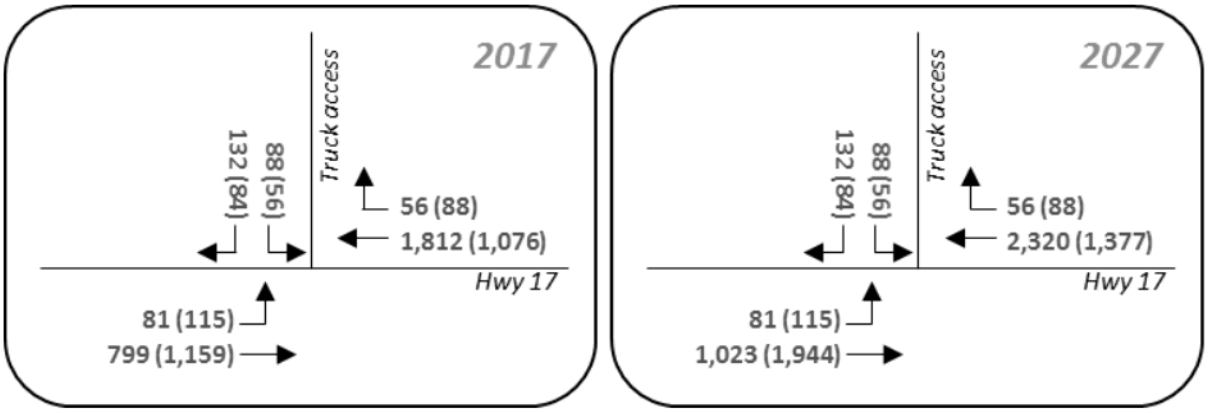
Source: Stantec, Class D Estimates, 2016

It should be recognized that the Ministry plans to convert or remove at-grade signalized intersections along Highway 17 as traffic volumes increase to ensure travel reliability and improve safety along the corridor. Therefore, the provision of an at-grade signal on Highway 17 for the proposed truck parking area is expected to be removed and replaced with upstream and downstream interchanges for truck and vehicle access.

To quantify signal disbenefits to Highway 17 through traffic, the operational analysis considered the impact of signals on Highway 17 based on 2017 and 2027 projected traffic volumes. A signalized protected-T configuration was modelled, consistent with Stantec's traffic impact recommendations and volumes. A signalized protected-T ensures eastbound free flow operations, with through movement traffic control on the westbound approach only.

Figure 3.4 illustrates the estimated site and highway traffic volumes at the proposed partial signal on Highway 17 at the truck parking site. The operational assessment indicates that by managing signal interruptions, highway delays in the westbound direction may be minimized at an estimated level of service E or better during peak periods. Beyond ten years, it is anticipated that the signals will be replaced with grade-separated interchanges along Highway 17. Synchro and SimTraffic analysis results are included in **Appendix C.**

Figure 3.4: Turning Movements at Highway 17 / Truck Access in 2017 and 2027



4.0 Multiple Account Evaluation

This section describes the evaluation of the costs, benefits, impacts, and risks of the preferred improvements based on a Multiple Account Evaluation (MAE) approach that is consistent with the BC Provincial Business Case Guidelines. The MAE methodology is intended to capture both the quantifiable measures of project cost and direct project benefits, in addition to more qualitative measures of direct project benefits. Within the MAE, the quantitative measures are monetized over a 25-year period using a 6% discount rate to determine the Net Present Value (NPV) and Benefit-Cost (B/C) Ratio. For this assignment, two concurrent but separate MAEs were completed for the Highway 1 six laning (216 Street to Highway 13) and Surrey Truck Parking facility improvements. The following accounts were assessed:

- **Financial**
  - Project Costs (construction, engineering, property)
  - Truck Facility Revenue and Expenses
  - Maintenance (annual and periodic rehabilitation)
  - Salvage Value
- **Customer Service**
  - Mobility (travel time and vehicle operating cost savings)
  - Safety (collision reductions)
- **Social/Community**
  - Noise and Visual Impacts
  - Community Displacement
  - Community Severance
  - Reduction in Illegal Truck Parking
  - Sustainable Transportation
  - Consistency with Provincial Plans
- **Environmental**
  - Terrestrial
  - Aquatic
  - Archaeological / Historical
  - GHG Reduction
- **Economic**
  - Net Present Value
  - Benefit-Cost Ratio

4.1 Financial Account

The financial account represents the discounted life-cycle costs over 25 years. These include the initial investment (construction, property acquisition, engineering and project management), annual maintenance and rehabilitation costs, and the salvage value at the end of the project's life cycle. In order to represent common dollars, the Present-Value (PV) method is typically used to discount future costs. A discount rate of 6% was assumed for this evaluation, as is consistent with the Provincial Business Case guidelines.

Table 4.1 summarizes financial account components including project costs, truck facility revenue and expenses, maintenance and rehabilitation costs, and salvage value. These components are discussed in further detail below.

Table 4.1: Estimated Project Capital and Property Costs

	Highway 1 Widening & Overpass/Interchange Improvements	s.13
FINANCIAL ACCOUNT		
PV Revenue	-	$4.4 M
PV Expenses	-	-$4.4 M
Capital Cost (2016 $)	$205.5 M	$29.9 M
Property Cost (2016 $)	-	s.13,s.1
Capital Cost (PV)	$179.5 M	$27.0 M
Property Cost (PV)	-	$0.1 M
Maintenance (PV)	$2.0 M	$0.3 M
Salvage Value (PV)	-$24.3 M	-$1.6 M
Total Incremental Cost	*$157.2 M*	s.13,s.17

- **Project Costs**. Conceptual cost estimates were prepared for the Highway 1 Six Laning project by Parsons. Project costs for this business case reflect improvements between 216 Street and 264 Street only, and exclude the 264 Street interchange. The capital cost for Highway 1 six laning and associated works was estimated to be **$205.5 M** (Class C)**.** No property costs are included as all improvements are to occur within the provincial right-of-way. Further details on Parsons' project costs for the entire 216 Street to Highway 11 segment are provided in Appendix B of the original Parsons *Highway 1 Widening (216 Street to Highway 11) Business Case,* found in **Appendix A** of this report.

  Conceptual level cost estimates were prepared by Stantec for the Truck Parking Facility project. The capital cost for the facility was estimated at **$29.9 M** (Class D)**.** An additional s.13,s.17 s.13,s.17

  As projects will be constructed and completed over the span of the next five fiscal years, project costs are discounted to present value at a rate of 6% for economic analysis.

- **Truck Facility Revenue and Expenses.** Stakeholder consultation conducted by Stantec indicated that a charge of $200 / month was considered a reasonable fee for overnight truck parking. This revenue is assumed to offset facility operating and maintenance costs so that the Province of British Columbia neither gains revenue from operations nor subsidizes operations and maintenance of the site. Projected expenses for the truck parking facility include business license fees, repairs and maintenance, supplies, janitorial, security, snow removal, sweeping and scrubbing, equipment servicing / PMP, utilities, telephone and management services. Discounted 25 year facility operating expenses were estimated by Stantec at **$4.4 M**. As the facility will be managed to be revenue neutral, with user costs set to cover expenses, this number has not be factored into the overall economic assessment of the project.

- **Maintenance.** Annual maintenance costs are calculated using values as described in the *Default Values for Benefit Cost Analysis In British Columbia 2012*. The annual maintenance of new roads is estimated to be approximately $3,839 per lane kilometre, while periodic rehabilitation costs which assume hot mix paving once every 15 years are estimated to be $110,000 per lane kilometre. 25 year Maintenance costs for Highway 1 Six Laning were calculated to reflect a proportion of total

Highway 1 Six Laning (216 Street to Highway 11) maintenance costs as presented in the original Parsons Six Laning report and are estimated at **$2.0 M**. Stantec's review provides a 25 year maintenance cost of **$0.3 M** for the Truck Parking Facility which assumes resurfacing at the 20 year horizon.

- **Salvage Value**. The salvage value represents the value of the investment at the end of the analysis period. As a salvage value for the discrete 216 Street to 264 Street segment was not included in the Parsons analysis, a salvage value of **-$24.3 M** was calculated to reflect 80% of project capital costs discounted to the end of the analysis period. The Stantec Review's stated 25 year salvage value of **-$1.6 M** was used for the truck parking facility.

4.2 Customer Service Account

The customer service account represents the cost to the roadway users over the project's life cycle. This includes travel time and vehicle operating costs, and collisions accrued and discounted over 25 years. Improvements to the corridor that result in improved mobility and safety can be compared to the financial account of the project.

Benefits in the customer service account identify benefits to roadway users, but also reflect improvements to local, regional, and provincial connectivity because they reflect the reduced travel time and lower collision costs experienced by these trips.

- **Mobility.** Mobility savings provides a monetary value of travel time savings for all traffic on the corridor. Travel time benefits were calculated separately for both projects for private vehicles and trucks using the assumed travel time costs as summarized in **Table 4.2.**

Table 4.2: Value of Travel Time

Vehicle/Driver Type	Value ($ per hour)
Automobile	$15.94
Single Unit Truck	$46.03
Combination Truck	$53.30

Source: Default Values for Benefit Cost Analysis in British Columbia, BC MoT Planning and Programming Branch, 2012.

Projected 25-year travel time and vehicle operating cost savings as are estimated for each project in **Table 4.3** (2016 dollars based on a discount rate of 6%).

The 25 year travel time and vehicle operating benefits for Highway 1 Six Laning were calculated to reflect a proportion of total Highway 1 Six Laning (216 Street to Highway 11) travel time and vehicle operations benefits as presented in the original Parsons Six Laning report and are estimated at **$172.2 M and $11.1 M,** respectively. These benefits mainly reflect changes in mainline operating speeds resulting from improvements. Present value benefits reflect a post-construction 25 year analysis period (2023 to 2047).

The 25 year travel time and vehicle operations benefits for the truck parking facility are comprised of two components. The first component reflects travel time and vehicle operating benefits to trucks and vehicles using the truck parking facility and the second component calculates the ten year disbenefits to Highway 17 through traffic of a new truck access signal at the parking facility. 25 year truck facility

user benefits are as reported in the Stantec review and result in **$23.8 M and $7.0 M** in travel time and vehicle operating savings. This calculation assumes 125 trucks will use the facility each weekday and that these trucks would otherwise travel an additional 45 minutes / 15 km per direction each day in search of parking. It is assumed that without the additional vehicle parking stalls, 33 truck drivers would be dropped off / picked-up at the parking lot each day in private vehicles that would add an additional 45 minutes and 20 km of private vehicle driving per day.

Ten year signal delay disbenefits to Highway 17 through traffic were calculated by Urban Systems using the Synchro / SimTraffic modelling application. A ten year horizon was chosen for the signal as it is likely that the facility will be served by a nearby upgraded interchange in the medium term future. A signalized protected-T configuration was modelled, consistent with Stantec's traffic impact recommendations and volumes. A signalized protected-T ensures eastbound free flow operations, with through movement traffic control on the westbound approach only. AM and PM peak hour 10 year westbound approach delays were calculated from a series of SimTraffic runs. The signal results in Highway 17 vehicle travel time and operation costs of **-$2.2M and -$0.2M**, respectively.

Table 4.3: Estimated Mobility Benefits (2016 $ PV) s.13

	Hwy 1 Widening & Overpass/Interchange Improvements	
Travel Time Savings (PV)	$172.2 M	$23.8 M
Vehicle Operating Savings (PV)	$11.1 M	$7.0 M
Hwy 17 / Truck Access Signal Travel Time Costs (PV)	-	-$2.2 M
Hwy 17 / Truck Access Signal Veh. Operating Costs (PV)	-	-$0.2 M
Total Incremental Mobility Benefits (PV)	*$183.3 M*	*$28.4 M*

It is worth noting that the travel time benefits noted above are incurred after project completion and do not account for the potential offsets to travel time during construction due to traffic disruption. The disruption to travel time during construction would only be temporary and should be managed through a traffic management plan.

- **Safety**. The Collision Prediction Model (CPM), a spreadsheet tool developed by BC MoTI, was used by Parsons to estimate the potential safety benefits resulting from Highway 1 Six Laning improvements along the entire 216 Street to Highway 11 segment. Using a combination of collision modification factors (CMFs) for BC and from the Highway Safety Manual, the CPM was used to evaluate and compare the safety benefits.

  The Parsons Six Laning Business Case estimates an incremental 13% reduction in collisions over the analysis period. Using information provided in the original business case on total number of collisions along the entire corridor per year as well as existing and improved breakdowns in collision type, Urban Systems recalculated incremental 25 year collision benefits to reflect the 216 Street to Highway 13 segment only.

The value of various collisions (by severity), as described in the *Default Values for Benefit Cost Analysis In British Columbia 2012* is summarized in **Table 4.4.**

Table 4.4: Cost of Collisions to Society

Severity Type	Value ($ per hour)
Fatal	$6,385,999
Injury	$135,577
Property Damage	$11,367

The proposed six laning improvements are expected to result in 25 year safety benefits valued at **$6.5 M.**

An analysis of safety impacts resulting from the construction of the truck parking facility was not conducted.

4.3 Social/Community Account

This account evaluates the potential impacts of each project on the community. These are generally qualitative measures but are considered in combination with the more quantifiable economic indicators. The following factors have been included in this review:

- Noise, Visual Impacts
- Community Displacement – Property takes, partial and full; and
- Community Severance – the 'barrier effect' of the highway on local and pedestrian traffic.
- Reduction in Illegal Truck Parking
- Sustainable Transportation – actions that promote non single-occupant vehicle modes of travel such as carpooling, walking, cycling, and public transit
- Consistency with Provincial Plans

Social/community impacts of both projects are summarized in **Table 4.5** as they relate to the existing conditions and are evaluated based on their estimated positive benefit, neutral or negative impact to key stakeholders.

Table 4.5: Summary of Socio-Community Account Indicators

Indicator	Highway 1 Six Laning	Highway 17 Truck Parking Facility
Noise and Visual Impacts	**Neutral** Both noise and visual impacts are expected to remain relatively the same as today with the proposed improvements. All widening is to occur within the existing freeway median.	**Neutral** The truck parking facility is not located near a residential or commercial zone. Neighbouring land uses are two Provincial highways and a rail yard / shunting facility. Any additional noise or visual impacts that may occur as a result of the truck parking facility will have very limited impacts on Surrey residences and businesses.
Community Displacement	**Neutral** Effects of widening on community displacement are limited as all improvements, including the 232 Street interchange reconfiguration, will occur within the provincial right-of-way.	**Neutral** The truck parking facility will be constructed on a vacant lot. No residential or commercial displacement is anticipated.
Community Severance	**Significant Benefit** Six laning improvements will add a new bridge structure across Highway 1 at 72 Avenue. This improved network connectivity reduces the barrier effect of the highway and removes east-west traffic from the interchange.	**Neutral** The truck parking facility will have limited effects on community severance.
Reduction in Illegal Truck Parking	N/A	**Modest Benefit** The proposed improvement provides 158 new truck parking stalls in the City of Surrey, which helps address the estimated 2,000 truck parking stall deficiency in that municipality.
Sustainable Transportation	**Modest Benefit** The proposed improvements include a 6 km extension of existing Highway 1 HOV lanes from 202 Street to Highway 10. HOV lanes provide reserved lanes for carpool vehicles and public transit and can act to incentivise sustainable transportation choices.	**Neutral** The truck parking facility will have limited sustainable transportation effects.
Consistency with Provincial Plans	**Significant Benefit** Six Laning Highway 1 through the western Fraser Valley was specifically identified in ***BC on the Move,*** the Province's ten year transportation plan.	**Significant Benefit** ***BC on the Move,*** the Province's ten year transportation plan, commits to constructing at least two new truck parking areas in the Lower Mainland.

4.4 Environmental Account

The environmental account is intended to identify any significant environmental impacts resulting from the proposed improvements. This is not intended to replace an environmental assessment, if required, but only as a qualitative measure of potential impact. In addition, qualitative measures of reduced greenhouse gas (GHG) emissions have also been included. The qualitative environmental review for both projects is summarized in **Table 4.6.**

MoTI Responses to Infrastructure Canada Annex D – Environmental and Aboriginal Consultation Information Requirements as it pertains to Highway 1 six laning is included in Appendix C of the original Parsons *Highway 1 Widening (216 Street to Highway 11) Business Case* found in **Appendix A** of this report. MoTI Responses to Infrastructure Canada Annex D as it pertains to the truck parking facility is included in **Appendix B** of this report.

Table 4.6: Summary of Environmental Account Indicators

Indicator	Highway 1 Six Laning	Highway 17 Truck Parking Facility
Terrestrial	Neutral Effects on terrestrial resources due to the Highway 1 widening would be limited as all widening is within the median of an existing freeway.	Unknown
Aquatic	Neutral Effects on aquatic resources due to the Highway 1 widening would be limited as all widening is within the median of an existing freeway.	Modest Impact According to Stantec's review, the truck parking facility will be constructed in an area with or adjacent to streams supporting fisheries with modest impacts that will need to be mitigated.
Archaeological / Historical	Neutral Effects on archaeological or historical sites due to the Highway 1 widening would be limited as all widening is within the median of an existing freeway.	Unknown
GHG Reduction	Significant Benefit Highway 1 Six Laning will significantly decrease vehicle idling through the segment as a result of improvements in vehicle operating conditions and may act to promote the use of High Occupancy Vehicles with the extension HOV facilities to 232 Street.	Modest Benefit The truck parking facility will have a modest benefit on GHG emissions as fewer trucks will travel long distances in search of parking.

4.5 Multiple Account Evaluation Summary

A summary of all MAE accounts considered in this Business Case is provided in **Table 4.7**. These include both quantitative measures used for the economic evaluation of the project and qualitative measures of direct project benefits and wider scale indirect benefits. Key economic indicators such as Net Present Value (NPV) and Benefit-Cost Ratio (B/C), are included for a 25-year period. The costs reported in the table below have been discounted to present value (PV) using a 6% discount rate.

Widening Highway 1 between the new 216 Street interchange and the 264 Street interchange, including a full interchange reconfiguration at 232 St and all associated overpass improvements, results in a **Net Present Value of $32.6 M and a benefit/cost ratio of 1.2,** which is considered very impressive due to the overall scale of the project. Constructing the proposed truck parking facility s.13,s.17 s.13,s.17 results in a **Net Present Value of $2.6 M and a benefit/cost ratio of 1.1.** The two improvements will result in overall benefits to the local, provincial and national economy. The anticipated social and economic benefits of both projects are also well aligned with provincial objectives.

Table 4.7: Multiple Account Evaluation Summary

Discount Rate = 6%	Highway 1 Widening & Overpass/Interchange Improvements [1]	s.13
FINANCIAL ACCOUNT		
PV Revenue	-	$4.4 M
PV Expenses	-	-$4.4 M
Capital Cost (2016 $)	$205.5 M	$29.9 M
Property Cost (2016 $)	-	s.13,s.17
Capital Cost (PV)	$179.5 M	$27.0 M
Property Cost (PV)	-	$0.1 M
Maintenance (PV)	$2.0 M	$0.3 M
Salvage Value (PV)	-$24.3 M	-$1.6 M
Total Incremental Cost	*$157.2 M*	s.13,s.17
CUSTOMER SERVICE ACCOUNT		
Travel Time Savings (PV)	$172.2 M	$23.8 M
Vehicle Operating Savings (PV)	$11.1 M	$7.0 M
Hwy 17 / Truck Access Signal Travel Time Costs (PV)		-$2.2 M
Hwy 17 / Truck Access Signal Veh. Operating Costs (PV)		-$0.2 M
Safety (PV)	$6.5 M	N/A
Total Incremental Benefits (PV)	*$189.8 M*	*$28.4 M*
SOCIAL/COMMUNITY ACCOUNT		
Noise and Visual Impacts	◑	◑
Community Displacement	◑	◑
Community Severance	●	◑
Reduction in Illegal Truck Parking	N/A	◕
Sustainable Transportation	◕	◑
Consistency with Provincial Plans	●	●
ENVIRONMENTAL ACCOUNT		
Terrestrial	◑	Unknown
Aquatic	◑	◔
Archaeological / Historical	◑	Unknown
GHG Reductions	●	◕
KEY ECONOMIC INDICATORS		
Net Present Value	**$32.6**	**$2.6 M**
Benefit-Cost	**1.2**	**1.1**

(1) MAE evaluation from the Highway 1 Widening (216 Street to highway 11) Business Case, Parsons, 2016. Customer service assessment extrapolated from the 15 year evaluation provided in background business case (including Class C estimates).

(2) MAE evaluation from Stantec assessment of the proposed truck parking area, 2016 (including Class D cost estimates).

● Significant Benefit ◕ Modest Benefit ◑ Neutral ◔ Modest Impact ○ Significant Impact

5.0 Sensitivity Analysis

In order to consider the risks and uncertainties inherent in this type of evaluation appropriately, a sensitivity analysis was conducted. This approach considers a range of uncertainty for key factors in the project assessment. The result is that the conclusions reached can be tested for resiliency against potentially changed economic conditions. For this assignment, sensitivity analyses were conducted for discount rates, and cost estimates.

5.1 Discount Rates

To convert future project related costs and benefits to a common present value for comparison, a discount rate was used in the benefit-cost evaluation. This rate is typically set to reflect the rate of inflation and is therefore, subject to changes depending on overall economic circumstances. In this type of evaluation, the discount rate is of particular importance for future benefits (mobility and safety). However, project costs are also affected where future costs must also be discounted to represent present value. According to the *BC Ministry of Transportation's Benefit-Cost Guidebook*, a discount rate of 6% should be used for Provincial benefit-cost evaluation. This value has been used for the original analysis presented above. On the other hand, the *Transport Canada – Guide to Benefit-Cost to Analysis* indicates that a rate of 10% is appropriate for federal business cases. Consequently, in order to test the sensitivity of the results of this evaluation, the benefit-cost analysis was also calculated using the 10% discount rate as preferred by Transport Canada, and an additional 8% rate for comparison. The results of the analysis are summarized in **Table 5.1**.

Table 5.1: Discount Rate Sensitivity

Account	Highway 1 6 Laning			Truck Parking Facility		
	Discount Rate			Discount Rate		
	6%	8%	10%	6%	8%	10%
FINANCIAL ACCOUNT						
PV Revenue	-	-	-	$4.4 M	$3.5 M	$2.8 M
PV Expenses	-	-	-	-$4.4 M	-$3.5 M	-$2.8 M
Capital Cost (PV)	$179.5 M	$172.0 M	$165.0 M	$27.0 M	$26.1 M	$25.3 M
Property Cost (PV)	-	-	-	s.13,s.17		
Maintenance (PV)	$2.0 M	$1.4 M	$1.1 M	$0.3 M	$0.2 M	$0.1 M
Construction Salvage Value (PV)	-$24.3 M	-$13.8 M	-$8.0 M	-$1.6 M	-$1.5 M	-$1.4 M
Total Incremental Cost (PV)	*$157.2 M*	*$159.6 M*	*$158.1 M*	s.13,s.17		
CUSTOMER SERVICE ACCOUNT						
Travel Time Savings (PV)	$172.2 M	$126.9 M	$95.5 M	$23.8 M	$18.8 M	$15.1 M
Vehicle Operating Savings (PV)	$11.1 M	$8.1 M	$6.1 M	$7.0 M	$5.5 M	$4.4 M
Hwy 17 / Truck Access Signal Travel Time Costs (PV)	-	-	-	-$2.2 M	-$1.9 M	-$1.6 M
Hwy 17 / Truck Access Signal Veh. Operating Costs (PV)	-	-	-	-$0.2 M	-$0.1 M	-$0.1 M
Safety (PV)	$6.5 M	$4.9 M	$3.8 M	N/A	N/A	N/A
Total Incremental Benefits (PV)	*$189.8 M*	*$139.9 M*	*$105.4 M*	*$28.4 M*	*$22.3 M*	*$17.8 M*
KEY ECONOMIC INDICATORS						
Net Present Value	**$32.6 M**	**-$19.7 M**	**-$52.7 M**	**$2.6 M**	**-$2.6 M**	**-$6.3 M**
Benefit-Cost Ratio	**1.2**	**0.9**	**0.7**	**1.1**	**0.9**	**0.7**

This analysis indicates that the key economic indicators are sensitive to a reasonable variation in discount rate. As expected, the economic indicators are improved with reduced discount rate assumptions. At an 8% discount rate, the Highway 1 widening project results in a NPV of -$19.7 M and a B/C ratio of 0.9, while the Truck Parking project results in a NPV of -$2.6 M and a B/C ratio of 0.9. At a 10% discount rate, the Highway 1 widening project results in a NPV of -$52.7 M and a B/C ratio of 0.7, while the Truck Parking project results in a NPV of -$6.3 M and a B/C ratio of 0.7.

5.2 Project Cost Estimates

Estimated project costs are based on the best engineering data available and a reasonable contingency, but without detailed engineering, the magnitude of potential risks may not be completely captured. To test the sensitivity of key economic indicators to reasonable variations in project cost, indicators are assessed at plus or minus 25% of estimated capital costs. Results are summarized in **Table 5.2**.

This analysis indicates that the key economic indicators are sensitive to a reasonable variation in the cost estimate. As expected, the economic indicators for both projects are improved with a 25% reduced cost estimate assumption, resulting in an NPV of $71.4 M and a B/C ratio of 1.6 for Highway 1 six laning and an NPV of $9.0 M and B/C ratio of 1.5 for the truck parking facility. Under a 25% increased cost estimate assumption economic indicators worsen, resulting in an NPV of -$6.2 M and a B/C ratio of 1.0 for Highway 1 6 laning and an NPV of -$3.8 and a B/C ratio of 0.9 for the truck parking facility.

Table 5.2: Project Cost Estimate Sensitivity

Account	Highway 1 6 Laning			Truck Parking Facility		
	Discount Rate			Discount Rate		
	-25%	Base	+25%	-25%	Base	+25%
FINANCIAL ACCOUNT						
PV Revenue	-	-	-	$4.4 M	$4.4 M	$4.4 M
PV Expenses	-	-	-	-$4.4 M	-$4.4 M	-$4.4 M
Capital Cost (PV)	$134.6 M	$179.5 M	$224.4 M	$20.2 M	$27.0 M	$33.7 M
Property Cost (PV)	-	-	-	s.13,s.17		
Maintenance (PV)	$2.0 M	$2.0 M	$2.0 M	$0.3 M	$0.3 M	$0.3 M
Construction Salvage Value (PV)	-$18.2 M	-$24.3 M	-$30.4 M	-$1.2 M	-$1.6 M	-$1.9 M
Total Incremental Cost (PV)	*$118.4 M*	*$157.2 M*	*$196.0 M*	s.13,s.17		
CUSTOMER SERVICE ACCOUNT						
Travel Time Savings (PV)	$172.2 M	$172.2 M	$172.2 M	$23.8 M	$23.8 M	$23.8 M
Vehicle Operating Savings (PV)	$11.1 M	$11.1 M	$11.1 M	$7.0 M	$7.0 M	$7.0 M
Hwy 17 / Truck Access Signal Travel Time Costs (PV)	-	-	-	-$2.2 M	-$2.2 M	-$2.2 M
Hwy 17 / Truck Access Signal Veh. Operating Costs (PV)	-	-	-	-$0.2 M	-$0.2 M	-$0.2 M
Safety (PV)	$6.5 M	$6.5 M	$6.5 M	N/A	N/A	N/A
Total Incremental Benefits (PV)	*$189.8 M*	*$189.8 M*	*$189.8 M*	*$28.4 M*	*$28.4 M*	*$28.4 M*
KEY ECONOMIC INDICATORS						
Net Present Value	**$71.4 M**	**$32.6 M**	**-$6.2 M**	**$9.0 M**	**$2.6 M**	**-$3.8 M**
Benefit-Cost Ratio	**1.6**	**1.2**	**1.0**	**1.5**	**1.1**	**0.9**

6.0 Potential Risks

In addition to the sensitivity analysis, it is important to identify potential risks to project cost and schedule. Some of the risks that have been identified are summarized in **Table 6.1.** A detailed project risk register for Highway 1 6 Laning is included in Appendix A of the original Parsons *Highway 1 Widening (216 Street to Highway 11) Business Case* found in **Appendix A** of this report.

Table 6.1: Potential Risks and Mitigation Measures

Potential Risks	Risk Description and Mitigation
Geotechnical	This area is well understood from a geotechnical perspective as a result of the Port Mann Highway 1 and South Fraser Perimeter Road projects. Preloading is anticipated in response to the soft soils in this area and this will be adequately advanced in the construction to limit any schedule delays.
Traffic Management	The construction delivery will include detour ramps and a detailed traffic management plan to reduce mobility impacts for Highway 1 users.
Property	No property is required for Highway 1 improvements as they will be contained within the existing right-of-way, therefore avoiding concerns around escalation. Property for Truck Parking Facility is already owned by the Crown.
Utilities	A Fortis Gas line exists in the Highway 1 project area. A mitigation strategy will be developed as part of the pre-load design to avoid impact.
Environmental	Detailed environmental assessments will be undertaken during the functional design stage. The Ministry will work closely with other agencies to develop an appropriate Environmental Protection Plan.
CP Rail Crossing Replacement	The Ministry will initiate discussions early with CP Rail to address design and detour needs for the project, avoiding any scheduling impacts and limiting service disruption.
First Nations	First Nations have been engaged regarding the Truck Parking Facility and there is interest in pursuing First Nations training and development opportunities as part of this project. Ongoing engagement is also occurring with impacted First Nations as part of the current Highway 1 / 216 Street Interchange Project out for tender which has allowed the Province to develop a positive relationship with the local First Nations.

7.0 Advancement of Provincial & Federal Transportation Strategies and Plans

Established in 1988, the National Highway System (NHS) is defined by routes that provide for inter-provincial and international trade/travel by connecting capital cities, major provincial populations, commercial centres, ports of entry, and other transportation modes. As part of the NHS, the Highway 1 segment between 216 Street and 264 Street is a key link to trade and tourism.

A number of Provincial transportation strategies and Federal transportation policies support transportation improvements to provide safe, efficient and reliable movement of peoples and goods, as well as advancement of partnering relationships as they relate to transportation investment. The proposed projects are anticipated to result in benefits that are well aligned with the goals of both Federal and Provincial transportation strategies and plans including:

- ***BC on the Move – 10 Year Transportation Plans (Provincial)*** – In support of accommodating the movement of people, goods and services in British Columbia, the provincial government's **BC On the Move – 10 Year Transportation Plan** identified the commitment to improve highway capacity and reliability with the widening of Highway 1 between Langley and Abbotsford. Consistent with this priority, BC On the Move also identified a commitment to work with industry to identify and construct at least two new truck parking areas nearby key highway corridors in the Lower Mainland. Truck parking facilities support mobility and reliability investments on BC's highways by providing convenient and accessible areas to enable commercial vehicles to park and access appropriate amenities.

- ***The Pacific Gateway Transportation Strategy 2012 – 2020 (Provincial)*** – The goal of this strategy is to ensure that British Columbia is the preferred North American gateway for Asia Pacific trade through expanding the Province's transportation network, while generating sustainable economic growth and additional jobs. Recognizing the importance of both Highway 1 and convenient drayage truck parking to the Asia Pacific gateway, the proposed improvements are certainly well aligned with this particular strategy.

- ***Partnering for the Future – A Transportation Vision for Canada (Federal)*** – In addition to BC on the Move, this Federal strategy also supports the advancement of partnering relationships as they relate to transportation investment. The continued expansion of cost-sharing initiatives between the Government of Canada and the Province of British Columbia is supported by both levels of government as an effective means to ensuring continued economic growth and quality of life improvements for all Canadians.

- ***Asia-Pacific Gateway and Corridor Initiative (Federal)*** – Led by Transport Canada, the goals of the *Asia-Pacific Gateway and Corridor Initiative* is to improve the efficiency and reliability of the gateway for Canadian and North American exports and imports and ensure travel routes are safe and open to through traffic, while minimizing environmental impacts. Thus, improvements to the segment of Highway 1 as well overall increases in drayage truck parking near the Port of Vancouver gateway would be consistent with federal transportation strategies and may be eligible for specific federal funding sources.

- ***Road Safety Strategy 2015 (Federal)*** – The goal of this initiative is to reduce fatalities and serious injuries caused by collisions on Canada's roads through a number of strategies including road infrastructure improvements and collaboration among governmental and non-governmental organizations. The proposed improvements will be designed to meet Provincial design and safety standards. Geometric improvements at the 232 Street interchange will be made to not only address current mobility issues, but also safety issues.

- ***Partnering for the Future – A Transportation Vision for Canada (Federal)*** – In addition to BC on the Move, this Federal strategy also supports the advancement of partnering relationships as they relate to transportation investment. The continued expansion of cost-sharing initiatives between the Government of Canada and the Province of British Columbia is supported by both levels of government as an effective means to ensuring continued economic growth and quality of life improvements for all Canadians.

8.0 Corridor Performance Measures

As part of the Province's commitment to accountability under the Capital Asset Management Framework (CAMF), MoTI is expected to measure and report on the performance of its completed capital project. To support this commitment, performance measures must be developed for the recommended option at the planning and programming stage of a project. Actual performance then needs to be measured and reported on post-construction[3].

For this project, performance measures were developed for the Customer Service account identified in **Section 4.0.** Additionally, truck parking facility targets were identified. Performance measures are summarized in **Table 8.1.**

[3] *Guidelines for Preparing MoTI Business Cases, Appendix 6, Performance Measures for MoTI Business Case (November, 2015)*

Table 8.1: Performance Measure Summary

Strategic Objective	Performance Measure	Method of Measurement
Customer Service – Mobility	Monitor levels of service and highway capacity. **1. Highway 1 (216 Street to 264 Street)** • **Level of Service** as calculated using the Highway Capacity Manual for freeway segments; LOS is not to exceed LOS E for any extended freeway segment. Current LOS is E / F for all of the study segments during the AM or PM peak hours. • **Travel Time** during the weekday AM and PM peak periods in both the eastbound and westbound directions of travel should be within 30% of free flow speeds. ○ Between 200 St and 264 Street, free flow speed = 8.7 minutes and current travel time is approximately 14 to 15 minutes (EB in PM peak) **2. Highway 17 / Truck Access Signal** • **Signal delays** for Highway 17 westbound through traffic (the sole signalized through movement) should not exceed LOS E in the weekday AM or PM peak hour.	TomTom historical traffic data; Ongoing data collection program.
Customer Service – Safety	Reduce collision frequencies and reduce collision rates and severities to below current levels. **1. Highway 1 (216 Street to 264 Street)** • **Reduce collision frequency** over the entire highway study section. • **Reduce the collision rate** through segments currently identified as exceeding critical rates. Collision rate for corridor should not exceed provincial averages. • **Reduce collision severities** through segments currently identified as exceeding critical rates as well as provincial averages for collision severity.	Collision data from the Ministry's Collision Infrastructure System.
Truck Parking Usage	**Facility usage** • 80% of available parking stalls are used on a typical weekday **Revenue neutral** • Full cost of facility operations borne by users	Facility usage audits / spot inspections; full cost accounting.

9.0 Project Implementation and Recommendations

This Business Case is intended to examine the benefits and costs of six laning Highway 1 between the soon to be constructed 216 Street interchange and the 264 Street interchange as well constructing a new truck parking facility along Highway 17 near the Port Mann Bridge overhead. Overall, the improvements were found to address the issues identified in the problem definition stage as follows:

- ***Mobility*** – Several segments on Highway 1 east of 200th Street currently operate with moderate delays during both weekday and weekend peak periods. As traffic volumes build on the corridor, these delays are expected to worsen. Adding additional lane capacity to the Highway will serve to improve operations over the short and longer-term, reducing delays for corridor travellers and improving overall levels of service in support of expected growth along the corridor over the next 25 years or so. Improving levels of service and ensuring a reliable travel experience is particularly important along Highway 1 as it is the primary corridor connecting Metro Vancouver and the Fraser Valley to the rest of the Province, and one of the primary channels for goods movement to / from the Port of Vancouver to national and international markets.

- ***Safety*** – The study segment experiences a collision rate that on a whole is higher than the average for similar facilities around the province. Approximately 180 collisions are reported to police every year along Highway 1 between 216 Street and Highway 11, with a number of segments near interchanges recording historical collision rates that exceed critical levels. Improvements to the interchange configuration at 232 Street and widening the roadway to six lanes will provide safety benefits. The increase in lane capacity through the area can reduce aggressive driving behaviour and, in turn, reduce the risk of collisions.

- ***Clearance Standards and Interchange Geometry*** – Most structures along this section of Highway 1 do not meet current clearance standards of 5.0m for large structures and 5.5m for lightweight structures. Moreover, the full cloverleaf design of the 232 Street (Highway 10) is no longer considered best practice as a result of the short weave and merge sections near the interchange. The improvement project will result in a full replacement of existing substandard underpasses at the CP Rail crossing, Glover Road, and 232 Street. The 232 Street interchange will be restructured as a Parclo configuration and will include an additional Highway 1 underpass at 72 Avenue.

- ***Insufficient Truck Parking*** – The Port of Vancouver and associated industries rely heavily on medium distance drayage trucking to facilitate the movement of goods across the region and to / from key intermodal facilities. Within the City of Surrey there is little overnight parking available for trucks resulting in truck drivers spending significant time looking for parking. Through work undertaken by the City of Surrey, it was estimated that an additional 2,000 parking stalls are required to meet truck demands within the community. Constructing a new overnight full service truck parking facility on s.13,s.17 overhead will supply 158 additional truck parking stalls, addressing a critical regional and provincial need.

Highway 1 Six Laning and associated improvements were found to have an impressive **net present value of $32.6 M and a B/C ratio of 1.2** while the Truck Parking Facility was found to have a **net present value of $2.6 M and a B/C ratio of 1.1**. As such, both projects reflect net positive economic benefits.

Benefits from the investment would accrue at the local and provincial and federal level. Partnership funding with the Federal Government for the proposed improvements is anticipated. The proposed project could be delivered either through traditional Design Bid Build or another method of Design Build or P3 arrangement. Highway 1 widening has been developed to a functional design level and Truck Parking Area to a conceptual level of detail. Further design work for each would begin in 2017-18, and the delivery for the truck parking area would be substantially complete by the end of fiscal year 2019-20, and by 2021-22 for the Highway 1 widening project as highlighted in **Table 9.1.**

Table 9.1: Estimated Project Schedule by Fiscal Year

Activity	2017 - 18	2018 - 19	2019 - 20	2020 - 21	2021 - 22
Truck Parking					
Project Detailed Design and Surveying	■				
Environmental Assessment	■				
Construction Permit		■			
Tender		■			
Start of on-site Construction		■			
Substantial Completion			■		
Project Completion				■	
Final Report				■	
Highway 1					
Project Functional & Detailed Design and Surveying	■				
Environmental Assessment	■	■			
Construction Permit			■		
Tender			■		
Start of on-site Construction			■	■	
Substantial Completion					■
Project Completion					■
Final Report					■

The proposed improvements for the 232 Street interchange are expected to have significant municipal benefits in addition to the aforementioned benefits to the highway. Consistent with previous discussions with local agencies, the Township of Langley will be requested to fund s.13,s.17 of the project costs for the interchange. **Table 9.2** below summarizes the allocations between agencies assuming s.13, federal contributions toward eligible costs for the Highway 1 improvements s.13, for the 232 Street interchange) and truck parking facility. **Table 9.3** summarizes the anticipated cash flow for each item and agency based on the delivery timeframe.

Table 9.2: Cost Allocations by Project Segment and Eligibility

Costs	Truck Parking	Highway 1 - 232nd Street Interchange	Highway 1 - 216th Street to 232nd Street Widening	Highway 1 - Widening WB East of 248 Overpass to 72nd Overpass	Highway 1 - Widening WB East 264th St Overpass to East of 248 St Overpass	Highway 1 Total Only	Highway 1 & Parking Area Total
A: Non-Eligible Costs							
Pre-development Activities	$ 718,000	$ 636,000-	$ 636,000	$ 159,000	$ 159,000	$ 1,590,000	**$ 2,308,000**
Property Acquisition	s.13,s.17	$ -					s.13,s.17
Administration & Other	$ 3,352,000	$ 5,214,000	$ 4,694,000	$ 1,271,000	$ 660,000	$ 11,839,000	**$ 15,191,000**
Non-Eligible Costs Sub-Total	s.13,s.17	***$ 5,850,000***	***$ 5,330,000***	***$ 1,430,000***	***$ 819,000***	**$ 13,429,000**	s.13,s.17
B: Eligible Costs							
Construction	$ 20,160,000	$ 55,500,000	$ 54,100,000	$ 13,287,000	$ 7,757,000	$ 130,644,000	**$ 150,804,000**
Engineering	$ 2,500,000	$ 6,500,000	$ 5,900,000	$ 1,800,000	$ 1,000,000	$ 15,200,000	**$ 17,700,000**
Environmental Mitigation	$ 700,000	$ -				$ -	**$ 700,000**
First Nations Consultation	$ 350,000	$ 800,000	$ 800,000	$ 600,000	$ 300,000	$ 2,500,000	**$ 2,850,000**
Contingency	$ 2,120,000	$ 18,600,000	$ 18,000,000	$ 4,526,100	$ 2,627,000	$ 43,753,100	**$ 45,873,100**
Eligible Costs Sub-Total	***$ 25,830,000***	***$ 81,400,000***	***$ 78,800,000***	***$ 20,213,100***	***$ 11,684,000***	**$ 192,097,100**	***$ 217,927,100***
Project Total	$ 30,000,000	$ 87,250,000	$ 84,130,000	$ 21,643,100	$ 12,503,000	$ 205,526,100	$ 235,526,100
Level of Contribution							

s.13

Table 9.3: Project Cash Flow by Fiscal Year

Costs	Previous Expenditures	2017 / 2018	2018 / 2019	2019 / 2020	2020 / 2021	2021 / 2022	TOTAL ALLOCATIONS
A: Non-Eligible Costs							
Pre-development Activities	$ 2,138,000	$ 85,000	$ 85,000	$ -	$ -	$ -	$ 2,308,000
Property Acquisition	$ -	s.13	$ -	$ -	$ -	$ -	s.13,s.17
Administration & Other	$ -	$ -	$ 1,713,200	$ 4,751,400	$ 6,076,400	$ 2,650,000	$ 15,191,000
Non-Eligible Costs Sub-Total	*$ 2,138,000*	s.13,s.17	*$ 1,798,200*	*$ 4,751,400*	*$ 6,076,400*	*$ 2,650,000*	s.13,s.17
B: Eligible Costs							
Construction	$ -	$ -	$ 30,264,000	$ 60,321,600	$ 45,189,600	$ 15,028,800	$ 150,804,000
Engineering	$ -	$ 2,700,000	$ 5,310,000	$ 5,310,000	$ 3,510,000	$ 870,000	$ 17,700,000
Environmental Mitigation	$ -	$ -	$ 350,000	$ 350,000	$ -	$ -	$ 700,000
First Nations Consultation	$ -	$ 460,000	$ 910,000	$ 570,000	$ 570,000	$ 340,000	$ 2,850,000
Contingency	$ -	$ 2,072,000	$ 8,731,310	$ 13,761,930	$ 13,761,930	$ 7,545,930	$ 45,873,100
Eligible Costs Sub-Total	$ -	$ 5,232,000	$ 45,565,310	$ 80,313,530	$ 63,031,530	$ 23,784,730	$ 217,927,100
Project Total	$ 2,138,000	$ 5,417,000	$ 47,363,510	$ 85,064,930	$ 69,107,930	$ 26,434,730	$ 235,526,100
Level of Contribution							

s.13

Appendix A

Highway 1 Widening (216 Street to Highway 11) Business Case. Parsons, 2016.

BRITISH COLUMBIA | Ministry of Transportation and Infrastructure

Highway 1 Widening (216 Street to Highway 11) Business Case

PARSONS

SEPTEMBER 2016 - Version 2
SW1200SWF

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EXECUTIVE SUMMARY

This business case focuses on the section of Highway 1 from 216 Street to Highway 11. A number of highway segments along this section of Highway 1 currently operate at the lower end of acceptable Levels of Service for a major highway facility during the weekday peak periods and the peak periods on the weekends. These problematic highway segments are characterized by lower than free flow speeds, relatively high vehicle density, limited freedom to maneuver, and nonrecurring congestion resulting from minor incidents / disruptions in the traffic stream. In the short and long term future, the majority of this section of highway is projected to have insufficient capacity to meet the forecasted travel demands.

A number of existing structures along the section of Highway 1 do not meet current guidelines for clearance above a roadway (5.0 m for large structures, 5.5 m for lightweight structures); with the most critical being the Glover Road underpass and the Roberts Bank Rail Corridor (CP Rail) underpass tunnel portals. These structures, which are at risk of vehicle impact, include the following:

- Glover Road underpass structure: 4.46 m;
- Roberts Bank Rail Corridor underpass tunnel portals: 4.40 m;
- 232 Street underpass structure: 4.62 m;
- 264 Street underpass structure: 4.60 m;
- Peardonville Road underpass structure: 4.92 m.

Several interchanges within this section of Highway 1 currently incorporate configurations that are no longer considered best practices to accommodate high traffic volumes. The interchanges at 232 Street and 264 Street have cloverleaf configurations that can give rise to conflicts due to the short weaving section separating high speed entry / exit points.

To address these issues, the Highway 1 Widening Project proposes to include widening of Highway 1 by adding one lane in each direction into the median from 216 Street to Highway 11. The project will include the demolition of existing underpasses and reconfiguration of two interchanges, the 232 Street interchange and the 264 Street interchange. In addition, to accommodate the Highway 1 widening, a number of grade separated crossing will need to be upgraded to achieve added crossing width and / or higher clearance under the overpass structures.

The scope of the Highway 1 Widening Project will also include the following key elements:

- Demolition and reconstruction of the Glover Road underpass structure;
- Demolition and reconstruction of the rail underpass structures at the CP Rail lane (Roberts Bank Corridor);
- Widening of the two overhead structures at Bradner Road;
- Upgrade of the entrance and exit ramps to the Bradner Rest Area along the westbound lanes of Highway 1;
- Demolition and reconstruction of the Peardonville Road underpass structure;
- New structure for the eastbound off-ramp to Highway 11; and
- Upgrade of the Highway 11 on-ramp to Highway 1 eastbound.

To provide the Ministry of Transportation and Infrastructure with some implementation flexibility in widening Highway 1, the corridor was divided into multiple segments based on the priority of construction and related costs. The segmentation or construction packages have been developed such that they can be delivered individually or bundled together into various combinations. The following segmentation / construction packages are proposed.

Package 1: 232 Street Interchange

This package would involve reconfiguring the 232 Street interchange to allow a new underpass structure to be constructed and the existing structure to be removed. As part of this work, the proposed 72 Avenue underpass would be constructed. Only localized widening of Highway 1 would be included, but any additional lanes on Highway 1 would not be opened to traffic.

Package 2: 264 Street Interchange

This package would involve reconfiguring the 264 Street interchange to allow a new underpass structure to be constructed and the existing structure to be removed. Only localized widening of Highway 1 would be included, but any additional lanes on Highway 1 would not be opened to traffic.

Package 3: Highway 1 Widening from 216 Street to 232 Street

This package would involve widening Highway 1 between the recently constructed interchange at 216 Street and the recently constructed 232 Street interchange (Package 1), a distance of approximately 2.1 kilometres. The widening would include development of the westbound HOV lane and transition from three to two general purpose lanes in the westbound direction. This package would also involve the

complex removal of the box structures at the CP Rail crossing and construction of a new rail bridge. Removal and construction of a new Glover Road overpass is also included in this construction package.

Package 4: Highway 1 Widening from 232 Street to 264 Street

Only highway widening, over a length of approximately 5.8 kilometres, is involved in this construction package. The widening would encompass the segment of highway, in both directions of travel, between the recently constructed 232 Street interchange (Package 1) and the 264 Street interchange (Package 2). No new structures or modifications to existing structures are included in this segment.

Package 5: Highway 1 Widening from 264 Street to Mt. Lehman Road

Widening the highway in both directions of travel between the recently constructed 264 Street interchange and the existing Mt. Lehman Road interchange represents the majority of the scope in this package. However, widening of the Bradner Road overhead structures is included as is the upgrade of the entrance and exit ramps to the Bradner Rest Area.

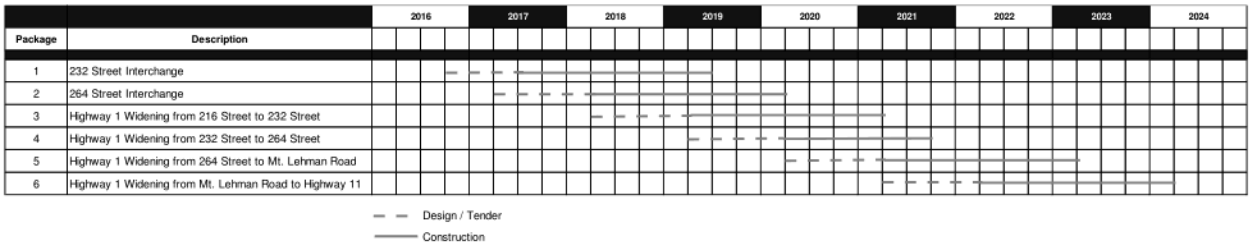
Package 6: Highway 1 Widening from Mt. Lehman Road to Highway 11

This construction package involves approximately 9.7 kilometres of widening of Highway 1 between the Mt. Lehman Road interchange and the Highway 11 interchange. Removal and construction of the new Peardonville Road underpass structure and associated municipal road works are included in this construction package. The new eastbound off-ramp structure to Highway 11 and reconfiguration of the eastbound on-ramps from Highway 11 are also included.

As mentioned above, the proposed construction packages described above have been developed to allow flexibility in the delivery of the overall project. Separately, each construction package has been sized such that each package can be easily delivered under a conventional design bid build approach using local construction firms. However, one or more of the construction packages could be bundled together as a larger conventional design bid build contract, or as a design build delivery. Further bundling of the construction packages could lead to two or even three design build alternative delivery packages. Finally, the overall project could be delivered as a single contract under a public private partnership approach.

Furthermore, if bundling of the constructions packages is considered, then it is assumed that production related efficiencies would result and the overall schedule, shown in ***Figure ES.1***, would be reduced.

Figure ES.1: Proposed Schedule



The project cost estimate, shown in ***Table ES.1***, is similarly divided into the project elemental tasks and grouped by the six work packages.

Table ES.1: Project Cost Estimate Summary

	Highway 1 Widening Cost Estimate Summary						Total
	Package 1	Package 2	Package 3	Package 4	Package 5	Package 6	
Project Management	4.5	3.4	4.1	3.5	6.5	8.3	30.3
Engineering	6.5	5.2	5.9	5.7	10.6	12.9	46.8
Grade Construction	14.1	15.3	15.6	31.8	55.1	43.6	175.0
Structural	33.7	19.1	31.6	0.0	7.0	39.5	130.9
Paving Construction	1.9	2.8	2.2	5.6	9.2	7.5	29.2
Operational Construction	0.8	0.7	0.4	1.3	1.6	2.2	6.9
Utilities	0.6	0.4	0.2	0.1	0.6	1.4	3.3
Resident Engineering	4.4	3.3	4.1	3.5	6.5	8.2	30.0
Contingency (30%)	19.9	15.1	18.5	15.5	29.1	37.1	135.0
Total ($M)	86.4	65.3	82.5	67.0	126.2	160.7	588.3
Total (rounded) $M	87	66	83	67	127	161	591

A calculation of the potential funding for this project from Infrastructure Canada is based on eligible project costs. For provincially-owned assets, Federal Funding of 50 percent of the total eligible costs is requested. The funding contribution calculation is shown in ***Table ES.2.***

Table ES.2: Project Cash Flow Projections

Cost Type	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	Total
A: Non-Eligible Costs									
Project Management	$50,000	$600,000	$1,000,000	$1,500,000	$1,400,000	$1,800,000	$1,500,000	$800,000	$ 8,700,000
Planning	$ 250,000								$ 250,000
Environmental									$ -
Stakeholder Relations		$ 120,000	$ 180,000	$ 230,000	$ 210,000	$ 260,000	$ 210,000	$ 120,000	$ 1,400,000
Corporate Services									$ -
Engineering	$ 200,000								$ 200,000
Propety Acquisition									$ -
Regional Recoveries									$ -
Contingency	$ 150,000	$ 200,000	$ 400,000	$ 500,000	$ 500,000	$ 600,000	$ 500,000	$ 300,000	$ 3,200,000
Sub-Total	**$ 650,000**	**$ 900,000**	**$ 1,600,000**	**$ 2,230,000**	**$ 2,100,000**	**$ 2,700,000**	**$ 2,200,000**	**$ 1,200,000**	**$ 13,600,000**
B: Eligible Costs									
Engineering External		$ 16,600,000	$ 8,400,000	$ 7,900,000	$ 14,600,000	$ 18,100,000			$ 65,600,000
Environmental External (included in Engineering)									$ -
Construction Supervision		$ 1,800,000	$ 3,400,000	$ 4,600,000	$ 3,800,000	$ 5,000,000	$ 7,400,000	$ 4,100,000	$ 30,100,000
Construction (Road and Bridge)		$ 20,400,000	$ 39,600,000	$ 54,400,000	$ 44,400,000	$ 56,200,000	$ 83,900,000	$ 47,100,000	$ 346,000,000
First Nations Consultation & Accomodation		$ 80,000	$ 150,000	$ 200,000	$ 170,000	$ 220,000	$ 320,000	$ 180,000	$ 1,300,000
Contingency		$ 11,700,000	$ 15,500,000	$ 20,100,000	$ 18,900,000	$ 23,900,000	$ 27,500,000	$ 15,400,000	$ 133,000,000
Sub-Total	**$ -**	**$ 50,600,000**	**$ 67,100,000**	**$ 87,200,000**	**$ 81,900,000**	**$ 103,400,000**	**$ 119,100,000**	**$ 67,000,000**	**$ 576,300,000**
TOTAL	**$ 650,000**	**$ 52,000,000**	**$ 69,000,000**	**$ 90,000,000**	**$ 84,000,000**	**$ 107,000,000**	**$ 122,000,000**	**$ 69,000,000**	**$ 590,000,000**
Federal Contribution	$ -	$ 25,300,000	$ 33,550,000	$ 43,600,000	$ 40,950,000	$ 51,700,000	$ 59,550,000	$ 33,500,000	$ 288,150,000

Table ES.3 provides an "at-a-glance" summary of the multiple account evaluation for the Highway 1 Widening Project versus a "No Build" or "Do Nothing" option.

Table ES.3: Evaluation Summary

Criterion/Option	No Build	Highway 1 Widening
Customer Service Account		
Travel Time	Highway is congested during peak and off peak periods. It is anticipated that these conditions will worsen in the short and long term futures.	Improved traffic performance will result in Travel Time Savings of approximately $65 M / year by 2041 Total Travel Time Savings: $334 M
Vehicle Operating Costs	Highway is congested during peak and off peak periods. It is anticipated that these conditions will worsen in the short and long term futures.	Improved traffic performance will result in less delays that translate into Vehicle Operating Cost savings of approximately $3.5 M / year by 2041 Total VOC Savings: $23 M
Road Safety Performance	Road Safety Performance is poor compared to provincial average	Improved Road Safety Performance resulting in a reduction of 400 crashes from 2025 to 2041 Total Road Safety Savings: $14 M
Environmental Account		
Terrestrial Impacts	NA	Low impact
Aquatic Impacts	NA	Low impact
Archaeological / Historical Impacts	NA	Low impact
Financial Account		
Capital Cost ($2016)	NA	-$449.0 M
Maintenance and Rehabilitation Cost ($2016)	-$8.2 M	-$5.4 M
Salvage Value ($2016)	NA	$83.7 M
Net Present Value ($2016)	NA	0.5 M
Overall Benefit Cost Ratio	NA	1.00

1.0 INTRODUCTION

The Highway 1 study section extends from 216 Street in the Township of Langley to Whatcom Road in the City of Abbottsford. However, the enclosed business case focuses only on the section of Highway 1 from 216 Street to Highway 11. The remaining segment, between Highway 11 and Whatcom Road in the City of Abbotsford is the subject of a further study.

The business case also assumes that the proposed interchange at 216 Street will be constructed separately from and prior to the scope of work proposed under the Highway 1 widening project. The 216 Street interchange project includes the extension of the median HOV lanes further east of the current terminus at the 202 Street interchange. The Highway 1 widening project will tie into the local widening of the highway which forms part of the 216 Street interchange project.

Within the study limits, the Highway 1 section consists of a four lane freeway with two lane carriage ways separated by a wide depressed median. Full movement interchanges are located along the highway section at:

- 232 Street (Highway 10);
- 264 Street (Highway 13);
- Mt Lehman Road;
- Clearbrook Road;
- McCallum Road; and
- Highway 11.

Further east, past Highway 11, only the Whatcom Road interchange is included in the remaining highway segment which will be assessed as part of the further study.

Existing auxiliary / climbing lane segments are located along the highway in the eastbound direction between the 232 Street interchange and the 264 Street interchange for a total length of approximately 6.4 km, in the westbound direction east of Mt. Lehman Road for a total length of approximately 2.2 km, and in the westbound direction between Highway 11 and immediately west of the McCallum Road interchange for a total length of approximately 2.6 km.

2.0 PROBLEM STATEMENT

A number of highway segments along the section of Highway 1 between 216 Street and Highway 11 currently operate at the lower end of acceptable Levels of Service for a major highway facility during the weekday peak periods and the peak periods on the weekends. These problematic highway segments are characterized by lower than free flow speeds, relatively high vehicle density, limited freedom to maneuver, and nonrecurring congestion resulting from minor incidents / disruptions in the traffic stream. In the short and long term future, the majority of this section of highway is projected to have insufficient capacity to meet the forecasted travel demands.

This section of Highway 1 also has a collision rate that is higher than the average for similar facilities around the province. Common collision types include rear end collisions and off road collisions, with contributing factors such as driver inattention, following too closely, alcohol involvement and fatigue. In addition to the direct collision costs are significant delay costs that occur when the highway lanes are blocked due to an incident. With approximately 180 collisions reported to police every year, this means there is a reportable collision every two days along this section of the Highway 1 corridor.

A number of existing structures along the section of Highway 1 do not meet current guidelines for clearance above a roadway (5.0 m for large structures, 5.5 m for lightweight structures); with the most critical being the Glover Road underpass and the Roberts Bank Rail Corridor (CP Rail) underpass tunnel portals. These structures, which are at risk of vehicle impact, include the following:

- Glover Road underpass structure: 4.46 m;
- Roberts Bank Rail Corridor underpass tunnel portals: 4.40 m;
- 232 Street underpass structure: 4.62 m;
- 264 Street underpass structure: 4.60 m;
- Peardonville Road underpass structure: 4.92 m.

Several interchanges within this section of Highway 1 currently incorporate configurations that are no longer considered best practices to accommodate high traffic volumes. The interchanges at 232 Street and 264 Street have cloverleaf configurations that can give rise to conflicts due to the short weaving section separating high speed entry / exit points. Although the configuration of the weave operation is mitigated somewhat by physical separation from the mainline, the combination of the short weaving distance, presence of heavy trucks, and high speed / high volume traffic may contribute to the relatively high collision frequencies at these interchanges.

In summary, the following issues are currently found or are forecast to occur within this section of Highway 1:

- Limited or insufficient capacity during the weekday AM and PM peak periods along most segments of the Highway 1 section between 216 Street and Highway 11;
- High collisions rates that exceed other similar provincial facilities;
- Vertical clearance issues at a number of existing structures including Glover Road, CP Rail overpass / portal, 232 Street, 264 Street, and Peardonville Road; and,
- Interchange configurations that no longer operate well under the higher traffic volumes experienced today or forecasted in the future planning horizon.

3.0 IDENTIFICATION & ANALYSIS OF OPTIONS

The development of the project scope to address the various issues was conducted with a primary focus on adding capacity to the section of Highway 1 between 216 Street in the Township of Langley and Highway 11 in the City of Abbotsford. To accommodate any additional capacity within this section of highway, primarily in the form of an additional lane in each direction of travel, other constraints within the highway corridor needed to be upgraded. These constraints included a number of existing overpass structures and underpass structures as well as topography within this section of highway that could potentially impact the available capacity. Therefore, a systematic process was conducted to develop options or solutions for the following four areas:

- Mainline Capacity;
- Interchange Reconfiguration;
- Climbing Lanes; and
- Replacement Structures.

3.1 Mainline Capacity

To address the identified road capacity, geometric design, and road safety problems facing Highway 1 between 216 Street and Highway 11, a number of optional solutions were generated. These options are described and evaluated below.

3.1.1 GENERATED OPTIONS

As identified in the Problem Statement, additional mainline capacity is required along the length of the subject section of highway. To provide this additional capacity in the form of an additional eastbound and westbound lane, the method of widening the highway was selected to be through the median given the space availability. The critical issues to address, however, were how to designate the additional capacity (i.e. make the lane accessible to all traffic or restrict its use to selected vehicles), and if there were a difference between the lane designation at either end, how to safely and efficiently manage the transitions.

Four mainline widening options were developed, as described below:

- Mainline Option 1: Provide One New General Purpose (GP) Lane in Each Direction Between 202 Street and Highway 11:
    - In this option, one new general purpose lane will be added to Highway 1 in each direction between 202 Street and Highway 11. Specifically,
    - In the westbound direction, the westbound on-ramp from Highway 11 will form the third lane of the highway, with all lanes designated for general purpose traffic. The three westbound general purpose lane cross-section will continue to 200 Street where the slow lane will drop at the existing westbound off-ramp. A median High Occupancy Vehicle (HOV) lane will develop approximately 1 km east of 202 Street, to tie in with the existing HOV facilities on Highway 1 westbound.
    - In the eastbound direction, the median HOV lane through 202 Street will terminate at approximately 1 km east of 202 Street, where the HOV lane designation will end and a three general purpose lane cross-section will be provided. The existing climbing lane between Highway 10 and Highway 13 may be preserved as a fourth eastbound lane. At the east end of the study corridor, the eastbound right lane will end approximately 1 km east of the Highway 11 eastbound on-ramp to preserve lane balance through the Highway 11 interchange. Two GP lanes will continue east of the Highway 11 interchange, as per existing conditions.

- Mainline Option 2: Provide One New High Occupancy Vehicle (HOV) Lane in Each Direction Between 202 Street and Highway 11:
    - In this option, an additional travel lane will be provided to Highway 1 in each direction between 202 Street and Highway 11 for the use of High Occupancy Vehicles (2+ Occupants) and Buses Only. Specifically,
    - In the westbound direction, the HOV lane will develop in the median approximately 1 km west of Highway 11. The two GP and one HOV lane cross-section will continue westbound and connect to the existing cross-section at 202 Street, which also consists of two general purpose lanes and one HOV lane.
    - In the eastbound direction, the median HOV lane through 202 Street will be carried through to approximately 1 km east of the Highway 11 eastbound on-ramp to preserve lane balance through the Highway 11 interchange, where the HOV lane designation will end. The existing climbing lane between Highway 10 and Highway 13 may be preserved as a fourth eastbound lane. There will be a short four-lane segment east of

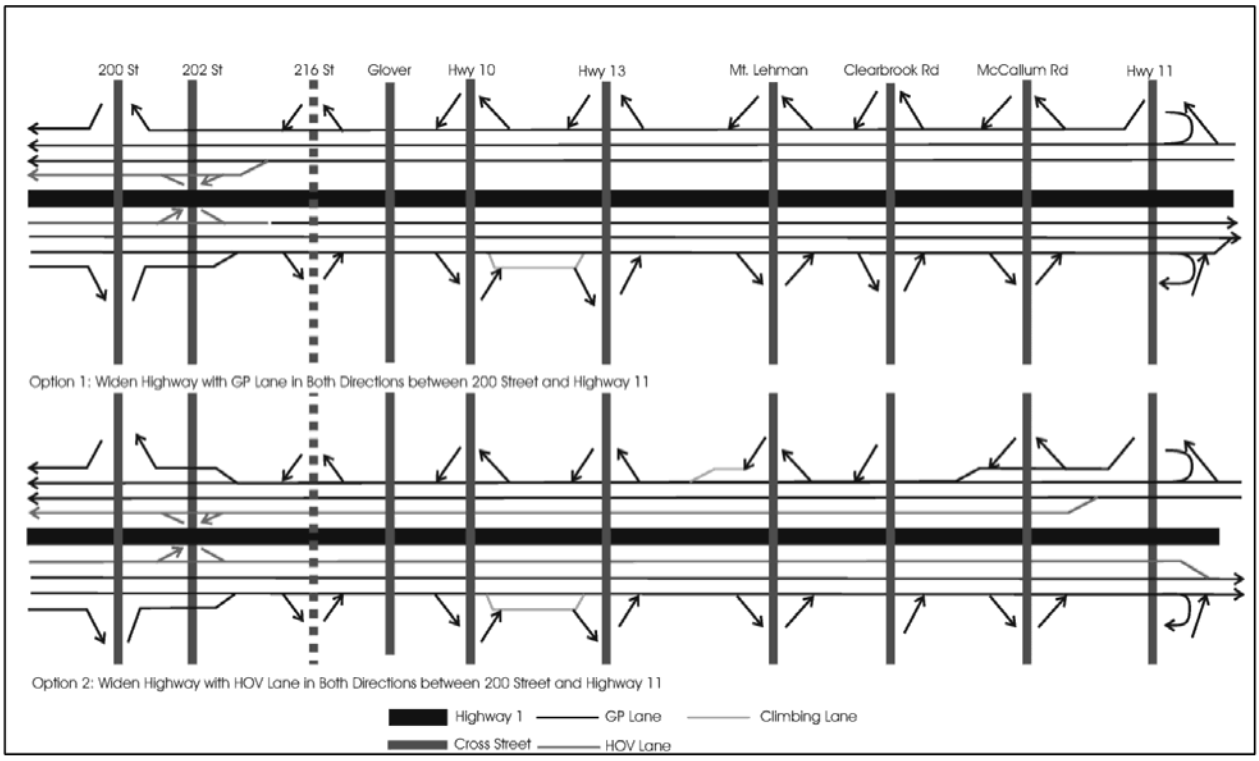
McCallum Road where the eastbound deceleration lane for the off-ramp to Highway 11 is located. Two GP lanes will continue east of the Highway 11 interchange, as per existing conditions.

- For consistency with the remainder of the Highway 1 corridor, the HOV lane will have a full-time designation.

- s.13

- Mainline Option 4: Provide One New General Purpose (GP) Lane in Each Direction Between Glover Road and Highway 11, Extend Existing HOV Lanes to Highway 10 with GP Lane Overlap, Provide New East Facing Ramps to / from Glover Road:
    - In this option, one new general purpose lane will be added to Highway 1 in each direction between Glover Road and Highway 11. In addition, the existing HOV lanes currently starting / ending at 202 Street will be extended eastward to Highway 10 with approximately 2 km of overlap with the new general purpose lanes. New east facing ramps to / from Glover Road will be provided also, giving a more direct access to / from the Trinity Western University Campus and Fort Langley, as well as reducing traffic volume on the mainline between Glover Road and 216 Street. Specifically,
    - In the westbound direction, the westbound on-ramp from Highway 11 will form the third lane of the highway, with all lanes designated for general purpose traffic. The three westbound general purpose lane cross section will continue to approximately 1 km west of Glover Road, where the westbound right lane will end. A westbound off-ramp to Glover Road will be provided at 1 km east of Glover Road. Also, a westbound HOV lane will develop in the median, approximately 1 km east of Highway 10 creating a four-lane segment. The HOV lane and two general purpose lanes will continue westward and connect to the existing cross-section at 202 Street, which also consists of two general purpose lanes and one HOV lane.
    - In the eastbound direction, the median HOV lane through 202 Street will be carried through the new Glover Road eastbound on-ramp and to approximately 1 km east of the Highway 10 interchange, where the HOV lane designation will end and a three general purpose lane cross-section will be provided. The existing climbing lane between Highway 10 and Highway 13 may be preserved as a fourth eastbound lane. At the east end of the study corridor, the eastbound right lane will end approximately 1 km east of the Highway 11 eastbound on-ramp to preserve lane balance through the Highway 11 interchange. Two GP lanes will continue east of the Highway 11 interchange, as per existing conditions.

The potential lane balancing options along the mainline using single line sketches are illustrated in ***Figure 3.1*** below.



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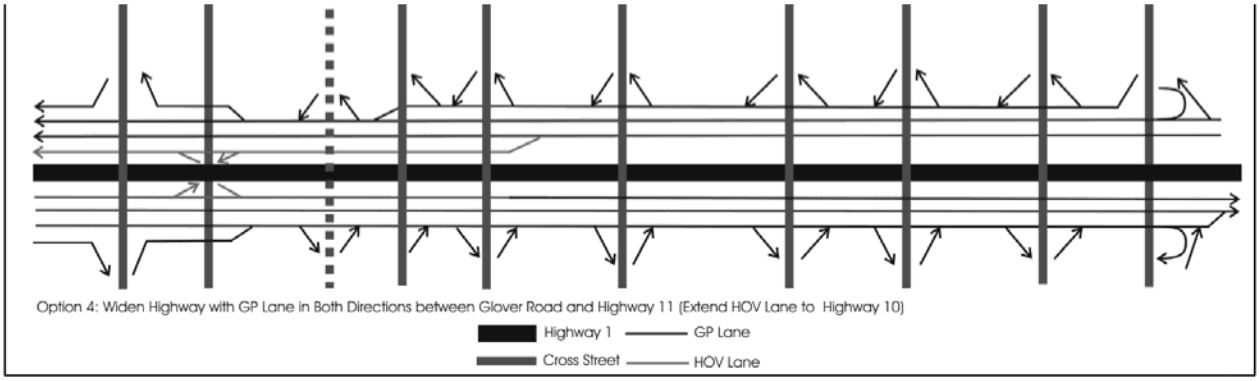


Figure 3.1: Mainline Capacity Improvement Options Schematics (Not to Scale)

3.1.2 EVALUATION CRITERIA

For the purpose of evaluating the Highway 1 widening options, three specific and relevant evaluation criteria were identified, namely highway usage, capacity, and operations performance. The evaluation included a quantitative evaluation using TransLink's Regional Transportation Model (RTM) to forecast travel demand and capacity performance, as well as a qualitative review of operations performance based on the lane designations and management of transition of the designations at either end of the corridor. The planning horizon for evaluating the mainline widening options was chosen as the RTM planning horizon of 2045.

The option evaluation criteria are presented below.

- **Highway Usage**

  The highway usage criterion considered the effectiveness of the HOV lane designations in serving the HOV traffic and in reducing congestion. If the forecast HOV demand derived from the RTM is not anticipated to be significantly high, the additional lane should not be restricted to HOV users but available to all users to improve traffic conditions in the general purpose lanes.

  Transit vehicles are allowed in HOV lanes. However, as the forecast demand is expected to be low (with 10 buses in the AM and PM Peak Hours), transit accommodation was not considered as a part of the highway usage criterion.

- **Capacity**

  The capacity criterion considered quantitatively whether the lane designations and the management of the transition of the lane designations at either end of the corridor are adequate to meet the corresponding forecast demand. The highest volume-to-capacity ratios of each segment, as obtained from the RTM, were assessed.

- **Operations Performance**

  The operations performance criterion considered qualitatively whether traffic will operate efficiently given the lane designations and management of the transition of the lane designations at either end of the corridor in each option.

3.1.3 OPTION EVALUATION

An assessment of the four mainline capacity improvement options was undertaken to select a preferred option that will best suit the long-term needs of the corridor based of the selected assessment criteria, highway usage, capacity, and operations performance. The option assessment results are presented below.

- **Highway Usage**

  The mainline capacity options were evaluated using the RTM. The forecast AM and PM Peak Hour total demand and HOV demand of each segment are summarized in ***Table 3.1*** below. Also presented in the table are the highest volume-to-capacity ratios of each segment using colours, with orange and red indicating segments with capacity issues.

Table 3.1: 2045 AM and PM Peak Hour Forecast Demand (Using Emme Capacity Assumptions)

Scenario		Direction	202 St - 216 St		216 St - 232 St		232 St - 264 St		264 St - Mt Lehman		Mt Lehman - Clearbrooke		Clearbrooke - McCallum		McCallum - Hwy 11	
			Total Veh	HOV	Total Veh	HOV	Total Veh	HOV	Total Veh	HOV	Total Veh	HOV	Total Veh	HOV	Total Veh	HOV
Base	AM	WB	3300	350	3150	350	3300	350	2950	300	3200	400	3600	400	3950	450
		EB	3050	250	3350	300	3700	350	3150	300	2600	250	2950	300	2650	250
	PM	WB	3450	500	3200	450	3400	500	3050	450	2700	450	3200	550	3500	600
		EB	3350	400	3700	500	4100	500	3650	450	3250	400	3600	400	3400	350
Mainline Option 1 (A New GP Lane)	AM	WB	3850	350	3750	400	3950	400	3500	350	3750	450	4050	450	4200	500
		EB	3300	300	3850	350	4150	350	3650	350	3000	300	3300	350	2900	300
	PM	WB	3950	550	3750	500	4000	550	3550	500	3100	500	3500	550	3650	650
		EB	3750	500	4350	550	4700	600	4400	550	3950	500	4300	500	3850	400
Mainline Option 2 (A New HOV Lane)	AM	WB	3350	350	3250	400	3450	400	3100	350	3350	450	3650	500	3900	550
		EB	3100	300	3400	350	3650	350	3250	300	2700	300	3000	300	2700	300
	PM	WB	3500	500	3300	500	3550	500	3200	500	2850	500	3300	600	3500	650
		EB	3400	450	3800	600	4050	600	3850	550	3500	500	3800	550	3600	450
Mainline Option 3 (A New GP Lane + HOV Extension)	AM	WB	3400	350	3500	400	3800	400	3400	350	3700	450	4000	450	4150	500
		EB	3150	300	3650	350	4000	350	3550	300	2950	300	3300	350	2900	300
	PM	WB	3600	500	3500	550	3850	550	3500	500	3050	500	3450	550	3600	650
		EB	3550	500	4050	600	4550	600	4300	550	3900	500	4250	500	3800	400
Mainline Option 4 (A New GP Lane + HOV Extension)	AM	WB	3450	350	3700	450	3900	450	3500	350	3750	450	4000	450	4200	500
		EB	3150	300	3800	400	4100	350	3600	350	3000	300	3300	350	2900	300
	PM	WB	3600	500	3750	600	3950	550	3550	500	3100	500	3450	550	3600	650
		EB	3550	500	4450	650	4700	600	4400	550	3950	500	4250	500	3850	400

LEGEND
V/C < 0.8
0.8 <= V/C < 0.9
0.9 <= V/C < 1.0
V/C >= 1.0

The highest forecast HOV demand across the four options was 650 vehicles per hour. With this relatively low level of HOV demand, designating the additional lane for HOV use only throughout the study corridor will result in lane underutilization. In addition, in segments where the overall demand was forecast to exceed capacity, the HOV designation will create a negative impact on traffic congestion by increasing traffic volume in the General Purpose lanes. Also, as mentioned previously, because transit demand / service levels are anticipated to be low during peak periods where work trips prevail, an HOV lane is not warranted for transit service. Consequently, Option 2,

which will provide an HOV lane in each direction between 202 Street and Highway 11, was not considered a viable option and hence was not considered further in the evaluation process.

- **Capacity**

  The highest volume-to-capacity ratios of each segment, shown in ***Table 3.1*** were extracted from the RTM using link capacity assumptions inherent in the RTM. The resultant volume-to-capacity ratios appeared to be conservative, with some of the segments exceeding 1.0 in all four options. However, if a theoretical capacity of 1700 vehicles per hour (vph) was assumed, instead of using the capacity assumptions in the RTM, the highest volume-to-capacity ratios of each segment will become lower, as presented in ***Table 3.2*** below.

Table 3.2: 2045 AM and PM Peak Hour Forecast Demand (Assuming Capacity = 1700 vph)

			202 St - 216 St		216 St - 232 St		232 St - 264 St		264 St - Mt Lehman		Mt Lehman - Clearbrooke		Clearbrooke - McCallum		McCallum - Hwy 11	
Scenario		Direction	Total Veh	HOV	Total Veh	HOV	Total Veh	HOV	Total Veh	HOV	Total Veh	HOV	Total Veh	HOV	Total Veh	HOV
Base	AM	WB	3300	350	3150	350	3300	350	2950	300	3200	400	3600	400	3950	450
		EB	3050	250	3350	300	3700	350	3150	300	2600	250	2950	300	2650	250
	PM	WB	3450	500	3200	450	3400	500	3050	450	2700	450	3200	550	3500	600
		EB	3350	400	3700	500	4100	500	3650	450	3250	400	3600	400	3400	350
Mainline Option 1 (A New GP Lane)	AM	WB	3850	350	3750	400	3950	400	3500	350	3750	450	4050	450	4200	500
		EB	3300	300	3850	350	4150	350	3650	350	3000	300	3300	350	2900	300
	PM	WB	3950	550	3750	500	4000	550	3550	500	3100	500	3500	550	3650	650
		EB	3750	500	4350	550	4700	600	4400	550	3950	500	4300	500	3850	400
Mainline Option 2 (A New HOV Lane)	AM	WB	3350	350	3250	400	3450	400	3100	350	3350	450	3650	500	3900	550
		EB	3100	300	3400	350	3650	350	3250	300	2700	300	3000	300	2700	300
	PM	WB	3500	500	3300	500	3550	500	3200	500	2850	500	3300	600	3500	650
		EB	3400	450	3800	600	4050	600	3850	550	3500	500	3800	550	3600	450
Mainline Option 3 (A New GP Lane + HOV Extension)	AM	WB	3400	350	3500	400	3800	400	3400	350	3700	450	4000	450	4150	500
		EB	3150	300	3650	350	4000	350	3550	300	2950	300	3300	350	2900	300
	PM	WB	3600	500	3500	550	3850	550	3500	500	3050	500	3450	550	3600	650
		EB	3550	500	4050	600	4550	600	4300	550	3900	500	4250	500	3800	400
Mainline Option 4 (A New GP Lane + HOV Extension)	AM	WB	3450	350	3700	450	3900	450	3500	350	3750	450	4000	450	4200	500
		EB	3150	300	3800	400	4100	350	3600	350	3000	300	3300	350	2900	300
	PM	WB	3600	500	3750	600	3950	550	3550	500	3100	500	3450	550	3600	650
		EB	3550	500	4450	650	4700	600	4400	550	3950	500	4250	500	3850	400

LEGEND
V/C < 0.8
0.8 <= V/C < 0.9
0.9 <= V/C < 1.0
V/C >= 1.0

According to the highest volume-to-capacity ratios in ***Table 3.2***, the remaining options (Options 1, 3, and 4) will have capacity issues in the following segments:

Option 1:

- Between 202 Street and 216 Street (eastbound); and
- Between 232 Street and 264 Street (eastbound).

Option 3:

- Between 202 Street and 216 Street (westbound and eastbound); and
- Between 216 Street and 232 Street (westbound and eastbound).

Option 4:

- Between 202 Street and 216 Street (westbound and eastbound);
- Between 216 Street and 232 Street (eastbound); and
- Between 232 Street and 264 Street (eastbound).

- **Operations Performance**

  In Option 1, a lane imbalance is created at the 200 Street westbound off-ramp (four lanes enter the ramp area and only three lanes carry through on the mainline), which is not desirable from a traffic operations perspective due to the forced lane changing in the vicinity of an off-ramp. This location at 200 Street is also a less appropriate place to drop a lane on a major interprovincial highway. Such a lane drop will potentially create operational issues as it will be unexpected by motorists continuing further west.

s.13

Option 4 is similar to Option 3, except for the new east facing ramps to / from Glover Road. However, the demand that will likely make use of the ramps was not considered sufficient (approximately 400 vph in the westbound direction and 600 vph in the eastbound direction) to justify the additional cost of providing a partial interchange at this location.

3.1.4 RATIONALE FOR CHOSEN OPTION

Option 3 was determined to be the preferred widening option for the study highway section,

s.13

This option was considered to offer the most appropriate balance between providing corridor capacity, accommodating special purpose lanes, as well as adding / removing lanes in a safe and efficient manner that is consistent with driver expectations.

3.2 Interchange Reconfiguration

To accommodate the additional lane in each direction of travel along the mainline, the existing overpass structures at the 232 Street and 264 Street interchanges require replacement as the current horizontal and vertical clearances are insufficient or substandard. Noting that the existing interchange configurations do not reflect current best practices given the high traffic volumes to be accommodated, and that the existing structures need to be replaced given the constraints mentioned above, a number of interchange reconfiguration options were developed. The preferred options would then form part of the Highway 1 widening project scope.

3.2.1 GENERATED OPTIONS

232 STREET / HIGHWAY 1 INTERCHANGE

For the interchange at 232 Street (Highway 10), several configuration options were developed to improve upon the deficient geometry associated with the existing cloverleaf interchange configuration as well as to accommodate future travel demand. A total of four improvement options were developed for the 232 Street interchange and are described as follows:

- **Option 1: Parclo B Interchange Configuration with Roundabouts**

  In this option, depicted in ***Exhibit 3.1***, a Parclo B configuration forms the primary element of the interchange with loop ramps in the northwest quadrant and the southeast quadrant. A single exit point is proposed for the exit from Highway 1 eastbound and also for the exit from Highway 1 westbound.

  The north ramp terminal would remain as a roundabout with the east leg connecting to 72 Avenue as per existing conditions. The loop ramp from Highway 1 westbound would connect directly to the roundabout to provide access to 72 Avenue (north) and 232 Street north. However, a bypass lane is proposed to allow a free flow westbound to southbound movement onto 232 Street as an add lane.

  A roundabout is also proposed at the south ramp terminal which is also the junction between 232 Street and 72 Avenue (south). The eastbound loop ramp from Highway 1 is proposed to connect directly into the roundabout thus eliminating the need for the directional eastbound to southbound ramp. Access to Highway 1 eastbound would continue to use the short segment of 72 Avenue (south) east of 232 Street and the existing on-ramp connection to the eastbound highway lanes.

The new three lane structure across Highway 1 is proposed to be located to the east of the existing structure to allow traffic to continue across the existing structure during the construction period.

- **Option 2: Parclo B Interchange Configuration**

  In this option, depicted in ***Exhibit 3.2***, a Parclo B configuration forms the primary element of the interchange with loop ramps in the northwest quadrant and the southeast quadrant. A single exit point is proposed for the exit from Highway 1 eastbound and also for the exit from Highway 1 westbound.

  The north ramp terminal would remain as a roundabout with the east leg connecting to 72 Avenue as per existing conditions. The loop ramp from Highway 1 westbound would connect directly to the roundabout to provide access to 72 Avenue (north) and 232 Street north. However, a bypass lane is proposed to allow a free flow westbound to southbound movement onto 232 Street as an add lane.

  The single lane eastbound exit from Highway 1 is proposed to subsequently diverge into a directional ramp connection to 232 Street southbound and a loop ramp in the southeast quadrant to access 232 Street northbound – as an add lane.

  Access to Highway 1 eastbound would continue to use the short segment of 72 Avenue (south) east of 232 Street and the existing on-ramp connection to the eastbound highway lanes. The existing at-grade intersection between 232 Street and 72 Avenue (south) would remain as per existing conditions.

  The new four lane structure across Highway 1 is proposed to be located to the west of the existing structure to allow traffic to continue across the existing structure during the construction period.

- **Option 3: Parclo B Interchange Configuration with 72 Avenue Flyover**

  In this option, depicted in ***Exhibit 3.3***, a Parclo B configuration forms the primary element of the interchange with loop ramps in the northwest quadrant and the southeast quadrant. A single exit point is proposed for the exit from Highway 1 eastbound and also for the exit from Highway 1 westbound.

  The north ramp terminal would remain as a roundabout as per existing conditions. The loop ramp from Highway 1 westbound would connect directly to the roundabout to provide access to 232 Street north. However, a bypass lane is proposed to allow a free flow westbound to southbound movement onto 232 Street as an add lane.

The single lane eastbound exit from Highway 1 is proposed to subsequently diverge into a single lane directional ramp connection to 232 Street southbound and a single lane loop ramp in the southeast quadrant to access 232 Street northbound – as an add lane. Access to Highway 1 eastbound would be reconfigured with a directional northbound to eastbound single lane ramp which will exit 232 Street north of the existing 72 Avenue (south) intersection. The southbound to eastbound movement, provided via a left turn movement at a new un-signalized intersection located north of 72 Avenue (south), would tie into the northbound to eastbound ramp prior to merging onto Highway 1.

The new four lane structure across Highway 1 is proposed to be located to the west of the existing structure to allow traffic to continue across the existing structure during the construction period. The new structure / 232 Street is orientated at a right angle to Highway 1 to minimize the overall length of the bridge. A new two lane flyover structure will provide continuity for 72 Avenue across Highway 1. The north leg of 72 Avenue, currently connecting to the north terminal roundabout, will be removed.

- **Option 4: Split Diamond Interchange Configuration**

  In this option, depicted in ***Exhibit 3.4***, the interchange exit and entrance ramps are connected to two cross streets. The east facing ramps to Highway 1 eastbound / from Highway 1 westbound are proposed to be connected to 72 Avenue which will cross Highway 1 over a new three lane east west orientated bridge structure. The west facing ramps to Highway 1 westbound / from Highway 1 eastbound are proposed to be connected to 232 Street which will cross Highway 1 over a new two lane north south orientated bridge structure.

  For the highway ramp connections at 72 Avenue, the close proximity of the west ramp terminal intersection with respect to the overpass structure will require the westbound left turn lane to continue across the structure as a third lane.

  The ramp terminal intersections along 232 Street, north and south of the highway, will be spaced to provide sufficient left turn storage away from the new bridge structure. This new bridge structure is proposed to be located to the west of the existing structure to allow traffic to continue across the existing structure during the construction period.

264 STREET / HIGHWAY 1 INTERCHANGE

For the interchange at 264 Street (Highway 13), several configuration options were developed to improve upon the deficient geometry associated with the existing cloverleaf interchange configuration as well as to accommodate future travel demand. A total of four

improvement options were developed for the 264 Street interchange and these are described as follows:

- **Option 1: Parclo B Interchange Configuration with Roundabouts**

  In this option, depicted in ***Exhibit 3.5***, a Parclo B configuration forms the primary element of the interchange with loop ramps in the northwest quadrant and the southeast quadrant. A single exit point is proposed for the exit from Highway 1 eastbound and also for the exit from Highway 1 westbound.

  The north ramp terminal would be reconstructed as a multi-lane roundabout junction connecting 264 Street and 56 Avenue. The single lane loop ramp from Highway 1 westbound would connect directly to the roundabout to provide access to 56 Avenue (north) and 264 Street north. However, a bypass lane is proposed to allow a free flow westbound to southbound movement onto 264 Street as an add lane. To reduce the complexity of the multi-lane roundabout, a bypass lane is also proposed for the northbound to eastbound movement.

  A roundabout is also proposed at the south ramp terminal which is also the junction between 264 Street and 56 Avenue (south). The single lane loop ramp from Highway 1 eastbound is proposed to connect directly into the roundabout thus eliminating the need for the direct eastbound to southbound ramp. A bypass lane is proposed to allow a free flow westbound to southbound movement onto 264 Street as an add lane. Another bypass lane for the southbound to westbound right turn movement is proposed to maintain a single lane roundabout configuration. Access to Highway 1 eastbound would continue to be provided by the existing free flow directional ramp from Highway 13 northbound and from the south terminal roundabout for the 264 Street southbound left turn movement.

  Access to Highway 1 westbound would be provided via 56 Avenue (north) where all movements would travel through the north ramp terminal junction / roundabout. The existing loop ramp in the northeast quadrant would be removed.

  The new four lane structure across Highway 1 is proposed to be located to the west of the existing structure to allow traffic to continue across the existing structure during the construction period.

- **Option 2: Parclo B Interchange Configuration**

  In this option, depicted in ***Exhibit 3.6***, a Parclo B configuration forms the primary element of the interchange with loop ramps in the northwest quadrant and the southeast quadrant. A single exit point is proposed for the exit from Highway 1 eastbound and also for the exit from Highway 1 westbound.

The north ramp terminal would remain as a signalized intersection between 264 Street and 56 Avenue as per existing conditions. The loop ramp from Highway 1 westbound would connect directly to the intersection to provide access to 56 Avenue (north) and 264 Street north. However, a bypass lane is proposed to allow a free flow westbound to southbound movement onto 264 Street as an add lane.

The single lane loop ramp from Highway 1 eastbound is proposed to connect directly into the south ramp terminal signalized intersection, therefore eliminating the need for the direct eastbound to southbound ramp. To provide a free flow eastbound to northbound movement, the loop ramp will also be configured to connect to 264 Street as an add lane. Access to Highway 1 eastbound would continue to be provided by the existing free flow directional ramp from Highway 13 northbound and from the south terminal intersection for the 264Street southbound left turn movement.

Access to Highway 1 westbound would be provided via 56 Avenue (north) where all movements would travel through the north ramp terminal intersection at 264 Street. The existing loop ramp in the northeast quadrant would be removed.

The new four lane structure across Highway 1 is proposed to be located to the west of the existing structure to allow traffic to continue across the existing structure during the construction period.

- **Option 3: Split Diamond Interchange Configuration**

  In this option, depicted in ***Exhibit 3.7***, the interchange exit and entrance ramps are connected to two cross streets. The east facing ramps to Highway 1 eastbound / from Highway 1 westbound are proposed to be connected to 56 Avenue which will cross Highway 1 over a new three lane east west orientated bridge structure. The west facing ramps to Highway 1 westbound / from Highway 1 eastbound are proposed to be connected to 264 Street which will cross Highway 1 over a new two lane north south orientated bridge structure.

  For the highway ramp connections at 56 Avenue, the close proximity of the west ramp terminal intersection with respect to the overpass structure will require the westbound left turn lane to continue across the structure as a third lane. A dedicated left turn and right turn lane are to be provided along the eastbound to east / west exit ramp. It is anticipated that both ramp terminals will be signalized.

  The ramp terminal intersections along 264 Street, north and south of the highway, will be spaced to provide sufficient left turn storage on 264 Street away from the new bridge structure. A dedicated left turn and right turn lane are to be provided

along the westbound to north / south exit ramp. The north ramp terminal and the south ramp terminal will be signalized.

The new two lane bridge structure for 264 Street is proposed to be located to the west of the existing structure to allow traffic to continue across the existing structure during the construction period.

- **Option 4: Parclo B Interchange Configuration with Directional Ramps**

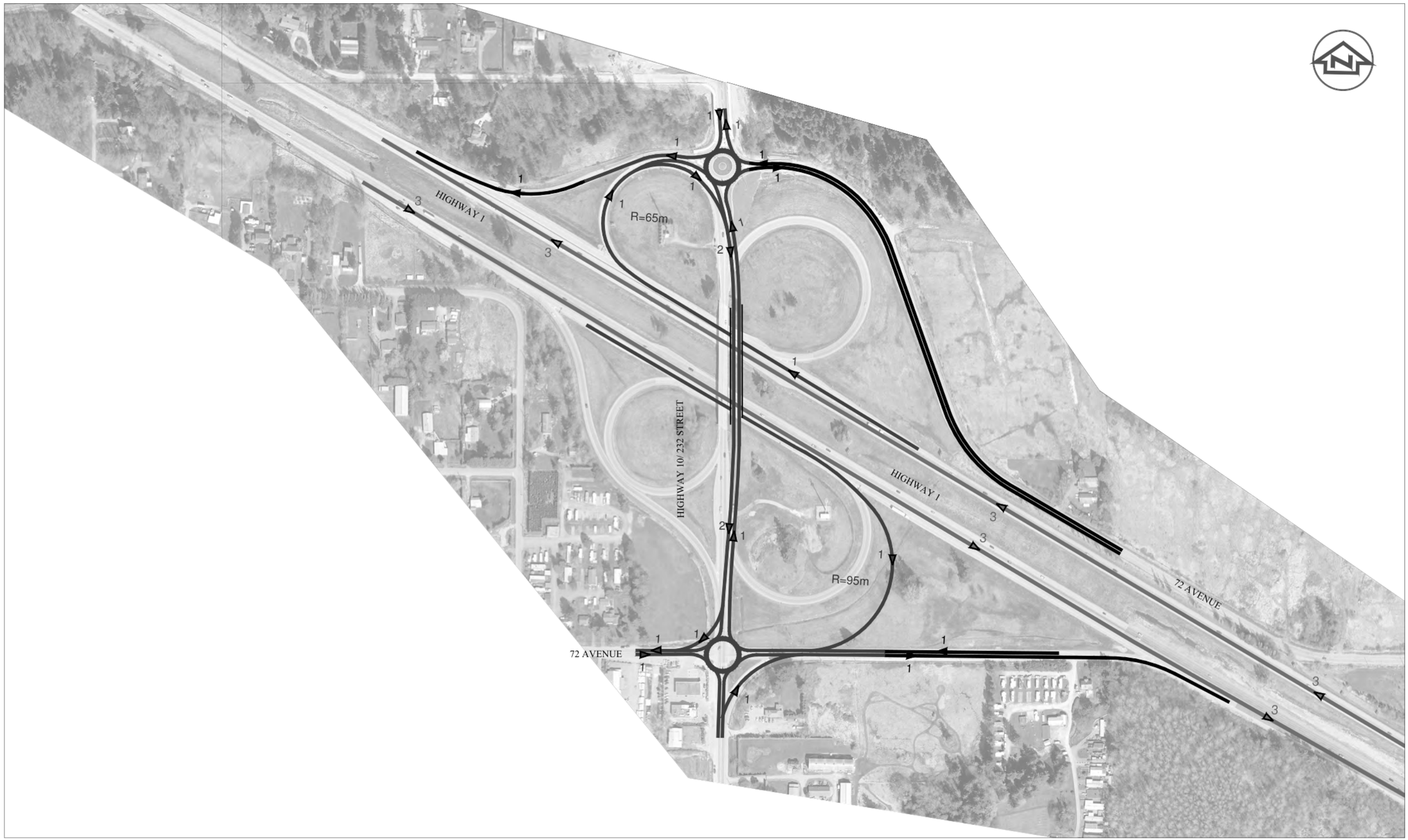
  In this option, depicted in ***Exhibit 3.8***, a Parclo B configuration forms the primary element of the interchange with loop ramps in the northwest quadrant and the southeast quadrant. A single exit point is proposed for the exit from Highway 1 eastbound and also for the exit from Highway 1 westbound.

  The north ramp terminal would remain as a signalized intersection between 264 Street and 56 Avenue as per existing conditions. The loop ramp from Highway 1 westbound would connect directly to the intersection to provide access to 56 Avenue (north) and 264 Street north. However, a bypass lane is proposed to allow a free flow westbound to southbound movement onto 264 Street as an add lane.

  The single lane eastbound exit from Highway 1 is proposed to subsequently diverge into a single lane directional ramp connection to 264 Street southbound and a single lane loop ramp in the southeast quadrant to access 264 Street northbound – as an add lane. Access to Highway 1 eastbound would be reconfigured with a southbound to eastbound single lane ramp which will exit 264 Street at the existing south intersection between 56 Avenue (south) and 264 Street.

  A new single lane directional ramp is provided for the northbound Highway 13 to Highway 1 eastbound and westbound. The northbound to westbound movement will be provided over a separate bridge structure with a design speed of 70 km/h. Access to Highway 1 westbound from 264 Street and 56 Avenue (north) would continue to be provided via 56 Avenue (north) where all movements would travel through the north ramp terminal intersection at 264 Street. The two westbound entrance ramps would merge into a single lane prior to merging onto Highway 1.

  The new four lane 264 Street bridge structure across Highway 1 is proposed to be located to the west of the existing structure to allow traffic to continue across the existing structure during the construction period.



PARSONS

SCALE 0 66m

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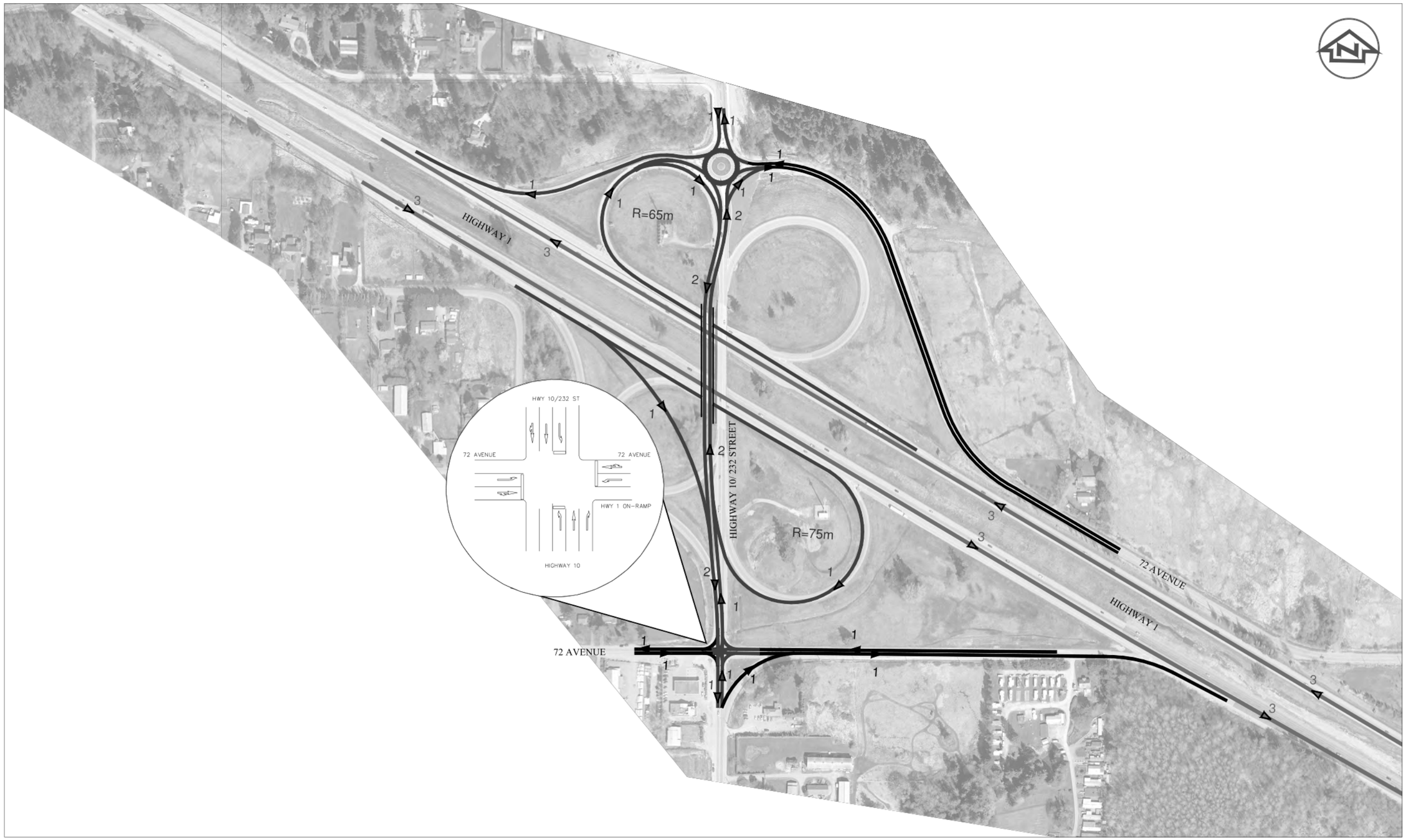
HIGHWAY 10 INTERCHANGE OPTION 1 - PARCLO B WITH ROUNDABOUTS

EXHIBIT 3.1

G:\SW\1200 – MoT A&M Contract #15\SWF – Highway 1 Functional Planning\Dwgs\Hwy 10 interchange Option 1, 2, & 3 v3.dwg May 15, 2015–5:05pm



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HIGHWAY 10 INTERCHANGE OPTION 2 - PARCLO B WITH SIGNALS

EXHIBIT 3.2

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HIGHWAY 10 INTERCHANGE OPTION 3 - SPLIT DIAMOND

EXHIBIT 3.3

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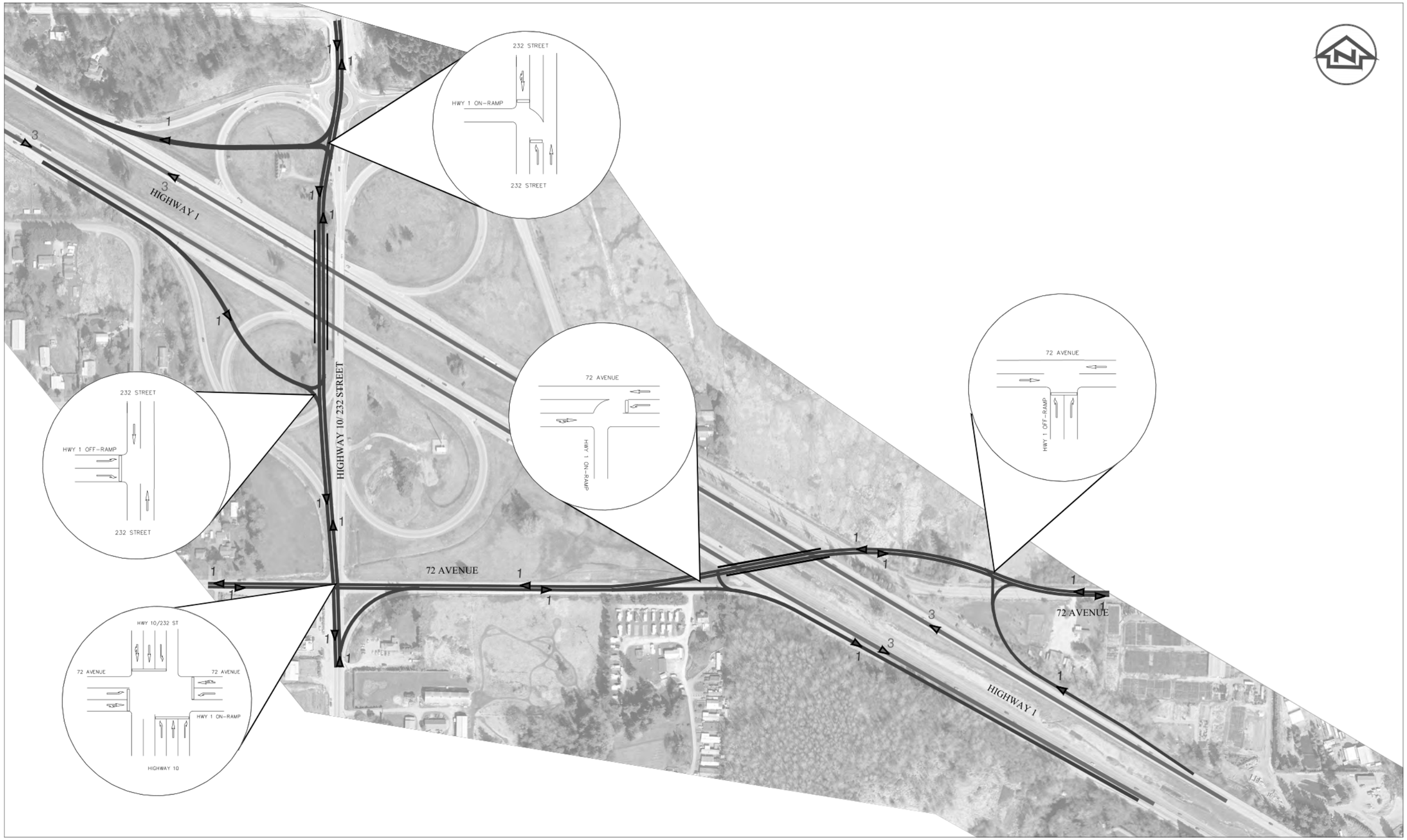

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HIGHWAY 10 INTERCHANGE OPTION 4 - SPLIT DIAMOND

EXHIBIT 3.4

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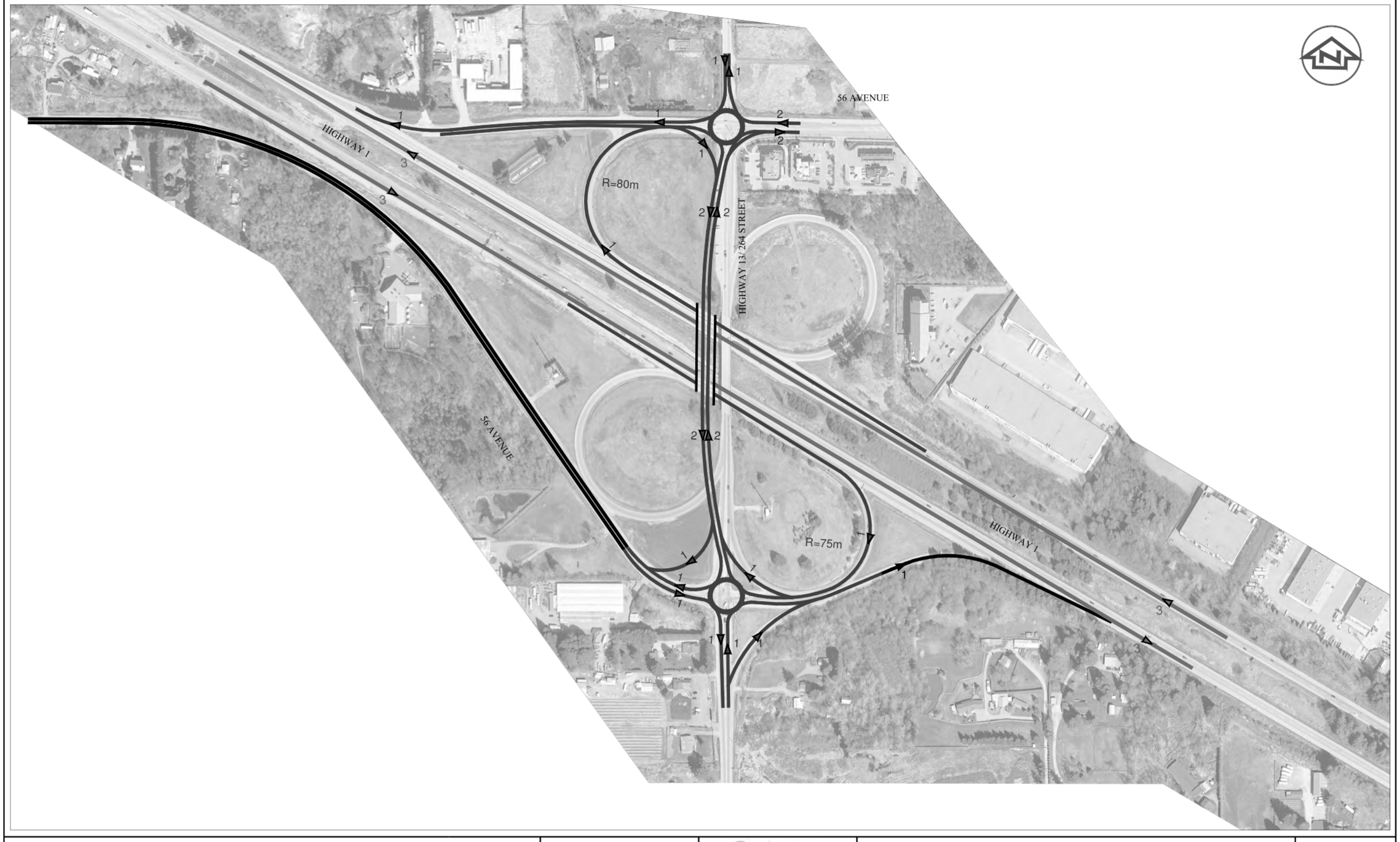

PARSONS

SCALE 0 66m

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HIGHWAY 13 INTERCHANGE OPTION 1 - PARCLO B WITH ROUNDABOUTS

EXHIBIT 3.5

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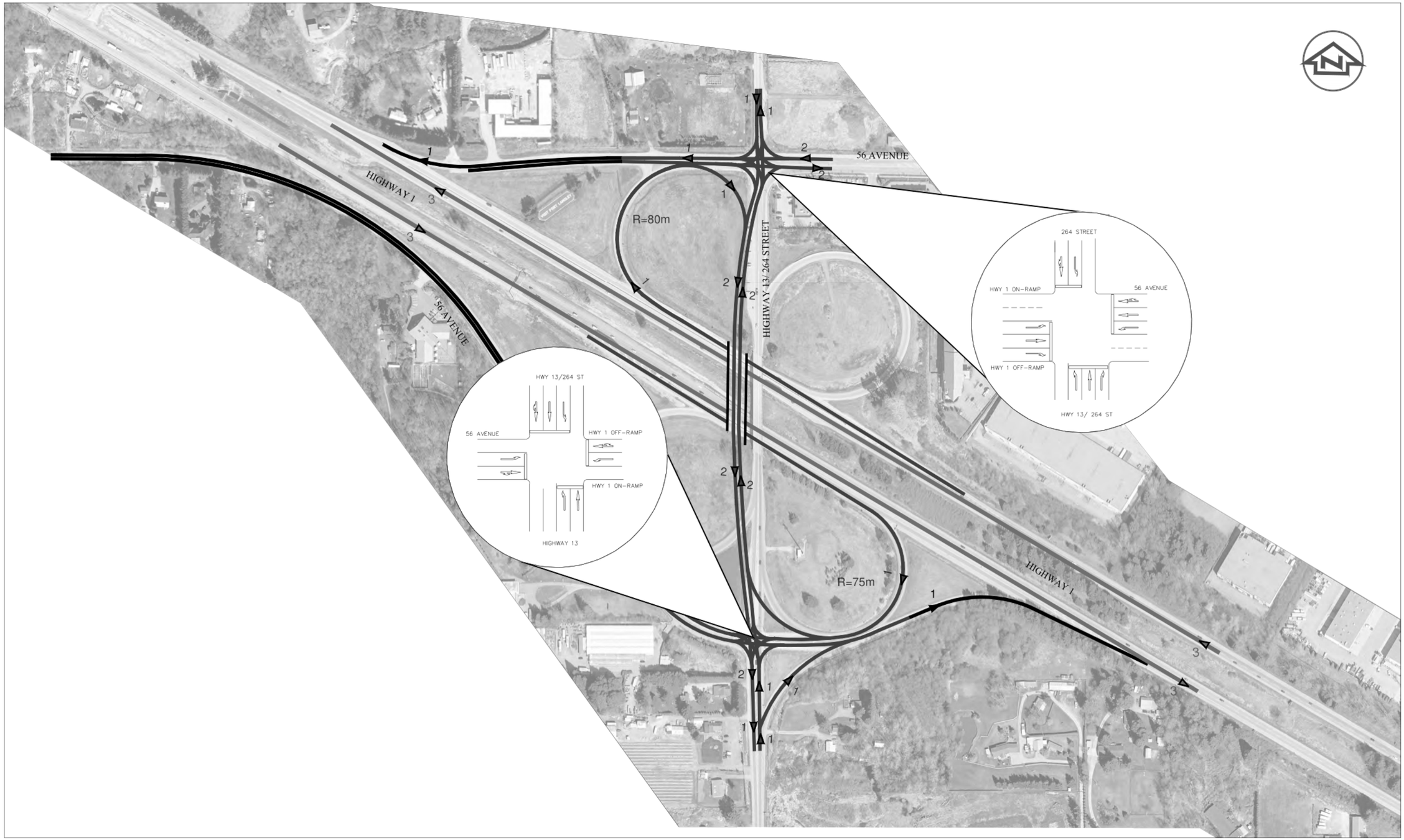

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HIGHWAY 13 INTERCHANGE OPTION 2 - PARCLO B WITH SIGNALS

EXHIBIT 3.6

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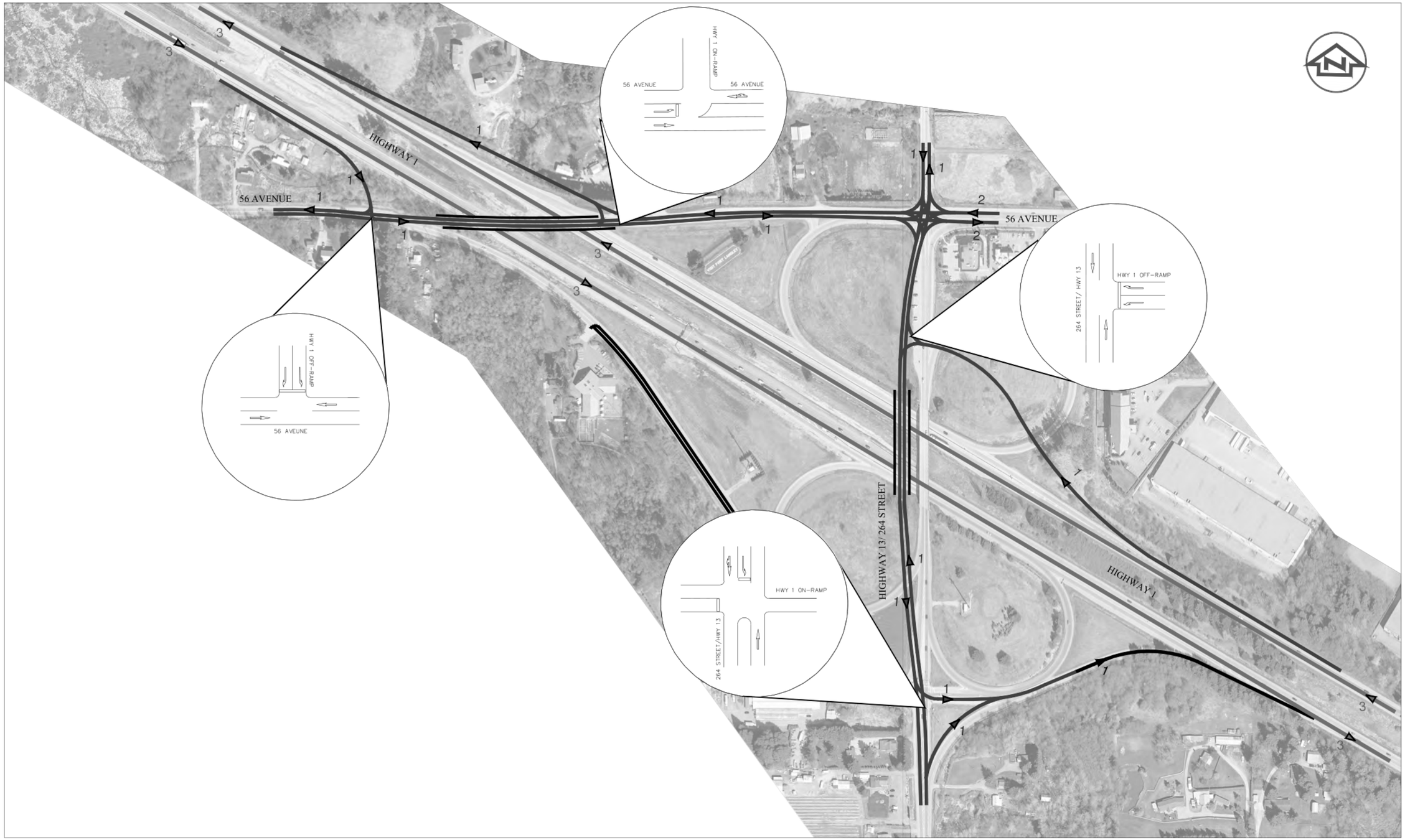

PARSONS

SCALE 0 66m

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Highway 1 Corridor Planing Study

HIGHWAY 13 INTERCHANGE OPTION 3 - SPLIT DIAMOND

EXHIBIT 3.7

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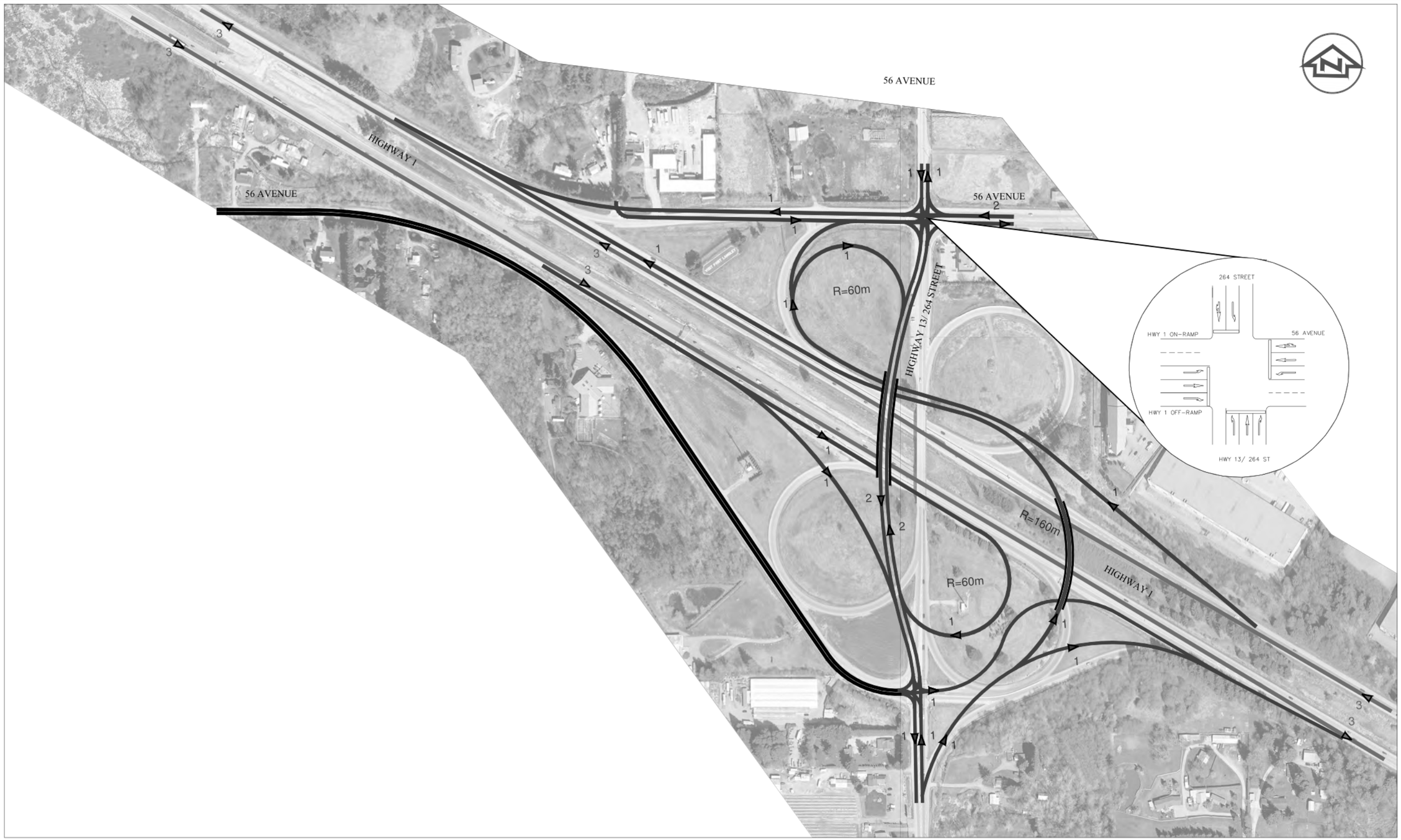

PARSONS

SCALE 0 66m

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HIGHWAY 13 INTERCHANGE OPTION 4 - SPLIT DIAMOND

EXHIBIT 3.8

G:\SW\1200 - MoT Admin Contract #15\SWF - Highway 1 Functional Planning\Dwgs\Hwy 13 interchange Option 1, 2 & 3 v3.dwg May 15, 2015-3:49pm

3.2.2 EVALUATION CRITERIA

In order to determine a preferred configuration for Highway 1 interchanges, a high level assessment was conducted using traffic performance and implementation costs as the key indicators along with several other criteria. The criteria applied in the assessment are described below.

- **Network Travel Time Savings**

  This criteria measures the accumulated travel time for all vehicles travelling through each interchange option over an established simulation period and compares the values obtained against the network travel time value calculated for the base case / existing configuration. A traffic operations model is used to obtain the network travel time which is measured in vehicle hours. Travel time savings will also be portrayed in terms of dollars for comparison against implementation costs.

- **Implementation Costs**

  Planning level cost estimates were produced for the proposed interchange improvements including roadways, structures, utilities and drainage, project management and design, and appropriate contingencies. The Elemental Parametric methodology was used to generate the implementation cost estimates.

- **Property Impacts / Surplus Land**

  As all of the options are located within the existing highway right of way, this criteria is not applicable and therefore does not form part of the assessment. However, some surplus property has been identified in some options.

- **Accommodation of Provincial Movements**

  A qualitative assessment is conducted as to how the key movements between provincial facilities are accommodated. Direct movements are deemed to provide improved mobility for provincial movements (between numbered highways) and would be rated higher as compared to provincial movements that are provided through circuitous routing or through use of the local road network. A qualitative rating ranging between high, medium, and low will be used to compare the options against the base case / existing conditions.

- **Network Connectivity**

  Improvements to the local road network to improve connectivity across the highway would be rated higher than options that continue to disrupt the continuity of the local road network. A qualitative rating ranging between high, medium, and low will be used to compare the options against the bases case / existing conditions.

3.2.3 OPTION EVALUATION

Using the evaluation criteria described above, the four interchange options developed for both the 232 Street and 264 Street interchanges were evaluated. As noted, some of the criteria were evaluated in a quantitative manner whereas others were evaluated qualitatively. Quantitative factors include performance metrics extracted from the traffic operations model as well as objective measures such as cost estimates using the Elemental Parametric methodology or the amount of property required in hectares.

For the evaluation criteria involving qualitative assessments, a descriptive assessment has been provided in relation to the base case conditions. The descriptive assessments include the use of indicators ranging from neutral, low, medium, to high impacts (or in some instances, benefits).

232 STREET / HIGHWAY 1 INTERCHANGE OPTIONS

To assess the interchange options with respect to the evaluation criteria, focused traffic analysis, cost estimating, and other measurements were conducted and the results are summarized as follows:

- **Network Travel Time Savings**

  To obtain the network travel time savings for each option, a traffic operations model was developed for the 2015 and 2045 planning horizons. The spatial limits of the traffic operations model included the segment of Highway 1 between 232 Street and 264 Street, incorporating both interchanges and the immediate local road network. The 2015 traffic volumes were derived from the RTM and validated against several short count observations conducted on-site in the fall of 2014. The 2045 travel demand was also derived from the RTM. Within each peak period, a three hour period was simulated as follows:

  - 06:00 to 09:00 for the AM peak period;
  - 15:00 to 18:00 for the PM peak period.

Once the base case (existing conditions) models were established for each time frame and peak period, the four interchange options were coded. Five model runs, with different seeds values applied to create randomness in the traffic generation, were conducted for each option for each time frame and peak period. The high and low network travel times were subsequently discarded and the average of the remaining three model runs was used in the analysis.

The following travel time savings summary table, ***Table 3.3*** provides the peak hour simulation results for each option and the base case. The change in travel time or travel time savings, is also provided for each option as compared to the base case.

Table 3.3: Network Travel Time Savings (rounded) – Highway 10 / 232 Street Interchange

Travel Period	Base	Option 1		Option 2		Option 3		Option 4	
	veh-hrs	veh-hrs	Savings	veh-hrs	Savings	veh-hrs	Savings	veh-hrs	Savings
2014 AM peak	2566	2562	0	2551	20	2563	0	2577	-10
2014 PM peak	2984	3005	-20	2984	0	3008	-20	3004	-20
2045 AM peak	3649	3645	0	3615	30	3644	10	3668	-20
2045 PM peak	4381	4363	20	4351	30	4373	10	4345	40

In order to compare the potential benefits of the improvements against the implementation costs over the typical 25 year amortization period, the travel time savings were converted into a monetary value using BC Ministry of Transportation and Infrastructure default values for value of time. Annual savings were conservatively estimated based on the summation of the AM and PM peak period savings applied to each week day (250 days) and average of the AM and PM peak period savings applied to represent potential savings for the weekend days (100 days). Interpolation between the 2015 and 2045 planning horizon was conducted to obtain travel time savings for each of the intermediate years and these values were summed to obtain a total for the 25 year period. The 25 year travel time savings, represented in present value ($ 2015), are shown below in ***Table 3.4***.

Table 3.4: Highway 10 / 232 Street Interchange Travel Time Benefits Summary

	Option 1	Option 2	Option 3	Option 4
Travel Time Benefits (S)	-0.4 M	2.4 M	-0.8 M	-1.2 M

- **Implementation Costs**

  A summary of the estimated implementation costs for each interchange option are provided in the cost summary table, ***Table 3.5***. These cost estimates represent high level costs for option comparison purposes. More detailed cost estimates for the preferred interchange options are included in the project cost estimate described in Section 11 Project Budget.

Table 3.5: Highway 10 / 232 Street Interchange Options Cost Summary

	Option 1	Option 2	Option 3	Option 4
Project Management	2.0	2.2	2.8	2.6
Engineering	2.8	3.2	4.1	3.9
Grade Construction	10.5	10.8	12.0	9.2
Structural	9.8	12.2	17.1	18.0
Paving Construction	0.7	0.8	0.9	0.8
Operational Construction	0.9	1.1	1.5	1.4
Utilities	0.3	0.3	0.4	0.4
Resident Engineering	2.0	2.2	2.8	2.6
Contingency (30%)	8.6	9.8	12.4	11.6
Management Reserve	1.9	2.2	2.7	2.6
Total (rounded) $M	40	45	57	54

- **Property Impacts**

  Property impacts were quantified by measuring the area of the potential land impacted by an expanded interchange footprint, where applicable. Conversely, potential surplus land within the existing highway right-of-way was quantified by measuring the area that could be utilized for other purposes. The area of property impacts and potential surplus lands is summarized in ***Table 3.6***.

Table 3.6: Highway 10 / 232 Street Interchange Options Property Summary

	Option 1	Option 2	Option 3	Option 4
Impacted Property (Ha)	0.0	0.0	0.0	0.0
Surplus Property (Ha)	5.0	4.5	8.4	10.3

- **Accommodation of Provincial Movements**

  The following discussion provides a summary of the how each interchange option accommodates the provincial movements, those key movements between Highway 10 and Highway 1.

  Option 1: The proposed configuration, as compared to the base case, does not provide any improvements for the provincial movements between Highway 1 and Highway 10 and may even cause some reduction in mobility for these key movements.

  - Highway 1 EB to Highway 10 WB – Similar to the base case, this movement is accommodated by a loop ramp connecting to the south terminal junction. However, travel through the south ramp terminal roundabout is less desirable as compared to the existing un-signalized intersection.
  - Highway 1 WB to Highway 10 WB – Similar to the base case, this movement is accommodated by a single loop ramp in the northwest quadrant. Southbound travel through the south ramp terminal roundabout is however, less desirable then the existing un-signalized intersection.
  - Highway 10 EB to Highway 1 EB – Similar to the base case, this movement is accommodated via 72 Avenue (south). Travel through the south terminal roundabout is avoided with the large right turn slip lane.
  - Highway 10 EB to Highway 1 WB –This movement is provided by a directional ramp from the roundabout at the north terminal junction. Travel through the roundabout is however, less desirable then the existing loop ramp in the northeast quadrant. It is noted that this is a low volume movement.

  Option 2: The proposed configuration, as compared to the base case, does not provide any improvements for the provincial movements between Highway 1 and Highway 10 and may even cause some minor reduction in mobility for one movement.

  - Highway 1 EB to Highway 10 WB – Same as the base case, this movement is accommodated by a directional ramp to the south terminal junction. .
  - Highway 1 WB to Highway 10 WB – Same as the base case, this movement is accommodated by a single loop ramp in the northwest quadrant.

- Highway 10 EB to Highway 1 EB – Same as the base case, this movement is accommodated via 72 Avenue (south).
- Highway 10 EB to Highway 1 WB –This movement is provided by a directional ramp from the roundabout at the north terminal junction. Travel through the roundabout is less desirable then the existing loop ramp in the northeast quadrant. It is noted that this is a low volume movement.

Option 3: The proposed configuration, as compared to the base case, provides some improvements to the provincial movements between Highway 1 and Highway 10.

- Highway 1 EB to Highway 10 WB – Same as the base case, this movement is accommodated by a directional ramp to the south terminal junction. .
- Highway 1 WB to Highway 10 WB – Same as the base case, this movement is accommodated by a single loop ramp in the northwest quadrant.
- Highway 10 EB to Highway 1 EB – This movement is improved with a new directional ramp located in the southeast quadrant, north of 72 Avenue (south).
- Highway 10 EB to Highway 1 WB –This movement is provided by a directional ramp from the roundabout at the north terminal junction. Travel through the roundabout is less desirable then the existing loop ramp in the northeast quadrant. It is noted that this is a low volume movement.

Option 4: The proposed configuration, as compared to the base case, is detrimental to some provincial movements between Highway 1 and Highway 10.

- Highway 1 EB to Highway 10 WB – Similar to the base case, this movement is accommodated by a directional ramp, although a right turn at the south ramp terminal is introduced.
- Highway 1 WB to Highway 10 WB – This movement is circuitous with access provided via 72 Avenue. Two left turn manoeuvres are required, one onto 72 Avenue from Highway 1and another from 72 Avenue to Highway 10 westbound.
- Highway 10 EB to Highway 1 EB – Same as the base case, this movement is accommodated via 72 Avenue (south).
- Highway 10 EB to Highway 1 WB – This movement is provided by a directional ramp at the north terminal junction through a left turn

movement. The left turn movement, at this junction, is less desirable then the existing loop ramp in the northeast quadrant. It is noted that this is a low volume movement.

- **Network Connectivity**

  A review of each option was conducted with respect to assessing improvements in the level of connectivity within the local road network and specifically across Highway 1. The findings from this review, are as follows:

  Option 1: The east west route, 72 Avenue, is still discontinuous across Highway 1. East west traffic on 72 Avenue must therefore continue to travel through the interchange along 232 Street. No improvement as compared to the base case.

  Option 2: The east west route, 72 Avenue, is still discontinuous across Highway 1. East west traffic on 72 Avenue must therefore continue to travel through the interchange along 232 Street. No improvement as compared to the base case.

  Option 3: With the new bridge structure across Highway 1, continuity along 72 Avenue is restored. This improved network connectivity removes the east west traffic from the interchange. Significant improvement compared to base case.

  Option 4: With the new bridge structure across Highway 1, continuity along 72 Avenue is restored. This improved network connectivity removes the east west traffic from the interchange; however, significant Highway 1 interchange traffic is added to 72 Avenue. Moderate improvement compared to base case.

- **Evaluation Summary**

  A summary of the interchange option evaluation is provided ***Table 3.7***.

Table 3.7: Highway 10 / 232 Street Interchange Evaluation Summary

Criteria	Option 1	Option 2	Option 3	Option 4
Travel Time Savings	0 hrs AM peak period (2014) -20 hrs PM peak period (2014) 0 hrs AM Peak Period (2045) 20 hrs PM Peak Period (2045) -$0.4 M Travel Time Savings (25 years)	20 hrs AM peak period (2014) 0 hrs PM peak period (2014) 30 hrs AM Peak Period (2045) 30 hrs PM Peak Period (2045) $2.4 M Travel Time Savings (25 years)	0 hrs AM peak period (2014) -20 hrs PM peak period (2014) 10 hrs AM Peak Period (2045) 10 hrs PM Peak Period (2045) -$0.8 M Travel Time Savings (25 years)	-10 hrs AM peak period (2014) -20 hrs PM peak period (2014) -20 hrs AM Peak Period (2045) 40 hrs PM Peak Period (2045) -$1.2 M Travel Time Savings (25 years)
Implementation Costs	**$40 M**	**$45 M**	**$57 M**	**$54 M**
Property Impacts	0.0 Ha – Property Impacts 5.0 Ha – Potential Surplus	0.0 Ha – Property Impacts 10.3 Ha – Potential Surplus	0.0 Ha – Property Impacts 5.0 Ha – Potential Surplus	0.0 Ha – Property Impacts 8.4 Ha – Potential Surplus
Network Connectivity	No improvement as compared to the base case.	No improvement as compared to the base case.	Significant improvement compared to base case.	Moderate improvement compared to base case.
Provincial Movements	The proposed configuration, as compared to the base case, does not provide any improvements for the provincial movements between Highway 1 and Highway 10 and may even cause some reduction in mobility for these key movements.	The proposed configuration, as compared to the base case, does not provide any improvements for the provincial movements between Highway 1 and Highway 10 and may even cause some minor reduction in mobility for one movement.	The proposed configuration, as compared to the base case, provides some improvements to the provincial movements between Highway 1 and Highway 10.	The proposed configuration, as compared to the base case, is detrimental to some provincial movements between Highway 1 and Highway 10.
Benefit / Cost and NPV	B/C = 0.2 NPV= -$30 M	B/C = 0.3 NPV= -$31 M	B/C = 0.2 NPV= -$42 M	B/C = 0.2 NPV= -$41 M
Overall	Possible	Possible	**Preferred**	Not Preferred

264 STREET / HIGHWAY 1 INTERCHANGE OPTIONS

To assess the interchange options with respect to the evaluation criteria, focused traffic analysis, cost estimating, and other measurements were conducted and the results summarized as follows:

- **Network Travel Time Savings**

  A similar process to that conducted for the 232 Street interchange traffic analysis was applied to the 264 Street interchange analysis in that a traffic operations model was developed for the 2015 and 2045 planning horizons to obtain the network travel time savings for each option. The spatial limits of the traffic operations model included the segment of Highway 1 between 232 Street and 264 Street, incorporating both interchanges and the immediate local road network. The 2015 traffic volumes were derived from TransLink's Regional Traffic Model and validated against several short count observations conducted on-site in the fall of 2014. The 2045 travel demand was also derived from the Regional Traffic Model. Within each peak period, a three hour period was simulated as follows:

  - 06:00 to 09:00 for the AM peak period
  - 15:00 to 18:00 for the PM peak period

  Once the base case (existing conditions) models were established for each time frame and peak period, the four interchange options were coded. Five model runs, with different seeds values applied to create randomness in the traffic generation, were conducted for each option for each time frame and peak period. The high and low network travel times were subsequently discarded and the average of the remaining three model runs was used in the analysis.

  The following travel time savings summary table, ***Table 3.8*** provides the peak hour simulation results for each option and the base case. The change in travel time or travel time savings, is also provided for each option as compared to the base case.

Table 3.8: Network Travel Time Savings (rounded) – Highway 13 / 264 Street Interchange

Travel Period	Base	Option 1		Option 2		Option 3		Option 4	
	veh-hrs	veh-hrs	Savings	veh-hrs	Savings	veh-hrs	Savings	veh-hrs	Savings
2014 AM peak	2560	2535	30	2545	20	2601	-40	2542	20
2014 PM peak	2973	2984	-10	2981	-10	3033	-60	2957	20
2045 AM peak	3708	3627	80	3618	90	6466	-2760	3612	100
2045 PM peak	4365	4430	-170	4352	10	6294	-1930	4265	100

In order to compare the potential benefits of the improvements against the implementation costs over the typical 25 year amortization period, the travel time savings were converted into a monetary value using BC Ministry of Transportation and Infrastructure default values for value of time. Annual savings were conservatively estimated based on the summation of the AM and PM peak period savings applied to each week day (250 days) and average of the AM and PM peak period savings applied to represent potential savings for the weekend days (100 days). Interpolation between the 2015 and 2045 planning horizon was conducted to obtain travel time savings for each of the intermediate years and these values were summed to obtain a total for the 25 year period. The 25 year travel time savings, represented in present value ($ 2015), are shown below in ***Table 3.9***.

Table 3.9: Highway 13 / 264 Street Interchange Travel Time Benefits Summary

	Option 1	Option 2	Option 3	Option 4
Travel Time Benefits (S)	-$1.3 M	$2.8 M	-$119 M	$6.5 M

- **Implementation Costs**

  A summary of estimated implementation costs for each option are provided in the cost summary table, ***Table 3.10***. These cost estimates represent high level costs for option comparison purposes. More detailed cost estimates for the preferred interchange options are included in the project cost estimate described in Section 10 Project Budget.

Table 3.10: Highway 13 / 264 Street Interchange Options Cost Summary

	Option 1	Option 2	Option 3	Option 4
Project Management	2.0	1.8	2.9	3.3
Engineering	3.0	2.6	4.3	5.0
Grade Construction	11.3	8.4	9.5	14.7
Structural	9.4	9.4	21.3	18.8
Paving Construction	0.9	0.7	0.7	1.2
Operational Construction	1.1	1.2	1.4	2.3
Utilities	0.4	0.3	0.4	0.6
Resident Engineering	2.0	1.8	2.9	3.3
Contingency (30%)	9.0	7.8	12.9	14.6
Management Reserve	2.0	1.7	2.8	3.2
Total (rounded) $M	42	36	60	67

- **Property Impacts**

  Property impacts were quantified by measuring the area of the potential land impacted by an expanded interchange footprint, where applicable. Conversely, potential surplus land within the existing highway right-of-way was quantified by measuring the area that could be utilized for other purposes. The area of property impacts and potential surplus lands is summarized in ***Table 3.11***.

Table 3.11: Highway 13 / 264 Street Interchange Options Property Summary

	Option 1	Option 2	Option 3	Option 4
Impacted Property (Ha)	0	0	0.3	0
Surplus Property (Ha)	4.7	4.7	7.3	4.2

- **Accommodation of Provincial Movements**

  The following discussion provides a summary of the how each interchange option accommodates the provincial movements, those key movements between Highway 13 and Highway 1.

  Option 1: The proposed configuration, as compared to the base case, does not provide any improvements for the provincial movements between Highway 1 and Highway 13 and may even cause some reduction in mobility for these key movements.

  - Highway 1 EB to Highway 13 SB – Similar to the base case, this movement is accommodated by a loop ramp connecting to the south terminal junction. Travel through the south ramp terminal roundabout is likely comparable to the existing signalized intersection with improvements during periods of low volumes.
  - Highway 1 WB to Highway 13 SB – Similar to the base case, this movement is accommodated by a single loop ramp in the northwest quadrant. Southbound travel through the south ramp terminal roundabout is likely comparable to the existing signalized intersection, with improvements during periods of low volumes.
  - Highway 13 NB to Highway 1 EB – Similar to the base case, this movement is accommodated by a directional ramp. Travel through the south terminal roundabout is avoided with the large right turn slip lane.
  - Highway 13 NB to Highway 1 WB –This movement is provided via 56 Avenue (north) connecting to the roundabout at the north terminal junction. Travel through the roundabout is however, less desirable then the existing loop ramp in the northeast quadrant.

Option 2: The proposed configuration, as compared to the base case, does not provide any improvements for the provincial movements between Highway 1 and Highway 13 and may even cause some minor reduction in mobility for one movement.

- Highway 1 EB to Highway 13 SB – Similar to the base case, this movement is accommodated by a loop ramp connecting to the south terminal junction. Travel through the south ramp terminal would be similar to existing conditions with a left turn movement required at the intersection.
- Highway 1 WB to Highway 13 SB – Same as the base case, this movement is accommodated by a single loop ramp in the northwest quadrant. Travel through the south ramp terminal intersection would be similar to existing conditions.
- Highway 13 NB to Highway 1 EB – Similar to the base case, this movement is accommodated by a directional ramp. Travel through the south terminal intersection is avoided with the large right turn slip lane.
- Highway 13 EB to Highway 1 WB –This movement is provided via 56 Avenue (north) by a directional ramp from the intersection at the north terminal junction. Travel through the intersection, via a left turn movement is however, less desirable then the existing loop ramp in the northeast quadrant.

Option 3: The proposed configuration, as compared to the base case, is detrimental to some provincial movements between Highway 1 and Highway 13.

- Highway 1 EB to Highway 13 SB – This movement is circuitous with access provided via 56 Avenue. A left turn manoeuvre is required onto 56 Avenue from Highway 1 with a right turn required at the intersection between 264 Street and 56 Avenue. Travel through four intersections is required to complete this movement.
- Highway 1 WB to Highway 13 SB – This movement is accommodated by a directional ramp with a left turn manoeuvre at the north ramp terminal, replacing the existing free flow loop ramp.
- Highway 13 NB to Highway 1 EB – Same as the base case, this movement is accommodated by a directional ramp. Travel through the south terminal intersection is avoided with the large right turn slip lane.
- Highway 13 NB to Highway 1 WB – This movement is provided via 56 Avenue and a directional ramp to enter Highway 1. However, a left

turn manoeuvre is required at the intersection between 264 Street and 56 Avenue. The left turn movement, at this junction, is less desirable then the existing loop ramp in the northeast quadrant.

Option 4: The proposed configuration, as compared to the base case, provides several improvements to the provincial movements between Highway 1 and Highway 13.

- Highway 1 EB to Highway 13 SB – This movement is accommodated by a directional ramp to the south terminal junction. This directional ramp replaces the existing loop ramp which connected to the same junction, but required a left turn manoeuvre to proceed southbound.
- Highway 1 WB to Highway 13 SB – Same as the base case, this movement is accommodated by a single loop ramp in the northwest quadrant.
- Highway 13 NB to Highway 1 EB – This movement is slightly improved with a new directional ramp which avoids the south terminal intersection.
- Highway 13 NB to Highway 1 WB –This movement is provided by a separate free flow directional ramp which diverges from Highway 13, south of the intersection at 56 Avenue (south).

- **Network Connectivity**

A review of each option was conducted with respect to assessing improvements in the level of connectivity within the local road network and specifically across Highway 1. The findings from this review, are as follows:

Option 1: The east west route, 56 Avenue, is still discontinuous across Highway 1. East west traffic on 56 Avenue must therefore continue to travel through the interchange along 264 Street. No improvement as compared to the base case.

Option 2: The east west route, 56 Avenue, is still discontinuous across Highway 1. East west traffic on 56 Avenue must therefore continue to travel through the interchange along 264 Street. No improvement as compared to the base case.

Option 3: With the new bridge structure across Highway 1, continuity along 56 Avenue is restored. This improved network connectivity removes the east west traffic from the interchange; however, significant Highway 1 interchange traffic is added to 56 Avenue. Moderate improvement compared to base case.

Option 4: The east west route, 56 Avenue, is still discontinuous across Highway 1. East west traffic on 56 Avenue must therefore continue to travel through the interchange along 264 Street. No improvement as compared to the base case.

- **Evaluation Summary**

  A summary of the interchange option evaluation is provided ***Table 3.12***.

Table 3.12: Highway 13 / 264 Street Interchange Evaluation Summary

Criteria	Option 1	Option 2	Option 3	Option 4
Travel Time Savings	30 hrs AM peak period (2014) -10 hrs PM peak period (2014) 80 hrs AM Peak Period (2045) -170 hrs PM Peak Period (2045) -$1.3 M Travel Time Savings (25 years)	20 hrs AM peak period (2014) -10 hrs PM peak period (2014) 90 hrs AM Peak Period (2045) 10 hrs PM Peak Period (2045) $2.8 M Travel Time Savings (25 years)	-40 hrs AM peak period (2014) -60 hrs PM peak period (2014) -2760 hrs AM Peak Period (2045) -1930 hrs PM Peak Period (2045) -$119 M Travel Time Savings (25 years)	20 hrs AM peak period (2014) 20 hrs PM peak period (2014) 100 hrs AM Peak Period (2045) 100 hrs PM Peak Period (2045) $6.5 M Travel Time Savings (25 years)
Implementation Costs	**$42 M**	**$36 M**	**$60 M**	**$67 M**
Property Impacts	0.0 Ha – Property Impacts 4.7 Ha – Potential Surplus	0.0 Ha – Property Impacts 4.7 Ha – Potential Surplus	0.3 Ha – Property Impacts 7.3 Ha – Potential Surplus	0.0 Ha – Property Impacts 4.2 Ha – Potential Surplus
Network Connectivity	No improvement as compared to the base case.	No improvement as compared to the base case.	Moderate improvement compared to base case.	No improvement as compared to the base case.
Provincial Movements	The proposed configuration, as compared to the base case, does not provide any improvements for the provincial movements between Highway 1 and Highway 13 and may even cause some reduction in mobility for these key movements.	The proposed configuration, as compared to the base case, does not provide any improvements for the provincial movements between Highway 1 and Highway 13 and may even cause some minor reduction in mobility for one movement.	The proposed configuration, as compared to the base case, is detrimental to some provincial movements between Highway 1 and Highway 13.	The proposed configuration, as compared to the base case, provides several improvements to the provincial movements between Highway 1 and Highway 13.
Benefit / Cost and NPV	B/C = 0.2 NPV= -$33 M	B/C = 0.3 NPV= -$24 M	B/C = -1.9 NPV= -$164 M	B/C = 0.3 NPV= -$43 M
Overall	Possible	**Preferred**	Not Preferred	Possible

3.2.4 RATIONALE FOR CHOSEN OPTIONS

232 STREET / HIGHWAY 1 INTERCHANGE

Based on the high level assessment, Option 3 was preferred for improving the interchange. In this option, the following improvements and advantages are noted:

- Removal of the undesirable geometry associated with the existing cloverleaf configuration.
- Single exits from Highway 1 in both directions.
- Improved traffic operations over the existing conditions.
- Connects 72 Avenue across Highway 1.
- No new land required for the 232 Street interchange.
- Significant surplus land in the northeast quadrant, with some surplus lands possibly available in the southwest quadrant and the southeast quadrant.
- Efficient traffic operations are provided for the key movements with direct connections between Highway 10 and Highway 1 (westbound to southbound and northbound to eastbound).

Option 3 also allows phased construction of the 72 Avenue flyover structure by retaining the existing connection of 72 Avenue to the north ramp terminal in the interim. This infrastructure deferral could reduce the initial implementation costs by approximately $10M. Furthermore, the Highway 10 EB to Highway 1 EB movement could be retained in the existing configuration as an interim stage – until such time that the potential surplus lands immediately north of 72 Avenue are identified for development.

264 STREET / HIGHWAY 1 INTERCHANGE

Based on the high level assessment, Option 2 was preferred for improving the interchange. In this option, the following improvements and advantages are noted:

- Removal of the undesirable geometry associated with the existing cloverleaf configuration.
- Single exits from Highway 1 in both directions.
- Improved operations over the existing conditions.
- No new land required for the 264 Street interchange.
- Potential surplus land in the southwest quadrant and northeast quadrants.
- Slightly improved traffic operations as compared to the base case.

Overall, Option 2 provides satisfactory mobility for the key movements between Highway 1 and Highway 13. However, the northbound to westbound highway to highway movement must pass through the intersection at 264 Street / 56 Avenue and utilize a section of 56 Avenue to gain access to Highway 1. If the highway to highway connectivity is deemed to be a critical component, then Option 4 could be considered as an alternate option instead of Option 2 in the subsequent design and implementation phases.

3.3 Auxiliary / Climbing Lanes

As there are significant grades in some segments of the study highway section, an analysis was conducted to assess the climbing lane requirements of Option 3 to better accommodate the slower truck traffic and preserve the capacity provided by the additional lane. The Highway Capacity Software (HCS) 2000 metric version was used, which applied the Highway Capacity Manual (HCM) procedures to analyze the Level of Service of mainline segments based on a number of factors including topography (including grade and length of grade), traffic volume, number of lanes, and percentage of heavy vehicles.

As the westbound and eastbound carriageways of the highway are separated by a wide median, the climbing segments of the two carriageways were assessed independently. In general, climbing segments with a grade greater than 2.0% were assessed, as heavy vehicles may have difficulty operating on these inclines especially if the segments are of sufficient length, causing the trucks to travel at a substantially lower speed than other vehicles in the traffic stream. For locations where the grade varies over the length of the climbing segment, each grade was assessed individually as a section, and the segment was also evaluated as a whole with an average grade weighted over the length of the segment. A Level of Service of E or F indicate that the mainline segments will likely operate at or beyond capacity, which will not be acceptable performance for Highway 1 and an auxiliary lane will be recommended.

For traffic volumes, the forecast travel demands from the RTM were adjusted to account for the differences noted between the observed and modelled volumes under existing conditions. The adjustments were applied on a directional basis for each of the peak hours assessed. For segments where an HOV lane will be provided, the HOV volume was subtracted from the total volumes such that only general purpose vehicles were considered in the analysis. Similarly, only the number of general purpose lanes was applied as opposed to the total number of lanes. For the percentage of heavy vehicles, the future modelled truck percentages were assumed to remain similar to the proportions observed under existing conditions, hence the latter were applied. One exception, however, was noted in the eastbound truck percentage at Glover Road in the afternoon peak hour, where the future modelled proportion was considerably lower than the observed proportion under

existing condition (9% compared to 14%). For this particular scenario, both truck percentages were evaluated.

In addition to the HCM procedures, the Geometric Design Guide for Canadian Roads (1999 Edition) published by the Transportation Association of Canada was also used, which states that a climbing lane will be required if a speed reduction of greater than 15 km/h will be experienced by trucks due to a combination of grade, length of grade, and the mass / power ratio of the heavy vehicle (section 2.1.8). The truck climbing lane will better accommodate the slower truck traffic while improving mobility for all motorists. Critical lengths of grade for a 15 km/h truck speed reduction are established in the Guide for various design truck mass / power ratios and grades. For analysis purposes, climbing segments evaluated to have a Level of Service of D or better but contain sections with significant grades were assessed using the truck speed reduction criterion, to examine if a truck climbing lane would be required for traffic operational reasons. The 180 g/W mass / power ratio, which is representative of the size and type of vehicle normally used for design, was assumed in the assessment.

Based on the inputs described above and illustrated in ***Figure 3.2*** below, the results from the HCS analysis for the preferred mainline Option 3 were obtained, as presented in ***Tables 3.13*** and ***3.14*** for the AM and PM Peak Hours, respectively.

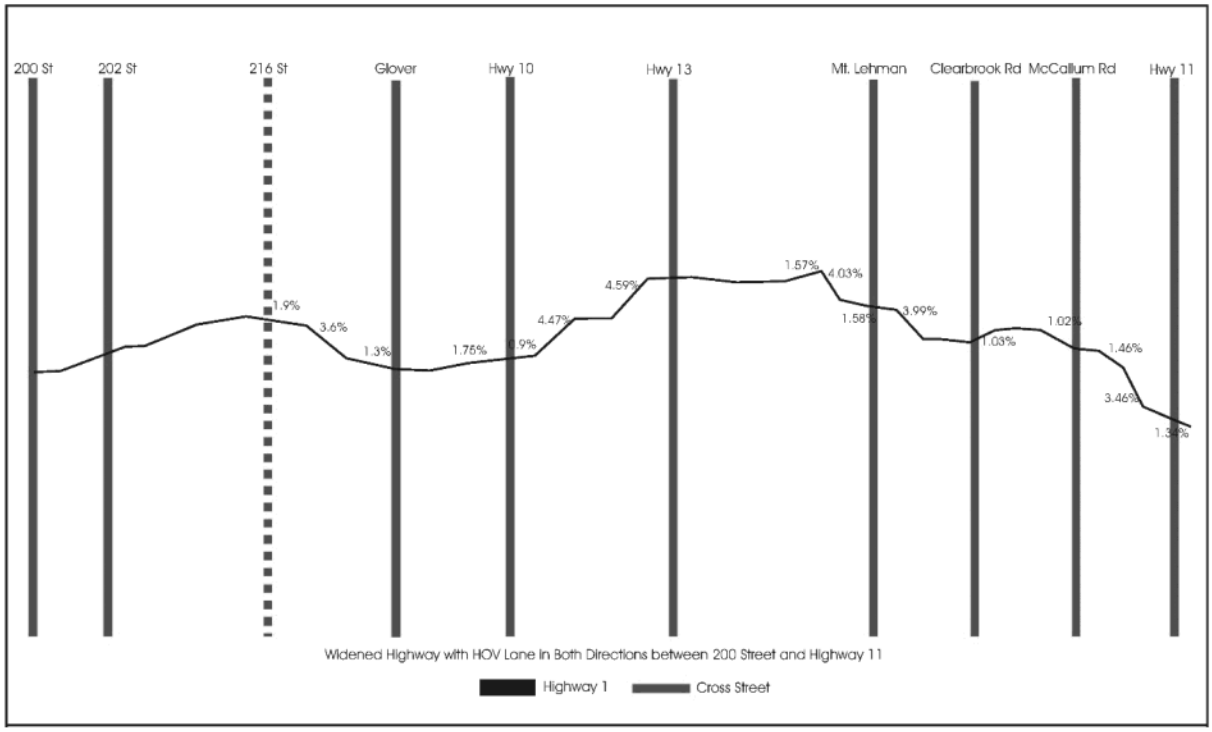


Figure 3.2: Significant Grades in Study Highway Section

Table 3.13: Climbing Lane Analysis – 2045 AM Peak Hour

Climbing Segment	Direction	Sub Segment	Grade (%)	Length (m)	GP Volume (vph)	% Trucks	Avg Density (pc/km/h)	Avg Speed (km/h)	LOS
#1 200 St to 216 St (2GP+1HOV)	EB	A	2.18	1600	3200	14	19.0	100.1	D
		B	1.01	900			19.0	100.1	D
		AB	1.76	2500			19.0	100.1	D
#2 216 St to Glover Rd (2GP+1HOV)	WB	A	1.98	1200	3600	16	23.6	91.6	E
		B	3.61	800			23.6	91.6	E
		C	1.34	700			23.6	91.6	E
		ABC	2.3	2700			-	-	F
#3 232 St to 264 St (3 GP)	EB	A	0.68	500	4700	14	18.1	102.8	D
		B	3.01	900			19.8	100.0	D
		C	-0.21	1300					
		D	0.67	400			18.1	102.8	D
		E	4.09	700			19.8	100.0	D
		F	0.42	1200			18.1	102.8	D
#4 East of Mt. Lehman to Clearbrook Rd (3 GP)	WB	A	4.03	900	4300	12	18.3	102.5	D
		B	1.58	900			16.1	104.8	D
		C	0.91	900	4600	12	17.4	103.7	D
		D	3.99	700			18.2	102.7	D
		ABCD	2.55	3400	4600	12	18.7	101.9	D
#5 East of McCallum Rd to Highway 11 (3 GP)	WB	A	1.01	500	4900	12	18.9	101.6	D
		B	0.68	500	5100	12	20.1	99.4	D
		C	1.46	500			20.1	99.4	D
		D	3.46	500			21.3	97.0	D
		E	1.34	700			20.1	99.4	D
		ABCDE	1.57	2700	5100	12	20.1	99.4	D

Table 3.14: Climbing Lane Analysis – 2045 PM Peak Hour

Climbing Segment	Direction	Sub Segment	Grade (%)	Length (m)	GP Volume (vph)	% Trucks	Avg Density (pc/km/h)	Avg Speed (km/h)	LOS
#1 200 St to 216 St (2GP+1HOV)	EB	A	2.18	1600	3500	14	21.9	95.0	D
		B	1.01	900			21.9	95.0	D
		AB	1.76	2500			21.9	95.0	D
#2 216 St to Glover Rd (2GP+1HOV)	WB	A	1.98	1200	3400	11	20.3	97.9	D
		B	3.61	800			21.8	95.2	D
		C	1.34	700			20.3	97.9	D
		ABC	2.3	2700			22.2	94.4	E
#3 232 St to 264 St (3 GP)	EB	A	0.68	500	5400	14	22.8	94.0	E
		B	3.01	900			26.4	86.2	E
		C	-0.21	1300					
		D	0.67	400			22.8	94.0	E
		E	4.09	700			26.4	86.2	E
		F	0.42	1200			22.8	94.0	E
#4 East of Mt. Lehman to Clearbrook Rd (3 GP)	WB	A	4.03	900	4100	9	16.5	104.6	D
		B	1.58	900			15.1	105.2	C
		C	0.91	900	3700	9	13.6	105.2	C
		D	3.99	700			14.2	105.2	C
		ABCD	2.55	3400	4100	9	15.8	105.0	C
#5 East of McCallum Rd to Highway 11 (3 GP)	WB	A	1.01	500	4100	9	15.1	105.2	C
		B	0.68	500	4200	9	15.5	105.1	C
		C	1.46	500			15.5	105.1	C
		D	3.46	500			16.2	104.8	D
		E	1.34	700			15.5	105.1	C
		ABCDE	1.57	2700	4200	9	15.5	105.1	C

As presented in ***Tables 3.13*** and ***3.14***, Climbing Segments 2 and 3 are anticipated to operate at Level of Service E or F. Also, Climbing Segment 1 is at the upper limit of Level of Service D. Hence, an auxiliary lane is recommended for the three climbing segments:

- Between approximately the Glover Road overpass and the 216 Street interchange in the westbound direction;

- Between the 232 Street and 264 Street interchanges in the eastbound direction;
- Between the 200 Street and 216 Street interchanges in the eastbound direction.

In addition, the critical length of grade criterion was assessed for the grades greater than 2% on the remaining climbing segments, Climbing Segments 4 and 5. From the analysis, it was found that sub segments A and D on Climbing Segment 4 as well as sub segment D in Climbing Segment 5 will require a truck climbing lane for improved traffic operations. However, due to spatial constraints at the Mount Lehman Road interchange in the westbound direction, it is infeasible to provide a truck climbing lane for sub segment D in Climbing Segment 4. Similarly, due to spatial constraints at the McCallum Road interchange in the westbound direction, it is infeasible to provide a continuous truck climbing lane over the entire grade which extends just east of the McCallum Road interchange. Overall, a truck climbing lane is recommended for the following two segments:

- For the sub segment (A) with a grade of 4.03% located west of the Mount Lehman Road interchange in the westbound direction; and
- For the sub segment (D) with a grade of 3.46% located between the Highway 11 and McCallum Road interchanges in the westbound direction.

Noting the anticipated degradation in travel speeds / level of service due to the varying topography along this section of Highway 1, the auxiliary / truck climbing lane segments recommended above will assist in preserving the capacity provided by the additional lane in each direction of travel.

3.4 Replacement / Upgraded Structures

Although no options have been identified and therefore no option evaluation undertaken, the following structures will need to be replaced or upgraded as part of the widening of the highway mainline:

- Glover Road Underpass Structure (replacement);
- CP Rail Underpass Structures / Portals (replacement);
- 232 Street Underpass Structure (replacement);
- 264 Street Underpass Structure (replacement);
- Bradner Road Overhead Structures (widening);
- Peardonville Road Underpass Structures (replacement).

4.0 PROJECT OBJECTIVES

The objectives of the Highway 1 Widening (216 Street to Highway 11) project are:

- To provide sufficient traffic capacity along the highway to meet the current peak hour traffic demands and the demands of the future up the year 2045;
- To address critical geometric and road safety deficiencies at a number of structures along the highway;
- To renew the configuration of two interchanges to meet current best practice; and
- To reduce levels of congestion, improve levels of service and decrease travel times along the highway.

5.0 PROJECT SCOPE STATEMENT

The project scope will generally include the widening of Highway 1 by adding one lane in each direction into the median from 216 Street to Highway 11. The project will include the demolition of existing underpass and reconfiguration of two interchanges, the 232 Street interchange and the 264 Street interchange. In addition, to accommodate the Highway 1 widening a number of grade separated crossing will need to be upgraded to achieve added crossing width and/or higher clearance under the structure. The scope of the Highway 1 Widening project will also include the following key elements:

- Demolition and reconstruction of the Glover Road underpass structure;
- Demolition and reconstruction of the rail underpass structures at the CP Rail lane (Roberts Bank Corridor);
- Widening of the two overhead structures at Bradner Road;
- Upgrade of the entrance and exit ramps to the Bradner Rest Area along the westbound lanes of Highway 1;
- Demolition and reconstruction of the Peardonville Road underpass structure;
- New structure for the eastbound off-ramp to Highway 11; and
- Upgrade of the Highway 11 on-ramp to Highway 1 eastbound.

5.1 Project Work Breakdown Structure

The project Work Breakdown Structure (WBS) defines the total scope of the Highway 1 Improvements project in a hierarchal format. Although it describes the same project scope as the corresponding project scope statement, it is more precise and detailed. The WBS will be the foundation of the project schedule and project resource estimates, and used to build the project work plan. The WBS for the Highway 1 Improvements project is shown in ***Figure 5.1***.

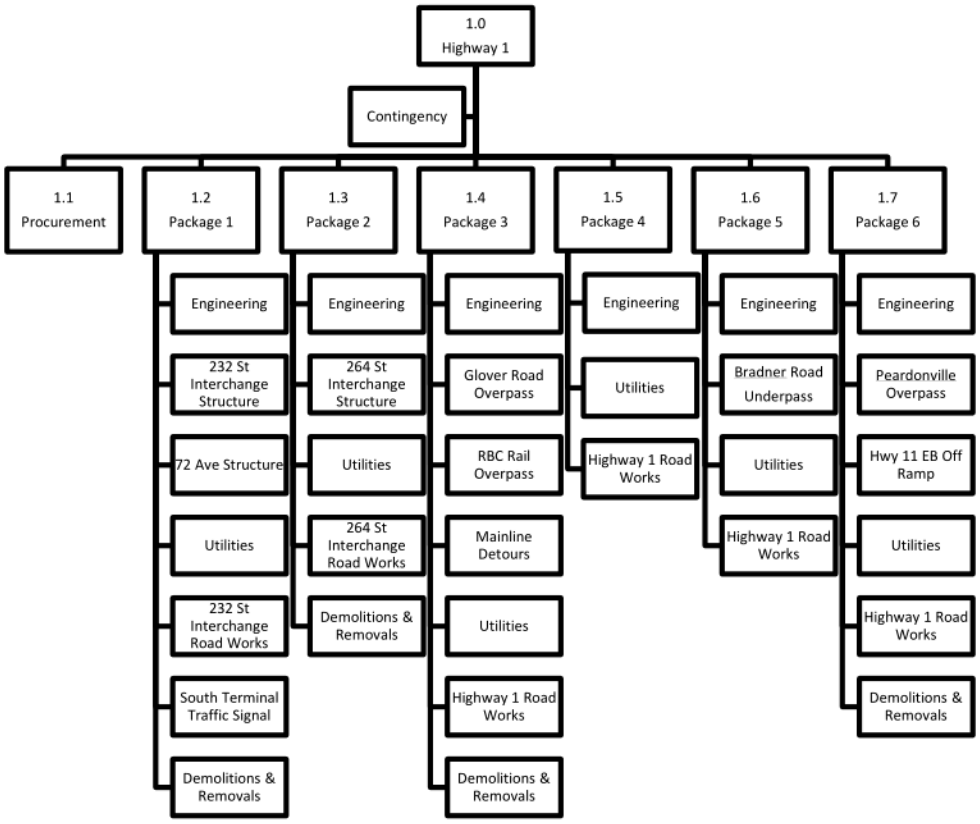


Figure 5.1: WBS for Highway 1 Improvements Project

5.2 Work Breakdown Structure Dictionary

The Highway 1 Widening project will consist of the following components: Procurement, Package 1, Package 2, Package 3, Package 4, Package 5 and Package 6, as defined below.

WBS 1.1 Procurement – will be managed in-house and will use a design-bid-build procurement method. The preliminary design, detailed design, tender documents and construction supervision will be outsourced to a prequalified engineering consulting firm. The construction will be conducted by a construction company that has been selected through open tender.

WBS 1.2 Package 1 (232 Street Interchange) – this package would involve reconfiguring the 232 Street interchange to allow a new underpass structure to be constructed and the existing structure to be removed. As part of this work, the proposed 72 Avenue underpass would be constructed. Only localized widening of Highway 1 would be included, but any additional lanes on Highway 1 would not be opened to traffic.

The new 232 Street underpass will have a different horizontal and vertical alignment than the existing bridge. The proposed bridge width is approximately 21.9 m wide to accommodate four 3.6 m traffic lanes, two 1.5 m shoulders, concrete parapets, 3.5 m multi-use path and a bicycle fence. It is a symmetrical 2-span bridge with a pier in the median resulting in two 46 m spans for a total length of 92 m.

WBS 1.3 Package 2 (264 Street Interchange) - this package would involve reconfiguring the 264 Street interchange to allow a new underpass structure to be constructed and the existing structure to be removed. Only localized widening of Highway 1 would be included, but any additional lanes on Highway 1 would not be opened to traffic.

A new 264 Street Parclo B configuration interchange will include a new structure spanning over Highway 1 as well as over the south and north off ramps.

The new underpass will have a different horizontal and vertical alignment than the existing bridge. The proposed bridge width is approximately 21.9 m wide to accommodate four 3.6 m traffic lanes, two 1.5 m shoulders, concrete parapets, 3.5 m multi-use path and a bicycle fence. It is a symmetrical 2-span bridge with a pier in the median resulting in two 50 m spans for a total length of 100 m.

WBS 1.4 Package 3 (Highway 1 Widening from 216 Street to 232 Street) – this package would involve widening Highway 1 between the recently constructed interchange at 216 Street and the recently constructed 232 Street interchange (Package 1), a distance of approximately 2.1 kilometres. The widening would include development of the westbound HOV lane and transition from three to two general purpose lanes in the westbound direction. This package would also involve the complex removal of the box structures at the CP Rail crossing and construction of a new rail bridge. Removal and construction of a new Glover Road overpass is also included in this construction package.

The new Glover Road Underpass will follow the existing horizontal alignment but will need to be raised approximately 1.5 m to accommodate the required 5 m vertical clearance below the bridge. A full road closure is anticipated as there are alternate routes across the highway within the area. The length of the bridge from abutment to abutment is 82m. The bridge width is determined to be 14.7 m to accommodate two 3.6 m traffic lanes, a 3.5 m multiuse path, two 1.5 m shoulders, parapets and a pedestrian/bicycle fence.

The proposed new RBC Rail structure is a three span structure with constant 33.5 m spans for a total length of 100.5 m. At this time, it is understood there are no current or future plans to double or expand the tracks through this area and a single rail bridge

is all that is required. The width of the bridge will be influenced by the staging approach and where the piles/foundations can be placed.

WBS 1.5 Package 4 (Highway 1 Widening from 232 Street to 264 Street) – only highway widening, over a length of approximately 5.8 kilometres, is involved in this construction package. The widening would encompass the segment of highway, in both directions of travel, between the recently constructed 232 Street interchange (Package 1) and the 264 Street interchange (Package 2). No new structures or modifications to existing structures are included in this segment.

WBS 1.6 Package 5 (Highway 1 Widening from 264 Street to Mt. Lehman Road) – widening the highway in both directions of travel between the recently constructed 264 Street interchange and the existing Mt. Lehman Road interchange represents the majority of the scope in this package. However, widening of the Bradner Road overhead structures is included as is the upgrade of the entrance and exit ramps to the Bradner Rest area.

The horizontal and vertical alignments of Highway 1 and Bradner Road do not need to change in case of bridge replacement. In addition, the new bridge superstructure will be able to provide sufficient height to accommodate the 5.0 m vertical clearance requirement. It is understood that a full bridge closure is not permitted and staged construction is required.

The new bridges will be one span structures with approximate length of 17 m. The abutments will be placed approximately adjacent to the shoulders of Bradner Road, which width is determined to be approximately 14.3 m to accommodate two 3.6 m traffic lanes, a 3.5 m multi-use path, two 1.5 m shoulders and parapets. The bridge width will be 16. 4 m consisting of 3 - 3.7 m traffic lanes, a 1.5 m and a 3 m shoulders and parapets.

WBS 1.7 Package 6 (Highway 1 Widening from Mt. Lehman Road to Highway 11) – this construction package involves approximately 9.7 kilometres of widening of Highway 1 between the Mt. Lehman Road interchange and the Highway 11 interchange. Removal and construction of the new Peardonville Road underpass structure and associated municipal road works are included in this construction package. The new eastbound off-ramp structure to Highway 11 and reconfiguration of the eastbound on-ramps from Highway 11 are also included.

A new alignment is proposed which will provide a direct connection from Peardonville Road to South Fraser Way resulting in an alignment that crosses the Highway at a 63 degree skew. The current underpass is slightly below the 5.0 m vertical clearance envelope. The new alignment will need to consider this as well as any additional superstructure depth to accommodate the necessary span lengths. The full existing

bridge closure is not required because of the new horizontal alignment. The new bridge will consist of four spans with a total length of 195.5 m spanning Highway 1 and Martens Street. One pier will be located in the middle of the highway median and other adjacent to the right shoulder of eastbound Highway. The bridge will be 14.7 m wide to accommodate two 3.6 m traffic lanes, a 3.5 m multi-use path, two 1.5 m shoulders, parapets and a bicycle fence.

Common Work Breakdown Elements to All Six Packages

The following work break down elements are generic to all six packages.

Engineering – will include design, project management and securing necessary approvals:

- Design – includes civil, structural, and electrical design for road works, structure, traffic signals, lighting and utilities. Rail design is also required for rail line profile raising at the Highway rail overpass crossing.
- Project Management – will be performed by in-house staff with construction management services being outsourced to an engineering consultant firm.
- Approvals – includes environmental assessment and approvals, and archaeological assessment approvals. Approvals from CP Rail for the design, construction detours and impacts to rail traffic operations will also be required in relation to the RBRC crossing within Work Package 3. Approvals from the Townships of Langley and City of Abbotsford for cost sharing, interchange design, and tie-ins to crossing roadways and municipal utility relocations. Approvals for BC Hydro, Fortis, and Telus for relocation of regional utilities.

Utilities – includes the relocation and / or protection of utilities (BC Hydro, gas, communications, municipal, and other) located within the median areas of Highway 1 which will be used for the widening of the carriage way. This work element also includes watercourse crossings of the highway, which again due to the widening of the carriage way will need to be lengthened or replaced.

6.0 PROJECT TIMELINE

As introduced in the previous section, multiple construction packages were identified to provide implementation flexibility in widening the Highway 1 section between 216 Street and Highway 11. This proposed implementation strategy and the associated timelines are described as follows.

6.1 Proposed Staging

To provide the Ministry of Transportation and Infrastructure with some implementation flexibility in widening Highway 1, the corridor was divided into multiple segments based on the priority of construction and related costs. The segmentation or construction packages have been developed such that they can be delivered individually or bundled together into various combinations. The following segmentation / construction packages are proposed.

Package 1: 232 Street Interchange

This package would involve reconfiguring the 232 Street interchange to allow a new underpass structure to be constructed and the existing structure to be removed. As part of this work, the proposed 72 Avenue underpass would be constructed. Only localized widening of Highway 1 would be included, but any additional lanes on Highway 1 would not be opened to traffic.

Package 2: 264 Street Interchange

This package would involve reconfiguring the 264 Street interchange to allow a new underpass structure to be constructed and the existing structure to be removed. Only localized widening of Highway 1 would be included, but any additional lanes on Highway 1 would not be opened to traffic.

Package 3: Highway 1 Widening from 216 Street to 232 Street

This package would involve widening Highway 1 between the recently constructed interchange at 216 Street and the recently constructed 232 Street interchange (Package 1), a distance of approximately 4.1 kilometres. The widening would include development of the westbound HOV lane and transition from three to two general purpose lanes in the westbound direction. This package would also involve the complex removal of the box structures at the CP Rail crossing and construction of a new rail bridge. Removal and construction of a new Glover Road overpass is also included in this construction package.

Package 4: Highway 1 Widening from 232 Street to 264 Street

Only highway widening, over a length of approximately 7.2 kilometres, is involved in this construction package. The widening would encompass the segment of highway, in both directions of travel, between the recently constructed 232 Street interchange (Package 1) and the 264 Street interchange (Package 2). No new structures or modifications to existing structures are included in this segment.

Package 5: Highway 1 Widening from 264 Street to Mt. Lehman Road

Widening the highway in both directions of travel between the recently constructed 264 Street interchange and the existing Mt. Lehman Road interchange represents the majority of the scope in this package. However, widening of the Bradner Road overhead structures is included as is the upgrade of the entrance and exit ramps to the Bradner Rest area.

Package 6: Highway 1 Widening from Mt. Lehman Road to Highway 11

This construction package involves approximately 10.1 kilometres of widening of Highway 1 between the Mt. Lehman Road interchange and the Highway 11 interchange. Removal and construction of the new Peardonville Road underpass structure and associated municipal road works are included in this construction package. The new eastbound off-ramp structure to Highway 11 and reconfiguration of the eastbound on-ramps from Highway 11 are also included.

As mentioned above, the proposed construction packages described above have been developed to allow flexibility in the delivery of the overall project. Separately, each construction package has been sized such that each package can be easily delivered under a conventional design bid build approach using local construction firms. However, one or more of the construction packages could be bundled together as a larger conventional design bid build contract, or as a design build delivery. Further bundling of the construction packages could lead to two or even three design build alternative delivery packages. Finally, the overall project could be delivered as a single contract under a public private partnership approach.

No recommendation is being made with respect to the actual method of delivery, which is highly dependent upon available funding and cash flow. Determination of the appropriate delivery approach is therefore deferred to the time frame when the Ministry of Transportation has funding secured to move forward with actual implementation.

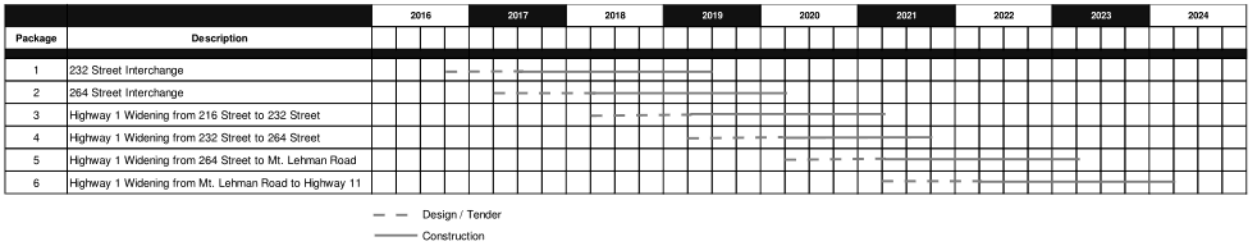
6.2 Potential Schedule

Assuming a "worst case" scenario in terms of length of time to complete the entire project, a high level schedule has been prepared to show the overall project duration if a near sequential construction sequence was chosen for each of the six construction packages described above. The proposed schedule, depicted in ***Figure 6.1***, assumes a near sequential implementation of the six proposed construction packages further assuming the packages will be delivered in a sequential manner from west to east. As can be seen in this potential schedule, if the design activities are assumed to start in Q4 of 2016, then the overall project would not be completed until the end of 2024.

It should be noted that some of the packages are independent of the other construction packages, therefore, more than one construction package could be implemented simultaneously. For example, Package 1 and Package 2 could be constructed simultaneously, as could Package 6. The other construction packages would be dependent upon completion of these initial three construction packages. Significant savings in the schedule duration could be gained if one or more construction packages were implemented simultaneously.

Furthermore, if bundling of the constructions packages is considered, then it is assumed that production related efficiencies would result and the overall schedule would be reduced.

Figure 6.1: Proposed Schedule



7.0 PROJECT OUTCOMES AND BENEFITS

This project has clear federal, provincial and municipal benefit in that current congestion along the Highway 1 corridor will be mitigated with the provision of an additional through lane in each direction, climbing lanes at critical steep highway segments, upgrades to existing grade separated crossings to gain minimum clearances for safety, and reconstruction of two existing interchanges to improve functionality and road safety. The Highway 1 corridor through the Fraser Valley provides the primary access to the provincial interior, the western provinces, and the rest of Canada. The corridor is a major goods movement route and also provides connectivity to key international border crossings at Highway 11 and Highway 13, as well as Highway 15 immediately west of the project limits.

With the reconstruction of the interchanges at Highway 10 (232 Street) and at Highway 13 (264 Street), improved access to / from the highway is provided in the Township of Langley. The additional through lane in each direction will also provide improved connectivity between the communities in the Fraser Valley and the Abbotsford International Airport.

7.1 Evaluation Criteria

In order to compare and contrast the relative merits and drawbacks of the Highway 1 Widening project versus a no build option, a set of high level evaluation criteria was developed based on similar Multiple Account Evaluations prepared for Ministry planning studies. The criteria are a combination of quantitative and mostly qualitative factors to assist in selecting a preferred alternative. For consistency with business case development, a 25 year project horizon has been assumed.

In keeping with the Ministry's Multiple Account categories, the evaluation criteria have been grouped into the respective Customer Service, Socio-Community, Financial, and Environmental accounts. The Economic account is not proposed at this level of analysis. Given that the Highway 1 Widening project proposes to widen the highway within the existing median, some of the evaluation criteria within the Multiple Account Evaluation are not applicable. These criteria and rationale for exclusion from the evaluation are shown in ***Table 7.1***.

Table 7.1: Evaluation Criteria Application

Account	Criteria	Applicable	Comments
Customer Service	Mobility Impacts	Yes	
	Vehicle Operating Costs	Yes	
	Road Safety	Yes	
	Travel Time	Yes	
Socio-Community	Residential Property Impacts	No	No properties required
	Business Property Impacts	No	No properties required
	ALR Impacts	No	No properties required
	Noise Impacts	No	Highway widening in the median
	Visual Impacts	No	Highway widening in the median
	Target Mode Shares	No	Highway widening is GP lanes only
	Community Severance	No	Highway widening in the median
	OCP Consistency	No	Highway widening in the median
	Business Impacts	No	Highway widening in the median
Environmental	Land Requirements	No	Highway widening in the median
	GHG Impacts	No	Regional Macro Travel Demand Model
	Terrestrial Impacts	Yes	
	Aquatic Impacts	Yes	
	Archaeological / Historical Impacts	Yes	
Financial	Capital Cost	Yes	
	Maintenance and Rehabilitation Cost	Yes	
	Salvage Value	Yes	
	BC Ratio	Yes	
	NPV	Yes	

The descriptions below include a summary of the criterion characteristics and rationale, as well as a range of evaluation output are discussed below.

A. Customer Service Account

A.1 Travel Time

Using the Emme3 2045 travel demand model outputs for the No Build option and Highway 1 Widening project, an assessment of the impact on level of service and mobility will be conducted at a high level.

Evaluation Output: *This quantitative assessment will take into consideration the AM and PM peak models which cover the entire Metro Vancouver road and transit network as well as the City of Abbotsford and Township of Langley network. The Network Travel Time Savings of the Highway 1 Widening project compared with a No Build Option will be forecast, compared and expressed as a present dollar value.*

A.2 Vehicle Operating Costs

With the proposed widening of the highway facility, it is anticipated that congestion levels will be reduced which in turn, will result in lower vehicle operating costs. Special analysis to ascertain the improvements in vehicle operating costs between the base No Build option and the Highway 1 Widening project will be conducted. The vehicle operating costs will solely represent the changes in overall fuel consumption, noting that the fuel consumption component represents the largest component of vehicle operating costs, where as other typical components such as tire wear and oil are primarily related to vehicle kilometres travelled (VKT). With the effects related to this project being very corridor focused, the VKT does not change significantly between the base No Build and the Highway 1 Widening.

Evaluation Output: *This quantitative assessment will estimate fuel consumption based on the expected reduction in travel delays (stoppages), for several typical vehicle types, over the study corridor as derived from a comparison of the base No Build and the Highway 1 Widening project. The resultant value will be expressed as a present dollar value.*

A.3 Expected Road Safety Performance

The expected road safety performance for both the No Build option and the Highway 1 Widening project are derived from the Highway Safety Manual Part C predictive method to determine both the predicted and expected crash frequency for the highway corridor. The predicted crash frequency is widely used in safety practices, especially when comparing different improvement alternatives. Meanwhile, the expected crash frequency, which solves the “regression to mean” bias by combining the predicted and observed crash frequency using the Empirical Bayes method, is a more reliable estimator of the crash frequency.

Evaluation Output: *The Expected Crash Frequency and Severity for the Highway 1 Widening project compared with a No Build Option will be predicted and expressed as a present dollar value.*

B. Environmental Account

B.1 Terrestrial Impacts

The relative severity of impacts to the terrestrial environment will be noted and ranked. The qualitative evaluation will determine whether each option would have low, medium or high terrestrial requirements.

Evaluation Output: Low / Medium / High Terrestrial Impacts

B.2 Aquatic Impacts

The relative severity of impacts to the aquatic environment will be noted and ranked.

The qualitative evaluation will determine whether each option would have low, medium or high aquatic requirements.

Evaluation Output: Low / Medium / High Aquatic Impacts

B.3 Archaeological / Historical Impacts

Any archaeologically or historically significant impacts will be noted and ranked in terms of the severity of impact. The qualitative evaluation will determine whether each option would have low, medium or high impacts.

Evaluation Output: Low / Medium / High Archaeological and Historical Impacts

C. Financial Account

C.1 Capital Cost

The relative construction cost of the Highway 1 Widening Project will be assessed and typical unit costs referenced from the Ministry's Construction and Rehabilitation Cost Guide, and using the Elemental Parametric "Wolski" method. The cost is dependent on the extent of physical modifications, the complexity of the modifications (including geotechnical, utilities, drainage, and environmental compensation features), and right-of-way requirements.

Evaluation Output: Total Construction Cost (Including Contingencies)

C.2 Maintenance and Rehabilitation Cost

Consideration for annual maintenance and rehabilitation costs will be based on standard lane-kilometre costs and scheduled major rehabilitation for major roadways. The cost will be expressed as a 25 year present value.

Evaluation Output: Maintenance and Rehabilitation Cost (25 Year Present Value)

C.3 Salvage Value

The salvage value of the proposed infrastructure at the end of the 25 year business case period will be reported as per the assumptions listed in the Ministry's ShortBenCost business case analysis tool.

Evaluation Output: Salvage Value (25 Year Present Value)

C.4 Benefit Cost Ratio and Net Present Value

This calculation takes into consideration the 25 year present value of each option's travel time savings benefits, operating cost savings benefits, capital costs, maintenance and rehabilitation costs and salvage value.

Evaluation Output: B/C Ratio, NPV (25 Year Benefits – Costs)

7.2 Evaluation of Highway 1 Widening Project

A. Customer Service Account

A.1 Travel Time

Using the 2015 and 2045 travel demand model outputs (TransLink RTM) and proposed geometric and operational modifications, an assessment of the impact on level of service and mobility was conducted at a high level.

To quantify the reduced travel times into travel time savings, the peak period travel time savings using the consumer surplus methodology were extracted from the models, and a monetary value of time was applied. For the purpose of this analysis the following values of time were assumed:

- Automobile - $15.94 / hour;
- Straight Truck - $46.03 / hour; and
- Combo Truck - $53.30 / hour.

The resulting estimates of travel time savings (rounded) for the base model year 2015 and 2045 are shown in ***Table 7.2*** for the AM and PM peak hours only.

Table 7.2: Network Travel Time Savings

Travel Period	Travel Time Savings
2015 AM peak	$4,900
2015 PM peak	$9,350
2045 AM peak	$17,750
2045 PM peak	$24,450

To expand these hourly values to daily and then to annual values, the following assumptions were also applied:

- Expansion of the 2015 AM peak hour value by a factor of four (4) was applied to account for peak period travel time savings and minor off-peak period travel time savings on weekdays. A factor of five (5) was applied to the 2045 value.
- Expansion of the 2015 PM peak hour value by a factor of four (4) was applied to account for peak period travel time savings and minor off peak period travel time savings on weekdays. A factor of six (6) was applied to the 2045 value.
- Potential travel time savings for a typical weekend day were estimated based on the assumption that a weekend day would recognize only half the travel time savings of a typical weekday.
- Annual values were calculated by expanding the weekday values by 260 and the weekend values by 100. To be conservative, no travel time savings were estimated for holidays.

The forecasted annual travel time savings are shown in ***Table 7.3***.

Table 7.3: Forecast Annual Travel Time Savings

	2015	2045
AM Peak Hour Travel Time Savings ($)	$4,900	$17,750
PM Peak Hour Travel Time Savings ($)	$9,350	$24,450
AM Peak Period Travel Time Savings ($)	$19,640	$88,825
PM Peak Period Travel Time Savings ($)	$37,400	$146,760
Weekday Travel Time Savings ($)	$57,050	$235,585
Weekend Travel Time Savings ($)	$28,525	$117,793
Annual Saving ($/annum)	**$17,685,000**	**$73,031,000**

The net present value of the forecast travel time savings for the Highway 1 Widening project, for the benefit period between 2024 and 2041, is shown in ***Table 7.4***. These values were estimated by interpolating between the 2015 and 2045 values shown in Table 7.3 and discounting the values using a 6% discount rate.

Table 7.4: Travel Time Benefits Summary (2025 – 2041) PV

	No Build	Highway 1 Widening
Travel Time Benefits	NA	**$334,000,000**

Note: Only nine months of benefits were assumed for 2024

A.2 Vehicle Operating Costs

Vehicle operating cost benefits were assessed at a high level, with fuel consumption representing the only factor in recognition that other typical components are related more to vehicle kilometres travelled which does change significantly in the analysis of benefits for the Highway 1 study corridor.

Fuel consumption was estimated for base traffic conditions and future base 2045 traffic conditions along the study corridor. A key assumption in estimating the vehicle operation cost savings is that the Highway 1 Widening project would eliminate the majority of congestion along the study corridor. Therefore, the amount of fuel saved is the difference between the fuel consumed during congested conditions and uncongested conditions. For the purposes of the calculations, the study corridor was divided into three segments:

- 200 Street to 264 Street
- 264 Street to Mt. Lehman Road; and
- Mt. Lehman Road to Highway 11.

It was assumed, based on observations and historical information obtained from Google Traffic, that a significant portion of each segment experiences congestion as shown in ***Table 7.5***.

Table 7.5 Congested Corridor Segments

Segment	Segment Description	Segment Length (km)	Congested Length (km)
1	200 Street to 264 Street	14.5	11.5
2	264 Street to Mt. Lehman Road	9.5	9.5
3	Mt Lehman Road to Highway 11	9.1	8

Currently, extended periods of congestion are observed on the corridor. For the purposes of estimating savings in fuel consumption, it is assumed that congestion relates to conditions where traffic occasionally is stopped, periods of idling occur, and necessary acceleration and deceleration operations occurs. Estimates of the duration of these events are shown in ***Table 7.6***.

Table 7.6: Current (2016) Congestion Event Durations (hrs)

Segment	Weekday			Weekend
	AM Peak	MD Peak	PM Peak	Peak
1	3.0	0.0	3.0	1.0
2	3.0	0.0	3.0	1.0
3	1.0	0.0	1.0	1.0

As traffic demand grows within the study corridor, it is assumed that these congested conditions will worsen over time. Estimates of the duration of these future congestion events are shown in ***Table 7.7***.

Table 7.7: Future (2045) Congestion Event Durations (hrs)

Segment	Weekday			Weekend
	AM Peak	MD Peak	PM Peak	Peak
1	4.5	0.0	4.5	1.5
2	4.5	0.0	4.5	1.5
3	1.5	0.0	1.5	1.5

During these congestion events, it was assumed that the highway is operating at capacity and processes approximately 3500 vehicles per hour. The assumed composition of the vehicle fleet is shown in ***Table 7.8***. For simplicity, autos were further aggregated into several typical "auto" vehicle classes. Research was conducted to determine representative fuel consumption rates for each vehicle class. These fuel consumption rates are achieved under uncongested conditions.

Table 7.8: Vehicle Fleet Composition and Fuel Consumption Rates

Vehicle Class	Percent of Fleet	Fuel Consumption (L/100 km)
Passenger Vehicles	45%	6.7
SUV	32%	8.0
Pick Up	9%	10.0
Mini Van	5%	8.7
Auto Total	**91%**	**7.6**
Trucks Total	**9%**	**35.0**

In a previous study for TI Corp, travel time data was collected along several routes within the Highway 1 corridor, before and after the completion of the Port Mann Bridge and related highway improvement. This data was used as input in a vehicle emissions model to estimate fuel savings. Based on the data collected, observations indicated that a vehicle consumed 14% to 40% more fuel in congested conditions, depending on the extent of the travel time savings and the class of the vehicle. The findings from this previous study were deemed to be relevant in estimating the potential reduction in fuel consumption as related to the widening of Highway 1. It should be noted however, that this previous study did not examine fuel savings for "heavy trucks." As such, figures for the "light trucks" vehicle class were used as a proxy for the "heavy trucks" vehicle class, thus the results can be considered conservative for this vehicle class.

For the purposes of estimating fuel consumption savings, it was assumed that the average speed of the corridor will increase from 60 km/h to 100 km/h after the completion of the Highway 1 Widening Project. Based on this assumption and the findings from the previous project, it was estimated that an auto vehicle will consume 14% more fuel in congested conditions, while a truck will consume 17% more fuel in the same congested conditions.

The daily fuel savings were expanded to annual figures by assuming 260 weekdays and 100 weekend days in a year. Price of fuel was assumed to be $1.25 / L for gasoline and $1.20 / L for diesel. Based on these assumptions, the total benefits in fuel savings was estimated to be approximately $2.6 million in 2016 and $3.9 million in 2045. Vehicle operating cost savings, as related to fuel consumption benefits, accruing between these two years were linearly interpolated. The present value of vehicle operations cost savings, using a 6% discount rate for the period from 2024 to 2041, is shown in ***Table 7.9***.

Table 7.9: Vehicle Operating Cost Savings Summary (2024-2041) PV

	No Build	Highway 1 Widening
Vehicle Operations Cost Savings	NA	$22,925,000

Note: Only nine months of benefits were assumed for 2024

A.3 Expected Road Safety Performance

Crash data for the study area was obtained from the Ministry of Transportation and Infrastructure for the years 2009, 2010, 2011 and 2012 as shown in ***Table 7.10***.

Table 7.10: Highway 1 Mainline Crash History

Year	Severity		Total
	Casualty	Property Damage Only	
2009	80	123	203
2010	78	131	209
2011	72	95	167
2012	87	94	181
Total	317	443	760
Average	80	110	190

The expected road safety performance for both the No Build option and the Highway 1 Widening project was derived from the Highway Safety Manual Part C predictive method to determine both the predicted and expected crash frequency for the highway corridor. The predicted crash frequency is widely used in safety practices, especially when comparing different improvement alternatives. Meanwhile, the expected crash frequency, which solves the "regression to mean" bias by combining the predicted and observed crash frequency using the Empirical Bayes method, is a more reliable estimator of the crash

frequency. To predict the expected road safety performance, models were prepared for both the No Build option and the Highway 1 Widening project using the Interactive Highway Safety Design Model (IHSDM). The model predictions are shown in ***Table 7.11***.

Table 7.11: Expected Highway 1 Mainline Crash Rates and Frequencies

Data Element	No Build Option	Highway 1 Widening
First Year of Analysis	2024 (partial)	
Last Year of Analysis	2041	
Evaluated Length (km)	34.9740	
Average Future Road AADT (vpd)	60,587	
Expected Crashes		
Total Crashes	3,259.07	2,846.95
Fatal and Injury Crashes	1,079.67	1,015.07
Property-Damage-Only Crashes	2,179.40	1,831.89
Percent of Total Expected Crashes		
Percent Fatal and Injury Crashes (%)	33	36
Percent Property-Damage-Only Crashes (%)	67	64
Expected Crash Rate		
Crash Rate (crashes/km/yr)	5.4815	4.7884
Fatal and Injury Crash Rate (crashes/km/yr)	1.8159	1.7073
Property-Damage-Only Crash Rate (crashes/km/yr)	3.6656	3.0811
Expected Travel Crash Rate		
Total Travel (million veh-km)	13,148.24	
Travel Crash Rate (crashes/million veh-km)	0.25	0.22
Travel Fatal and Injury Crash Rate (crashes/million veh-km)	0.08	0.08
Travel Property-Damage-Only Crash Rate (crashes/million veh-km)	0.17	0.14

The expected difference in crash frequency between the two options, sorted by crash severity, is shown in ***Table 7.12***.

Table 7.12: Highway 1 Expected Road Safety Performance (2024 – 2041)

Severity	No Build	Highway 1 Widening	
	Crashes	Crashes	Difference
Fatality	34	31	-3
Incapacitating Injury	84	79	-5
Injury	963	905	-58
Property Damage Only	2,179	1,832	-347
Total	3,259	2,847	-412

Collision costs for economic analysis are based upon "Default Values for Benefit Cost Analysis in British Columbia, 2012", a reference used by the Ministry of Transportation and Infrastructure in British Columbia. This reference provides the following collision costs:

- Fatal crash - $6,385,999
- Non-fatal injury crash - $135,577
- Property damage only crash - $11,367

The present value of the expected crash cost savings for the Highway 1 Widening project, for the period from 2024 to 2041, is shown in ***Table 7.13***.

Table 7.13: Road Safety Benefits Summary (2024 – 2041) PV

	No Build	Highway 1 Widening
Road Safety Benefits	NA	$14,125,000

Note: Only nine months of benefits were assumed for 2024

B. Environmental Account

B.1 Terrestrial Impacts

Effects on terrestrial resources due to the Highway 1 widening would be limited as all widening is within the median of an existing freeway. However, there are 77 Species at Risk that may potentially be encountered in the project area along Highway 1. Should Species at Risk be encountered in the project area, project work would stop while species are relocated. Overall Terrestrial impacts are expected to be low.

B.2 Aquatic Impacts

Effects on aquatic resources due to the Highway 1 widening would be limited as all widening is within the median of an existing freeway. However, there are several rivers, creeks, and ditches within the project area which are known to contain fish. The project will take actions to salvage fish and protect habitat prior to construction. Also all work within

the area of these watercourses will be restricted to the fishery window. Overall Aquatics impacts are expected to be low.

B.3 Archaeological / Historical Impacts

Effects on archaeological or historic sites due to the Highway 1 widening would be limited as all widening is within the median of an existing freeway. There are four pre-contact archaeological sites and one historical archaeological site exist within one kilometre of the project. Although the probability is low, the potential for encountering archaeological artifacts is greatest at the water courses and the undisturbed areas such as the 272 Street overpass, Bradner Road crossing and Townline overpass. However, in the unlikely event that archaeological artifacts are found, construction will stop in the vicinity of the affected area and the artifacts will be removed by an archaeological team. Overall archaeological and historic site impacts are expected to be low.

C. Financial Account

C.1 Capital Cost

The relative construction cost was assessed at a high level using a functional design and typical unit costs referenced from the Ministry's Construction and Rehabilitation Cost Guide, and used the Elemental Parametric method. The cost is dependent on the extent of physical modifications, the complexity of the modifications (including geotechnical, utilities, drainage, and environmental compensation features), and right-of-way requirements.

Table 7.14: Highway 1 Widening Capital Cost Summary ($2016)

	No Build	Hwy 1 Widening ($M)
Project Management	NA	30.3
Engineering	NA	46.8
Grade Construction	NA	175.0
Structural	NA	130.9
Paving Construction	NA	29.2
Operational Construction	NA	6.9
Utilities	NA	3.3
Resident Engineering	NA	30.0
Contingency (30%)	NA	135.0
Total (rounded) $M	NA	591

C.2 Maintenance and Rehabilitation Cost

Consideration for annual maintenance and rehabilitation costs was based on standard lane-kilometre costs and scheduled major rehabilitation for major roadways. The cost is expressed as a 25 year present value. The No Build Option is assumed to require road surface rehabilitation in the year 2030. Based on the suggested implementation schedule, the Highway 1 Widening project would not require road surface rehabilitation until after the 2041 horizon year. The maintenance and rehabilitation cost estimates in present value are shown in ***Table 7.15*** for the base No Build and the Highway 1 Widening Project.

Table 7.15: Maintenance and Rehabilitation Cost Estimates (PV)

	No Build	Highway 1 Widening
Maintenance & Rehabilitation	$8,200,000	$5,400,000

C.3 Salvage Value

The salvage value of the Highway 1 Widening project at the end of the 25 year business case period is assumed to be approximately 80 percent of the original construction value, which equals $359,100,000, discounted at six percent to present value from the horizon year 2041. The estimated present value of the Salvage Value for the Highway 1 Widening project is shown in ***Table 7.16***.

Table 7.16: Salvage Value Estimates (PV)

	No Build	Highway 1 Widening
Salvage Value	NA	$83,700,000

C.4 Benefit Cost Ratio and Net Present Value

This calculation takes into consideration the 25 year present value of the travel time savings benefits, vehicle operating cost savings benefits, capital costs, maintenance and rehabilitation costs, and salvage value. The calculated benefit cost ratio and the net present value of the Highway 1 Widening Project are depicted in ***Table 7.17***.

Table 7.17: Benefit Cost Ratio and Net Present Value ($2016)

	No Build	Hwy 1 Widening
B/C Ratio	NA	1.00
NPV	NA	0.5 M

Table 7.18 provides an “at-a-glance” summary of the evaluation results.

Table 7.18: Evaluation Summary

Criterion/Option	No Build	Highway 1 Widening
Customer Service Account		
Travel Time	Highway is congested during peak and off peak periods. It is anticipated that these conditions will worsen in the short and long term futures.	Improved traffic performance will result in Travel Time Savings of approximately $65 M / year by 2041 Total Travel Time Savings: $334 M
Vehicle Operating Costs	Highway is congested during peak and off peak periods. It is anticipated that these conditions will worsen in the short and long term futures.	Improved traffic performance will result in less delays that translate into Vehicle Operating Cost savings of approximately $3.5 M / year by 2041 Total VOC Savings: $23 M
Road Safety Performance	Road Safety Performance is poor compared to provincial average	Improved Road Safety Performance resulting in a reduction of 400 crashes from 2025 to 2041 Total Road Safety Savings: $14 M
Environmental Account		
Terrestrial Impacts	NA	Low impact
Aquatic Impacts	NA	Low impact
Archaeological / Historical Impacts	NA	Low impact
Financial Account		
Capital Cost ($2016)	NA	-$449.0 M
Maintenance and Rehabilitation Cost ($2016)	-$8.2 M	-$5.4 M
Salvage Value ($2016)	NA	$83.7 M
Net Present Value ($2016)	NA	0.5 M
Overall Benefit Cost Ratio	NA	1.00

The above results indicate that the estimated benefits more or less equal the estimated costs of the Highway 1 Widening project. However, it should be noted that the benefit estimates are considered conservative as the analysis assumes that all of the benefits will occur at completion of the final construction package, whereas some minor interim benefits are anticipated to accrue after completion of each construction package. Furthermore, other minor benefits such as reliability and sale of surplus lands have not been captured.

Table 7.19 presents the results of several scenarios developed to explore the Project's sensitivity to adjustments in key evaluation inputs. In the scenarios below, the discount rate and initial capital cost were varied. The sensitivity scenarios are as follows:

- Increase of the discount rate (in real terms) to 8% and 10%.
- Escalation of initial capital costs by 25%.

Table 7.19: Project Sensitivity Analysis

	Base Case	Sensitivity Cases		
		A	B	C
	Discounted NPV (at 6%)	Discounted NPV (at 8%)	Discounted NPV (at 10%)	Discounted NPV (at 6%) (Capital Cost Increases by 25%)
Benefits:				
Travel Time Savings	$334.0 million	$248.37 million	$187.31 million	$334.0 million
Vehicle Operating Costs	$22.925 million	$17.25 million	$13.16 million	$22.925 million
Safety Benefits	$14.125 million	$10.69 million	$8.20 million	$14.125 million
Present Value of Benefits	**$371.05 million**	**$276.31 million**	**$208.67 million**	**$371.05 million**
Costs:				
Capital costs	-$449.0 million	-$412.5 million	-$380.15 million	-$561.25 million
O&M costs	-$5.25 million	-$3.95 million	-$3.00 million	-$5.25 million
Salvage value of asset	$83.70 million	$52.45 million	$33.15 million	$130.77 million
Present Value of Costs	**-$370.55 million**	**-$364.00 million**	**-$350.00 million**	**-$435.73 million**
Net Present Value	**$0.50 million**	**-$87.69 million**	**-$141.33 million**	**-$64.68 million**
Benefit Cost Ratio	**1.00 to 1**	**0.76 to 1**	**0.60 to 1**	**0.85 to 1**

8.0 PROJECT PERFORMANCE MEASURES

The primary objectives of this project are to provide additional capacity along Highway 1 in both directions of travel between 216 Street and Highway 11 to address current and future congestion as well as various safety issues.

Noting the capacity and safety objectives, performance measures will focus on throughput and travel time as well as a reduction in vehicle collisions. The following specific performance measures are proposed:

- **Traffic Throughput** during the weekday AM and PM peak periods in both the eastbound and westbound directions of travel (target threshold):
    - Between 232 Street and 264 Street (>4700 vph);
        - Current volumes ~ 3500 to 3600 vph
    - Between 264 Street and Mt. Lehman Road (>4400 vph)
        - Current volumes ~ 3500 to 3600 vph
    - Between Mt. Lehman Road and Clearbrook Road (>3900 vph)
        - Current volumes ~ 3500 to 3600 vph
    - Between McCallum Road and Highway 11 (>4200 vph)
        - Current volumes ~ 3500 to 3600 vph
- **Level of Service**
    - As calculated using the Highway Capacity Manual for freeway segments; and,
    - Level of Service not exceeding LOS D for any highway segment within the highway section. Current LOS is E / F for all of the study segments during the AM or PM peak hours.
- **Travel Time** during the weekday AM and PM peak periods in both the eastbound and westbound directions of travel where free flow speeds and associated travel times represent the target threshold:
    - Between 200 Street and 264 Street (@ free flow speed = 8.7 min)
        - Current travel time is approximately 14 to 15 min (EB – PM Peak)
    - Between 264 Street and Mt. Lehman Road (@ free flow speed = 5.7 min)
        - Current travel time is approximately 9 to 10 min (EB – PM Peak)
    - Between Mt. Lehman Road and Highway 11 (@ free flow speed = 5.5 min)
        - Current travel time is approximately 8 to 9 min (WB – AM Peak)

- **Reduction in vehicle collisions** over the entire highway study section. The target threshold should aim for a collision rate that is less the existing collision rate for any segment within the highway section. The current collision rate as calculated in Section 7 is approximately 0.25 collisions per million vehicle kilometres travelled – averaged over the period between 2016 to 2041. The collision rate associated with the Highway 1 Widening Project is predicted to be approximately 0.22 collisions per million vehicles kilometres travelled.

To calculate the change in each performance measure in addressing the primary project objectives, additional "before" and "after" data collection activities are recommended. The "before" data collection activities should be undertaken at the outset of the project to confirm / validate the values presented above. According to the proposed schedule, the before data collection activities would be conducted either in the spring or fall of 2017. The "after" data collection activities are recommended to be conducted at the completion of the entire project. This could either occur in the fall of 2024 or the spring of 2025. The "before" and "after" data collection activities should be conducted in the same season such that the data is directly comparable.

The collision data statistics should be collected over a three to five year time frame leading up to initial construction and the after substantial completion of the entire project.

9.0 PROJECT RISK MANAGEMENT

As with any project, the Highway 1 project has uncertainties and risks that could impact the project objectives (scope, budget, and schedule). These uncertainties and risks need to be identified, addressed, and managed for the project to be implemented successfully. This section discusses risk management planning, identified project risks, risk responses strategies, and the overall risk impact profile of the Highway 1 project.

9.1 Risk Management Planning Methodology

The Risk Management Plan for this project followed a systematic process to identify project risks, conduct a qualitative analysis, and propose a response strategy for identified risks. The process included the following steps.

9.1.1 RISK IDENTIFICATION

Determining which risks will affect the project and documenting their characteristics. Risk identification used the following risk breakdown structure:

- Environmental and Archaeological (EA);
- Structural and Geotechnical (SG);
- Design (D);
- Right-of-Way (RW);
- Utility (U);
- Hydraulics (H);
- Partner / Stakeholder (PS);
- Project Management (PM);
- Contracting (CG); and
- Construction (CN).

A review of functional project design documents was conducted to identify project risks. The functional design documents included:

- Highway 1 Functional Planning Background and Problem Definition, July 2014;
- Highway 1 Function Planning Option Generation & Evaluation Criteria, July 2014;

- Highway 1 Corridor Planning Study - Draft Functional Planning Report, undated and ongoing;
- Environmental Constraints Review of the Highway 1 Corridor Between 216 Street and Highway 11, Draft Report, dated October 2014;
- Archaeological and Heritage Resources Review of Proposed Improvements along Highway 1 Between 216 Street and Highway 11, Draft Report, dated December 2014; and
- Geotechnical Overview Assessment – Highway 1 Corridor 216 Street to Highway 11, Draft Report, dated December 2013.

9.1.2 QUALITATIVE RISK ANALYSIS

Prioritizing risks for further analysis or action by assessing and combining their probability of occurrence and impact to the project.

9.1.3 QUANTITATIVE RISK ANALYSIS

Numerically analyzing the effect of identified potential high impact risks on overall project objectives (Scope, Cost, and Schedule).

9.1.4 RISK RESPONSE PLANNING

Developing options, and determining actions to be taken to reduce threats to the projects objectives. Planned risk responses must be appropriate to the significance of the risk, cost effective, timely, realistic within the project context, agreed upon by all parties involved, and owned by a responsible person.

For this project, the following strategies were used to respond to risks:

- Avoidance – the team changes the project plan to eliminate the risk or to protect the project objectives from its impact. The team might achieve this by changing scope, adding time, or adding resources.
- Transference – the ownership and responsibility for its management to a third party; it does not eliminate it. Transferring liability for risk is most effective in dealing with financial risk exposure.
- Mitigation – the team seeks to reduce the probability or consequences of a risk event to an acceptable threshold. Mitigation costs should be appropriate, given the probability of the risk and its consequences.

- Acceptance – the Project Manager and team decide to include a Risk Response Allowance in the project plan to deal with a risk. A response strategy will be developed and the project team will implement it, if the risk occurs.
- Recognized - But No Action Taken – the Project Manager and team decide not to change the project plan to deal with a risk, or cannot identify a suitable response action. Cost risks will be referred to the project contingency, and for schedule risks no action will be taken, leaving the project team to deal with the risk as it occurs.

9.2 Project Risks and Response Strategies

The results of the Risk Management process were documented in a project risk register. A summary of the project risks identified and response strategies are shown in ***Table 9.1***. A detailed Project Risk Register is attached as ***Appendix A***.

Table 9.1: Summary of Project Risks and Response Strategies

Risk Identification					Risk-Response Strategy	
Risk Event	Risk Description	Risk Trigger	Impact Area	Affected WBS	Strategy	ACTION TO BE TAKEN
Soft Soil Issues in Project Area	Poor road subgrade conditions may be encountered in between 232 Street and 248 Street, near Townline Road, and near the south side of the Hwy 11 interchange.	Geotechnical investigation	Scope	WBS 1.4 & 1.7	Mitigate	Preloading / surcharging the insitu soils to consolidate soils and reduce differential settlement.
Interchange Configuration Enhancement	Should MoTI decide to place greater emphasis on Provincially significant traffic movements at the 264 St Interchange and add directional ramps.	Detailed design	Scope	WBS 1.3	Avoid	Confirm the design objectives for the 264 Street Interchange during the detailed design process.
Liquefaction	Liquefaction and softening soils under seismic conditions are a design concern primarily near the south side of the Hwy 11 interchange.	Detailed design	Scope	WBS 1.4 to 1.7	Avoid	On the south side of Highway 1 use deep foundations for the ramp abutment and mechanically stabilized earth embankments for the road fills and ramp approach.
Environmental Permits	Environmental permits within the Design Bid Build Contract process could cause undo delay to the project schedule.	Detailed design	Schedule	WBS 1.2 to 1.7	Avoid	MoTI to obtain all necessary environmental permits and provide to the successful contractor.
Archaeological Artifacts	Four pre-contact archaeological sites and one historical archaeological site exist within one kilometre of the project. Potential for encountering archaeological artifacts is greatest at the water courses and the undisturbed areas such as the 272 St overpass, Bradner Rd crossing and Townline overpass.	Archaeological artifacts uncovered during construction.	Scope	WBS 1.4 to 1.7	Accept	If Archaeological artifacts are found, construction stops in the vicinity of the affected area and the artifacts are removed by an archaeological team.
Species at Risk	Should Species at Risk be encountered in the project area during construction. There are 77 Species at Risk that may potentially be encountered in the project area along Highway 1.	Construction encounters Species at Risk.	Scope	WBS 1.2 to 1.7	Accept	Should Species at Risk be encountered in the project area, project work would stop while species are relocated.

Risk Identification					Risk-Response Strategy	
Risk Event	Risk Description	Risk Trigger	Impact Area	Affected WBS	Strategy	ACTION TO BE TAKEN
Nesting Birds Impact	Should birds be nesting in trees within the project area, possibly in the trees located within the Highway 1 median. An existing stick nest of an unknown raptor is located near 216 Street.	Tree removal during construction.	Scope	WBS 1.4 to 1.7	Avoid	Clearing and grubbing to be undertaken outside the period of Mar. 1 to Aug. 1, which is the breeding bird period to avoid impacting active nests.
Fish Habitat Impacts	Should fish be encountered in the 7 river/creeks and / or tributaries located within the project area.	Construction encounters fish in creeks.	Scope	WBS 1.4 to 1.7	Transfer	Take actions to salvage fish and protect habitat prior to construction.
Steel Cost and Schedule Volatility	The price and delivery time of steel is very volatile and often mirrors the state of the general economy.	The procurement of the steel for the bridge.	Scope	WBS 1.1	Mitigate	The estimate for steel costs and schedule for delivery will be reviewed and updated at the time of tender for construction.
Fortis Gas Lines	Fortis gas line crossings of Highway 1. Potential impacts due to preloading of road or deep fills, especially at Townline Rd.	Detailed Design	Scope	WBS 1.2 to 1.7	Mitigate	Detailed design to review potential impacts of road preloading or deep road fills on crossing gas lines and recommend appropriate response strategy.
Funding Agreements	Agreement for partial funding of the project with other levels of government could take longer than anticipated.	Detailed Design	Schedule	WBS 1.1	Mitigate	Engage potential funding partners as early as possible to mitigate impacts to construction schedules.
Traffic Management	Maintaining adequate traffic flow during the reconstruction of the 232 St and 264 St interchanges, the RBC rail overpass, and the Glover Road overpass.	Detailed Design	Scope	WBS 1.2, 1.3 & 1.4	Avoid	Build temporary detour ramps and highway median crossovers to maintain traffic flow while avoiding the active construction areas.
Available Construction Windows (Days & Hours)	Construction on site will be restricted by fish windows and noise control bylaws.	Establishing the project base schedule timeline, and onsite construction.	Schedule	WBS 1.4 to 1.7	Transfer	Work to comply with all construction window regulations or obtain permission for variance.

10.0 LEGAL REQUIREMENTS

The Province of British Columbia will manage the delivery of this project and confirms the following legal requirements:

- That the project will adhere to all applicable legislation and that all necessary permits and authorizations required for the project will be obtained;
- That the contract award process for eligible expenditures to be funded under the project will be in accordance with the Provinces' policies and procedures and will be transparent, competitive, fair, consistent with value for money principles, or in a manner otherwise acceptable to Canada, and if applicable, in accordance and consistent with the Agreement on Internal Trade and international trade agreements; and
- That an environmental impact assessment, Aboriginal consultations, and an Archaeological Impact Assessment have be conducted as part of this project. Consultation Logs from engagements with First Nations are available upon request.

11.0 PROJECT BUDGET

The project cost estimate along with the estimated cash flow, as per the suggested implementation schedule outlined in Section 6, are summarized herein. The cash flow projection has also be prepared recognizing both eligible and ineligible costs as per Infrastructure Canada guidelines.

11.1 Project Cost Estimate

The project cost estimate is partitioned by work package and work activity, as shown in ***Table 11.1***. The cost estimate was prepared using an Elemental Parametric Estimating Method. This method of estimating builds up the estimate of a project from the expected cost of its elements and its parameters. The project cost estimate is divided into the project elemental tasks and grouped by the six work packages.

Table 11.1: Project Cost Estimate Summary

	Highway 1 Widening Cost Estimate Summary						Total
	Package 1	Package 2	Package 3	Package 4	Package 5	Package 6	
Project Management	4.5	3.4	4.1	3.5	6.5	8.3	30.3
Engineering	6.5	5.2	5.9	5.7	10.6	12.9	46.8
Grade Construction	14.1	15.3	15.6	31.8	55.1	43.6	175.0
Structural	33.7	19.1	31.6	0.0	7.0	39.5	130.9
Paving Construction	1.9	2.8	2.2	5.6	9.2	7.5	29.2
Operational Construction	0.8	0.7	0.4	1.3	1.6	2.2	6.9
Utilities	0.6	0.4	0.2	0.1	0.6	1.4	3.3
Resident Engineering	4.4	3.3	4.1	3.5	6.5	8.2	30.0
Contingency (30%)	19.9	15.1	18.5	15.5	29.1	37.1	135.0
Total ($M)	86.4	65.3	82.5	67.0	126.2	160.7	588.3
Total (rounded) $M	87	66	83	67	127	161	591

11.2 Potential Project Cost Sharing and Cash Flow Projection

A calculation of the potential funding for this project from Infrastructure Canada is based on eligible project costs. For provincially-owned assets, federal funding of 50 percent of the total eligible costs is requested. The funding contribution calculation and cash flow projection is shown in ***Table 11.2***.

Table 11.2: Project Cash Flow Projection

Cost Type	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	Total
A: Non-Eligible Costs									
Project Management	$50,000	$600,000	$1,000,000	$1,500,000	$1,400,000	$1,800,000	$1,500,000	$800,000	$ 8,700,000
Planning	$ 250,000								$ 250,000
Environmental									$ -
Stakeholder Relations		$ 120,000	$ 180,000	$ 230,000	$ 210,000	$ 260,000	$ 210,000	$ 120,000	$ 1,400,000
Corporate Services									$ -
Engineering	$ 200,000								$ 200,000
Propety Acquisition									$ -
Regional Recoveries									$ -
Contingency	$ 150,000	$ 200,000	$ 400,000	$ 500,000	$ 500,000	$ 600,000	$ 500,000	$ 300,000	$ 3,200,000
Sub-Total	**$ 650,000**	**$ 900,000**	**$ 1,600,000**	**$ 2,230,000**	**$ 2,100,000**	**$ 2,700,000**	**$ 2,200,000**	**$ 1,200,000**	**$ 13,600,000**
B: Eligible Costs									
Engineering External		$ 16,600,000	$ 8,400,000	$ 7,900,000	$ 14,600,000	$ 18,100,000			$ 65,600,000
Environmental External (included in Engineering)									$ -
Construction Supervision		$ 1,800,000	$ 3,400,000	$ 4,600,000	$ 3,800,000	$ 5,000,000	$ 7,400,000	$ 4,100,000	$ 30,100,000
Construction (Road and Bridge)		$ 20,400,000	$ 39,600,000	$ 54,400,000	$ 44,400,000	$ 56,200,000	$ 83,900,000	$ 47,100,000	$ 346,000,000
First Nations Consultation & Accomodation		$ 80,000	$ 150,000	$ 200,000	$ 170,000	$ 220,000	$ 320,000	$ 180,000	$ 1,300,000
Contingency		$ 11,700,000	$ 15,500,000	$ 20,100,000	$ 18,900,000	$ 23,900,000	$ 27,500,000	$ 15,400,000	$ 133,000,000
Sub-Total	**$ -**	**$ 50,600,000**	**$ 67,100,000**	**$ 87,200,000**	**$ 81,900,000**	**$ 103,400,000**	**$ 119,100,000**	**$ 67,000,000**	**$ 576,300,000**
TOTAL	**$ 650,000**	**$ 52,000,000**	**$ 69,000,000**	**$ 90,000,000**	**$ 84,000,000**	**$ 107,000,000**	**$ 122,000,000**	**$ 69,000,000**	**$ 590,000,000**
Federal Contribution	$ -	$ 25,300,000	$ 33,550,000	$ 43,600,000	$ 40,950,000	$ 51,700,000	$ 59,550,000	$ 33,500,000	$ 288,150,000

12.0 CONCLUSIONS

There are a number issues currently present, or predicted to occur within the short term future, along Highway 1 from 216 Street to Highway 11. These issues include:

- Limited or insufficient capacity during the weekday AM and PM peak periods along most segments of the Highway 1 section between 216 Street and Highway 11;
- High collisions rates that exceed other similar provincial facilities;
- Vertical clearance issues at a number of existing structures including Glover Road, CP Rail overpass / portal, 232 Street, 264 Street, and Peardonville Road; and,
- Interchange configurations that no longer operate well under the higher traffic volumes experienced today or forecasted in the future planning horizon.

To address these issues, the preferred solution is to widen of Highway 1 by adding one lane in each direction into the median from 216 Street to Highway 11. The project will include the demolition of existing underpasses and reconfiguration of two interchanges, the 232 Street interchange and the 264 Street interchange. In addition, to accommodate the Highway 1 widening a number of grade separated crossings will need to be upgraded to achieve added crossing width and/or higher clearance under the structures. Consequently, the following scope of work is included in the proposed Highway 1 Widening project:

- Demolition and reconstruction of the Glover Road underpass structure;
- Demolition and reconstruction of the rail underpass structures at the CP Rail lane (Roberts Bank Corridor);
- Widening of the two overhead structures at Bradner Road;
- Upgrade of the entrance and exit ramps to the Bradner Rest Area along the westbound lanes of Highway 1;
- Demolition and reconstruction of the Peardonville Road underpass structure;
- New structure for the eastbound off-ramp to Highway 11; and
- Upgrade of the Highway 11 on-ramp to Highway 1 eastbound.

The estimated benefits of widening the highway over this section shows a benefit to cost ratio of 1.0. However, it should be noted that the estimated benefits are considered conservative and that the construction costs are high, due to the need to replace several overpass structures.

APPENDIX A

Project Risk Management Register

QUANTITATIVE RISK ANALYSIS

Project Title	Highway 1 Widening (216 St to Highway 11) Project		
Start Date	10/30/2016	Target Completion Date	06/30/24
Project #	SW1200F	Estimated CN Duration	96.0Mo
Last Review Date	9/19/2016	Estimated PE Cost	77.0 $M
Project Manager	MoTI - TBA	Estimated ROW Cost	1.0 $M
Est $ Impact of Significant Project Risks (exp. Value)	17.8$M	Estimated CN Cost	500.0 $M

RISK MANAGEMENT SUMMARY RESULTS

Planned and Actual	MIN	MAX	LIKELY
Planned Cost to Respond			40.1 $M
Est. $ of Cost Avoided (via risk management)	-23.6 $M	-11.5 $M	-17.6 $M
Actual Cost to Respond			0.0 $M
Est. Actual $ Cost Avoided (via risk management)	0.0 $M	0.0 $M	0.0 $M

Proactive Risk Management: Develop an action response strategy; assign risk owners to implement action; monitor and record effectiveness of the risk response action.

Risk Breakdown Structure (functional assignment)	Planned Response Cost	Likely Cost Avoidance	Risk Breakdown Structure (functional assignment)	Planned Response Cost	Likely Cost Avoidance
Environmental & Archaeological	0.8 $M	-0.1 $M	Hydraulics	0.0 $M	0.0 $M
Structural & Geotechnical	4.8 $M	4.8 $M	Partner / Stakeholder	0.2 $M	-0.1 $M
Design	31.0 $M	######	Project Management	3.0 $M	-0.3 $M
Right-of-Way	0.0 $M	0.0 $M	Contracting	0.0 $M	0.0 $M
Utility	0.3 $M	-0.1 $M	Construction	0.0 $M	0.0 $M

Risk Identification

Risk ID# (1)	Status (2)	RBS Group (3)	Project Phase--Date Identified (4)	WBS Group (5)	Summary Description Threat and/or Opportunity (6)	Detailed Description of Risk Event (Specific, Measurable, Attributable, Relevant, Time bound) [SMART] (7)	Risk Trigger (8)
SG1	Dormant	Structural & Geotechnical	9/17/16 Scoping / Pre-design	Road Works	Threat Soft soil issues in project area. Threat	Poor road subgrade conditions may be encountered in between 232 Street and 248 Street, near Townline Road, and near the south side of the Hwy 11 interchange.	Geotechnical investigation & Detailed Design
U1	Dormant	Utility	9/17/16 Scoping / Pre-design	Utilities	Threat Fortis Gas Line Threat	Fortis gas line crossings of Highway 1. Potential impacts due to preloading of road or deep fills, especially at Townline Rd.	Detailed Design
D1	Dormant	Design	9/16/16 Scoping / Pre-design	All Construction	Threat Interchange Configuration Enhancement Threat	Should MoTI decide to place greater emphasis on Provincially significant traffic movements at the 264 St Interchange and add directional ramps.	Detailed Design
SG2	Dormant	Structural & Geotechnical	9/16/16 Scoping / Pre-design	Road Works	Threat Liquefaction. Threat	Liquefaction and softening soils under seismic conditions are a design concern primarily near the south side of the Hwy 11 interchange.	Detailed Design
EA1	Dormant	Environment & Archaeologic	9/16/16 Scoping / Pre-design	Road Works	Threat Presence of archaeological artifacts in the work area. Threat	Four pre-contact archaeological sites and one historical archaeological site exist within one kilometre of the project. Potential for encountering archaeological artifacts is greatest at the water courses and the undisturbed areas such as the 272 St overpass, Bradner Rd crossing and Townline overpass.	Archaeological artifacts uncovered during construction.

Quantitative Analysis

Type (9); Probability (10); Risk Impact ($M and / or Mo) [10a], (11); Estimated Expected Risk Impact ($M) ([min + (4 X ML) + max] X [probability])/6 (12)

Risk ID#	Type	Probability	MIN	MAX	Most Likely	Est. Expected Risk Impact
SG1	Cost	90%	0.2$M	0.5$M	0.3$M	0.3$M
SG1	Schedule		4.0Mo	12.0Mo	10.0Mo	8.4Mo
U1	Cost	80%	0.10$M	0.40$M	0.30$M	0.2$M
U1	Schedule		2.0Mo	4.0Mo	3.0Mo	2.4Mo
D1	Cost	50%	25.00$M	35.00$M	31.00$M	15.33$M
D1	Schedule		5.0Mo	9.0Mo	7.0Mo	3.5Mo
SG2	Cost	95%	0.8$M	3.0$M	1.5$M	1.6$M
SG2	Schedule		6.0Mo	12.0Mo	10.0Mo	9.2Mo
EA1	Cost	15%	0.20$M	1.00$M	0.50$M	0.08$M
EA1	Schedule		3.0Mo	8.0Mo	5.0Mo	0.8Mo

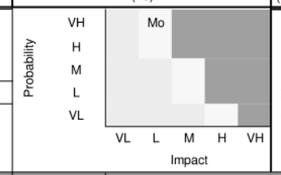
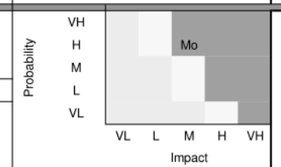
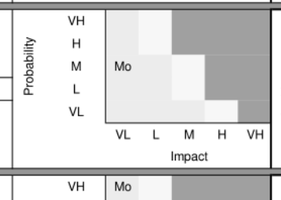
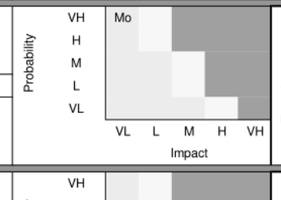
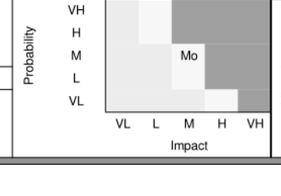
Qualitative Display of Most Likely Impact / Response / Monitoring and Control / Critical Issue

Risk ID#	Probability (13)	Impact (14)	Risk Matrix (15) (Probability VH/H/M/L/VL vs. Impact VL/L/M/H/VH)	Strategy (16)	ACTION TO BE TAKEN Response Actions including advantages and disadvantages include date (17)	Risk Owner (18)	Risk Review Dates (19)	Date, Status and Review Comments (Do not delete prior comments, therefore providing a history) (20)	Is Risk on Critical Path? (21)
SG1	Very High	Cost: NO RISK Schedule: Moderate	Mo: Probability VH, Impact M	Mitigation	Preloading / surcharging the insitu soils to consolidate soils and reduce differential settlement.	MoTI Project Manager	2016-Oct-1 2024-Dec-1		YES
U1	Very High	Cost: NO RISK Schedule: Very Low	Mo: Probability VH, Impact VL	Mitigation	Detailed design to review potential impacts of road preloading or deep road fills on crossing gas lines and recommend appropriate response strategy.	MoTI Project Manager	2016-Oct-1 2024-Dec-1		YES
D1	Moderate	Cost: High Schedule: Low	Mo: Probability M, Impact L; $: Probability M, Impact H	Avoidance	Confirm the design objectives for the 264 Street Interchange during the detailed design process.	MoTI Project Manager	2017-Jan-1 2017-Jun-1		YES
SG2	Very High	Cost: NO RISK Schedule: Moderate	Mo: Probability VH, Impact M	Avoidance	On the south side of Highway 1 use deep foundations for the ramp abutment and mechanically stabilized earth embankments for the road fills and ramp approach.	MoTI Project Manager	2017-Jan-1 2017-Jun-1		YES
EA1	Very Low	Cost: NO RISK Schedule: Very Low	Mo: Probability VL, Impact VL	Acceptance	If Archaeological artifacts are found, construction stops in the vicinity of the affected area and the artifacts are removed by an archaeological team.	MoTI Project Manager	2016-Mar-1 2016-Dec-1		YES

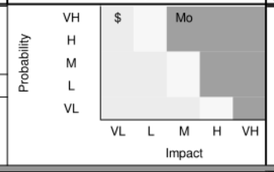
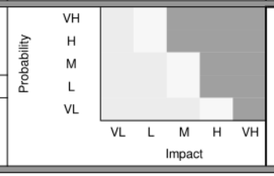
Response Cost & Cost Avoidance (based on estimated expected values)

Risk ID#	Estimated Response $ Entered: Planned Cost to Respond [$M] (enter single number estimate) (22)	Calculated Est. Cost Avoidance: Est Cost Avoided [$M] (Expected Value of Risk) - (Est. Cost to Respond) (23)	Actual Response $ Entered: Actual Cost to Respond [$M] (24)	Calculated Actual Cost Avoidance: Est. Actual Costs Avoided [$M] (25)
SG1	$0.3	-$0.1 $0.2 $0.0		$0.0 $0.0 $0.0
U1	$0.3	-$0.2 $0.0 -$0.1		$0.0 $0.0 $0.0
D1	$31.00	-$18.5 -$13.5 -$15.5		$0.0 $0.0 $0.0
SG2	$1.5	-$0.7 $1.4 -$0.1		$0.0 $0.0 $0.0
EA1	$0.10	$0.0 $0.0 $0.0		$0.0 $0.0 $0.0

QUANTITATIVE RISK ANALYSIS

Risk Identification								Quantitative Analysis					Qualitative Display of Most Likely Impact			Response		Monitoring and Control			Critical Issue		Estimated Response $ Entered	Calculated Est. Cost Avoidance	Actual Response $ Entered	Calculated Actual Cost Avoidance
Risk ID#	Status	RBS Group	Project Phase--Date Identified	WBS Group	Summary Description Threat and/or Opportunity	Detailed Description of Risk Event (Specific, Measurable, Attributable, Relevant, Time bound) [SMART]	Risk Trigger	Type	Probability	Risk Impact ($M and / or Mo)		Estimated Expected Risk Impact ($M) ((min + (4 X ML) + max) X (probability))/6	Probability	Impact	Risk Matrix	Strategy	ACTION TO BE TAKEN Response Actions including advantages and disadvantages include date	Risk Owner	Risk Review Dates	Date, Status and Review Comments (Do not delete prior comments, therefore providing a history)	Is Risk on Critical Path?		**Planned Cost to Respond [$M]** (enter single number estimate)	Est Cost Avoided [$M] (Expected Value of Risk) - (Est. Cost to Respond)	**Actual Cost to Respond [$M]**	**Est. Actual Costs Avoided [$M]**
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	[10a]	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)		(22)	(23)	(24)	(25)
EA2	Dormant	Environment & Archaeologi	9/16/16	All Construction	Threat Environmental Permits Threat	Environmental permits within the Design Bid Build Contract process could cause undo delay to the project schedule.	Detailed Design	Cost	90%	MIN	0.02$M	0.04$M	Very High	NO RISK		Avoidance	MoTI to obtain all necessary environmental permits and provide to the successful contractor.	MoTI Project Manager	2016-Jun-1 2016-Jan-1		YES		**$0.05**	$0.0 $0.0 $0.0		$0.0 $0.0 $0.0
			Scoping / Pre-design							MAX	0.07$M															
										Most Likely	0.05$M															
								Schedule		MIN	5.0Mo	6.8Mo														
										MAX	12.0Mo															
										Most Likely	7.0Mo															
EA3	Dormant	Environment & Archaeologi	9/16/16	All Construction	Threat Species at Risk Threat	Should Species at Risk be encountered in the project area during construction. There are 77 Species at Risk that may potentially be encountered in the project area along Highway 1.	Construction encounters Species at Risk.	Cost	70%	MIN	0.30$M	0.28$M	High	NO RISK		Acceptance	Should Species at Risk be encountered in the project area, project work would stop while species are relocated.	MoTI Project Manager	2016-Dec-1 2016-Mar-1		YES		**$0.28**	$0.0 $0.0 $0.0		$0.0 $0.0 $0.0
			Scoping / Pre-design							MAX	0.50$M															
										Most Likely	0.40$M															
								Schedule		MIN	6.0Mo	8.4Mo														
										MAX	18.0Mo															
										Most Likely	12.0Mo															
EA4	Dormant	Environment & Archaeologi	9/16/16	All Construction	Threat Nesting birds impact Threat	Should birds be nesting in trees within the project area possibly in the trees located within the Highway 1 median. An existing stick nest of an unknown raptor is located near 216 Street.	Tree removal during construction.	Cost	50%	MIN	0.02$M	0.04$M	Moderate	NO RISK		Avoidance	Clearing and grubbing to be undertaken outside the period of Mar. 1 to Aug. 1, which is the breeding bird period to avoid impacting active nests.	MoTI Project Manager	2016-Dec-1 2016-Mar-1		YES		**$0.08**	-$0.1 $0.0 $0.0		$0.0 $0.0 $0.0
			Scoping / Pre-design							MAX	0.10$M															
										Most Likely	0.08$M															
								Schedule		MIN	2.0Mo	2.2Mo														
										MAX	8.0Mo															
										Most Likely	4.0Mo															
EA5	Dormant	Environment & Archaeologi	9/16/16	All Construction	Threat Fish habitat impacts Threat	Should fish be encountered in the 7 river/creeks and / or tributaries located within the project area.	Construction encounters fish in creeks.	Cost	95%	MIN	0.20$M	0.29$M	Very High	NO RISK		Transference	Take actions to salvage fish and protect habitat prior to construction.	Contractor	2016-Dec-1 2016-Mar-1		YES		**$0.30**	-$0.1 $0.1 $0.0		$0.0 $0.0 $0.0
			Scoping / Pre-design							MAX	0.40$M															
										Most Likely	0.30$M															
								Schedule		MIN	1.0Mo	3.2Mo														
										MAX	7.0Mo															
										Most Likely	3.0Mo															
PM1	Dormant	Structural & Geotechnical	9/16/16	Procurement	Threat Steel Cost and Schedule Volatility Threat	The price of steel, and the time for manufacture and delivery, are very volatile and often mirrors the state of the general economy, currency exchange rates, and the relationship of supply and demand.	The procurement of the steel for the bridge.	Cost	50%	MIN	1.0$M	1.4$M	Moderate	Very Low		Mitigation	The estimate for steel costs and schedule for delivery will be reviewed and updated at the time of tender for construction.	MoTI Project Manager	2016-Dec-1 2016-Mar-1		YES		**$3.00**	-$2.5 -$1.0 -$1.5		$0.0 $0.0 $0.0
			Scoping / Pre-design							MAX	4.0$M															
										Most Likely	3.0$M															
								Schedule		MIN	1.0Mo	1.3Mo		NO RISK												
										MAX	6.0Mo															
										Most Likely	2.0Mo															
PSI	Dormant	Partner / Stakeholder	9/16/16	Procurement	Threat Funding Agreements Threat	Agreement for partial funding of the project with other levels of government could take longer than anticipated.	Functional and detailed design	Cost	50%	MIN	0.1$M	0.1$M	Moderate	NO RISK		Mitigation	Engage potential funding partners as early as possible to mitigate impacts to construction schedules.	MoTI Project Manager	2016-Dec-1 2016-Mar-1		YES		**$0.2**	-$0.2 -$0.1 -$0.1		$0.0 $0.0 $0.0
			Scoping / Pre-design							MAX	0.3$M															
										Most Likely	0.2$M															
								Schedule		MIN	6.0Mo	6.5Mo														
										MAX	24.0Mo															
										Most Likely	12.0Mo															

QUANTITATIVE RISK ANALYSIS

Risk Identification								Quantitative Analysis					Qualitative Display of Most Likely Impact			Response			Monitoring and Control			Critical Issue		Estimated Response $ Entered	Calculated Est. Cost Avoidance	Actual Response $ Entered	Calculated Actual Cost Avoidance
Risk ID#	Status	RBS Group	Project Phase--Date Identified	WBS Group	Summary Description Threat and/or Opportunity	Detailed Description of Risk Event (Specific, Measurable, Attributable, Relevant, Time bound) [SMART]	Risk Trigger	Type	Probability	Risk Impact ($M and / or Mo)		Estimated Expected Risk Impact ($M) ((min + (4 X ML) + max) X (probability))/6	Probability	Impact	Risk Matrix	Strategy	ACTION TO BE TAKEN Response Actions including advantages and disadvantages include date	Risk Owner	Risk Review Dates	Date, Status and Review Comments (Do not delete prior comments, therefore providing a history)	Is Risk on Critical Path?		**Planned Cost to Respond [$M]** (enter single number estimate)	Est Cost Avoided [$M] (Expected Value of Risk) - (Est. Cost to Respond)	**Actual Cost to Respond [$M]**	**Est. Actual Costs Avoided [$M]**
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	[10a]	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)		**(22)**	**(23)**	**(24)**	**(25)**
PM1	Dormant	Project Management	9/16/16 Scoping / Pre-design	Road Works	Threat Traffic Management Threat	Maintaining adequate traffic flow during the reconstruction of the 232 St and 264 St interchanges, the RBC rail overpass, and the Glover Road overpass.	Detailed Design	Cost	90%	MIN	2.0$M	2.9$M	Very High	Very Low		Avoidance	Build temporary detour ramps and highway median crossovers to maintain traffic flow while avoiding the active construction areas.	MoTI Project Manager	2016-Dec-1 2016-Mar-1		YES		$3.0	-$1.2 $1.5 -$0.3		$0.0 $0.0 $0.0
										MAX	5.0$M															
										Most Likely	3.0$M															
								Schedule		MIN	6.0Mo	11.7Mo		Moderate												
										MAX	24.0Mo															
										Most Likely	12.0Mo															
			11/28/14	Utilities	Threat Threat			Cost	0%	MIN		0.0$M	NO RISK	NO RISK								YES		$0.0	$0.0 $0.0 $0.0		$0.0 $0.0 $0.0
										MAX																
										Most Likely																
								Schedule		MIN	0.0Mo	0.0Mo														
										MAX	0.0Mo															
										Most Likely	0.0Mo															

APPENDIX B

Project Cost Estimate

APPENDIX B

PACKAGE 1 – SECTIONS

ID	Chainage Start	Chainage End	Description
W.13	7+600	8+800	Highway 1 Westbound Local Widening around 232 Street
E.15	7+600	8+800	Highway 1 Eastbound Local Widening around 232 Street
72.1			72 Avenue Overpass
231.1			232 Street Overpass Replacement
232.2			Highway 1 Eastbound Off Ramp
232.3			Highway 1 Eastbound On Ramp
232.4			Highway 1 Westbound Off Ramp
232.5			Highway 1 Westbound On Ramp

File: Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 1 -	72 Avenue New Overpass and approaches	8+800 to 7+600 East and west of 232 St Interchange	8+800 to 7+600 East of 232 St IC to east of CP Rail Overpass	232 St New Overpass and approaches	232 St Interchange EB Off Ramp Loop	232 St Interchange EB On Ramp	232 St Interchange WB off Ramp Loop	232 St Interchange WB On Ramp			Total Line Cost
Parsons **Hwy 1 Widening**											
(2016Dollars) **Package 1 - 232 IC**											
ACTIVITY **EST.DATE April 4, 2016**	0	0	0	0	0	0	0	0			
CODE R3 DATE: Sept 15, 2016	0	Interchange	Rail Overpass	0	0	0	0	0			C/LM
Conceptual Est. Divison\site	**Section 72.1**	**Section W.13**	**Section E.15**	**Section 232.1**	**Section 232.2**	**Section 232.3**	**Section 232.4**	**Section 232.5**	**MR**	**5120**	
Blk Est. # 6.14A Road Type	21	16	16	21	21	21	21	21	OR	0	
Version Sept.1, 200 DESCRIPTION \Length	570	1200	1400	555	575	460	200	160	TR	5120	5120
	MR	MR	MR	MR	MR	MR	MR	MR			
Engineering	5,684,592	1,162,546	1,414,130	4,652,283	597,120	397,531	152,392	219,751		14,280,346	2789
Land	0	0	0	0	0	0	0	0		0	0
Construction	29,483,844	5,394,490	6,610,587	24,327,114	2,806,850	1,770,429	648,855	1,098,028		72,140,198	14090
Management Reserve	0	0	0	0	0	0	0	0		0	0
Escalation	0	0	0	0	0	0	0	0		0	0
Total	35,168,436	6,557,036	8,024,717	28,979,398	3,403,970	2,167,960	801,247	1,317,779		86,420,544	16879
BASIC QUANTITY SUMMARY											
Construct.Cost ONLY Per L.M.	51,726	4,495	4,722	43,833	4,881	3,849	3,244	6,863	$/LM	14,090	
Land Area	1.6	1.9	4.5	2.1	1.3	1.1	0.5	0.7	ha	13.7	
Mobilization	607,395	106,409	131,565	500,446	56,095	35,127	12,782	22,136		1,471,954	
Land Cont.	0	0	0	0	0	0	0	0		0	
Construction Cont.	6,273,266	1,145,509	1,403,122	5,171,249	595,024	375,605	137,651	232,800		15,334,226	16,647,738
Engineering Cont.	1,311,829	268,280	326,338	1,073,604	137,797	91,738	35,167	50,712		3,295,465	
Supervision Cont.	530,698	99,373	122,398	442,701	52,711	32,956	12,084	20,591		1,313,512	
Total Cont.	8,115,793	1,513,162	1,851,858	6,687,553	785,532	500,298	184,903	304,103		19,943,202	
S.G.S.B.	3,977	8,714	6,512	6,405	3,333	2,666	1,159	2,505	m3	35,271	
C.B.C.	2,288	4,611	3,484	3,944	1,845	1,476	642	1,346	m3	19,635	
Asphalt	1,338	1,971	4,812	2,420	1,645	1,316	572	1,188	t	15,261	
Concrete Barrier	0	115	185	100	80	0	80	0	lm	560	
Noise Attentuation Wall	0	0	0	0	0	0	0	0	m2	0	
No. of Light Poles	0	0	0	24	19	15	7	5	ea	70	
Sidewalk	0	0	0	0	0	0	0	0	lm	0	
Curb and Gutter	0	0	0	0	0	0	0	0	lm	0	
Signals	0	0	0	0	0	0	0	0	ea	0	
Bridge total area	2289	0	0	2099	0	0	0	0	m2	4,388	
											ENG
Total Rock	0	0	0	0	0	0	0	0	m3	0	0
Total OM	570	21,130	19,090	15,492	14,384	5,706	2,220	3,719	m3	82,311	0
Total Stripping	0	5,500	6,300	0	0	0	0	838	m3	12,638	0
Total Borrow	0	0	0	0	0	0	0	0	m3	0	
Total Cut/Excavation	570	26,630	25,390	15,492	14,384	5,706	2,220	4,556	m3	94,948	0
Total Fill	14,749	18,251	27,784	33,772	18,513	12,509	1,702	2,851	m3	130,131	0
Surplus or Deficit	-14,179	8,380	-2,394	-18,280	-4,130	-6,802	518	1,705	m3	-35,183	
ENG & PM	**5.685**	**1.163**	**1.414**	**4.652**	**0.597**	**0.398**	**0.152**	**0.220**		**14.280**	14.281
LAND	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**		**0.000**	0.000
CONST.	**1.780**	**5.394**	**6.611**	**4.584**	**2.807**	**1.770**	**0.649**	**1.098**		**24.693**	24.693
BRIDGES-R/W	**27.704**	**0.000**	**0.000**	**19.743**	**0.000**	**0.000**	**0.000**	**0.000**		**47.447**	47.447
MANAGEMENT RESERVE	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**		**0.000**	0.000
ESCALATION	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**		**0.000**	0.000
TOTAL (Millions) (2016Dollars)	**35.169**	**6.557**	**8.025**	**28.979**	**3.404**	**2.168**	**0.801**	**1.318**		**86.420**	86.421
TOTAL Cost per meter	**$ 61,699**	**$ 5,464**	**$ 5,732**	**$ 52,215**	**$ 5,920**	**$ 4,713**	**$ 4,006**	**$ 8,236**		**$ 16,879**	
Construction cost per meter	**$ 51,726**	**$ 4,495**	**$ 4,722**	**$ 43,832**	**$ 4,882**	**$ 3,848**	**$ 3,245**	**$ 6,863**		**$ 14,090**	

File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 1 -	72 Avenue New Overpass and approaches	8+800 to 7+600 East and west	8+800 to 7+600 East of 232 St IC	232 St New Overpass and approaches	232 St Interchange EB Off Ramp Loop	232 St Interchange EB On Ramp	232 St Interchange WB off Ramp Loop	232 St Interchange WB On Ramp			Total Line Cost
	Parsons **Hwy 1 Widening**											
	(2016Dollars) **Package 1 - 232 IC**											
ACTIVITY	**EST.DATE April 4, 2016**	0	of 232 St	to east of CP	0	0	0	0	0			C/LM
CODE	R3 DATE: Sept 15, 2016	0	Interchange	Rail Overpass	0	0	0	0	0			
Conceptual Est.	Divison\site	**Section 72.1**	**Section W.13**	**Section E.15**	**Section 232.1**	**Section 232.2**	**Section 232.3**	**Section 232.4**	**Section 232.5**	**MR**	**5120**	
Blk Est. # 6.14A	Road Type	21	16	16	21	21	21	21	21	OR	0	
Version Sept.1, 200	DESCRIPTION \Length	570	1200	1400	555	575	460	200	160	TR	5120	5120
		MR	MR	MR	MR	MR	MR	MR	MR			
	SUMMARY BY ACTIVITY LEVEL											Cost/LM
2000	PROJECT MANAGEMENT	1,811,318	337,714	413,306	1,492,557	175,318	111,659	41,267	67,871		4,451,010	869
2500	PLANNING	0	0	0	0	0	0	0	0		0	0
3000	PRELIMINARY DESIGN	220,634	195,600	228,200	181,490	93,725	74,980	32,600	26,080		1,053,309	206
3500	DETAILED DESIGN	2,340,812	360,952	446,287	1,904,632	190,280	119,154	43,357	75,088		5,480,563	1070
	Total Engineering	2,561,446	556,552	674,487	2,086,123	284,005	194,134	75,957	101,168		6,533,872	1276
4000	LAND ACQUISITION	0	0	0	0	0	0	0	0		0	0
5000	GRADE CONSTRUCTION	1,034,183	3,306,529	3,822,775	2,516,522	1,584,918	957,193	294,744	588,383		14,105,247	2755
5200	ROAD SIDE CONSTRUCTION	0	0	0	0	0	0	0	0		0	0
5300	OTHER CONSTRUCTION	0	0	0	0	0	0	0	0		0	0
5500	STRUCTURAL CONSTRUCTION	19,649,825	0	0	14,003,921	0	0	0	0		33,653,746	6573
6000	PAVING CONSTRUCTION	163,812	293,377	619,831	280,405	204,493	160,532	78,277	141,276		1,942,003	379
6500	OPERATIONAL CONSTRUCTION	6,067	53,457	74,469	381,149	136,501	88,292	65,817	30,341		836,092	163
6700	UTILITY CONSTRUCTION	57,000	165,000	160,000	55,500	57,500	46,000	20,000	16,000		577,000	113
6800	RESIDENT ENGINEERING	1,768,994	331,244	407,993	1,475,668	175,703	109,852	40,281	68,636		4,378,372	855
											0	0
	Total Construction	22,679,880	4,149,608	5,085,067	18,713,165	2,159,115	1,361,868	499,119	844,637		55,492,460	10838
9700	CONTINGENCY	8,115,793	1,513,162	1,851,858	6,687,553	785,532	500,298	184,903	304,103		19,943,202	3895
	SUB-TOTAL	35,168,436	6,557,036	8,024,717	28,979,398	3,403,970	2,167,960	801,247	1,317,779		86,420,544	16879
9800	MANAGEMENT RESERVE	0	0	0	0	0	0	0	0		0	0
	TOTAL	35,168,436	6,557,036	8,024,717	28,979,398	3,403,970	2,167,960	801,247	1,317,779		86,420,544	16879
9900	ESCALATION	0	0	0	0	0	0	0	0		0	0
	TOTAL COST	35,168,436	6,557,036	8,024,717	28,979,398	3,403,970	2,167,960	801,247	1,317,779		86,420,544	16879
	Const. Less Resident Eng.	20,910,886	3,818,363	4,677,074	17,237,496	1,983,412	1,252,016	458,838	776,001		51,114,088	9983

File: Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 1 -	72 Avenue New Overpass and approaches	8+800 to 7+600 East and west of 232 St	8+800 to 7+600 East of 232 St IC to east of CP Rail Overpass	232 St New Overpass and approaches	232 St Interchange EB Off Ramp Loop	232 St Interchange EB On Ramp	232 St Interchange WB off Ramp Loop	232 St Interchange WB On Ramp			Total Line Cost
Parsons **Hwy 1 Widening**											
(2016Dollars) **Package 1 - 232 IC**											
ACTIVITY **EST.DATE April 4, 2016**											
CODE R3 DATE: Sept 15, 2016											C/LM
Conceptual Est. Divison\site	**Section 72.1**	**Section W.13**	**Section E.15**	**Section 232.1**	**Section 232.2**	**Section 232.3**	**Section 232.4**	**Section 232.5**	**MR**	**5120**	
Blk Est. # 6.14A Road Type	21	16	16	21	21	21	21	21	OR	0	
Version Sept.1, 200 DESCRIPTION \Length	570	1200	1400	555	575	460	200	160	TR	5120	5120
	MR	MR	MR	MR	MR	MR	MR	MR			
2500 PLANNING											
2521 Consultant - transport. planning study	0	0	0	0	0	0	0	0		0	0
2531 Consultant - corridor study	0	0	0	0	0	0	0	0		0	0
2541 Consultant - functional plan. study	0	0	0	0	0	0	0	0		0	0
2502 Consultant - general	0	0	0	0	0	0	0	0		0	0
Consultant sub-total	0	0	0	0	0	0	0	0		0	0
2510 Client - project ident.	0	0	0	0	0	0	0	0		0	0
2520 Client - transport. planning study	0	0	0	0	0	0	0	0		0	0
2530 Client - corridor study	0	0	0	0	0	0	0	0		0	0
2540 Client - functional plan. study	0	0	0	0	0	0	0	0		0	0
2501 Client - general	0	0	0	0	0	0	0	0		0	0
Client Sub-total	0	0	0	0	0	0	0	0		0	0
2599 Planning Contingency	0	0	0	0	0	0	0	0		0	0
TOTAL PLANNING	0	0	0	0	0	0	0	0		0	0
3000 PRELIMINARY DESIGN											
3013 Consultant - aerial base plan	0	0	0	0	0	0	0	0		0	0
3014 Consultant - prel. design	39,900	84,000	98,000	38,850	40,250	32,200	14,000	11,200		358,400	70
3015 Consultant - control survey	0	0	0	0	0	0	0	0		0	0
3021 Consultant - environmental impact	15,960	33,600	39,200	15,540	16,100	12,880	5,600	4,480		143,360	28
3031 Consultant - funct.-road field survey	0	0	0	0	0	0	0	0		0	0
3041 Consultant - functional design	28,500	60,000	70,000	27,750	28,750	23,000	10,000	8,000		256,000	50
3051 Consultant - funct. structural des.	127,724	0	0	91,025	0	0	0	0		218,749	43
3061 Consultant - geotechnical design	8,550	18,000	21,000	8,325	8,625	6,900	3,000	2,400		76,800	15
3071 Consultant - right-of-way research	0	0	0	0	0	0	0	0		0	0
3002 Consultant - general	0	0	0	0	0	0	0	0		0	0
Consultant sub-total	220,634	195,600	228,200	181,490	93,725	74,980	32,600	26,080		1,053,309	206
3010 Client - aerial base plan	0	0	0	0	0	0	0	0		0	0
3011 Client - prel. design	0	0	0	0	0	0	0	0		0	0
3012 Client - control survey	0	0	0	0	0	0	0	0		0	0
3020 Client - environmental impact	0	0	0	0	0	0	0	0		0	0
3030 Client - funct.-road field survey	0	0	0	0	0	0	0	0		0	0
3040 Client - functional design	0	0	0	0	0	0	0	0		0	0
3050 Client - funct. structural des.	0	0	0	0	0	0	0	0		0	0
3060 Client - geotechnical design	0	0	0	0	0	0	0	0		0	0
3070 Client - right-of-way research	0	0	0	0	0	0	0	0		0	0
3001 Client - general	0	0	0	0	0	0	0	0		0	0
Client Sub-total	0	0	0	0	0	0	0	0		0	0
3099 Preliminary design Contingency	66,190	58,680	68,460	54,447	28,118	22,494	9,780	7,824		315,993	62
TOTAL PRELIMINARY DESIGN	286,824	254,280	296,660	235,938	121,843	97,474	42,380	33,904		1,369,302	267
6700 UTILITIES											
6710 Util. Prov. - Hydro	34,200	65,000	60,000	33,300	34,500	27,600	12,000	9,600		276,200	54
6711 Util. Prov. - Telephone	22,800	0	0	22,200	23,000	18,400	8,000	6,400		100,800	20
Util. Prov. sub-total	57,000	65,000	60,000	55,500	57,500	46,000	20,000	16,000		377,000	74
6712 Util.Others - pipelines	0	100,000	100,000	0	0	0	0	0		200,000	39
6713 Util.Others - telecommunication	0	0	0	0	0	0	0	0		0	0
6714 Util.Others - storm & sewer inspect.	0	0	0	0	0	0	0	0		0	0
6715 Util.Others - waterworks inspect.	0	0	0	0	0	0	0	0		0	0
6716 Util.Others - engineering services	0	0	0	0	0	0	0	0		0	0
6717 Util.Others - parks/recreation-prel.	0	0	0	0	0	0	0	0		0	0
6718 Util.Others - transit	0	0	0	0	0	0	0	0		0	0
6719 Util.Others - tr-ops/signs & detours	0	0	0	0	0	0	0	0		0	0
6701 Util.Others - general	0	0	0	0	0	0	0	0		0	0
Util.Others sub-total	0	100,000	100,000	0	0	0	0	0		200,000	39
6799 Util.Others Contingency	17,100	49,500	48,000	16,650	17,250	13,800	6,000	4,800		173,100	34
TOTAL UTILITIES	74,100	214,500	208,000	72,150	74,750	59,800	26,000	20,800		750,100	147
5000 GRADE CONSTRUCTION											
5032 Grade Const - water	0	50,000	50,000	0	0	0	0	0		100,000	20
5033 Grade Const - sanitary	0	0	0	0	0	0	0	0		0	0

File: Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 1 -	72 Avenue New Overpass and approaches	8+800 to 7+600 East and west of 232 St	8+800 to 7+600 East of 232 St IC to east of CP Rail Overpass	232 St New Overpass and approaches	232 St Interchange EB Off Ramp Loop	232 St Interchange EB On Ramp	232 St Interchange WB off Ramp Loop	232 St Interchange WB On Ramp			Total Line Cost
Parsons **Hwy 1 Widening**											
(2016Dollars) **Package 1 - 232 IC**											
ACTIVITY **EST.DATE April 4, 2016**											
CODE R3 DATE: Sept 15, 2016	0	Interchange	Rail Overpass	0	0	0	0	0			C/LM
Conceptual Est. Divison\site	**Section 72.1**	**Section W.13**	**Section E.15**	**Section 232.1**	**Section 232.2**	**Section 232.3**	**Section 232.4**	**Section 232.5**	**MR**	**5120**	
Blk Est. # 6.14A Road Type	21	16	16	21	21	21	21	21	OR	0	
Version Sept.1, 200 DESCRIPTION \Length	570	1200	1400	555	575	460	200	160	TR	5120	5120
	MR	MR	MR	MR	MR	MR	MR	MR			
5034 Grade Const - storm	0	0	0	0	0	0	0	0		0	0
5031 Grade Const - mobilization	0	1,500	1,500	0	0	0	0	0		3,000	1
5039 Grade Const - utility contingency	0	15,450	15,450	0	0	0	0	0		30,900	6
Grade Const. Utilities Sub-total	0	66,950	66,950	0	0	0	0	0		133,900	26
5010 Grade Const - site prep./clear,grubbing	46,800	0	0	0	0	0	0	0		46,800	9
5020 Grade Const - road grade/exc,placing,fill	466,925	1,630,715	1,870,120	1,632,847	1,130,760	603,512	142,860	272,791		7,750,530	1514
5030 Grade Const - drainage/pipe,cul.	0	500,000	1,000,000	0	0	0	0	0		1,500,000	293
5040 Grade Const - muiltiplate	0	0	0	0	0	0	0	0		0	0
5050 Grade Const -SGSB/produce,place,comp	278,407	610,011	455,810	448,339	233,289	186,631	81,144	175,347		2,468,978	482
5051 Grade Const -CBC/produce,place,comp	205,893	415,014	313,558	354,995	166,040	132,832	57,753	121,095		1,767,180	345
5060 Grade Const - grade finishing landscaping	0	0	0	0	0	0	0	0		0	0
5061 Grade Const - grade finishing hydro seed.	6,036	4,482	21,943	7,044	8,666	6,338	4,403	2,013		60,927	12
5062 Grade Const - grade finishing fencing	0	0	0	0	0	0	0	0		0	0
5063 Grade Const - noise barriers	0	0	0	0	0	0	0	0		0	0
5064 Grade Const - passing lanes	0	0	0	0	0	0	0	0		0	0
5090 Grade Const - sidewalks,curb & gutter	0	0	0	0	0	0	0	0		0	0
5005 Grade Const -detours c/w ex,bf,paving	0	0	0	0	0	0	0	0		0	0
5001 Grade Const - mobilization	30,122	94,807	109,843	73,297	46,163	27,879	8,585	17,137		407,832	80
5099 Grade Const - Contingency	310,255	976,509	1,131,382	754,956	475,476	287,158	88,423	176,515		4,200,674	820
Grade Construction Sub-total	1,344,438	4,231,538	4,902,657	3,271,478	2,060,394	1,244,350	383,168	764,898		18,202,921	3555
GRADE CONSTRUCTION COSTS	1,344,438	4,298,488	4,969,607	3,271,478	2,060,394	1,244,350	383,168	764,898		18,336,821	3581
3510 Grade Eng. - detailed design	94,111	300,894	347,872	229,003	144,228	87,105	26,822	53,543		1,283,577	251
3519 Grade Eng. - detailed design/Contingency	28,233	90,268	104,362	68,701	43,268	26,131	8,047	16,063		385,073	75
6810 Grade Eng. - general const. supervision	40,333	128,955	149,088	98,144	61,812	37,331	11,495	22,947		550,105	107
6811 Grade Eng. - quality assurance	26,889	85,970	99,392	65,430	41,208	24,887	7,663	15,298		366,736	72
6812 Grade Eng. - surveying	26,889	85,970	99,392	65,430	41,208	24,887	7,663	15,298		366,736	72
6819 Grade Eng. - Residency Contingency	28,233	90,268	104,362	68,701	43,268	26,131	8,047	16,063		385,073	75
Grade Engineering Sub-total	244,688	782,325	904,468	595,409	374,992	226,472	69,736	139,211		3,337,301	652
Total Grade Const. & Eng. Costs	1,589,125	5,080,813	5,874,075	3,866,887	2,435,386	1,470,822	452,904	904,110		21,674,122	4233
5500 STRUCTURAL CONSTRUCTION											
5522 Struct.Const - water	0	0	0	0	0	0	0	0		0	0
5523 Struct.Const - sanitary	0	0	0	0	0	0	0	0		0	0
5524 Struct.Const - storm	0	0	0	0	0	0	0	0		0	0
5521 Struct.Const - mobilization	0	0	0	0	0	0	0	0		0	0
5599 Struct.Const - utility contingency	0	0	0	0	0	0	0	0		0	0
Structural Const. Utilities Sub-total	0	0	0	0	0	0	0	0		0	0
5510 Struct.Const - tunnel site preparation	0	0	0	0	0	0	0	0		0	0
5511 Struct.Const - tunnel construction	0	0	0	0	0	0	0	0		0	0
5512 Struct.Const - snow shed site prep.	0	0	0	0	0	0	0	0		0	0
5513 Struct.Const - snow shed site const.	0	0	0	0	0	0	0	0		0	0
5514 Struct.Const - bridge site preparation	0	0	0	1,000,000	0	0	0	0		1,000,000	195
5515 Struct.Const - bridge piers	0	0	0	0	0	0	0	0		0	0
5516 Struct.Const - bridge abutments	0	0	0	0	0	0	0	0		0	0
5517 Struct.Const - bridge superstructure	17,165,100	0	0	12,596,040	0	0	0	0		29,761,140	5813
5518 Struct.Const - retain. wall site prep.	0	0	0	0	0	0	0	0		0	0
5519 Struct.Const - retaining wall const.	1,912,400	0	0	0	0	0	0	0		1,912,400	374
5501 Struct.Const - mobilization	572,325	0	0	407,881	0	0	0	0		980,206	191
5529 Struct.Const - Contingency	5,894,948	0	0	4,201,176	0	0	0	0		10,096,124	1972
Structural Construction Sub-total	25,544,773	0	0	18,205,098	0	0	0	0		43,749,870	8545
STRUCTURAL CONSTRUCTION COSTS	25,544,773	0	0	18,205,098	0	0	0	0		43,749,870	8545
3520 Struct. Eng. - detailed design	2,043,582	0	0	1,456,408	0	0	0	0		3,499,990	684
3529 Struct. Eng. - detailed design/Contingency	613,075	0	0	436,922	0	0	0	0		1,049,997	205
6820 Struct. Eng. - general const. supervision	1,021,791	0	0	728,204	0	0	0	0		1,749,995	342
6821 Struct. Eng. - quality assurance	510,895	0	0	364,102	0	0	0	0		874,997	171
6822 Struct. Eng. - surveying	127,724	0	0	91,025	0	0	0	0		218,749	43
6829 Struct. Eng. - Residency Contingency	498,123	0	0	354,999	0	0	0	0		853,122	167
Structural Engineering Sub-total	4,815,190	0	0	3,431,661	0	0	0	0		8,246,851	1611
Total Structural & Eng. Costs	30,359,962	0	0	21,636,758	0	0	0	0		51,996,721	10156

File: Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 1 -	72 Avenue New Overpass and approaches	8+800 to 7+600 East and west of 232 St	8+800 to 7+600 East of 232 St IC to east of CP Rail Overpass	232 St New Overpass and approaches	232 St Interchange EB Off Ramp Loop	232 St Interchange EB On Ramp	232 St Interchange WB off Ramp Loop	232 St Interchange WB On Ramp			Total Line Cost
Parsons **Hwy 1 Widening**											
(2016Dollars) **Package 1 - 232 IC**											
ACTIVITY **EST.DATE April 4, 2016**											
CODE R3 DATE: Sept 15, 2016	0	Interchange	Rail Overpass	0	0	0	0	0			C/LM
Conceptual Est. Divison\site	**Section 72.1**	**Section W.13**	**Section E.15**	**Section 232.1**	**Section 232.2**	**Section 232.3**	**Section 232.4**	**Section 232.5**	**MR**	**5120**	
Blk Est. # 6.14A Road Type	21	16	16	21	21	21	21	21	OR	0	
Version Sept.1, 200 DESCRIPTION \Length	570	1200	1400	555	575	460	200	160	TR	5120	5120
	MR	MR	MR	MR	MR	MR	MR	MR			
6000 PAVING CONSTRUCTION											
6020 Paving Cons - machine paving asphalt	159,041	284,832	601,777	272,238	198,537	155,856	75,997	137,162		1,885,440	368
6030 Paving Cons - machine paving concrete	0	0	0	0	0	0	0	0		0	0
6040 Paving Cons - hot reprofiling	0	0	0	0	0	0	0	0		0	0
6050 Paving Cons - shoulder paving	0	0	0	0	0	0	0	0		0	0
6060 Paving Cons - pavement finishing	0	0	0	0	0	0	0	0		0	0
6070 Paving Cons - seal coating	0	0	0	0	0	0	0	0		0	0
6001 Paving Cons - mobilization	4,771	8,545	18,053	8,167	5,956	4,676	2,280	4,115		56,563	11
6010 Paving Cons - pavement design	0	0	0	0	0	0	0	0		0	0
6099 Paving Cons - Contingency	49,144	88,013	185,949	84,121	61,348	48,160	23,483	42,383		582,601	114
PAVING CONSTRUCTION COSTS	212,955	381,390	805,780	364,526	265,841	208,692	101,760	183,659		2,524,604	493
3560 Paving Eng. - detailed design	14,907	26,697	56,405	25,517	18,609	14,608	7,123	12,856		176,722	35
3569 Paving Eng. - detailed design/Contingency	4,472	8,009	16,921	7,655	5,583	4,383	2,137	3,857		53,017	10
6860 Paving Eng. - general const. supervision	4,259	7,628	16,116	7,291	5,317	4,174	2,035	3,673		50,492	10
6861 Paving Eng. - quality assurance	8,518	15,256	32,231	14,581	10,634	8,348	4,070	7,346		100,984	20
6862 Paving Eng. - surveying	1,065	1,907	4,029	1,823	1,329	1,043	509	918		12,623	2
6869 Paving Eng. - Residency Contingency	4,153	7,437	15,713	7,108	5,184	4,069	1,984	3,581		49,230	10
Paving Engineering Sub-total	37,374	66,934	141,414	63,974	46,655	36,625	17,859	32,232		443,068	87
Total Paving Const. & Eng. Costs	250,329	448,325	947,194	428,500	312,496	245,317	119,619	215,892		2,967,671	580
6500 OPERATIONAL CONSTRUCTION											
6510 Operat.Cons - lighting	0	0	0	132,000	104,500	82,500	38,500	27,500		385,000	75
6520 Operat.Cons - signals	0	0	0	200,000	0	0	0	0		200,000	39
6530 Operat.Cons - signing	1,140	2,400	2,800	1,110	1,150	920	400	320		10,240	2
6540 Operat.Cons - guard rail	0	34,500	55,500	30,000	24,000	0	24,000	0		168,000	33
6550 Operat.Cons - pavement markings	4,750	15,000	14,000	6,938	2,875	2,300	1,000	1,638		48,500	9
6501 Operat.Cons - mobilization	177	1,557	2,169	11,101	3,976	2,572	1,917	884		24,352	5
6599 Operat.Cons - contingency	1,820	16,037	22,341	114,345	40,950	26,487	19,745	9,102		250,828	49
OPERATIONAL CONSTRUCTION COSTS	7,887	69,494	96,810	495,494	177,451	114,779	85,562	39,444		1,086,920	212
3540 Operat. Eng - detailed design	552	4,865	6,777	34,685	12,422	8,035	5,989	2,761		76,084	15
3549 Operat. Eng - detailed design/Contingency	166	1,459	2,033	10,405	3,726	2,410	1,797	828		22,825	4
6840 Operat. Eng - general const. supervision	434	3,822	5,325	27,252	9,760	6,313	4,706	2,169		59,781	12
6841 Operat. Eng - quality assurance	158	1,390	1,936	9,910	3,549	2,296	1,711	789		21,738	4
6842 Operat. Eng - surveying	39	347	484	2,477	887	574	428	197		5,435	1
6849 Operat. Eng - Residency Contingency	189	1,668	2,323	11,892	4,259	2,755	2,053	947		26,086	5
Operational Enginering Sub-total	1,538	13,551	18,878	96,621	34,603	22,382	16,685	7,692		211,949	41
Total Operational Const.& Eng.Costs	9,425	83,045	115,688	592,115	212,054	137,161	102,247	47,135		1,298,869	254
5200 ROAD SIDE CONSTRUCTION											
5203 RoadSide C - water	0	0	0	0	0	0	0	0		0	0
5204 RoadSide C - sanitary	0	0	0	0	0	0	0	0		0	0
5205 RoadSide C - storm	0	0	0	0	0	0	0	0		0	0
5202 RoadSide C - mobilization	0	0	0	0	0	0	0	0		0	0
5209 RoadSide C - Utility Contingency	0	0	0	0	0	0	0	0		0	0
Road Side Const. Utilities Sub-total	0	0	0	0	0	0	0	0		0	0
5210 RoadSide C - weighscales	0	0	0	0	0	0	0	0		0	0
5220 RoadSide C - safety rest areas	0	0	0	0	0	0	0	0		0	0
5230 RoadSide C - tourist rest & view areas	0	0	0	0	0	0	0	0		0	0
5201 RoadSide C - mobilization	0	0	0	0	0	0	0	0		0	0
5299 RoadSide C - Contingency	0	0	0	0	0	0	0	0		0	0
Road Side Construction Sub-total	0	0	0	0	0	0	0	0		0	0
ROAD SIDE CONSTRUCTION COSTS	0	0	0	0	0	0	0	0		0	0
3550 RoadSide E - detailed design	0	0	0	0	0	0	0	0		0	0
3559 RoadSide E - detailed design/Contingency	0	0	0	0	0	0	0	0		0	0
6850 RoadSide E - general const. supervision	0	0	0	0	0	0	0	0		0	0
6851 RoadSide E - quality assurance	0	0	0	0	0	0	0	0		0	0
6852 RoadSide E - surveying	0	0	0	0	0	0	0	0		0	0
6859 RoadSide E - Residency Contingency	0	0	0	0	0	0	0	0		0	0

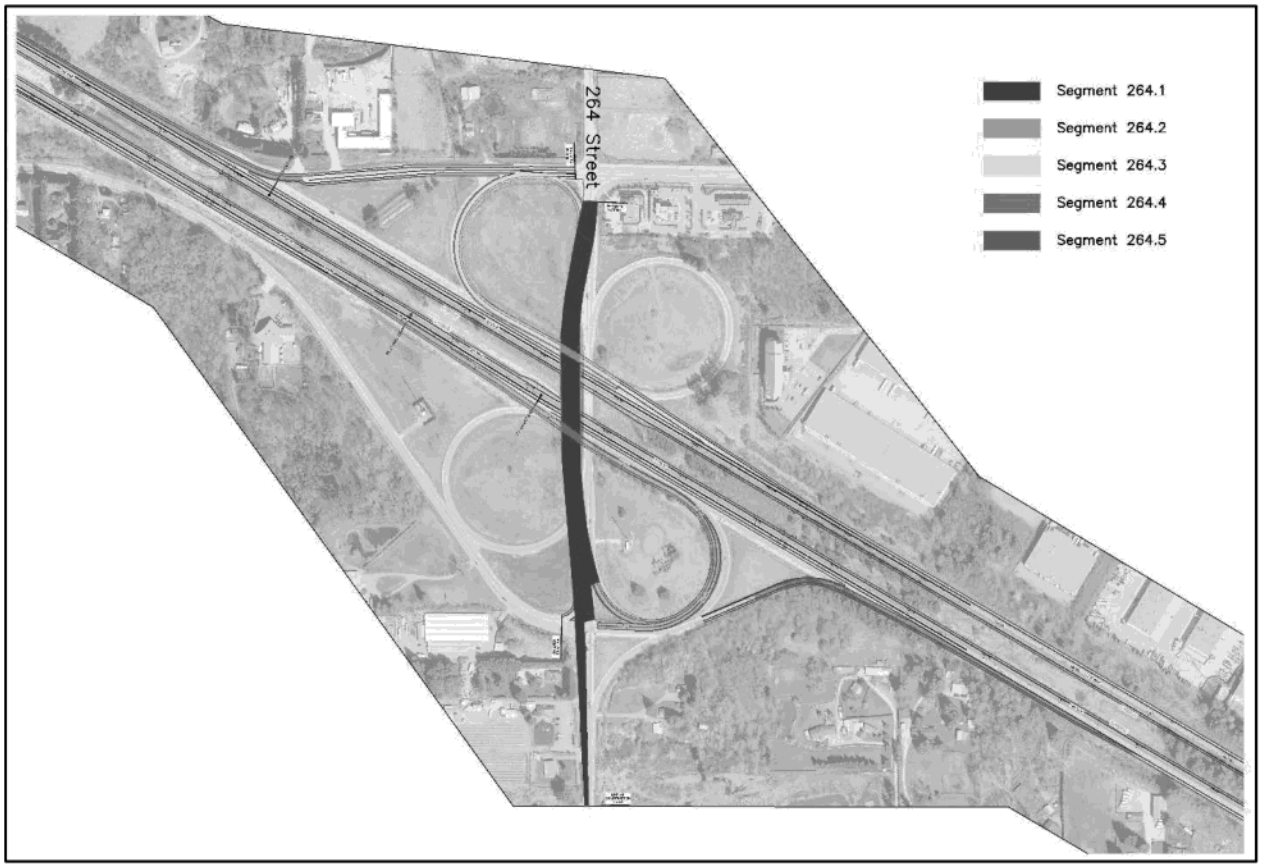
File: Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 1 - Parsons (2016Dollars) **Hwy 1 Widening** **Package 1 - 232 IC** ACTIVITY CODE **EST.DATE April 4, 2016** R3 DATE: Sept 15, 2016 Conceptual Est. Blk Est. # 6.14A Version Sept.1, 200		Divison\site Road Type DESCRIPTION \Length	72 Avenue New Overpass and approaches 0 0 **Section 72.1** 21 570 MR	8+800 to 7+600 East and west of 232 St Interchange 0 0 **Section W.13** 16 1200 MR	8+800 to 7+600 East of 232 St IC to east of CP Rail Overpass 0 0 **Section E.15** 16 1400 MR	232 St New Overpass and approaches 0 0 **Section 232.1** 21 555 MR	232 St Interchange EB Off Ramp Loop 0 0 **Section 232.2** 21 575 MR	232 St Interchange EB On Ramp 0 0 **Section 232.3** 21 460 MR	232 St Interchange WB off Ramp Loop 0 0 **Section 232.4** 21 200 MR	232 St Interchange WB On Ramp 0 0 **Section 232.5** 21 160 MR	**MR** OR TR	**5120** 0 5120	Total Line Cost C/LM 5120
	Road Side Engineering Sub-total	0	0	0	0	0	0	0	0		0	0
	Total Road Side Const.& Eng.Costs	0	0	0	0	0	0	0	0		0	0
5300	OTHER CONSTRUCTION											
5303	Other Const - water	0	0	0	0	0	0	0	0		0	0
5304	Other Const - sanitary	0	0	0	0	0	0	0	0		0	0
5305	Other Const - storm	0	0	0	0	0	0	0	0		0	0
5302	Other Const - mobilization	0	0	0	0	0	0	0	0		0	0
5309	Other Const - utility contingency	0	0	0	0	0	0	0	0		0	0
	Other Const. Utilities Sub-total	0	0	0	0	0	0	0	0		0	0
5310	Other Const - railroads main & spur lines	0	0	0	0	0	0	0	0		0	0
5320	Other Const - railroad crossings	0	0	0	0	0	0	0	0		0	0
5330	Other Const - marine work	0	0	0	0	0	0	0	0		0	0
5340	Other Const - environmental mitigations	0	0	0	0	0	0	0	0		0	0
5301	Other Const - mobilization	0	0	0	0	0	0	0	0		0	0
5399	Other Const - Contingency	0	0	0	0	0	0	0	0		0	0
	Other Construction Sub-total	0	0	0	0	0	0	0	0		0	0
	OTHER CONSTRUCTION COSTS	0	0	0	0	0	0	0	0		0	0
3570	Other Eng. - detailed design	0	0	0	0	0	0	0	0		0	0
3579	Other Eng. - detailed design/Contingency	0	0	0	0	0	0	0	0		0	0
6870	Other Eng. - general const. supervision	0	0	0	0	0	0	0	0		0	0
6871	Other Eng. - quality assurance	0	0	0	0	0	0	0	0		0	0
6872	Other Eng. - surveying	0	0	0	0	0	0	0	0		0	0
6879	Other Eng. - Residency Contingency	0	0	0	0	0	0	0	0		0	0
	Other Engineering Sub-total	0	0	0	0	0	0	0	0		0	0
	Total Other Const.& Eng.Costs	0	0	0	0	0	0	0	0		0	0
3500	DETAILED DESIGN											
	from 3510,3520,3540,3550,3570	2,799,097	432,193	534,370	2,269,296	227,835	142,672	51,915	89,908		6,547,286	1279
3530	Geotech. En - detailed design	187,660	28,496	35,233	159,020	15,022	9,407	3,423	5,928		444,189	87
3539	Geotech. En - Contingency	56,298	8,549	10,570	47,706	4,507	2,822	1,027	1,778		133,257	26
	TOTAL DETAILED DESIGN COSTS	3,043,055	469,238	580,173	2,476,022	247,364	154,901	56,364	97,615		7,124,732	1392
6800	RESIDENT ENGINEERING											
	from 6810,6820,6840,6850,6860,6870	2,299,692	430,617	530,391	1,918,369	228,414	142,807	52,365	89,227		5,691,883	
	TOTAL RESIDENT ENG. COSTS	2,299,692	430,617	530,391	1,918,369	228,414	142,807	52,365	89,227		5,691,883	1112
											0	
											0	0
	PART 1 SUMMARY											
	CONSTRUCTION	20,910,886	3,818,363	4,677,074	17,237,496	1,983,412	1,252,016	458,838	776,001		51,114,088	9983
	ENGINEERING & SUPERVISION	4,330,439	887,796	1,082,480	3,561,791	459,708	303,986	116,238	169,804		10,912,244	2131
	CONTRACTUAL CONTINGENCY	7,572,398	1,411,848	1,727,866	6,239,786	732,936	466,801	172,523	283,742		18,607,900	3634
											0	0
	CONSTRUCTION COST TOTAL	32,813,723	6,118,008	7,487,420	27,039,074	3,176,057	2,022,803	747,599	1,229,547		80,634,232	15749
2000	PROJECT MANAGEMENT											
2060	Project Man. - office costs wages	738,309	137,655	168,467	608,379	71,461	45,513	16,821	27,665		1,814,270	354
2062	Project Man. - office costs - expenses	0	0	0	0	0	0	0	0		0	0
2063	Project Man. - printing costs	0	0	0	0	0	0	0	0		0	0
2061	Project Man. - general	0	0	0	0	0	0	0	0		0	0
	Project Manager Sub-total	738,309	137,655	168,467	608,379	71,461	45,513	16,821	27,665		1,814,270	354
2010	Client - office costs wages	656,274	122,360	149,748	540,781	63,521	40,456	14,952	24,591		1,612,685	315
2012	Client - office costs - expenses	0	0	0	0	0	0	0	0		0	0
2030	Client - printing costs	0	0	0	0	0	0	0	0		0	0
2011	Client - general	0	0	0	0	0	0	0	0		0	0
	Client Sub-total	656,274	122,360	149,748	540,781	63,521	40,456	14,952	24,591		1,612,685	315

File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 1 -	72 Avenue New Overpass and approaches	8+800 to 7+600 East and west of 232 St	8+800 to 7+600 East of 232 St IC to east of CP Rail Overpass	232 St New Overpass and approaches	232 St Interchange EB Off Ramp Loop	232 St Interchange EB On Ramp	232 St Interchange WB off Ramp Loop	232 St Interchange WB On Ramp			Total Line Cost
Parsons	**Hwy 1 Widening**											
(2016Dollars)	**Package 1 - 232 IC**											
ACTIVITY	**EST.DATE April 4, 2016**	0	0	0	0	0	0	0	0			
CODE	R3 DATE: Sept 15, 2016		Interchange	Rail Overpass								C/LM
Conceptual Est.	Divison\site	**Section 72.1**	**Section W.13**	**Section E.15**	**Section 232.1**	**Section 232.2**	**Section 232.3**	**Section 232.4**	**Section 232.5**	**MR**	**5120**	
Blk Est. # 6.14A	Road Type	21	16	16	21	21	21	21	21	OR	0	
Version Sept.1, 200	DESCRIPTION \Length	570	1200	1400	555	575	460	200	160	TR	5120	5120
		MR	MR	MR	MR	MR	MR	MR	MR			
2070	Public Rel. - wages & expenses	196,882	36,708	44,925	162,234	19,056	12,137	4,486	7,377		483,805	94
2072	Public Rel. - adv., media, displays	0	0	0	0	0	0	0	0		0	0
2073	Public Rel. - opening ceremonies	0	0	0	0	0	0	0	0		0	0
2071	Public Rel. - general	0	0	0	0	0	0	0	0		0	0
	Public Relations Sub-total	196,882	36,708	44,925	162,234	19,056	12,137	4,486	7,377		483,805	94
2040	Legal Costs - lawyers fees	22,970	4,283	5,241	18,927	2,223	1,416	523	861		56,444	11
2041	Legal Costs - general	0	0	0	0	0	0	0	0		0	0
	Legal Costs Sub-total	22,970	4,283	5,241	18,927	2,223	1,416	523	861		56,444	11
2080	Insurance - const./ liability, E&O	196,882	36,708	44,925	162,234	19,056	12,137	4,486	7,377		483,805	94
2081	Insurance - general	0	0	0	0	0	0	0	0		0	0
	Legal Costs Sub-total	196,882	36,708	44,925	162,234	19,056	12,137	4,486	7,377		483,805	94
2099	Project Management Contingency	543,395	101,314	123,992	447,767	52,595	33,498	12,380	20,361		1,335,303	261
	TOTAL PROJECT MANAGEMENT COSTS	2,354,713	439,028	537,297	1,940,324	227,914	145,156	53,648	88,232		5,786,312	1130
4000	LAND	0	0	0	0	0	0	0	0		0	
4010	Land(Code 4 - Mrkt,ROW,Serv,Imp.V,Ease.C,T	0	0	0	0	0	0	0	0		0	0
	Acquisition Sub-total	0	0	0	0	0	0	0	0		0	0
4020	Land(Code 4 - Bus.,5%,Mrg.P,Rel$,P/Tax,Etc	0	0	0	0	0	0	0	0		0	0
4030	Land(Code 4 - Owners(LS,Apprsl,Rprt,Lgl,In	0	0	0	0	0	0	0	0		0	0
4040	Land(Code 4 - Demolition	0	0	0	0	0	0	0	0		0	0
4050	Land(Code 4 - Pro.Man,P.Tax,Util,Security	0	0	0	0	0	0	0	0		0	0
4060	Land(Code 4 - Not Used	0	0	0	0	0	0	0	0		0	0
4070	Land(Code 4 - Not Used	0	0	0	0	0	0	0	0		0	0
4080	Land(Code 4 - Acq.F,M/Sal,TrvlV,Cntr.S,Appr.	0	0	0	0	0	0	0	0		0	0
4090	Land(Code 4 - Surveys	0	0	0	0	0	0	0	0		0	0
											0	0
											0	0
											0	0
											0	0
	Associated costs-sub-total	0	0	0	0	0	0	0	0		0	0
4099	Land Contingency Sub-total	0	0	0	0	0	0	0	0		0	0
	TOTAL LAND COSTS	0	0	0	0	0	0	0	0		0	0
9800	MANAGEMENT RESERVE											
	MAN. RES. - planning	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - preliminary design	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - utility construction	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - grade construction	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - structural construction	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - paving construction	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - operation construction	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - roadside construction	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - other construction	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - project management	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - land	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - detailed eng.	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - residency eng.	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - risk contingency	0	0	0	0	0	0	0	0		0	0
	TOTAL MANAGEMENT RESERVE	0	0	0	0	0	0	0	0		0	0
	TOTAL LESS ESCALATION											
	FISCAL											
9900	ESCALATION											
	YEAR PROJECTED ESCALATION											
	2006-2007	0	0	0	0	0	0	0	0		0	0
	2007-2008	0	0	0	0	0	0	0	0		0	0
	2008-2009	0	0	0	0	0	0	0	0		0	0
	2009-2010	0	0	0	0	0	0	0	0		0	0
	2010-2011	0	0	0	0	0	0	0	0		0	0
	2011-2012	0	0	0	0	0	0	0	0		0	0
	2012-2013	0	0	0	0	0	0	0	0		0	0
	2013-2014	0	0	0	0	0	0	0	0		0	0

File: Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 1 -	72 Avenue New Overpass and approaches	8+800 to 7+600 East and west of 232 St	8+800 to 7+600 East of 232 St IC to east of CP	232 St New Overpass and approaches	232 St Interchange EB Off Ramp Loop	232 St Interchange EB On Ramp	232 St Interchange WB off Ramp Loop	232 St Interchange WB On Ramp			Total Line Cost
Parsons **Hwy 1 Widening**											
(2016Dollars) **Package 1 - 232 IC**											
ACTIVITY **EST.DATE April 4, 2016**	0	Interchange	Rail Overpass	0	Loop	0	Loop	0			
CODE R3 DATE: Sept 15, 2016	0	0	0	0	0	0	0	0			C/LM
Conceptual Est. Divison\site	**Section 72.1**	**Section W.13**	**Section E.15**	**Section 232.1**	**Section 232.2**	**Section 232.3**	**Section 232.4**	**Section 232.5**	**MR**	**5120**	
Blk Est. # 6.14A Road Type	21	16	16	21	21	21	21	21	OR	0	
Version Sept.1, 200 DESCRIPTION \Length	570	1200	1400	555	575	460	200	160	TR	5120	5120
	MR	MR	MR	MR	MR	MR	MR	MR			
2014-2015	0	0	0	0	0	0	0	0		0	0
TOTAL ESCALATION	0	0	0	0	0	0	0	0		0	0
PART 2 SUMMARY NON-CONSTRUCTION COSTS											
Non-Construction	1,811,318	337,714	413,306	1,492,557	175,318	111,659	41,267	67,871		4,451,010	869
Non-Const. Contingency	543,395	101,314	123,992	447,767	52,595	33,498	12,380	20,361		1,335,303	261
TOTAL NON-CONSTRUCTION COST	2,354,713	439,028	537,297	1,940,324	227,914	145,156	53,648	88,232		5,786,312	1130
DIVISION TOTAL FOR ROAD TYPE	35,168,436	6,557,036	8,024,717	28,979,398	3,403,970	2,167,960	801,247	1,317,779		86,420,544	16879

PACKAGE 2 – SECTIONS

ID	Chainage Start	Chainage End	Description
W.10	14+600	16+500	Highway 1 Westbound Lanes Local Widening around 264 Street
E.12	14+600	16+500	Highway 1 Eastbound Lanes Local Widening around 264 Street
264.1			264 Street Overpass Replacement
264.2			Highway 1 Eastbound Off Ramp
264.3			Highway 1 Westbound Off Ramp
264.4			Highway 1 Westbound On Ramp
264.5			Highway 1 Eastbound On Ramp



File: Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 2 -	16+500 to 14+600 East and West of the 264 St Interchange	264 Street New Overpass and approaches	264 Street Interchange EB Off Ramp Loop	264 Street Interchange WB Off Ramp Loop	264 Street Interchange WB On Ramp	264 Street Interchange EB On Ramp	16+500 to 14+600 To the east and west of 264 St IC			Total Line Cost
Parsons **Hwy 1 Widening**										
(2016Dollars) **Package 2 - 264 IC**										C/LM
ACTIVITY CODE **EST.DATE April 4, 2016**										
R3 DATE: Sept 15, 2016										
Conceptual Est. Divison\site	**Section W.10**	**Section 264.1**	**Section 264.2**	**Section 264.3**	**Section 264.4**	**Section 264.5**	**Section E.12**	**MR**	**6571**	
Blk Est. # 6.14A Road Type	16	21	21	21	21	21	16	OR	0	
Version Sept.1, 200 DESCRIPTION \Length	1900	507	740	604	470	450	1900	TR	6571	6571
	MR	MR	MR	MR	MR	MR	MR			
Engineering	1,748,755	5,722,005	793,688	595,467	288,885	278,635	1,734,567		11,162,001	1699
Land	0	0	0	0	0	0	0		0	0
Construction	7,844,136	29,875,245	3,761,256	2,759,980	1,114,335	1,078,975	7,752,373		54,186,300	8246
Management Reserve	0	0	0	0	0	0	0		0	0
Escalation	0	0	0	0	0	0	0		0	0
Total	9,592,891	35,597,250	4,554,944	3,355,446	1,403,221	1,357,610	9,486,940		65,348,301	9945
BASIC QUANTITY SUMMARY										
Construct.Cost ONLY Per L.M.	4,128	58,926	5,083	4,570	2,371	2,398	4,080	$/LM	8,246	
Land Area	2.6	1.4	1.5	1.4	1.0	0.6	6.4	ha	14.8	
Mobilization	159,611	615,479	75,266	55,063	21,620	20,949	158,003		1,105,991	
Land Cont.	0	0	0	0	0	0	0		0	
Construction Cont.	1,661,997	6,354,648	797,436	585,266	236,786	229,275	1,642,428		11,507,836	12,504,531
Engineering Cont.	403,559	1,320,463	183,159	137,415	66,666	64,300	400,285		2,575,846	
Supervision Cont.	148,188	539,640	70,546	51,652	20,368	19,719	146,581		996,695	
Total Cont.	2,213,744	8,214,750	1,051,141	774,334	323,820	313,295	2,189,294		15,080,377	
S.G.S.B.	11,650	4,835	4,565	3,501	2,024	2,046	8,910	m3	37,531	
C.B.C.	5,358	2,950	2,558	1,938	1,155	1,160	4,723	m3	19,842	
Asphalt	6,521	2,551	2,385	1,728	1,120	1,107	6,768	t	22,179	
Concrete Barrier	125	80	0	0	0	0	85	lm	290	
Noise Attentuation Wall	0	0	0	0	0	0	0	m2	0	
No. of Light Poles	0	22	25	20	16	15	0	ea	98	
Sidewalk	0	0	0	0	0	0	0	lm	0	
Curb and Gutter	0	0	0	0	0	0	0	lm	0	
Signals	0	0	0	0	0	0	0	ea	0	
Bridge total area	0	2701	0	0	0	0	0	m2	2,701	
										ENG
Total Rock	0	0	0	0	0	0	0	m3	0	0
Total OM	42,740	9,025	24,615	15,878	3,663	2,942	35,790	m3	134,653	0
Total Stripping	5,200	4,563	2,220	1,812	350	1,125	5,100	m3	20,370	0
Total Borrow	0	0	0	0	0	0	0	m3	0	
Total Cut/Excavation	47,940	13,588	26,835	17,690	4,013	4,067	40,890	m3	155,023	0
Total Fill	36,605	12,121	14,759	12,494	2,808	2,255	34,891	m3	115,934	0
Surplus or Deficit	11,336	1,467	12,076	5,195	1,205	1,811	5,999	m3	39,089	
ENG & PM	**1.749**	**5.722**	**0.794**	**0.595**	**0.289**	**0.279**	**1.735**		**11.162**	11.163
LAND	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**		**0.000**	0.000
CONST.	**7.844**	**2.928**	**3.761**	**2.760**	**1.114**	**1.079**	**7.752**		**27.239**	27.238
BRIDGES-R/W	**0.000**	**26.947**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**		**26.947**	26.947
MANAGEMENT RESERVE	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**		**0.000**	0.000
ESCALATION	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**		**0.000**	0.000
TOTAL (Millions) (2016Dollars)	**9.593**	**35.597**	**4.555**	**3.355**	**1.403**	**1.358**	**9.487**		**65.348**	65.348
TOTAL Cost per meter	**$ 5,049**	**$ 70,212**	**$ 6,155**	**$ 5,555**	**$ 2,986**	**$ 3,017**	**$ 4,993**		**$ 9,945**	
Construction cost per meter	**$ 4,128**	**$ 58,925**	**$ 5,082**	**$ 4,570**	**$ 2,370**	**$ 2,398**	**$ 4,080**		**$ 8,246**	

File: Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 2 - Parsons (2016Dollars) **Hwy 1 Widening** **Package 2 - 264 IC** **EST.DATE April 4, 2016** R3 DATE: Sept 15, 2016											Total Line Cost
ACTIVITY CODE			16+500 to 14+600 East and West of the 264 St Interchange	264 Street New Overpass and approaches 0 0	264 Street Interchange EB Off Ramp Loop 0	264 Street Interchange WB Off Ramp Loop 0	264 Street Interchange WB On Ramp 0	264 Street Interchange EB On Ramp 0	16+500 to 14+600 To the east and west of 264 St IC			C/LM
Conceptual Est.		Divison\site	**Section W.10**	**Section 264.1**	**Section 264.2**	**Section 264.3**	**Section 264.4**	**Section 264.5**	**Section E.12**	**MR**	**6571**	
Blk Est. # 6.14A		Road Type	16	21	21	21	21	21	16	OR	0	
Version Sept.1, 200		DESCRIPTION \Length	1900	507	740	604	470	450	1900	TR	6571	6571
			MR	MR	MR	MR	MR	MR	MR			
	SUMMARY BY ACTIVITY LEVEL											Cost/LM
2000		PROJECT MANAGEMENT	494,073	1,833,403	234,598	172,819	72,272	69,922	488,616		3,365,703	512
2500		PLANNING	0	0	0	0	0	0	0		0	0
3000		PRELIMINARY DESIGN	309,700	206,878	120,620	98,452	76,610	73,350	309,700		1,195,310	182
3500		DETAILED DESIGN	541,423	2,361,261	255,311	186,780	73,338	71,062	535,966		4,025,142	613
		Total Engineering	851,123	2,568,139	375,931	285,232	149,948	144,412	845,666		5,220,451	794
4000		LAND ACQUISITION	0	0	0	0	0	0	0		0	0
5000		GRADE CONSTRUCTION	4,567,874	1,561,668	2,141,386	1,559,019	516,098	499,523	4,495,741		15,341,308	2335
5200		ROAD SIDE CONSTRUCTION	0	0	0	0	0	0	0		0	0
5300		OTHER CONSTRUCTION	0	0	0	0	0	0	0		0	0
5500		STRUCTURAL CONSTRUCTION	0	19,113,329	0	0	0	0	0		19,113,329	2909
6000		PAVING CONSTRUCTION	850,007	300,575	295,247	213,814	133,009	132,190	878,239		2,803,081	427
6500		OPERATIONAL CONSTRUCTION	62,109	155,887	147,488	117,655	93,179	87,537	50,779		714,634	109
6700		UTILITY CONSTRUCTION	60,000	50,700	74,000	60,400	47,000	45,000	50,000		387,100	59
6800		RESIDENT ENGINEERING	493,961	1,798,799	235,153	172,174	67,895	65,731	488,605		3,322,318	506
											0	0
		Total Construction	6,033,951	22,980,958	2,893,274	2,123,061	857,181	829,981	5,963,364		41,681,770	6343
9700		CONTINGENCY	2,213,744	8,214,750	1,051,141	774,334	323,820	313,295	2,189,294		15,080,377	2295
		SUB-TOTAL	9,592,891	35,597,250	4,554,944	3,355,446	1,403,221	1,357,610	9,486,940		65,348,301	9945
9800		MANAGEMENT RESERVE	0	0	0	0	0	0	0		0	0
		TOTAL	9,592,891	35,597,250	4,554,944	3,355,446	1,403,221	1,357,610	9,486,940		65,348,301	9945
9900		ESCALATION	0	0	0	0	0	0	0		0	0
		TOTAL COST	9,592,891	35,597,250	4,554,944	3,355,446	1,403,221	1,357,610	9,486,940		65,348,301	9945
		Const. Less Resident Eng.	5,539,989	21,182,159	2,658,121	1,950,887	789,286	764,250	5,474,759		38,359,452	5838

File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 2 - Parsons **Hwy 1 Widening** (2016Dollars) **Package 2 - 264 IC** ACTIVITY **EST.DATE April 4, 2016** CODE R3 DATE: Sept 15, 2016 Conceptual Est. Divison\site Blk Est. # 6.14A Road Type Version Sept.1, 200 DESCRIPTION \Length			16+500 to 14+600 East and West of the 264 St Interchange **Section W.10** 16 1900 MR	264 Street New Overpass and approaches 0 0 **Section 264.1** 21 507 MR	264 Street Interchange EB Off Ramp Loop 0 **Section 264.2** 21 740 MR	264 Street Interchange WB Off Ramp Loop 0 **Section 264.3** 21 604 MR	264 Street Interchange WB On Ramp 0 **Section 264.4** 21 470 MR	264 Street Interchange EB On Ramp 0 **Section 264.5** 21 450 MR	16+500 to 14+600 To the east and west of 264 St IC **Section E.12** 16 1900 MR	**MR** OR TR	**6571** 0 6571	Total Line Cost C/LM 6571
2500		PLANNING										
2521	Consultant	- transport. planning study	0	0	0	0	0	0	0		0	0
2531	Consultant	- corridor study	0	0	0	0	0	0	0		0	0
2541	Consultant	- functional plan. study	0	0	0	0	0	0	0		0	0
2502	Consultant	- general	0	0	0	0	0	0	0		0	0
	Consultant sub-total		0	0	0	0	0	0	0		0	0
2510	Client	- project ident.	0	0	0	0	0	0	0		0	0
2520	Client	- transport. planning study	0	0	0	0	0	0	0		0	0
2530	Client	- corridor study	0	0	0	0	0	0	0		0	0
2540	Client	- functional plan. study	0	0	0	0	0	0	0		0	0
2501	Client	- general	0	0	0	0	0	0	0		0	0
	Client Sub-total		0	0	0	0	0	0	0		0	0
2599	Planning Contingency		0	0	0	0	0	0	0		0	0
	TOTAL PLANNING		0	0	0	0	0	0	0		0	0
3000		PRELIMINARY DESIGN										
3013	Consultant	- aerial base plan	0	0	0	0	0	0	0		0	0
3014	Consultant	- prel. design	133,000	35,490	51,800	42,280	32,900	31,500	133,000		459,970	70
3015	Consultant	- control survey	0	0	0	0	0	0	0		0	0
3021	Consultant	- environmental impact	53,200	14,196	20,720	16,912	13,160	12,600	53,200		183,988	28
3031	Consultant	- funct.-road field survey	0	0	0	0	0	0	0		0	0
3041	Consultant	- functional design	95,000	25,350	37,000	30,200	23,500	22,500	95,000		328,550	50
3051	Consultant	- funct. structural des.	0	124,237	0	0	0	0	0		124,237	19
3061	Consultant	- geotechnical design	28,500	7,605	11,100	9,060	7,050	6,750	28,500		98,565	15
3071	Consultant	- right-of-way research	0	0	0	0	0	0	0		0	0
3002	Consultant	- general	0	0	0	0	0	0	0		0	0
	Consultant sub-total		309,700	206,878	120,620	98,452	76,610	73,350	309,700		1,195,310	182
3010	Client	- aerial base plan	0	0	0	0	0	0	0		0	0
3011	Client	- prel. design	0	0	0	0	0	0	0		0	0
3012	Client	- control survey	0	0	0	0	0	0	0		0	0
3020	Client	- environmental impact	0	0	0	0	0	0	0		0	0
3030	Client	- funct.-road field survey	0	0	0	0	0	0	0		0	0
3040	Client	- functional design	0	0	0	0	0	0	0		0	0
3050	Client	- funct. structural des.	0	0	0	0	0	0	0		0	0
3060	Client	- geotechnical design	0	0	0	0	0	0	0		0	0
3070	Client	- right-of-way research	0	0	0	0	0	0	0		0	0
3001	Client	- general	0	0	0	0	0	0	0		0	0
	Client Sub-total		0	0	0	0	0	0	0		0	0
3099	Preliminary design Contingency		92,910	62,063	36,186	29,536	22,983	22,005	92,910		358,593	55
	TOTAL PRELIMINARY DESIGN		402,610	268,941	156,806	127,988	99,593	95,355	402,610		1,553,903	236
6700		UTILITIES										
6710	Util. Prov.	- Hydro	60,000	30,420	44,400	36,240	28,200	27,000	50,000		276,260	42
6711	Util. Prov.	- Telephone	0	20,280	29,600	24,160	18,800	18,000	0		110,840	17
	Util. Prov.	sub-total	60,000	50,700	74,000	60,400	47,000	45,000	50,000		387,100	59
6712	Util.Others	- pipelines	0	0	0	0	0	0	0		0	0
6713	Util.Others	- telecommunication	0	0	0	0	0	0	0		0	0
6714	Util.Others	- storm & sewer inspect.	0	0	0	0	0	0	0		0	0
6715	Util.Others	- waterworks inspect.	0	0	0	0	0	0	0		0	0
6716	Util.Others	- engineering services	0	0	0	0	0	0	0		0	0
6717	Util.Others	- parks/recreation-prel.	0	0	0	0	0	0	0		0	0
6718	Util.Others	- transit	0	0	0	0	0	0	0		0	0
6719	Util.Others	- tr-ops/signs & detours	0	0	0	0	0	0	0		0	0
6701	Util.Others	- general	0	0	0	0	0	0	0		0	0
	Util.Others	sub-total	0	0	0	0	0	0	0		0	0
6799	Util.Others Contingency		18,000	15,210	22,200	18,120	14,100	13,500	15,000		116,130	18
	TOTAL UTILITIES		78,000	65,910	96,200	78,520	61,100	58,500	65,000		503,230	77
5000		GRADE CONSTRUCTION										
5032	Grade Const	- water	50,000	0	0	0	0	0	50,000		100,000	15
5033	Grade Const	- sanitary	0	0	0	0	0	0	0		0	0

File: Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 2 - Parsons (2016Dollars) Hwy 1 Widening Package 2 - 264 IC ACTIVITY CODE EST.DATE April 4, 2016 R3 DATE: Sept 15, 2016 Conceptual Est. Blk Est. # 6.14A Version Sept.1, 200			16+500 to 14+600 East and West of the 264 St Interchange	264 Street New Overpass and approaches 0 0	264 Street Interchange EB Off Ramp Loop 0	264 Street Interchange WB Off Ramp Loop 0	264 Street Interchange WB On Ramp 0	264 Street Interchange EB On Ramp 0	16+500 to 14+600 To the east and west of 264 St IC			Total Line Cost C/LM
Divison\site			**Section W.10**	**Section 264.1**	**Section 264.2**	**Section 264.3**	**Section 264.4**	**Section 264.5**	**Section E.12**	**MR**	**6571**	
Road Type			16	21	21	21	21	21	16	OR	0	
DESCRIPTION \Length			1900	507	740	604	470	450	1900	TR	6571	6571
			MR	MR	MR	MR	MR	MR	MR			
5034	Grade Const	- storm	0	0	0	0	0	0	0		0	0
5031	Grade Const	- mobilization	1,500	0	0	0	0	0	1,500		3,000	0
5039	Grade Const	- utility contingency	15,450	0	0	0	0	0	15,450		30,900	5
	Grade Const.	Utilities Sub-total	66,950	0	0	0	0	0	66,950		133,900	20
5010	Grade Const	- site prep./clear,grubbing	34,438	0	3,048	2,803	1,910	1,235	24,106		67,539	10
5020	Grade Const	- road grade/exc,placing,fill	3,044,235	907,136	1,516,195	1,082,428	249,719	234,290	2,710,830		9,744,833	1483
5030	Grade Const	- drainage/pipe,cul.	0	0	0	0	0	0	500,000		500,000	76
5040	Grade Const	- muiltiplate	0	0	0	0	0	0	0		0	0
5050	Grade Const	-SGSB/produce,place,comp	815,515	338,483	319,541	245,055	141,676	143,216	623,713		2,627,198	400
5051	Grade Const	-CBC/produce,place,comp	482,207	265,536	230,236	174,414	103,955	104,437	425,028		1,785,813	272
5060	Grade Const	- grade finishing landscaping	0	0	0	0	0	0	0		0	0
5061	Grade Const	- grade finishing hydro seed.	8,435	5,027	9,995	8,911	3,806	1,797	31,120		69,090	11
5062	Grade Const	- grade finishing fencing	0	0	0	0	0	0	0		0	0
5063	Grade Const	- noise barriers	0	0	0	0	0	0	0		0	0
5064	Grade Const	- passing lanes	0	0	0	0	0	0	0		0	0
5090	Grade Const	- sidewalks,curb & gutter	0	0	0	0	0	0	0		0	0
5005	Grade Const	-detours c/w ex,bf,paving	0	0	0	0	0	0	0		0	0
5001	Grade Const	- mobilization	131,545	45,485	62,370	45,408	15,032	14,549	129,444		443,834	68
5099	Grade Const	- Contingency	1,354,912	468,500	642,416	467,706	154,830	149,857	1,333,272		4,571,492	696
	Grade Construction	Sub-total	5,871,286	2,030,168	2,783,801	2,026,724	670,928	649,379	5,777,513		19,809,800	3015
	GRADE CONSTRUCTION COSTS		5,938,236	2,030,168	2,783,801	2,026,724	670,928	649,379	5,844,463		19,943,700	3035
3510	Grade Eng.	- detailed design	415,677	142,112	194,866	141,871	46,965	45,457	409,112		1,396,059	212
3519	Grade Eng.	- detailed design/Contingency	124,703	42,634	58,460	42,561	14,089	13,637	122,734		418,818	64
6810	Grade Eng.	- general const. supervision	178,147	60,905	83,514	60,802	20,128	19,481	175,334		598,311	91
6811	Grade Eng.	- quality assurance	118,765	40,603	55,676	40,534	13,419	12,988	116,889		398,874	61
6812	Grade Eng.	- surveying	118,765	40,603	55,676	40,534	13,419	12,988	116,889		398,874	61
6819	Grade Eng.	- Residency Contingency	124,703	42,634	58,460	42,561	14,089	13,637	122,734		418,818	64
	Grade Engineering	Sub-total	1,080,759	369,491	506,652	368,864	122,109	118,187	1,063,692		3,629,753	552
	Total Grade Const. & Eng. Costs		7,018,995	2,399,659	3,290,453	2,395,588	793,037	767,566	6,908,156		23,573,454	3587
5500		STRUCTURAL CONSTRUCTION										
5522	Struct.Const	- water	0	0	0	0	0	0	0		0	0
5523	Struct.Const	- sanitary	0	0	0	0	0	0	0		0	0
5524	Struct.Const	- storm	0	0	0	0	0	0	0		0	0
5521	Struct.Const	- mobilization	0	0	0	0	0	0	0		0	0
5599	Struct.Const	- utility contingency	0	0	0	0	0	0	0		0	0
	Structural Const.	Utilities Sub-total	0	0	0	0	0	0	0		0	0
5510	Struct.Const	- tunnel site preparation	0	0	0	0	0	0	0		0	0
5511	Struct.Const	- tunnel construction	0	0	0	0	0	0	0		0	0
5512	Struct.Const	- snow shed site prep.	0	0	0	0	0	0	0		0	0
5513	Struct.Const	- snow shed site const.	0	0	0	0	0	0	0		0	0
5514	Struct.Const	- bridge site preparation	0	1,000,000	0	0	0	0	0		1,000,000	152
5515	Struct.Const	- bridge piers	0	0	0	0	0	0	0		0	0
5516	Struct.Const	- bridge abutments	0	0	0	0	0	0	0		0	0
5517	Struct.Const	- bridge superstructure	0	17,556,630	0	0	0	0	0		17,556,630	2672
5518	Struct.Const	- retain. wall site prep.	0	0	0	0	0	0	0		0	0
5519	Struct.Const	- retaining wall const.	0	0	0	0	0	0	0		0	0
5501	Struct.Const	- mobilization	0	556,699	0	0	0	0	0		556,699	85
5529	Struct.Const	- Contingency	0	5,733,999	0	0	0	0	0		5,733,999	873
	Structural Construction	Sub-total	0	24,847,328	0	0	0	0	0		24,847,328	3781
	STRUCTURAL CONSTRUCTION COSTS		0	24,847,328	0	0	0	0	0		24,847,328	3781
3520	Struct. Eng.	- detailed design	0	1,987,786	0	0	0	0	0		1,987,786	303
3529	Struct. Eng.	- detailed design/Contingency	0	596,336	0	0	0	0	0		596,336	91
6820	Struct. Eng.	- general const. supervision	0	993,893	0	0	0	0	0		993,893	151
6821	Struct. Eng.	- quality assurance	0	496,947	0	0	0	0	0		496,947	76
6822	Struct. Eng.	- surveying	0	124,237	0	0	0	0	0		124,237	19
6829	Struct. Eng.	- Residency Contingency	0	484,523	0	0	0	0	0		484,523	74
	Structural Engineering	Sub-total	0	4,683,721	0	0	0	0	0		4,683,721	713
	Total Structural & Eng. Costs		0	29,531,049	0	0	0	0	0		29,531,049	4494

File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 2 -	16+500 to 14+600 East and West of the 264 St Interchange	264 Street New Overpass and approaches	264 Street Interchange EB Off Ramp Loop	264 Street Interchange WB Off Ramp Loop	264 Street Interchange WB On Ramp	264 Street Interchange EB On Ramp	16+500 to 14+600 To the east and west of 264 St IC			Total Line Cost
	Parsons **Hwy 1 Widening**										
	(2016Dollars) **Package 2 - 264 IC**										
ACTIVITY	**EST.DATE April 4, 2016**										
CODE	R3 DATE: Sept 15, 2016										C/LM
	Conceptual Est. Divison\site	**Section W.10**	**Section 264.1**	**Section 264.2**	**Section 264.3**	**Section 264.4**	**Section 264.5**	**Section E.12**	**MR**	**6571**	
Blk Est. # 6.14A	Road Type	16	21	21	21	21	21	16	OR	0	
Version Sept.1, 200	DESCRIPTION \Length	1900	507	740	604	470	450	1900	TR	6571	6571
		MR	MR	MR	MR	MR	MR	MR			
6000	PAVING CONSTRUCTION										
6020	Paving Cons - machine paving asphalt	825,249	291,821	286,647	207,586	129,135	128,340	852,659		2,721,438	414
6030	Paving Cons - machine paving concrete	0	0	0	0	0	0	0		0	0
6040	Paving Cons - hot reprofiling	0	0	0	0	0	0	0		0	0
6050	Paving Cons - shoulder paving	0	0	0	0	0	0	0		0	0
6060	Paving Cons - pavement finishing	0	0	0	0	0	0	0		0	0
6070	Paving Cons - seal coating	0	0	0	0	0	0	0		0	0
6001	Paving Cons - mobilization	24,757	8,755	8,599	6,228	3,874	3,850	25,580		81,643	12
6010	Paving Cons - pavement design	0	0	0	0	0	0	0		0	0
6099	Paving Cons - Contingency	255,002	90,173	88,574	64,144	39,903	39,657	263,472		840,924	128
	PAVING CONSTRUCTION COSTS	1,105,009	390,748	383,821	277,958	172,912	171,848	1,141,711		3,644,005	555
3560	Paving Eng. - detailed design	77,351	27,352	26,867	19,457	12,104	12,029	79,920		255,080	39
3569	Paving Eng. - detailed design/Contingency	23,205	8,206	8,060	5,837	3,631	3,609	23,976		76,524	12
6860	Paving Eng. - general const. supervision	22,100	7,815	7,676	5,559	3,458	3,437	22,834		72,880	11
6861	Paving Eng. - quality assurance	44,200	15,630	15,353	11,118	6,916	6,874	45,668		145,760	22
6862	Paving Eng. - surveying	5,525	1,954	1,919	1,390	865	859	5,709		18,220	3
6869	Paving Eng. - Residency Contingency	21,548	7,620	7,485	5,420	3,372	3,351	22,263		71,058	11
	Paving Engineering Sub-total	193,929	68,576	67,361	48,782	30,346	30,159	200,370		639,523	97
	Total Paving Const. & Eng. Costs	1,298,938	459,324	451,181	326,740	203,257	202,007	1,342,081		4,283,528	652
6500	OPERATIONAL CONSTRUCTION										
6510	Operat.Cons - lighting	0	121,000	137,500	110,000	88,000	82,500	0		539,000	82
6520	Operat.Cons - signals	0	0	0	0	0	0	0		0	0
6530	Operat.Cons - signing	3,800	1,014	1,480	1,208	940	900	3,800		13,142	2
6540	Operat.Cons - guard rail	37,500	24,000	0	0	0	0	25,500		87,000	13
6550	Operat.Cons - pavement markings	19,000	5,333	4,213	3,020	1,525	1,588	20,000		54,678	8
6501	Operat.Cons - mobilization	1,809	4,540	4,296	3,427	2,714	2,550	1,479		20,815	3
6599	Operat.Cons - contingency	18,633	46,766	44,246	35,296	27,954	26,261	15,234		214,390	33
	OPERATIONAL CONSTRUCTION COSTS	80,742	202,653	191,735	152,951	121,133	113,798	66,013		929,024	141
3540	Operat. Eng - detailed design	5,652	14,186	13,421	10,707	8,479	7,966	4,621		65,032	10
3549	Operat. Eng - detailed design/Contingency	1,696	4,256	4,026	3,212	2,544	2,390	1,386		19,510	3
6840	Operat. Eng - general const. supervision	4,441	11,146	10,545	8,412	6,662	6,259	3,631		51,096	8
6841	Operat. Eng - quality assurance	1,615	4,053	3,835	3,059	2,423	2,276	1,320		18,580	3
6842	Operat. Eng - surveying	404	1,013	959	765	606	569	330		4,645	1
6849	Operat. Eng - Residency Contingency	1,938	4,864	4,602	3,671	2,907	2,731	1,584		22,297	3
	Operational Enginering Sub-total	15,745	39,517	37,388	29,826	23,621	22,191	12,872		181,160	28
	Total Operational Const.& Eng.Costs	96,486	242,170	229,123	182,777	144,753	135,989	78,885		1,110,184	169
5200	ROAD SIDE CONSTRUCTION										
5203	RoadSide C - water	0	0	0	0	0	0	0		0	0
5204	RoadSide C - sanitary	0	0	0	0	0	0	0		0	0
5205	RoadSide C - storm	0	0	0	0	0	0	0		0	0
5202	RoadSide C - mobilization	0	0	0	0	0	0	0		0	0
5209	RoadSide C - Utility Contingency	0	0	0	0	0	0	0		0	0
	Road Side Const. Utilities Sub-total	0	0	0	0	0	0	0		0	0
5210	RoadSide C - weighscales	0	0	0	0	0	0	0		0	0
5220	RoadSide C - safety rest areas	0	0	0	0	0	0	0		0	0
5230	RoadSide C - tourist rest & view areas	0	0	0	0	0	0	0		0	0
5201	RoadSide C - mobilization	0	0	0	0	0	0	0		0	0
5299	RoadSide C - Contingency	0	0	0	0	0	0	0		0	0
	Road Side Construction Sub-total	0	0	0	0	0	0	0		0	0
	ROAD SIDE CONSTRUCTION COSTS	0	0	0	0	0	0	0		0	0
3550	RoadSide E - detailed design	0	0	0	0	0	0	0		0	0
3559	RoadSide E - detailed design/Contingency	0	0	0	0	0	0	0		0	0
6850	RoadSide E - general const. supervision	0	0	0	0	0	0	0		0	0
6851	RoadSide E - quality assurance	0	0	0	0	0	0	0		0	0
6852	RoadSide E - surveying	0	0	0	0	0	0	0		0	0
6859	RoadSide E - Residency Contingency	0	0	0	0	0	0	0		0	0

File: Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 2 - Parsons **Hwy 1 Widening** (2016Dollars) **Package 2 - 264 IC** ACTIVITY **EST.DATE April 4, 2016** CODE R3 DATE: Sept 15, 2016 Conceptual Est.			16+500 to 14+600 East and West of the 264 St Interchange	264 Street New Overpass and approaches 0 0	264 Street Interchange EB Off Ramp Loop 0	264 Street Interchange WB Off Ramp Loop 0	264 Street Interchange WB On Ramp 0	264 Street Interchange EB On Ramp 0	16+500 to 14+600 To the east and west of 264 St IC			Total Line Cost C/LM
		Divison\site	**Section W.10**	**Section 264.1**	**Section 264.2**	**Section 264.3**	**Section 264.4**	**Section 264.5**	**Section E.12**	**MR**	**6571**	
Blk Est. # 6.14A		Road Type	16	21	21	21	21	21	16	OR	0	
Version Sept.1, 200		DESCRIPTION \Length	1900	507	740	604	470	450	1900	TR	6571	6571
			MR	MR	MR	MR	MR	MR	MR			
	Road Side Engineering Sub-total		0	0	0	0	0	0	0		0	0
	Total Road Side Const.& Eng.Costs		0	0	0	0	0	0	0		0	0
5300	OTHER CONSTRUCTION											
5303	Other Const - water		0	0	0	0	0	0	0		0	0
5304	Other Const - sanitary		0	0	0	0	0	0	0		0	0
5305	Other Const - storm		0	0	0	0	0	0	0		0	0
5302	Other Const - mobilization		0	0	0	0	0	0	0		0	0
5309	Other Const - utility contingency		0	0	0	0	0	0	0		0	0
	Other Const. Utilities Sub-total		0	0	0	0	0	0	0		0	0
5310	Other Const - railroads main & spur lines		0	0	0	0	0	0	0		0	0
5320	Other Const - railroad crossings		0	0	0	0	0	0	0		0	0
5330	Other Const - marine work		0	0	0	0	0	0	0		0	0
5340	Other Const - environmental mitigations		0	0	0	0	0	0	0		0	0
5301	Other Const - mobilization		0	0	0	0	0	0	0		0	0
5399	Other Const - Contingency		0	0	0	0	0	0	0		0	0
	Other Construction Sub-total		0	0	0	0	0	0	0		0	0
	OTHER CONSTRUCTION COSTS		0	0	0	0	0	0	0		0	0
3570	Other Eng. - detailed design		0	0	0	0	0	0	0		0	0
3579	Other Eng. - detailed design/Contingency		0	0	0	0	0	0	0		0	0
6870	Other Eng. - general const. supervision		0	0	0	0	0	0	0		0	0
6871	Other Eng. - quality assurance		0	0	0	0	0	0	0		0	0
6872	Other Eng. - surveying		0	0	0	0	0	0	0		0	0
6879	Other Eng. - Residency Contingency		0	0	0	0	0	0	0		0	0
	Other Engineering Sub-total		0	0	0	0	0	0	0		0	0
	Total Other Const.& Eng.Costs		0	0	0	0	0	0	0		0	0
3500	DETAILED DESIGN											
	from 3510,3520,3540,3550,3570		648,283	2,822,867	305,701	223,645	87,812	85,087	641,749		4,815,144	733
3530	Geotech. En - detailed design		42,744	189,825	20,156	14,746	5,790	5,610	42,313		321,184	49
3539	Geotech. En - Contingency		12,823	56,948	6,047	4,424	1,737	1,683	12,694		96,355	15
	TOTAL DETAILED DESIGN COSTS		703,850	3,069,640	331,904	242,814	95,339	92,380	696,756		5,232,684	796
6800	RESIDENT ENGINEERING											
	from 6810,6820,6840,6850,6860,6870		642,150	2,338,439	305,699	223,826	88,263	85,450	635,186		4,319,013	
	TOTAL RESIDENT ENG. COSTS		642,150	2,338,439	305,699	223,826	88,263	85,450	635,186		4,319,013	657
											0	
											0	0
	PART 1 SUMMARY											
	CONSTRUCTION		5,539,989	21,182,159	2,658,121	1,950,887	789,286	764,250	5,474,759		38,359,452	5838
	ENGINEERING & SUPERVISION		1,345,084	4,366,938	611,084	457,406	217,843	210,142	1,334,271		8,542,769	1300
	CONTRACTUAL CONTINGENCY		2,065,522	7,664,729	980,761	722,488	302,139	292,318	2,042,709		14,070,666	2141
											0	0
	CONSTRUCTION COST TOTAL		8,950,596	33,213,826	4,249,966	3,130,781	1,309,268	1,266,710	8,851,739		60,972,887	9279
2000	PROJECT MANAGEMENT											
2060	Project Man. - office costs wages		201,388	747,311	95,624	70,443	29,459	28,501	199,164		1,371,890	209
2062	Project Man. - office costs - expenses		0	0	0	0	0	0	0		0	0
2063	Project Man. - printing costs		0	0	0	0	0	0	0		0	0
2061	Project Man. - general		0	0	0	0	0	0	0		0	0
	Project Manager Sub-total		201,388	747,311	95,624	70,443	29,459	28,501	199,164		1,371,890	209
2010	Client - office costs wages		179,012	664,277	84,999	62,616	26,185	25,334	177,035		1,219,458	186
2012	Client - office costs - expenses		0	0	0	0	0	0	0		0	0
2030	Client - printing costs		0	0	0	0	0	0	0		0	0
2011	Client - general		0	0	0	0	0	0	0		0	0
	Client Sub-total		179,012	664,277	84,999	62,616	26,185	25,334	177,035		1,219,458	186

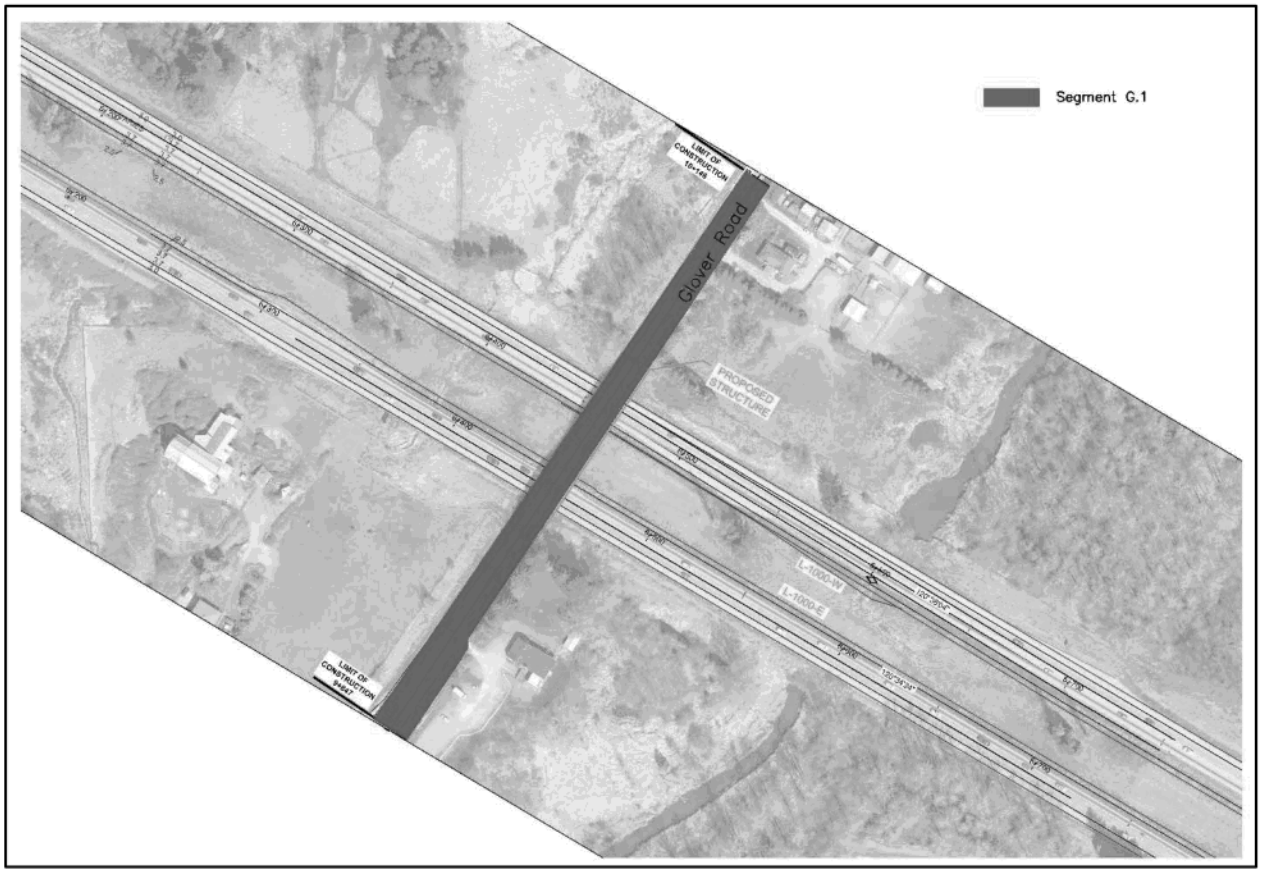
File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 2 - Parsons **Hwy 1 Widening** (2016Dollars) **Package 2 - 264 IC** ACTIVITY **EST.DATE April 4, 2016** CODE R3 DATE: Sept 15, 2016 Conceptual Est. Divison\site Blk Est. # 6.14A Road Type Version Sept.1, 200 DESCRIPTION \Length	16+500 to 14+600 East and West of the 264 St Interchange **Section W.10** 16 1900 MR	264 Street New Overpass and approaches 0 0 **Section 264.1** 21 507 MR	264 Street Interchange EB Off Ramp Loop 0 **Section 264.2** 21 740 MR	264 Street Interchange WB Off Ramp Loop 0 **Section 264.3** 21 604 MR	264 Street Interchange WB On Ramp 0 **Section 264.4** 21 470 MR	264 Street Interchange EB On Ramp 0 **Section 264.5** 21 450 MR	16+500 to 14+600 To the east and west of 264 St IC **Section E.12** 16 1900 MR	**MR** OR TR **6571** 0 6571	Total Line Cost C/LM 6571
2070	Public Rel.	- wages & expenses	53,704	199,283	25,500	18,785	7,856	7,600	53,110		365,837	56
2072	Public Rel.	- adv., media, displays	0	0	0	0	0	0	0		0	0
2073	Public Rel.	- opening ceremonies	0	0	0	0	0	0	0		0	0
2071	Public Rel.	- general	0	0	0	0	0	0	0		0	0
	Public Relations Sub-total		53,704	199,283	25,500	18,785	7,856	7,600	53,110		365,837	56
2040	Legal Costs	- lawyers fees	6,265	23,250	2,975	2,192	916	887	6,196		42,681	6
2041	Legal Costs	- general	0	0	0	0	0	0	0		0	0
	Legal Costs Sub-total		6,265	23,250	2,975	2,192	916	887	6,196		42,681	6
2080	Insurance	- const./ liability, E&O	53,704	199,283	25,500	18,785	7,856	7,600	53,110		365,837	56
2081	Insurance	- general	0	0	0	0	0	0	0		0	0
	Legal Costs Sub-total		53,704	199,283	25,500	18,785	7,856	7,600	53,110		365,837	56
2099	Project Management Contingency		148,222	550,021	70,379	51,846	21,681	20,977	146,585		1,009,711	154
	TOTAL PROJECT MANAGEMENT COSTS		642,295	2,383,424	304,978	224,665	93,953	90,899	635,201		4,375,414	666
4000		LAND	0	0	0	0	0	0	0		0	
4010	Land(Code 4	-Mrkt,ROW,Serv,Imp.V,Ease.C,T	0	0	0	0	0	0	0		0	0
	Acquisition Sub-total		0	0	0	0	0	0	0		0	0
4020	Land(Code 4	-Bus.,5%,Mrg.P,Rel$,P/Tax,Etc	0	0	0	0	0	0	0		0	0
4030	Land(Code 4	-Owners(LS,Apprsl,Rprt,Lgl,In	0	0	0	0	0	0	0		0	0
4040	Land(Code 4	-Demolition	0	0	0	0	0	0	0		0	0
4050	Land(Code 4	-Pro.Man,P.Tax,Util,Security	0	0	0	0	0	0	0		0	0
4060	Land(Code 4	-Not Used	0	0	0	0	0	0	0		0	0
4070	Land(Code 4	-Not Used	0	0	0	0	0	0	0		0	0
4080	Land(Code 4	-Acq.F,M/Sal,TrvlV,Cntr.S,Appr.	0	0	0	0	0	0	0		0	0
4090	Land(Code 4	-Surveys	0	0	0	0	0	0	0		0	0
											0	0
											0	0
											0	0
											0	0
	Associated costs-sub-total		0	0	0	0	0	0	0		0	0
4099	Land Contingency Sub-total		0	0	0	0	0	0	0		0	0
	TOTAL LAND COSTS		0	0	0	0	0	0	0		0	0
9800		MANAGEMENT RESERVE										
	MAN. RES.	- planning	0	0	0	0	0	0	0		0	0
	MAN. RES.	- preliminary design	0	0	0	0	0	0	0		0	0
	MAN. RES.	- utility construction	0	0	0	0	0	0	0		0	0
	MAN. RES.	- grade construction	0	0	0	0	0	0	0		0	0
	MAN. RES.	- structural construction	0	0	0	0	0	0	0		0	0
	MAN. RES.	- paving construction	0	0	0	0	0	0	0		0	0
	MAN. RES.	- operation construction	0	0	0	0	0	0	0		0	0
	MAN. RES.	- roadside construction	0	0	0	0	0	0	0		0	0
	MAN. RES.	- other construction	0	0	0	0	0	0	0		0	0
	MAN. RES.	- project management	0	0	0	0	0	0	0		0	0
	MAN. RES.	- land	0	0	0	0	0	0	0		0	0
	MAN. RES.	- detailed eng.	0	0	0	0	0	0	0		0	0
	MAN. RES.	- residency eng.	0	0	0	0	0	0	0		0	0
	MAN. RES.	- risk contingency	0	0	0	0	0	0	0		0	0
	TOTAL MANAGEMENT RESERVE		0	0	0	0	0	0	0		0	0
	TOTAL LESS ESCALATION											
	FISCAL											
9900	ESCALATION											
	YEAR	PROJECTED ESCALATION										
	2006-2007		0	0	0	0	0	0	0		0	0
	2007-2008		0	0	0	0	0	0	0		0	0
	2008-2009		0	0	0	0	0	0	0		0	0
	2009-2010		0	0	0	0	0	0	0		0	0
	2010-2011		0	0	0	0	0	0	0		0	0
	2011-2012		0	0	0	0	0	0	0		0	0
	2012-2013		0	0	0	0	0	0	0		0	0
	2013-2014		0	0	0	0	0	0	0		0	0

File: Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 2 - Parsons (2016Dollars) ACTIVITY CODE Conceptual Est. Blk Est. # 6.14A Version Sept.1, 200		Hwy 1 Widening Package 2 - 264 IC EST.DATE April 4, 2016 R3 DATE: Sept 15, 2016	16+500 to 14+600 East and West of the 264 St Interchange	264 Street New Overpass and approaches 0 0	264 Street Interchange EB Off Ramp Loop 0	264 Street Interchange WB Off Ramp Loop 0	264 Street Interchange WB On Ramp 0	264 Street Interchange EB On Ramp 0	16+500 to 14+600 To the east and west of 264 St IC			Total Line Cost C/LM
		Divison\site	**Section W.10**	**Section 264.1**	**Section 264.2**	**Section 264.3**	**Section 264.4**	**Section 264.5**	**Section E.12**	**MR**	**6571**	
		Road Type	16	21	21	21	21	21	16	OR	0	
		DESCRIPTION \Length	1900	507	740	604	470	450	1900	TR	6571	6571
			MR	MR	MR	MR	MR	MR	MR			
	2014-2015		0	0	0	0	0	0	0		0	0
	TOTAL ESCALATION		0	0	0	0	0	0	0		0	0
	PART 2 SUMMARY NON-CONSTRUCTION COSTS											
		Non-Construction	494,073	1,833,403	234,598	172,819	72,272	69,922	488,616		3,365,703	512
		Non-Const. Contingency	148,222	550,021	70,379	51,846	21,681	20,977	146,585		1,009,711	154
		TOTAL NON-CONSTRUCTION COSTS	642,295	2,383,424	304,978	224,665	93,953	90,899	635,201		4,375,414	666
	DIVISION TOTAL FOR ROAD TYPE		9,592,891	35,597,250	4,554,944	3,355,446	1,403,221	1,357,610	9,486,940		65,348,301	9945

APPENDIX B

PACKAGE 3 – SECTIONS

ID	Chainage Start	Chainage End	Description
G.1			Glover Road Overpass Replacement
W.15	5+500	6+800	Highway 1 Westbound Lanes
W.14	6+800	7+600	Highway 1 Westbound Lanes
E.16	6+000	7+600	Highway 1 Eastbound Lanes



File: Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 3 -	Glover Road New Overpass and Approaches	6+800 to 5+500 West of CP	7+600 to 6+800 West of 232 St Ic	7+600 to 6+000 East of CP Rail			Total Line Cost
Parsons **Hwy 1 Widening**							
(2016Dollars) **Package 3 - West of 232**							
ACTIVITY **EST.DATE April 4, 2016**	0	overpass to west	to west of CP	Overpass to west			
CODE R3 DATE: Sept 15, 2016	0	of Glover Rd	Rail overpass	f Glover Road Overpass			C/LM
Conceptual Est. Divison\site	**Section G.1**	**Section W.15**	**Section W.14**	**Section E.16**	**MR**	**4080**	
Blk Est. # 6.14A Road Type	21	16	16	16	OR	0	
Version Sept.1, 200 DESCRIPTION \Length	380	1300	800	1600	TR	4080	4080
	MR	MR	MR	MR			
Engineering	2,639,794	1,792,953	6,537,207	2,098,515		13,068,469	3203
Land	0	0	0	0		0	0
Construction	13,537,680	8,905,611	36,709,309	10,320,760		69,473,361	17028
Management Reserve	0	0	0	0		0	0
Escalation	0	0	0	0		0	0
Total	16,177,474	10,698,564	43,246,516	12,419,275		82,541,830	20231
BASIC QUANTITY SUMMARY							
Construct.Cost ONLY Per L.M.	35,625	6,850	45,887	6,450	$/LM	17,028	
Land Area	0.3	4.7	2.9	5.1	ha	12.9	
Mobilization	278,445	181,678	706,478	210,428		1,377,028	
Land Cont.	0	0	0	0		0	
Construction Cont.	2,879,384	1,886,280	7,279,723	2,185,406		14,230,792	15,461,853
Engineering Cont.	609,183	413,758	1,508,586	484,273		3,015,800	
Supervision Cont.	244,697	168,862	621,194	196,308		1,231,060	
Total Cont.	3,733,263	2,468,899	9,409,504	2,865,987		18,477,653	
S.G.S.B.	1,221	8,554	5,242	7,396	m3	22,414	
C.B.C.	759	4,893	3,013	3,985	m3	12,650	
Asphalt	892	6,889	4,243	5,507	t	17,532	
Concrete Barrier	215	130	130	315	lm	790	
Noise Attentuation Wall	0	0	0	0	m2	0	
No. of Light Poles	12	0	0	0	ea	12	
Sidewalk	0	0	0	0	lm	0	
Curb and Gutter	0	0	0	0	lm	0	
Signals	0	0	0	0	ea	0	
Bridge total area	1352	0	0	0	m2	1,352	
							ENG
Total Rock	0	0	0	0	m3	0	0
Total OM	0	23,550	18,800	32,110	m3	74,460	0
Total Stripping	0	3,700	1,800	4,600	m3	10,100	0
Total Borrow	0	0	0	0	m3	0	
Total Cut/Excavation	0	27,250	20,600	36,710	m3	84,560	0
Total Fill	3,803	16,629	16,802	26,910	m3	64,144	0
Surplus or Deficit	-3,803	10,621	3,799	9,800	m3	20,416	
ENG & PM	**2.640**	**1.793**	**6.537**	**2.099**		**13.068**	13.069
LAND	**0.000**	**0.000**	**0.000**	**0.000**		**0.000**	0.000
CONST.	**1.540**	**8.906**	**7.666**	**10.321**		**28.432**	28.433
BRIDGES-R/W	**11.998**	**0.000**	**29.043**	**0.000**		**41.041**	41.041
MANAGEMENT RESERVE	**0.000**	**0.000**	**0.000**	**0.000**		**0.000**	0.000
ESCALATION	**0.000**	**0.000**	**0.000**	**0.000**		**0.000**	0.000
TOTAL (Millions) (2016Dollars)	**16.178**	**10.699**	**43.246**	**12.420**		**82.541**	82.543
TOTAL Cost per meter	**$ 42,572**	**$ 8,230**	**$ 54,058**	**$ 7,762**		**$ 20,231**	
Construction cost per meter	**$ 35,626**	**$ 6,851**	**$ 45,886**	**$ 6,451**		**$ 17,028**	

File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 3 -	Glover Road	6+800	7+600	7+600			Total
	Parsons **Hwy 1 Widening**	New Overpass	to 5+500	to 6+800	to 6+000			Line
	(2016Dollars) **Package 3 - West of 232**	and Approaches	West of CP	West of 232 St Ic	East of CP Rail			Cost
ACTIVITY	**EST.DATE April 4, 2016**	0	overpass to west	to west of CP	Overpass to west			
CODE	R3 DATE: Sept 15, 2016	0	of Glover Rd	Rail overpass	f Glover Road Overpass			C/LM
Conceptual Est.	Divison\site	**Section G.1**	**Section W.15**	**Section W.14**	**Section E.16**	**MR**	**4080**	
Blk Est. # 6.14A	Road Type	21	16	16	16	OR	0	
Version Sept.1, 200	DESCRIPTION \Length	380	1300	800	1600	TR	4080	4080
		MR	MR	MR	MR			
	SUMMARY BY ACTIVITY LEVEL							Cost/LM
2000	PROJECT MANAGEMENT	833,206	551,020	2,100,053	639,643		4,123,922	1011
2500	PLANNING	0	0	0	0		0	0
3000	PRELIMINARY DESIGN	117,254	211,900	264,300	260,800		854,254	209
3500	DETAILED DESIGN	1,080,151	616,275	2,664,267	713,799		5,074,492	1244
	Total Engineering	1,197,405	828,175	2,928,567	974,599		5,928,746	1453
4000	LAND ACQUISITION	0	0	0	0		0	0
5000	GRADE CONSTRUCTION	791,258	5,328,147	3,080,203	6,398,311		15,597,920	3823
5200	ROAD SIDE CONSTRUCTION	0	0	0	0		0	0
5300	OTHER CONSTRUCTION	0	0	0	0		0	0
5500	STRUCTURAL CONSTRUCTION	8,509,860	0	23,072,000	0		31,581,860	7741
6000	PAVING CONSTRUCTION	120,540	849,865	523,422	709,265		2,203,092	540
6500	OPERATIONAL CONSTRUCTION	138,288	59,586	52,118	117,111		367,102	90
6700	UTILITY CONSTRUCTION	38,000	50,000	10,000	60,000		158,000	39
6800	RESIDENT ENGINEERING	815,655	562,872	2,070,648	654,359		4,103,534	1006
							0	0
	Total Construction	10,413,600	6,850,470	28,808,392	7,939,046		54,011,508	13238
9700	CONTINGENCY	3,733,263	2,468,899	9,409,504	2,865,987		18,477,653	4529
	SUB-TOTAL	16,177,474	10,698,564	43,246,516	12,419,275		82,541,830	20231
9800	MANAGEMENT RESERVE	0	0	0	0		0	0
	TOTAL	16,177,474	10,698,564	43,246,516	12,419,275		82,541,830	20231
9900	ESCALATION	0	0	0	0		0	0
	TOTAL COST	16,177,474	10,698,564	43,246,516	12,419,275		82,541,830	20231
	Const. Less Resident Eng.	9,597,945	6,287,598	26,737,744	7,284,687		49,907,975	12232

File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 3 - Parsons (2016Dollars) ACTIVITY CODE Conceptual Est. Blk Est. # 6.14A Version Sept.1, 200		Glover Road New Overpass and Approaches 0 0 Divison\site Section G.1 Road Type 21 DESCRIPTION \Length 380 MR	6+800 to 5+500 West of CP overpass to west of Glover Rd Section W.15 16 1300 MR	7+600 to 6+800 West of 232 St Ic to west of CP Rail overpass Section W.14 16 800 MR	7+600 to 6+000 East of CP Rail Overpass to west f Glover Road Overpass Section E.16 16 1600 MR	MR OR TR	4080 0 4080	Total Line Cost C/LM 4080
		Hwy 1 Widening							
		Package 3 - West of 232							
		EST.DATE April 4, 2016							
		R3 DATE: Sept 15, 2016							
2500		PLANNING							
2521	Consultant	- transport. planning study	0	0	0	0		0	0
2531	Consultant	- corridor study	0	0	0	0		0	0
2541	Consultant	- functional plan. study	0	0	0	0		0	0
2502	Consultant	- general	0	0	0	0		0	0
	Consultant sub-total		0	0	0	0		0	0
2510	Client	- project ident.	0	0	0	0		0	0
2520	Client	- transport. planning study	0	0	0	0		0	0
2530	Client	- corridor study	0	0	0	0		0	0
2540	Client	- functional plan. study	0	0	0	0		0	0
2501	Client	- general	0	0	0	0		0	0
	Client Sub-total		0	0	0	0		0	0
2599	Planning Contingency		0	0	0	0		0	0
		TOTAL PLANNING	0	0	0	0		0	0
3000		PRELIMINARY DESIGN							
3013	Consultant	- aerial base plan	0	0	0	0		0	0
3014	Consultant	- prel. design	26,600	91,000	56,000	112,000		285,600	70
3015	Consultant	- control survey	0	0	0	0		0	0
3021	Consultant	- environmental impact	10,640	36,400	22,400	44,800		114,240	28
3031	Consultant	- funct.-road field survey	0	0	0	0		0	0
3041	Consultant	- functional design	19,000	65,000	40,000	80,000		204,000	50
3051	Consultant	- funct. structural des.	55,314	0	133,900	0		189,214	46
3061	Consultant	- geotechnical design	5,700	19,500	12,000	24,000		61,200	15
3071	Consultant	- right-of-way research	0	0	0	0		0	0
3002	Consultant	- general	0	0	0	0		0	0
	Consultant sub-total		117,254	211,900	264,300	260,800		854,254	209
3010	Client	- aerial base plan	0	0	0	0		0	0
3011	Client	- prel. design	0	0	0	0		0	0
3012	Client	- control survey	0	0	0	0		0	0
3020	Client	- environmental impact	0	0	0	0		0	0
3030	Client	- funct.-road field survey	0	0	0	0		0	0
3040	Client	- functional design	0	0	0	0		0	0
3050	Client	- funct. structural des.	0	0	0	0		0	0
3060	Client	- geotechnical design	0	0	0	0		0	0
3070	Client	- right-of-way research	0	0	0	0		0	0
3001	Client	- general	0	0	0	0		0	0
	Client Sub-total		0	0	0	0		0	0
3099	Preliminary design Contingency		35,176	63,570	79,290	78,240		256,276	63
	TOTAL PRELIMINARY DESIGN		152,430	275,470	343,590	339,040		1,110,530	272
6700		UTILITIES							
6710	Util. Prov.	- Hydro	22,800	0	10,000	10,000		42,800	10
6711	Util. Prov.	- Telephone	15,200	50,000	0	50,000		115,200	28
	Util. Prov.	sub-total	38,000	50,000	10,000	60,000		158,000	39
6712	Util.Others	- pipelines	0	0	0	0		0	0
6713	Util.Others	- telecommunication	0	0	0	0		0	0
6714	Util.Others	- storm & sewer inspect.	0	0	0	0		0	0
6715	Util.Others	- waterworks inspect.	0	0	0	0		0	0
6716	Util.Others	- engineering services	0	0	0	0		0	0
6717	Util.Others	- parks/recreation-prel.	0	0	0	0		0	0
6718	Util.Others	- transit	0	0	0	0		0	0
6719	Util.Others	- tr-ops/signs & detours	0	0	0	0		0	0
6701	Util.Others	- general	0	0	0	0		0	0
	Util.Others	sub-total	0	0	0	0		0	0
6799	Util.Others Contingency		11,400	15,000	3,000	18,000		47,400	12
	TOTAL UTILITIES		49,400	65,000	13,000	78,000		205,400	50
5000		GRADE CONSTRUCTION							
5032	Grade Const	- water	0	0	0	0		0	0
5033	Grade Const	- sanitary	0	0	0	0		0	0

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	Parsons **Hwy 1 Widening**	New Overpass	to 5+500	to 6+800	to 6+000			Line
	(2016Dollars) **Package 3 - West of 232**	and Approaches	West of CP	West of 232 St Ic	East of CP Rail			Cost
ACTIVITY	**EST.DATE April 4, 2016**	0	overpass to west	to west of CP	Overpass to west			
CODE	R3 DATE: Sept 15, 2016	0	of Glover Rd	Rail overpass	f Glover Road Overpass			C/LM
	Conceptual Est. Divison\site	**Section G.1**	**Section W.15**	**Section W.14**	**Section E.16**	**MR**	**4080**	
Blk Est. # 6.14A	Road Type	21	16	16	16	OR	0	
Version Sept.1, 200	DESCRIPTION \Length	380	1300	800	1600	TR	4080	4080
		MR	MR	MR	MR			
5034	Grade Const - storm	0	0	0	0		0	0
5031	Grade Const - mobilization	0	0	0	0		0	0
5039	Grade Const - utility contingency	0	0	0	0		0	0
	Grade Const. Utilities Sub-total	0	0	0	0		0	0
5010	Grade Const - site prep./clear,grubbing	0	4,713	0	11,600		16,313	4
5020	Grade Const - road grade/exc,placing,fill	114,098	1,608,370	1,340,045	2,299,700		5,362,213	1314
5030	Grade Const - drainage/pipe,cul.	0	2,500,000	1,000,000	3,000,000		6,500,000	1593
5040	Grade Const - muiltiplate	0	0	0	0		0	0
5050	Grade Const -SGSB/produce,place,comp	85,491	598,781	366,941	517,737		1,568,950	385
5051	Grade Const -CBC/produce,place,comp	68,310	440,382	271,160	358,674		1,138,526	279
5060	Grade Const - grade finishing landscaping	0	0	0	0		0	0
5061	Grade Const - grade finishing hydro seed.	312	20,713	12,343	24,242		57,610	14
5062	Grade Const - grade finishing fencing	0	0	0	0		0	0
5063	Grade Const - noise barriers	0	0	0	0		0	0
5064	Grade Const - passing lanes	0	0	0	0		0	0
5090	Grade Const - sidewalks,curb & gutter	0	0	0	0		0	0
5005	Grade Const -detours c/w ex,bf,paving	500,000	0	0	0		500,000	123
5001	Grade Const - mobilization	23,046	155,189	89,715	186,359		454,308	111
5099	Grade Const - Contingency	237,377	1,598,444	924,061	1,919,493		4,679,376	1147
	Grade Construction Sub-total	1,028,635	6,926,592	4,004,264	8,317,805		20,277,296	4970
	GRADE CONSTRUCTION COSTS	1,028,635	6,926,592	4,004,264	8,317,805		20,277,296	4970
3510	Grade Eng. - detailed design	72,004	484,861	280,299	582,246		1,419,411	348
3519	Grade Eng. - detailed design/Contingency	21,601	145,458	84,090	174,674		425,823	104
6810	Grade Eng. - general const. supervision	30,859	207,798	120,128	249,534		608,319	149
6811	Grade Eng. - quality assurance	20,573	138,532	80,085	166,356		405,546	99
6812	Grade Eng. - surveying	20,573	138,532	80,085	166,356		405,546	99
6819	Grade Eng. - Residency Contingency	21,601	145,458	84,090	174,674		425,823	104
	Grade Engineering Sub-total	187,212	1,260,640	728,776	1,513,840		3,690,468	905
	Total Grade Const. & Eng. Costs	1,215,847	8,187,231	4,733,040	9,831,645		23,967,764	5874
5500	STRUCTURAL CONSTRUCTION							
5522	Struct.Const - water	0	0	0	0		0	0
5523	Struct.Const - sanitary	0	0	0	0		0	0
5524	Struct.Const - storm	0	0	0	0		0	0
5521	Struct.Const - mobilization	0	0	0	0		0	0
5599	Struct.Const - utility contingency	0	0	0	0		0	0
	Structural Const. Utilities Sub-total	0	0	0	0		0	0
5510	Struct.Const - tunnel site preparation	0	0	0	0		0	0
5511	Struct.Const - tunnel construction	0	0	0	0		0	0
5512	Struct.Const - snow shed site prep.	0	0	0	0		0	0
5513	Struct.Const - snow shed site const.	0	0	0	0		0	0
5514	Struct.Const - bridge site preparation	1,000,000	0	6,000,000	0		7,000,000	1716
5515	Struct.Const - bridge piers	0	0	6,000,000	0		6,000,000	1471
5516	Struct.Const - bridge abutments	0	0	2,000,000	0		2,000,000	490
5517	Struct.Const - bridge superstructure	6,762,000	0	6,000,000	0		12,762,000	3128
5518	Struct.Const - retain. wall site prep.	0	0	0	0		0	0
5519	Struct.Const - retaining wall const.	500,000	0	0	0		500,000	123
5501	Struct.Const - mobilization	247,860	0	600,000	0		847,860	208
5529	Struct.Const - Contingency	2,552,958	0	6,180,000	0		8,732,958	2140
	Structural Construction Sub-total	11,062,818	0	26,780,000	0		37,842,818	9275
	STRUCTURAL CONSTRUCTION COSTS	11,062,818	0	26,780,000	0		37,842,818	9275
3520	Struct. Eng. - detailed design	885,025	0	2,142,400	0		3,027,425	742
3529	Struct. Eng. - detailed design/Contingency	265,508	0	642,720	0		908,228	223
6820	Struct. Eng. - general const. supervision	442,513	0	1,071,200	0		1,513,713	371
6821	Struct. Eng. - quality assurance	221,256	0	535,600	0		756,856	186
6822	Struct. Eng. - surveying	55,314	0	133,900	0		189,214	46
6829	Struct. Eng. - Residency Contingency	215,725	0	522,210	0		737,935	181
	Structural Engineering Sub-total	2,085,341	0	5,048,030	0		7,133,371	1748
	Total Structural & Eng. Costs	13,148,159	0	31,828,030	0		44,976,189	11024

File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 3 - Parsons **Hwy 1 Widening** (2016Dollars) **Package 3 - West of 232** ACTIVITY **EST.DATE April 4, 2016** CODE R3 DATE: Sept 15, 2016 Conceptual Est. Blk Est. # 6.14A Version Sept.1, 200		Glover Road New Overpass and Approaches 0 0 Divison\site **Section G.1** Road Type 21 DESCRIPTION \Length 380 MR	6+800 to 5+500 West of CP overpass to west of Glover Rd **Section W.15** 16 1300 MR	7+600 to 6+800 West of 232 St Ic to west of CP Rail overpass **Section W.14** 16 800 MR	7+600 to 6+000 East of CP Rail Overpass to west f Glover Road Overpass **Section E.16** 16 1600 MR	MR OR TR	4080 0 4080	Total Line Cost C/LM 4080
6000		PAVING CONSTRUCTION							
6020	Paving Cons	- machine paving asphalt	117,029	825,112	508,177	688,607		2,138,925	524
6030	Paving Cons	- machine paving concrete	0	0	0	0		0	0
6040	Paving Cons	- hot reprofiling	0	0	0	0		0	0
6050	Paving Cons	- shoulder paving	0	0	0	0		0	0
6060	Paving Cons	- pavement finishing	0	0	0	0		0	0
6070	Paving Cons	- seal coating	0	0	0	0		0	0
6001	Paving Cons	- mobilization	3,511	24,753	15,245	20,658		64,168	16
6010	Paving Cons	- pavement design	0	0	0	0		0	0
6099	Paving Cons	- Contingency	36,162	254,960	157,027	212,779		660,928	162
	PAVING CONSTRUCTION COSTS		156,702	1,104,825	680,449	922,044		2,864,020	702
3560	Paving Eng.	- detailed design	10,969	77,338	47,631	64,543		200,481	49
3569	Paving Eng.	- detailed design/Contingency	3,291	23,201	14,289	19,363		60,144	15
6860	Paving Eng.	- general const. supervision	3,134	22,097	13,609	18,441		57,280	14
6861	Paving Eng.	- quality assurance	6,268	44,193	27,218	36,882		114,561	28
6862	Paving Eng.	- surveying	784	5,524	3,402	4,610		14,320	4
6869	Paving Eng.	- Residency Contingency	3,056	21,544	13,269	17,980		55,848	14
	Paving Engineering Sub-total		27,501	193,897	119,419	161,819		502,636	123
	Total Paving Const. & Eng. Costs		184,203	1,298,722	799,868	1,083,863		3,366,656	825
6500		OPERATIONAL CONSTRUCTION							
6510	Operat.Cons	- lighting	66,000	0	0	0		66,000	16
6520	Operat.Cons	- signals	0	0	0	0		0	0
6530	Operat.Cons	- signing	760	2,600	1,600	3,200		8,160	2
6540	Operat.Cons	- guard rail	64,500	39,000	39,000	94,500		237,000	58
6550	Operat.Cons	- pavement markings	3,000	16,250	10,000	16,000		45,250	11
6501	Operat.Cons	- mobilization	4,028	1,736	1,518	3,411		10,692	3
6599	Operat.Cons	- contingency	41,486	17,876	15,635	35,133		110,131	27
	OPERATIONAL CONSTRUCTION COSTS		179,774	77,461	67,753	152,244		477,233	117
3540	Operat. Eng	- detailed design	12,584	5,422	4,743	10,657		33,406	8
3549	Operat. Eng	- detailed design/Contingency	3,775	1,627	1,423	3,197		10,022	2
6840	Operat. Eng	- general const. supervision	9,888	4,260	3,726	8,373		26,248	6
6841	Operat. Eng	- quality assurance	3,595	1,549	1,355	3,045		9,545	2
6842	Operat. Eng	- surveying	899	387	339	761		2,386	1
6849	Operat. Eng	- Residency Contingency	4,315	1,859	1,626	3,654		11,454	3
	Operational Enginering Sub-total		35,056	15,105	13,212	29,688		93,060	23
	Total Operational Const.& Eng.Costs		214,830	92,566	80,965	181,932		570,293	140
5200		ROAD SIDE CONSTRUCTION							
5203	RoadSide Cı	- water	0	0	0	0		0	0
5204	RoadSide Cı	- sanitary	0	0	0	0		0	0
5205	RoadSide Cı	- storm	0	0	0	0		0	0
5202	RoadSide Cı	- mobilization	0	0	0	0		0	0
5209	RoadSide Cı	- Utility Contingency	0	0	0	0		0	0
	Road Side Const. Utilities Sub-total		0	0	0	0		0	0
5210	RoadSide Cı	- weighscales	0	0	0	0		0	0
5220	RoadSide Cı	- safety rest areas	0	0	0	0		0	0
5230	RoadSide Cı	- tourist rest & view areas	0	0	0	0		0	0
5201	RoadSide Cı	- mobilization	0	0	0	0		0	0
5299	RoadSide Cı	- Contingency	0	0	0	0		0	0
	Road Side Construction Sub-total		0	0	0	0		0	0
	ROAD SIDE CONSTRUCTION COSTS		0	0	0	0		0	0
3550	RoadSide Eı	- detailed design	0	0	0	0		0	0
3559	RoadSide Eı	- detailed design/Contingency	0	0	0	0		0	0
6850	RoadSide Eı	- general const. supervision	0	0	0	0		0	0
6851	RoadSide Eı	- quality assurance	0	0	0	0		0	0
6852	RoadSide Eı	- surveying	0	0	0	0		0	0
6859	RoadSide Eı	- Residency Contingency	0	0	0	0		0	0

File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 3 - Parsons **Hwy 1 Widening** (2016Dollars) **Package 3 - West of 232** ACTIVITY **EST.DATE April 4, 2016** CODE R3 DATE: Sept 15, 2016 Conceptual Est. Divison\site Blk Est. # 6.14A Road Type Version Sept.1, 200 DESCRIPTION \Length	Glover Road New Overpass and Approaches 0 0 **Section G.1** 21 380 MR	6+800 to 5+500 West of CP overpass to west of Glover Rd **Section W.15** 16 1300 MR	7+600 to 6+800 West of 232 St Ic to west of CP Rail overpass **Section W.14** 16 800 MR	7+600 to 6+000 East of CP Rail Overpass to west f Glover Road Overpass **Section E.16** 16 1600 MR		**MR** OR TR	**4080** 0 4080	Total Line Cost C/LM 4080
	Road Side Engineering Sub-total	0	0	0	0		0	0
	Total Road Side Const.& Eng.Costs	0	0	0	0		0	0
5300	OTHER CONSTRUCTION							
5303	Other Const - water	0	0	0	0		0	0
5304	Other Const - sanitary	0	0	0	0		0	0
5305	Other Const - storm	0	0	0	0		0	0
5302	Other Const - mobilization	0	0	0	0		0	0
5309	Other Const - utility contingency	0	0	0	0		0	0
	Other Const. Utilities Sub-total	0	0	0	0		0	0
5310	Other Const - railroads main & spur lines	0	0	0	0		0	0
5320	Other Const - railroad crossings	0	0	0	0		0	0
5330	Other Const - marine work	0	0	0	0		0	0
5340	Other Const - environmental mitigations	0	0	0	0		0	0
5301	Other Const - mobilization	0	0	0	0		0	0
5399	Other Const - Contingency	0	0	0	0		0	0
	Other Construction Sub-total	0	0	0	0		0	0
	OTHER CONSTRUCTION COSTS	0	0	0	0		0	0
3570	Other Eng. - detailed design	0	0	0	0		0	0
3579	Other Eng. - detailed design/Contingency	0	0	0	0		0	0
6870	Other Eng. - general const. supervision	0	0	0	0		0	0
6871	Other Eng. - quality assurance	0	0	0	0		0	0
6872	Other Eng. - surveying	0	0	0	0		0	0
6879	Other Eng. - Residency Contingency	0	0	0	0		0	0
	Other Engineering Sub-total	0	0	0	0		0	0
	Total Other Const.& Eng.Costs	0	0	0	0		0	0
3500	DETAILED DESIGN							
	from 3510,3520,3540,3550,3570	1,274,758	737,908	3,217,594	854,681		6,084,941	1491
3530	Geotech. En - detailed design	99,568	48,653	189,195	56,353		393,768	97
3539	Geotech. En - Contingency	29,870	14,596	56,758	16,906		118,130	29
	TOTAL DETAILED DESIGN COSTS	1,404,196	801,157	3,463,548	927,939		6,596,840	1617
6800	RESIDENT ENGINEERING							
	from 6810,6820,6840,6850,6860,6870	1,060,352	731,734	2,691,842	850,666		5,334,594	
	TOTAL RESIDENT ENG. COSTS	1,060,352	731,734	2,691,842	850,666		5,334,594	1307
							0	
							0	0
	PART 1 SUMMARY							
	CONSTRUCTION	9,597,945	6,287,598	24,265,744	7,284,687		47,435,975	11626
	ENGINEERING & SUPERVISION	2,013,060	1,391,047	4,999,215	1,628,958		10,032,280	2459
	CONTRACTUAL CONTINGENCY	3,483,302	2,303,594	8,779,488	2,674,094		17,240,476	4226
							0	0
	CONSTRUCTION COST TOTAL	15,094,307	9,982,239	38,044,447	11,587,739		74,708,731	18311
2000	PROJECT MANAGEMENT							
2060	Project Man. - office costs wages	339,622	224,600	856,000	260,724		1,680,946	412
2062	Project Man. - office costs - expenses	0	0	0	0		0	0
2063	Project Man. - printing costs	0	0	0	0		0	0
2061	Project Man. - general	0	0	0	0		0	0
	Project Manager Sub-total	339,622	224,600	856,000	260,724		1,680,946	412
2010	Client - office costs wages	301,886	199,645	760,889	231,755		1,494,175	366
2012	Client - office costs - expenses	0	0	0	0		0	0
2030	Client - printing costs	0	0	0	0		0	0
2011	Client - general	0	0	0	0		0	0
	Client Sub-total	301,886	199,645	760,889	231,755		1,494,175	366

File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 3 -	Glover Road	6+800	7+600	7+600				Total
	Parsons	**Hwy 1 Widening**	New Overpass	to 5+500	to 6+800	to 6+000				Line
	(2016Dollars)	**Package 3 - West of 232**	and Approaches	West of CP	West of 232 St Ic	East of CP Rail				Cost
ACTIVITY		**EST.DATE April 4, 2016**	0	overpass to west	to west of CP	Overpass to west				
CODE		R3 DATE: Sept 15, 2016	0	of Glover Rd	Rail overpass	f Glover Road Overpass				C/LM
	Conceptual Est.	Divison\site	**Section G.1**	**Section W.15**	**Section W.14**	**Section E.16**	**MR**	**4080**		
Blk Est. # 6.14A		Road Type	21	16	16	16	OR	0		
Version Sept.1, 200		DESCRIPTION \Length	380	1300	800	1600	TR	4080	4080	
			MR	MR	MR	MR				
2070	Public Rel.	- wages & expenses	90,566	59,893	228,267	69,526		448,252	110	
2072	Public Rel.	- adv., media, displays	0	0	0	0		0	0	
2073	Public Rel.	- opening ceremonies	0	0	0	0		0	0	
2071	Public Rel.	- general	0	0	0	0		0	0	
	Public Relations Sub-total		90,566	59,893	228,267	69,526		448,252	110	
2040	Legal Costs	- lawyers fees	10,566	6,988	26,631	8,111		52,296	13	
2041	Legal Costs	- general	0	0	0	0		0	0	
	Legal Costs Sub-total		10,566	6,988	26,631	8,111		52,296	13	
2080	Insurance	- const./ liability, E&O	90,566	59,893	228,267	69,526		448,252	110	
2081	Insurance	- general	0	0	0	0		0	0	
	Legal Costs Sub-total		90,566	59,893	228,267	69,526		448,252	110	
2099	Project Management Contingency		249,962	165,306	630,016	191,893		1,237,177	303	
	TOTAL PROJECT MANAGEMENT COSTS		1,083,167	716,325	2,730,070	831,536		5,361,099	1314	
4000		LAND	0	0	0	0		0		
4010	Land(Code 4	-Mrkt,ROW,Serv,Imp.V,Ease.C,T	0	0	0	0		0	0	
	Acquisition Sub-total		0	0	0	0		0	0	
4020	Land(Code 4	-Bus.,5%,Mrg.P,Rel$,P/Tax,Etc	0	0	0	0		0	0	
4030	Land(Code 4	-Owners(LS,Apprsl,Rprt,Lgl,In	0	0	0	0		0	0	
4040	Land(Code 4	-Demolition	0	0	0	0		0	0	
4050	Land(Code 4	-Pro.Man,P.Tax,Util,Security	0	0	0	0		0	0	
4060	Land(Code 4	-Not Used	0	0	0	0		0	0	
4070	Land(Code 4	-Not Used	0	0	0	0		0	0	
4080	Land(Code 4	-Acq.F,M/Sal,TrvlV,Cntr.S,Appr.	0	0	0	0		0	0	
4090	Land(Code 4	-Surveys	0	0	0	0		0	0	
								0	0	
								0	0	
								0	0	
								0	0	
	Associated costs-sub-total		0	0	0	0		0	0	
4099	Land Contingency Sub-total		0	0	0	0		0	0	
	TOTAL LAND COSTS		0	0	0	0		0	0	
9800		MANAGEMENT RESERVE								
	MAN. RES.	- planning	0	0	0	0		0	0	
	MAN. RES.	- preliminary design	0	0	0	0		0	0	
	MAN. RES.	- utility construction	0	0	0	0		0	0	
	MAN. RES.	- grade construction	0	0	0	0		0	0	
	MAN. RES.	- structural construction	0	0	0	0		0	0	
	MAN. RES.	- paving construction	0	0	0	0		0	0	
	MAN. RES.	- operation construction	0	0	0	0		0	0	
	MAN. RES.	- roadside construction	0	0	0	0		0	0	
	MAN. RES.	- other construction	0	0	0	0		0	0	
	MAN. RES.	- project management	0	0	0	0		0	0	
	MAN. RES.	- land	0	0	0	0		0	0	
	MAN. RES.	- detailed eng.	0	0	0	0		0	0	
	MAN. RES.	- residency eng.	0	0	0	0		0	0	
	MAN. RES.	- risk contingency	0	0	0	0		0	0	
	TOTAL MANAGEMENT RESERVE		0	0	0	0		0	0	
	TOTAL LESS ESCALATION									
	FISCAL									
9900	ESCALATION									
	YEAR	PROJECTED ESCALATION								
	2006-2007		0	0	0	0		0	0	
	2007-2008		0	0	0	0		0	0	
	2008-2009		0	0	0	0		0	0	
	2009-2010		0	0	0	0		0	0	
	2010-2011		0	0	0	0		0	0	
	2011-2012		0	0	0	0		0	0	
	2012-2013		0	0	0	0		0	0	
	2013-2014		0	0	0	0		0	0	

File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 3 -	Glover Road	6+800	7+600	7+600			Total
Parsons	**Hwy 1 Widening**	New Overpass	to 5+500	to 6+800	to 6+000			Line
(2016Dollars)	**Package 3 - West of 232**	and Approaches	West of CP	West of 232 St Ic	East of CP Rail			Cost
ACTIVITY	**EST.DATE April 4, 2016**	0	overpass to west	to west of CP	Overpass to west			
CODE	R3 DATE: Sept 15, 2016	0	of Glover Rd	Rail overpass	f Glover Road Overpass			C/LM
Conceptual Est.	Divison\site	**Section G.1**	**Section W.15**	**Section W.14**	**Section E.16**	**MR**	**4080**	
Blk Est. # 6.14A	Road Type	21	16	16	16	OR	0	
Version Sept.1, 200	DESCRIPTION \Length	380	1300	800	1600	TR	4080	4080
		MR	MR	MR	MR			
2014-2015		0	0	0	0		0	0
TOTAL ESCALATION		0	0	0	0		0	0
PART 2 SUMMARY NON-CONSTRUCTION COSTS								
	Non-Construction	833,206	551,020	2,100,053	639,643		4,123,922	1011
	Non-Const. Contingency	249,962	165,306	630,016	191,893		1,237,177	303
	TOTAL NON-CONSTRUCTION COST	1,083,167	716,325	2,730,070	831,536		5,361,099	1314
DIVISION TOTAL FOR ROAD TYPE		16,177,474	10,698,564	40,774,516	12,419,275		80,069,830	19625

PACKAGE 4 – SECTIONS

ID	Chainage Start	Chainage End	Description
W.12	8+800	12+800	Highway 1 Westbound Lanes
W.11	12+800	14+600	Highway 1 Westbound Lanes
E.14	8+800	12+200	Highway 1 Eastbound Lanes
E.13	12+200	14+600	Highway 1 Eastbound Lanes

File: Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 4 - Between 232 and	12+800 to 8+800 East of 248 St Overpass to 72 Ave	14+600 to 12+800 West of 264 St IC to east of 248 St overpass	12+200 to 8+800 Just east of 248 St Overpass to east of 232 St IC	14+600 to 12+200 West of 264 St IC to east of 248 St Overpass			Total Line Cost
Parsons (2016Dollars) ACTIVITY CODE Conceptual Est.	**Hwy 1 Widening** **Package 4 - Btw 232 and 264** **EST.DATE April 4, 2016** R3 DATE: Sept 15, 2016						C/LM
Blk Est. # 6.14A Version Sept.1, 200 Divison\site	**Section W.12**	**Section W.11**	**Section E.14**	**Section E.13**	**MR**	**11600**	
Road Type	16	16	16	16	OR	0	
DESCRIPTION \Length	4000	1800	3400	2400	TR	11600	11600
	MR	MR	MR	MR			
Engineering	3,807,086	2,112,378	3,404,209	2,599,117		11,922,790	1028
Land	0	0	0	0		0	0
Construction	17,215,383	10,088,309	15,636,464	12,170,501		55,110,657	4751
Management Reserve	0	0	0	0		0	0
Escalation	0	0	0	0		0	0
Total	21,022,469	12,200,688	19,040,673	14,769,618		67,033,447	5779
BASIC QUANTITY SUMMARY							
Construct.Cost ONLY Per L.M.	4,304	5,605	4,599	5,071	$/LM	4,751	
Land Area	11.7	5.8	9.5	7.6	ha	34.6	
Mobilization	351,927	207,280	319,489	249,821		1,128,517	
Land Cont.	0	0	0	0		0	
Construction Cont.	3,644,353	2,134,984	3,310,239	2,576,154		11,665,730	12,717,844
Engineering Cont.	878,558	487,472	785,587	599,796		2,751,413	
Supervision Cont.	328,428	193,087	298,176	232,423		1,052,114	
Total Cont.	4,851,339	2,815,543	4,394,001	3,408,373		15,469,257	
S.G.S.B.	18,164	8,364	15,299	11,106	m3	52,934	
C.B.C.	9,989	4,480	8,501	5,977	m3	28,947	
Asphalt	13,824	6,188	13,360	9,378	t	42,751	
Concrete Barrier	1,530	225	1,620	445	lm	3,820	
Noise Attentuation Wall	0	0	0	0	m2	0	
No. of Light Poles	0	0	0	0	ea	0	
Sidewalk	0	0	0	0	lm	0	
Curb and Gutter	0	0	0	0	lm	0	
Signals	0	0	0	0	ea	0	
Bridge total area	0	0	0	0	m2	0	
							ENG
Total Rock	0	0	0	0	m3	0	0
Total OM	50,760	39,770	41,540	47,360	m3	179,430	0
Total Stripping	22,300	6,800	18,900	8,000	m3	56,000	0
Total Borrow	0	0	0	0	m3	0	
Total Cut/Excavation	73,060	46,570	60,440	55,360	m3	235,430	0
Total Fill	75,808	37,341	84,836	45,218	m3	243,202	0
Surplus or Deficit	-2,748	9,230	-24,396	10,142	m3	-7,772	
ENG & PM	**3.807**	**2.112**	**3.404**	**2.599**		**11.923**	11.922
LAND	**0.000**	**0.000**	**0.000**	**0.000**		**0.000**	0.000
CONST.	**17.215**	**10.088**	**15.636**	**12.171**		**55.111**	55.110
BRIDGES-R/W	**0.000**	**0.000**	**0.000**	**0.000**		**0.000**	0.000
MANAGEMENT RESERVE	**0.000**	**0.000**	**0.000**	**0.000**		**0.000**	0.000
ESCALATION	**0.000**	**0.000**	**0.000**	**0.000**		**0.000**	0.000
TOTAL (Millions) (2016Dollars)	**21.022**	**12.200**	**19.040**	**14.770**		**67.034**	67.032
TOTAL Cost per meter	**$ 5,256**	**$ 6,778**	**$ 5,600**	**$ 6,154**		**$ 5,779**	
Construction cost per meter	**$ 4,304**	**$ 5,604**	**$ 4,599**	**$ 5,071**		**$ 4,751**	

File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 4 - Between 232 and	12+800 to 8+800 East of 248 St Overpass to 72 Ave	14+600 to 12+800 West of 264 St IC to east of 248 St overpass	12+200 to 8+800 Just east of 248 St Overpass to east of 232 St IC	14+600 to 12+200 West of 264 St IC to east of 248 St Overpass			Total Line Cost
	Parsons **Hwy 1 Widening**							
	(2016Dollars) **Package 4 - Btw 232 and 264**							
ACTIVITY CODE	**EST.DATE April 4, 2016**							C/LM
	R3 DATE: Sept 15, 2016							
Conceptual Est.	Divison\site	**Section W.12**	**Section W.11**	**Section E.14**	**Section E.13**	**MR**	**11600**	
Blk Est. # 6.14A	Road Type	16	16	16	16	OR	0	
Version Sept.1, 200	DESCRIPTION \Length	4000	1800	3400	2400	TR	11600	11600
		MR	MR	MR	MR			
	SUMMARY BY ACTIVITY LEVEL							Cost/LM
2000	PROJECT MANAGEMENT	1,082,743	628,385	980,672	760,695		3,452,495	298
2500	PLANNING	0	0	0	0		0	0
3000	PRELIMINARY DESIGN	652,000	293,400	554,200	391,200		1,890,800	163
3500	DETAILED DESIGN	1,193,785	703,121	1,083,750	847,426		3,828,082	330
	Total Engineering	1,845,785	996,521	1,637,950	1,238,626		5,718,882	493
4000	LAND ACQUISITION	0	0	0	0		0	0
5000	GRADE CONSTRUCTION	9,781,110	6,227,769	8,658,063	7,167,670		31,834,611	2744
5200	ROAD SIDE CONSTRUCTION	0	0	0	0		0	0
5300	OTHER CONSTRUCTION	0	0	0	0		0	0
5500	STRUCTURAL CONSTRUCTION	0	0	0	0		0	0
6000	PAVING CONSTRUCTION	1,779,522	797,072	1,759,707	1,236,163		5,572,464	480
6500	OPERATIONAL CONSTRUCTION	522,210	91,773	551,359	173,349		1,338,691	115
6700	UTILITY CONSTRUCTION	65,000	0	65,000	10,000		140,000	12
6800	RESIDENT ENGINEERING	1,094,760	643,624	993,920	774,742		3,507,047	302
							0	0
	Total Construction	13,242,602	7,760,238	12,028,049	9,361,924		42,392,813	3655
9700	CONTINGENCY	4,851,339	2,815,543	4,394,001	3,408,373		15,469,257	1334
	SUB-TOTAL	21,022,469	12,200,688	19,040,673	14,769,618		67,033,447	5779
9800	MANAGEMENT RESERVE	0	0	0	0		0	0
	TOTAL	21,022,469	12,200,688	19,040,673	14,769,618		67,033,447	5779
9900	ESCALATION	0	0	0	0		0	0
	TOTAL COST	21,022,469	12,200,688	19,040,673	14,769,618		67,033,447	5779
	Const. Less Resident Eng.	12,147,842	7,116,614	11,034,129	8,587,182		38,885,766	3352

File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 4 - Between 232 and		12+800 to 8+800 East of 248 St Overpass to 72 Ave	14+600 to 12+800 West of 264 St IC to east of 248 St overpass	12+200 to 8+800 Just east of 248 St Overpass to east of 232 St IC	14+600 to 12+200 West of 264 St IC to east of 248 St Overpass			Total Line Cost
	Parsons	**Hwy 1 Widening**							
	(2016Dollars)	**Package 4 - Btw 232 and 264**							
ACTIVITY CODE		**EST.DATE April 4, 2016** R3 DATE: Sept 15, 2016							C/LM
	Conceptual Est.	Divison\site	**Section W.12**	**Section W.11**	**Section E.14**	**Section E.13**	**MR**	**11600**	
Blk Est. # 6.14A		Road Type	16	16	16	16	OR	0	
Version Sept.1, 200		DESCRIPTION \Length	4000	1800	3400	2400	TR	11600	11600
			MR	MR	MR	MR			
2500		PLANNING							
2521	Consultant	- transport. planning study	0	0	0	0		0	0
2531	Consultant	- corridor study	0	0	0	0		0	0
2541	Consultant	- functional plan. study	0	0	0	0		0	0
2502	Consultant	- general	0	0	0	0		0	0
	Consultant sub-total		0	0	0	0		0	0
2510	Client	- project ident.	0	0	0	0		0	0
2520	Client	- transport. planning study	0	0	0	0		0	0
2530	Client	- corridor study	0	0	0	0		0	0
2540	Client	- functional plan. study	0	0	0	0		0	0
2501	Client	- general	0	0	0	0		0	0
	Client Sub-total		0	0	0	0		0	0
2599	Planning Contingency		0	0	0	0		0	0
	TOTAL PLANNING		0	0	0	0		0	0
3000		PRELIMINARY DESIGN							
3013	Consultant	- aerial base plan	0	0	0	0		0	0
3014	Consultant	- prel. design	280,000	126,000	238,000	168,000		812,000	70
3015	Consultant	- control survey	0	0	0	0		0	0
3021	Consultant	- environmental impact	112,000	50,400	95,200	67,200		324,800	28
3031	Consultant	- funct.-road field survey	0	0	0	0		0	0
3041	Consultant	- functional design	200,000	90,000	170,000	120,000		580,000	50
3051	Consultant	- funct. structural des.	0	0	0	0		0	0
3061	Consultant	- geotechnical design	60,000	27,000	51,000	36,000		174,000	15
3071	Consultant	- right-of-way research	0	0	0	0		0	0
3002	Consultant	- general	0	0	0	0		0	0
	Consultant sub-total		652,000	293,400	554,200	391,200		1,890,800	163
3010	Client	- aerial base plan	0	0	0	0		0	0
3011	Client	- prel. design	0	0	0	0		0	0
3012	Client	- control survey	0	0	0	0		0	0
3020	Client	- environmental impact	0	0	0	0		0	0
3030	Client	- funct.-road field survey	0	0	0	0		0	0
3040	Client	- functional design	0	0	0	0		0	0
3050	Client	- funct. structural des.	0	0	0	0		0	0
3060	Client	- geotechnical design	0	0	0	0		0	0
3070	Client	- right-of-way research	0	0	0	0		0	0
3001	Client	- general	0	0	0	0		0	0
	Client Sub-total		0	0	0	0		0	0
3099	Preliminary design Contingency		195,600	88,020	166,260	117,360		567,240	49
	TOTAL PRELIMINARY DESIGN		847,600	381,420	720,460	508,560		2,458,040	212
6700		UTILITIES							
6710	Util. Prov.	- Hydro	15,000	0	15,000	10,000		40,000	3
6711	Util. Prov.	- Telephone	50,000	0	50,000	0		100,000	9
	Util. Prov.	sub-total	65,000	0	65,000	10,000		140,000	12
6712	Util.Others	- pipelines	0	0	0	0		0	0
6713	Util.Others	- telecommunication	0	0	0	0		0	0
6714	Util.Others	- storm & sewer inspect.	0	0	0	0		0	0
6715	Util.Others	- waterworks inspect.	0	0	0	0		0	0
6716	Util.Others	- engineering services	0	0	0	0		0	0
6717	Util.Others	- parks/recreation-prel.	0	0	0	0		0	0
6718	Util.Others	- transit	0	0	0	0		0	0
6719	Util.Others	- tr-ops/signs & detours	0	0	0	0		0	0
6701	Util.Others	- general	0	0	0	0		0	0
	Util.Others	sub-total	0	0	0	0		0	0
6799	Util.Others Contingency		19,500	0	19,500	3,000		42,000	4
	TOTAL UTILITIES		84,500	0	84,500	13,000		182,000	16
5000		GRADE CONSTRUCTION							
5032	Grade Const	- water	0	0	0	0		0	0
5033	Grade Const	- sanitary	0	0	0	0		0	0

File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 4 - Between 232 and	12+800 to 8+800 East of 248 St Overpass to 72 Ave	14+600 to 12+800 West of 264 St IC to east of 248 St overpass	12+200 to 8+800 Just east of 248 St Overpass to east of 232 St IC	14+600 to 12+200 West of 264 St IC to east of 248 St Overpass			Total Line Cost
	Parsons	**Hwy 1 Widening**							
	(2016Dollars)	**Package 4 - Btw 232 and 264**							
ACTIVITY CODE		**EST.DATE April 4, 2016** R3 DATE: Sept 15, 2016							C/LM
	Conceptual Est.	Divison\site	**Section W.12**	**Section W.11**	**Section E.14**	**Section E.13**	**MR**	**11600**	
Blk Est. # 6.14A		Road Type	16	16	16	16	OR	0	
Version Sept.1, 200		DESCRIPTION \Length	4000	1800	3400	2400	TR	11600	11600
			MR	MR	MR	MR			
5034	Grade Const	- storm	0	0	0	0		0	0
5031	Grade Const	- mobilization	0	0	0	0		0	0
5039	Grade Const	- utility contingency	0	0	0	0		0	0
	Grade Const. Utilities Sub-total		0	0	0	0		0	0
5010	Grade Const	- site prep./clear,grubbing	14,500	19,575	12,325	0		46,400	4
5020	Grade Const	- road grade/exc,placing,fill	5,256,640	3,010,015	5,013,665	3,606,940		16,887,260	1456
5030	Grade Const	- drainage/pipe,cul.	2,000,000	2,000,000	1,500,000	2,000,000		7,500,000	647
5040	Grade Const	- muiltiplate	0	0	0	0		0	0
5050	Grade Const	-SGSB/produce,place,comp	1,271,479	585,514	1,070,920	777,452		3,705,365	319
5051	Grade Const	-CBC/produce,place,comp	898,991	403,200	765,134	537,926		2,605,250	225
5060	Grade Const	- grade finishing landscaping	0	0	0	0		0	0
5061	Grade Const	- grade finishing hydro seed.	54,613	28,074	43,843	36,585		163,115	14
5062	Grade Const	- grade finishing fencing	0	0	0	0		0	0
5063	Grade Const	- noise barriers	0	0	0	0		0	0
5064	Grade Const	- passing lanes	0	0	0	0		0	0
5090	Grade Const	- sidewalks,curb & gutter	0	0	0	0		0	0
5005	Grade Const	-detours c/w ex,bf,paving	0	0	0	0		0	0
5001	Grade Const	- mobilization	284,887	181,391	252,177	208,767		927,222	80
5099	Grade Const	- Contingency	2,934,333	1,868,331	2,597,419	2,150,301		9,550,383	823
	Grade Construction Sub-total		12,715,443	8,096,100	11,255,482	9,317,970		41,384,994	3568
	GRADE CONSTRUCTION COSTS		12,715,443	8,096,100	11,255,482	9,317,970		41,384,994	3568
3510	Grade Eng.	- detailed design	890,081	566,727	787,884	652,258		2,896,950	250
3519	Grade Eng.	- detailed design/Contingency	267,024	170,018	236,365	195,677		869,085	75
6810	Grade Eng.	- general const. supervision	381,463	242,883	337,664	279,539		1,241,550	107
6811	Grade Eng.	- quality assurance	254,309	161,922	225,110	186,359		827,700	71
6812	Grade Eng.	- surveying	254,309	161,922	225,110	186,359		827,700	71
6819	Grade Eng.	- Residency Contingency	267,024	170,018	236,365	195,677		869,085	75
	Grade Engineering Sub-total		2,314,211	1,473,490	2,048,498	1,695,871		7,532,069	649
	Total Grade Const. & Eng. Costs		15,029,653	9,569,590	13,303,980	11,013,841		48,917,063	4217
5500		STRUCTURAL CONSTRUCTION							
5522	Struct.Const	- water	0	0	0	0		0	0
5523	Struct.Const	- sanitary	0	0	0	0		0	0
5524	Struct.Const	- storm	0	0	0	0		0	0
5521	Struct.Const	- mobilization	0	0	0	0		0	0
5599	Struct.Const	- utility contingency	0	0	0	0		0	0
	Structural Const. Utilities Sub-total		0	0	0	0		0	0
5510	Struct.Const	- tunnel site preparation	0	0	0	0		0	0
5511	Struct.Const	- tunnel construction	0	0	0	0		0	0
5512	Struct.Const	- snow shed site prep.	0	0	0	0		0	0
5513	Struct.Const	- snow shed site const.	0	0	0	0		0	0
5514	Struct.Const	- bridge site preparation	0	0	0	0		0	0
5515	Struct.Const	- bridge piers	0	0	0	0		0	0
5516	Struct.Const	- bridge abutments	0	0	0	0		0	0
5517	Struct.Const	- bridge superstructure	0	0	0	0		0	0
5518	Struct.Const	- retain. wall site prep.	0	0	0	0		0	0
5519	Struct.Const	- retaining wall const.	0	0	0	0		0	0
5501	Struct.Const	- mobilization	0	0	0	0		0	0
5529	Struct.Const	- Contingency	0	0	0	0		0	0
	Structural Construction Sub-total		0	0	0	0		0	0
	STRUCTURAL CONSTRUCTION COSTS		0	0	0	0		0	0
3520	Struct. Eng.	- detailed design	0	0	0	0		0	0
3529	Struct. Eng.	- detailed design/Contingency	0	0	0	0		0	0
6820	Struct. Eng.	- general const. supervision	0	0	0	0		0	0
6821	Struct. Eng.	- quality assurance	0	0	0	0		0	0
6822	Struct. Eng.	- surveying	0	0	0	0		0	0
6829	Struct. Eng.	- Residency Contingency	0	0	0	0		0	0
	Structural Engineering Sub-total		0	0	0	0		0	0
	Total Structural & Eng. Costs		0	0	0	0		0	0

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	Parsons **Hwy 1 Widening**	East of 248 St	West of 264 St	Just east of 248	West of 264 St IC			Cost
	(2016Dollars) **Package 4 - Btw 232 and 264**	Overpass to 72	IC to east of 248	St Overpass to east	to east of 248			
ACTIVITY	**EST.DATE April 4, 2016**	Ave	St overpass	of 232 St IC	St Overpass			C/LM
CODE	R3 DATE: Sept 15, 2016							
Conceptual Est.	Divison\site	**Section W.12**	**Section W.11**	**Section E.14**	**Section E.13**	**MR**	**11600**	
Blk Est. # 6.14A	Road Type	16	16	16	16	OR	0	
Version Sept.1, 200	DESCRIPTION \Length	4000	1800	3400	2400	TR	11600	11600
		MR	MR	MR	MR			
6000	PAVING CONSTRUCTION							
6020	Paving Cons - machine paving asphalt	1,727,691	773,856	1,708,454	1,200,158		5,410,159	466
6030	Paving Cons - machine paving concrete	0	0	0	0		0	0
6040	Paving Cons - hot reprofiling	0	0	0	0		0	0
6050	Paving Cons - shoulder paving	0	0	0	0		0	0
6060	Paving Cons - pavement finishing	0	0	0	0		0	0
6070	Paving Cons - seal coating	0	0	0	0		0	0
6001	Paving Cons - mobilization	51,831	23,216	51,254	36,005		162,305	14
6010	Paving Cons - pavement design	0	0	0	0		0	0
6099	Paving Cons - Contingency	533,857	239,122	527,912	370,849		1,671,739	144
	PAVING CONSTRUCTION COSTS	2,313,379	1,036,193	2,287,619	1,607,012		7,244,203	625
3560	Paving Eng. - detailed design	161,937	72,534	160,133	112,491		507,094	44
3569	Paving Eng. - detailed design/Contingency	48,581	21,760	48,040	33,747		152,128	13
6860	Paving Eng. - general const. supervision	46,268	20,724	45,752	32,140		144,884	12
6861	Paving Eng. - quality assurance	92,535	41,448	91,505	64,280		289,768	25
6862	Paving Eng. - surveying	11,567	5,181	11,438	8,035		36,221	3
6869	Paving Eng. - Residency Contingency	45,111	20,206	44,609	31,337		141,262	12
	Paving Engineering Sub-total	405,998	181,852	401,477	282,031		1,271,358	110
	Total Paving Const. & Eng. Costs	2,719,377	1,218,045	2,689,096	1,889,042		8,515,561	734
6500	OPERATIONAL CONSTRUCTION							
6510	Operat.Cons - lighting	0	0	0	0		0	0
6520	Operat.Cons - signals	0	0	0	0		0	0
6530	Operat.Cons - signing	8,000	3,600	6,800	4,800		23,200	2
6540	Operat.Cons - guard rail	459,000	67,500	486,000	133,500		1,146,000	99
6550	Operat.Cons - pavement markings	40,000	18,000	42,500	30,000		130,500	11
6501	Operat.Cons - mobilization	15,210	2,673	16,059	5,049		38,991	3
6599	Operat.Cons - contingency	156,663	27,532	165,408	52,005		401,607	35
	OPERATIONAL CONSTRUCTION COSTS	678,873	119,305	716,767	225,354		1,740,298	150
3540	Operat. Eng - detailed design	47,521	8,351	50,174	15,775		121,821	11
3549	Operat. Eng - detailed design/Contingency	14,256	2,505	15,052	4,732		36,546	3
6840	Operat. Eng - general const. supervision	37,338	6,562	39,422	12,394		95,716	8
6841	Operat. Eng - quality assurance	13,577	2,386	14,335	4,507		34,806	3
6842	Operat. Eng - surveying	3,394	597	3,584	1,127		8,701	1
6849	Operat. Eng - Residency Contingency	16,293	2,863	17,202	5,408		41,767	4
	Operational Enginering Sub-total	132,380	23,264	139,770	43,944		339,358	29
	Total Operational Const.& Eng.Costs	811,253	142,569	856,536	269,298		2,079,656	179
5200	ROAD SIDE CONSTRUCTION							
5203	RoadSide C - water	0	0	0	0		0	0
5204	RoadSide C - sanitary	0	0	0	0		0	0
5205	RoadSide C - storm	0	0	0	0		0	0
5202	RoadSide C - mobilization	0	0	0	0		0	0
5209	RoadSide C - Utility Contingency	0	0	0	0		0	0
	Road Side Const. Utilities Sub-total	0	0	0	0		0	0
5210	RoadSide C - weighscales	0	0	0	0		0	0
5220	RoadSide C - safety rest areas	0	0	0	0		0	0
5230	RoadSide C - tourist rest & view areas	0	0	0	0		0	0
5201	RoadSide C - mobilization	0	0	0	0		0	0
5299	RoadSide C - Contingency	0	0	0	0		0	0
	Road Side Construction Sub-total	0	0	0	0		0	0
	ROAD SIDE CONSTRUCTION COSTS	0	0	0	0		0	0
3550	RoadSide E - detailed design	0	0	0	0		0	0
3559	RoadSide E - detailed design/Contingency	0	0	0	0		0	0
6850	RoadSide E - general const. supervision	0	0	0	0		0	0
6851	RoadSide E - quality assurance	0	0	0	0		0	0
6852	RoadSide E - surveying	0	0	0	0		0	0
6859	RoadSide E - Residency Contingency	0	0	0	0		0	0

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	Parsons	**Hwy 1 Widening**	East of 248 St	West of 264 St	Just east of 248	West of 264 St IC				Cost
	(2016Dollars)	**Package 4 - Btw 232 and 264**	Overpass to 72	IC to east of 248	St Overpass to east	to east of 248				
ACTIVITY		**EST.DATE April 4, 2016**	Ave	St overpass	of 232 St IC	St Overpass				C/LM
CODE		R3 DATE: Sept 15, 2016								
	Conceptual Est.	Divison\site	**Section W.12**	**Section W.11**	**Section E.14**	**Section E.13**	**MR**	**11600**		
Blk Est. # 6.14A		Road Type	16	16	16	16	OR	0		
Version Sept.1, 200		DESCRIPTION \Length	4000	1800	3400	2400	TR	11600	11600	
			MR	MR	MR	MR				
	Road Side Engineering Sub-total		0	0	0	0		0	0	
	Total Road Side Const.& Eng.Costs		0	0	0	0		0	0	
5300		OTHER CONSTRUCTION								
5303	Other Const - water		0	0	0	0		0	0	
5304	Other Const - sanitary		0	0	0	0		0	0	
5305	Other Const - storm		0	0	0	0		0	0	
5302	Other Const - mobilization		0	0	0	0		0	0	
5309	Other Const - utility contingency		0	0	0	0		0	0	
	Other Const. Utilities Sub-total		0	0	0	0		0	0	
5310	Other Const - railroads main & spur lines		0	0	0	0		0	0	
5320	Other Const - railroad crossings		0	0	0	0		0	0	
5330	Other Const - marine work		0	0	0	0		0	0	
5340	Other Const - environmental mitigations		0	0	0	0		0	0	
5301	Other Const - mobilization		0	0	0	0		0	0	
5399	Other Const - Contingency		0	0	0	0		0	0	
	Other Construction Sub-total		0	0	0	0		0	0	
	OTHER CONSTRUCTION COSTS		0	0	0	0		0	0	
3570	Other Eng. - detailed design		0	0	0	0		0	0	
3579	Other Eng. - detailed design/Contingency		0	0	0	0		0	0	
6870	Other Eng. - general const. supervision		0	0	0	0		0	0	
6871	Other Eng. - quality assurance		0	0	0	0		0	0	
6872	Other Eng. - surveying		0	0	0	0		0	0	
6879	Other Eng. - Residency Contingency		0	0	0	0		0	0	
	Other Engineering Sub-total		0	0	0	0		0	0	
	Total Other Const.& Eng.Costs		0	0	0	0		0	0	
3500		DETAILED DESIGN								
	from 3510,3520,3540,3550,3570		1,429,400	841,895	1,297,648	1,014,681		4,583,624	395	
3530	Geotech. En - detailed design		94,246	55,510	85,559	66,902		302,217	26	
3539	Geotech. En - Contingency		28,274	16,653	25,668	20,071		90,665	8	
	TOTAL DETAILED DESIGN COSTS		1,551,920	914,058	1,408,875	1,101,653		4,976,506	429	
6800		RESIDENT ENGINEERING								
	from 6810,6820,6840,6850,6860,6870		1,423,189	836,711	1,292,096	1,007,165		4,559,161		
	TOTAL RESIDENT ENG. COSTS		1,423,189	836,711	1,292,096	1,007,165		4,559,161	393	
								0		
								0	0	
		PART 1 SUMMARY								
		CONSTRUCTION	12,147,842	7,116,614	11,034,129	8,587,182		38,885,766	3352	
		ENGINEERING & SUPERVISION	2,940,545	1,640,145	2,631,870	2,013,368		9,225,928	795	
		CONTRACTUAL CONTINGENCY	4,526,516	2,627,028	4,099,800	3,180,165		14,433,508	1244	
								0	0	
	CONSTRUCTION COST TOTAL		19,614,903	11,383,787	17,765,799	13,780,714		62,545,203	5392	
2000		PROJECT MANAGEMENT								
2060	Project Man. - office costs wages		441,335	256,135	399,730	310,066		1,407,267	121	
2062	Project Man. - office costs - expenses		0	0	0	0		0	0	
2063	Project Man. - printing costs		0	0	0	0		0	0	
2061	Project Man. - general		0	0	0	0		0	0	
	Project Manager Sub-total		441,335	256,135	399,730	310,066		1,407,267	121	
2010	Client - office costs wages		392,298	227,676	355,316	275,614		1,250,904	108	
2012	Client - office costs - expenses		0	0	0	0		0	0	
2030	Client - printing costs		0	0	0	0		0	0	
2011	Client - general		0	0	0	0		0	0	
	Client Sub-total		392,298	227,676	355,316	275,614		1,250,904	108	

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	Parsons **Hwy 1 Widening**							
	(2016Dollars) **Package 4 - Btw 232 and 264**							
ACTIVITY CODE	**EST.DATE April 4, 2016** R3 DATE: Sept 15, 2016							C/LM
	Conceptual Est. Divison\site	**Section W.12**	**Section W.11**	**Section E.14**	**Section E.13**	**MR**	**11600**	
Blk Est. # 6.14A	Road Type	16	16	16	16	OR	0	
Version Sept.1, 200	DESCRIPTION \Length	4000	1800	3400	2400	TR	11600	11600
		MR	MR	MR	MR			
2070	Public Rel. - wages & expenses	117,689	68,303	106,595	82,684		375,271	32
2072	Public Rel. - adv., media, displays	0	0	0	0		0	0
2073	Public Rel. - opening ceremonies	0	0	0	0		0	0
2071	Public Rel. - general	0	0	0	0		0	0
	Public Relations Sub-total	117,689	68,303	106,595	82,684		375,271	32
2040	Legal Costs - lawyers fees	13,730	7,969	12,436	9,646		43,782	4
2041	Legal Costs - general	0	0	0	0		0	0
	Legal Costs Sub-total	13,730	7,969	12,436	9,646		43,782	4
2080	Insurance - const./ liability, E&O	117,689	68,303	106,595	82,684		375,271	32
2081	Insurance - general	0	0	0	0		0	0
	Legal Costs Sub-total	117,689	68,303	106,595	82,684		375,271	32
2099	Project Management Contingency	324,823	188,516	294,202	228,209		1,035,749	89
	TOTAL PROJECT MANAGEMENT COSTS	1,407,565	816,901	1,274,874	988,904		4,488,244	387
4000	LAND	0	0	0	0		0	
4010	Land(Code 4 -Mrkt,ROW,Serv,Imp.V,Ease.C,T	0	0	0	0		0	0
	Acquisition Sub-total	0	0	0	0		0	0
4020	Land(Code 4 -Bus.,5%,Mrg.P,Rel$,P/Tax,Etc	0	0	0	0		0	0
4030	Land(Code 4 -Owners(LS,Apprsl,Rprt,Lgl,In	0	0	0	0		0	0
4040	Land(Code 4 -Demolition	0	0	0	0		0	0
4050	Land(Code 4 -Pro.Man,P.Tax,Util,Security	0	0	0	0		0	0
4060	Land(Code 4 -Not Used	0	0	0	0		0	0
4070	Land(Code 4 -Not Used	0	0	0	0		0	0
4080	Land(Code 4 -Acq.F,M/Sal,TrvlV,Cntr.S,Appr.	0	0	0	0		0	0
4090	Land(Code 4 -Surveys	0	0	0	0		0	0
							0	0
							0	0
							0	0
							0	0
	Associated costs-sub-total	0	0	0	0		0	0
4099	Land Contingency Sub-total	0	0	0	0		0	0
	TOTAL LAND COSTS	0	0	0	0		0	0
9800	MANAGEMENT RESERVE							
	MAN. RES. - planning	0	0	0	0		0	0
	MAN. RES. - preliminary design	0	0	0	0		0	0
	MAN. RES. - utility construction	0	0	0	0		0	0
	MAN. RES. - grade construction	0	0	0	0		0	0
	MAN. RES. - structural construction	0	0	0	0		0	0
	MAN. RES. - paving construction	0	0	0	0		0	0
	MAN. RES. - operation construction	0	0	0	0		0	0
	MAN. RES. - roadside construction	0	0	0	0		0	0
	MAN. RES. - other construction	0	0	0	0		0	0
	MAN. RES. - project management	0	0	0	0		0	0
	MAN. RES. - land	0	0	0	0		0	0
	MAN. RES. - detailed eng.	0	0	0	0		0	0
	MAN. RES. - residency eng.	0	0	0	0		0	0
	MAN. RES. - risk contingency	0	0	0	0		0	0
	TOTAL MANAGEMENT RESERVE	0	0	0	0		0	0
	TOTAL LESS ESCALATION							
	FISCAL							
9900	ESCALATION							
	YEAR PROJECTED ESCALATION							
	2006-2007	0	0	0	0		0	0
	2007-2008	0	0	0	0		0	0
	2008-2009	0	0	0	0		0	0
	2009-2010	0	0	0	0		0	0
	2010-2011	0	0	0	0		0	0
	2011-2012	0	0	0	0		0	0
	2012-2013	0	0	0	0		0	0
	2013-2014	0	0	0	0		0	0

File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 4 - Between 232 and	12+800 to 8+800 East of 248 St Overpass to 72 Ave	14+600 to 12+800 West of 264 St IC to east of 248 St overpass	12+200 to 8+800 Just east of 248 St Overpass to east of 232 St IC	14+600 to 12+200 West of 264 St IC to east of 248 St Overpass			Total Line Cost
	Parsons **Hwy 1 Widening**							
	(2016Dollars) **Package 4 - Btw 232 and 264**							
ACTIVITY CODE	**EST.DATE April 4, 2016**							
	R3 DATE: Sept 15, 2016							C/LM
Conceptual Est.	Divison\site	**Section W.12**	**Section W.11**	**Section E.14**	**Section E.13**	**MR**	**11600**	
Blk Est. # 6.14A	Road Type	16	16	16	16	OR	0	
Version Sept.1, 200	DESCRIPTION \Length	4000	1800	3400	2400	TR	11600	11600
		MR	MR	MR	MR			
	2014-2015	0	0	0	0		0	0
	TOTAL ESCALATION	0	0	0	0		0	0
	PART 2 SUMMARY NON-CONSTRUCTION COSTS							
	Non-Construction	1,082,743	628,385	980,672	760,695		3,452,495	298
	Non-Const. Contingency	324,823	188,516	294,202	228,209		1,035,749	89
	TOTAL NON-CONSTRUCTION COSTS	1,407,565	816,901	1,274,874	988,904		4,488,244	387
	DIVISION TOTAL FOR ROAD TYPE	21,022,469	12,200,688	19,040,673	14,769,618		67,033,447	5779

PACKAGE 5 – SECTIONS

ID	Chainage Start	Chainage End	Description
W.9	16+500	19+800	Highway 1 Westbound Lanes
W.8	19+800	21+200	Highway 1 Westbound Lanes
W.7	21+200	22+400	Highway 1 Westbound Lanes
W.6	22+400	24+400	Highway 1 Westbound Lanes
W.5	24+400	25+400	Highway 1 Westbound Lanes
W.4	25+400	26+300	Highway 1 Westbound Lanes
E.11	16+500	18+600	Highway 1 Eastbound Lanes
E.10	18+600	21+600	Highway 1 Eastbound Lanes
E.9	21+600	24+400	Highway 1 Eastbound Lanes
E.8	24+400	26+300	Highway 1 Eastbound Lanes

File: Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 5 - Between 264 and Mt	19+800 to 16+500 West of Rest Stop to east of 264 St IC	21+200 to 19+800 East and West of the Rest stop	22+400 to 21+200 East of Bradner to east of Rest Stop Off-Ramp	24+400 to 22+400 East of Automall's Western Tip to east of Bradner	25+400 to 24+400 E of Fraser Hwy WB On ramp to E of automall W tip	26+300 to 25+400 W of Peardonville to E of Fraser Hwy WB on ramp	18+600 to 16+500 East of 275 St to east of 264 St IC	21+600 to 18+600 East of Bradner Underpass to just East of 275 St	24+400 to 21+600 W of Fraser Hwy IC to east of Bradner	26+300 to 24+400 To the east and west of the Fraser Hwy IC			Total Line Cost
Parsons **Hwy 1 Widening**													
(2016Dollars) **Package 5 - Btw 264 & Mt Lehman**													
ACTIVITY **EST.DATE April 4, 2016**													
CODE R3 DATE: Sept 15, 2016													C/LM
Conceptual Est. Divison\site	**Section W.9**	**Section W.8**	**Section W.7**	**Section W.6**	**Section W.5**	**Section W.4**	**Section E.11**	**Section E.10**	**Section E.9**	**Section E.8**	**MR**	**19800**	
Blk Est. # 6.14A Road Type	16	16	16	16	16	16	16	16	16	16	OR	0	
Version Sept.1, 200 DESCRIPTION \Length	3300	1400	1200	2000	1000	900	2100	3000	3000	1900	TR	19800	19800
	MR	MR	MR	MR	MR	MR	MR	MR	MR	MR			
Engineering	3,588,003	1,693,293	1,983,651	2,104,970	1,182,300	738,293	2,397,930	3,791,702	2,807,649	1,954,418		22,242,209	1123
Land	0	0	0	0	0	0	0	0	0	0		0	0
Construction	16,856,864	8,148,252	9,413,839	9,811,434	5,697,212	3,161,976	11,420,367	17,728,893	12,627,081	9,060,339		103,926,257	5249
Management Reserve	0	0	0	0	0	0	0	0	0	0		0	0
Escalation	0	0	0	0	0	0	0	0	0	0		0	0
Total	20,444,866	9,841,545	11,397,490	11,916,404	6,879,512	3,900,268	13,818,297	21,520,595	15,434,730	11,014,757		126,168,465	6372
BASIC QUANTITY SUMMARY													
Construct.Cost ONLY Per L.M.	5,108	5,820	7,845	4,906	5,697	3,513	5,438	5,910	4,209	4,769	$/LM	5,249	
Land Area	11.0	6.8	3.8	6.6	3.3	2.5	6.9	9.5	10.1	6.1	ha	66.6	
Mobilization	344,653	167,285	191,334	200,306	115,602	64,956	233,058	361,633	258,179	184,661		2,121,666	
Land Cont.	0	0	0	0	0	0	0	0	0	0		0	
Construction Cont.	3,569,424	1,723,038	2,000,742	2,078,150	1,207,205	669,042	2,418,494	3,760,815	2,674,246	1,918,505		22,019,663	23,982,982
Engineering Cont.	828,001	390,760	457,766	485,762	272,839	170,375	553,368	875,008	647,919	451,020		5,132,817	
Supervision Cont.	320,622	157,328	171,682	186,027	107,536	60,644	216,975	330,468	239,695	172,342		1,963,320	
Total Cont.	4,718,046	2,271,126	2,630,190	2,749,939	1,587,580	900,062	3,188,838	4,966,291	3,561,861	2,541,867		29,115,800	
S.G.S.B.	15,444	12,259	5,561	9,357	4,663	4,056	9,801	13,866	14,075	8,805	m3	97,886	
C.B.C.	8,205	6,247	2,988	4,973	2,488	2,250	5,223	7,473	7,456	4,731	m3	52,033	
Asphalt	11,326	6,765	4,128	7,797	3,901	3,116	7,212	10,327	10,291	6,321	t	71,184	
Concrete Barrier	220	1,155	205	140	105	415	200	595	120	325	lm	3,480	
Noise Attentuation Wall	0	0	0	0	0	0	0	0	0	0	m2	0	
No. of Light Poles	0	31	0	0	0	0	0	0	0	16	ea	47	
Sidewalk	0	0	0	0	0	0	0	0	0	0	lm	0	
Curb and Gutter	0	0	0	0	0	0	0	0	0	0	lm	0	
Signals	0	0	0	0	0	0	0	0	0	0	ea	0	
Bridge total area	0	0	279	0	0	0	0	279	0	0	m2	558	
													ENG
Total Rock	0	0	0	0	0	0	0	0	0	0	m3	0	0
Total OM	78,840	32,140	21,630	49,970	23,130	14,080	54,430	58,530	75,710	35,970	m3	444,430	0
Total Stripping	7,500	2,335	3,200	3,600	1,400	2,800	4,400	9,200	0	5,900	m3	40,335	0
Total Borrow	0	0	0	0	0	0	0	0	0	0	m3	0	
Total Cut/Excavation	86,340	34,475	24,830	53,570	24,530	16,880	58,830	67,730	75,710	41,870	m3	484,765	0
Total Fill	64,343	28,428	18,791	40,457	17,825	11,466	34,995	55,453	46,173	35,788	m3	353,717	0
Surplus or Deficit	21,998	6,047	6,039	13,113	6,705	5,415	23,836	12,277	29,538	6,082	m3	131,048	
ENG & PM	**3.588**	**1.693**	**1.984**	**2.105**	**1.182**	**0.738**	**2.398**	**3.792**	**2.808**	**1.954**		**22.242**	22.242
LAND	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**		**0.000**	0.000
CONST.	**16.857**	**8.148**	**4.408**	**9.811**	**5.697**	**3.162**	**11.420**	**12.842**	**12.627**	**9.060**		**94.033**	94.032
BRIDGES-R/W	**0.000**	**0.000**	**5.006**	**0.000**	**0.000**	**0.000**	**0.000**	**4.887**	**0.000**	**0.000**		**9.893**	9.893
MANAGEMENT RESERVE	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**		**0.000**	0.000
ESCALATION	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**		**0.000**	0.000
TOTAL (Millions) (2016Dollars)	**20.445**	**9.841**	**11.398**	**11.916**	**6.879**	**3.900**	**13.818**	**21.521**	**15.435**	**11.014**		**126.168**	126.167
TOTAL Cost per meter	**$ 6,195**	**$ 7,030**	**$ 9,498**	**$ 5,958**	**$ 6,880**	**$ 4,334**	**$ 6,580**	**$ 7,174**	**$ 5,145**	**$ 5,797**		**$ 6,372**	
Construction cost per meter	**$ 5,108**	**$ 5,820**	**$ 7,845**	**$ 4,906**	**$ 5,697**	**$ 3,513**	**$ 5,438**	**$ 5,910**	**$ 4,209**	**$ 4,768**		**$ 5,249**	

File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 5 - Between 264 and Mt	19+800	21+200	22+400	24+400	25+400	26+300	18+600	21+600	24+400	26+300				Total
	Parsons **Hwy 1 Widening**	to 16+500	to 19+800	to 21+200	to 22+400	to 24+400	to 25+400	to 16+500	to 18+600	to 21+600	to 24+400				Line
	(2016Dollars) **Package 5 - Btw 264 & Mt Lehman**	West of Rest	East and	East of Bradner	East of Automall's	E of Fraser Hwy	W of Peardonville	East of 275 St	East of Bradner	W of Fraser Hwy	To the east and				Cost
ACTIVITY	**EST.DATE April 4, 2016**	Stop to east of	West of the	to east of Rest	Western Tip to	WB On ramp to E	to E of Fraser Hwy	to east of	Underpass to just	IC to east of	west of the				
CODE	R3 DATE: Sept 15, 2016	264 St IC	Rest stop	Stop Off-Ramp	east of Bradner	of automall W tip	WB on ramp	264 St IC	East of 275 St	Bradner	Fraser Hwy IC				C/LM
Conceptual Est.	Divison\site	**Section W.9**	**Section W.8**	**Section W.7**	**Section W.6**	**Section W.5**	**Section W.4**	**Section E.11**	**Section E.10**	**Section E.9**	**Section E.8**	**MR**	**19800**		
Blk Est. # 6.14A	Road Type	16	16	16	16	16	16	16	16	16	16	OR	0		
Version Sept.1, 200	DESCRIPTION \Length	3300	1400	1200	2000	1000	900	2100	3000	3000	1900	TR	19800	19800	
		MR	MR	MR	MR	MR	MR	MR	MR	MR	MR				
	SUMMARY BY ACTIVITY LEVEL													Cost/LM	
2000	PROJECT MANAGEMENT	1,052,994	506,880	587,017	613,743	354,323	200,880	711,698	1,108,398	794,951	567,305		6,498,189	328	
2500	PLANNING	0	0	0	0	0	0	0	0	0	0		0	0	
3000	PRELIMINARY DESIGN	537,900	228,200	218,679	326,000	163,000	146,700	342,300	511,530	489,000	309,700		3,273,009	165	
3500	DETAILED DESIGN	1,169,108	567,454	720,189	679,464	392,139	220,338	790,563	1,296,766	875,779	626,394		7,338,193	371	
	Total Engineering	1,707,008	795,654	938,868	1,005,464	555,139	367,038	1,132,863	1,808,296	1,364,779	936,094		10,611,202	536	
4000	LAND ACQUISITION	0	0	0	0	0	0	0	0	0	0		0	0	
5000	GRADE CONSTRUCTION	10,265,132	4,352,083	2,408,667	5,775,879	3,407,259	1,689,783	6,984,808	7,399,051	7,464,154	5,316,854		55,063,671	2781	
5200	ROAD SIDE CONSTRUCTION	0	0	0	0	0	0	0	0	0	0		0	0	
5300	OTHER CONSTRUCTION	0	0	0	0	0	0	0	0	0	0		0	0	
5500	STRUCTURAL CONSTRUCTION	0	0	3,550,616	0	0	0	0	3,466,156	0	0		7,016,772	354	
6000	PAVING CONSTRUCTION	1,459,178	836,748	531,681	1,028,159	514,379	400,999	929,082	1,329,909	1,325,841	808,614		9,164,589	463	
6500	OPERATIONAL CONSTRUCTION	108,768	554,629	78,177	73,130	47,380	139,359	87,756	220,935	74,160	214,549		1,598,843	81	
6700	UTILITY CONSTRUCTION	65,000	0	100,000	50,000	55,000	0	60,000	120,000	50,000	55,000		555,000	28	
6800	RESIDENT ENGINEERING	1,068,739	524,426	572,273	620,090	358,453	202,148	723,252	1,101,558	798,984	574,475		6,544,399	331	
													0	0	
	Total Construction	12,966,818	6,267,886	7,241,415	7,547,257	4,382,471	2,432,289	8,784,898	13,637,610	9,713,139	6,969,492		79,943,274	4038	
9700	CONTINGENCY	4,718,046	2,271,126	2,630,190	2,749,939	1,587,580	900,062	3,188,838	4,966,291	3,561,861	2,541,867		29,115,800	1470	
	SUB-TOTAL	20,444,866	9,841,545	11,397,490	11,916,404	6,879,512	3,900,268	13,818,297	21,520,595	15,434,730	11,014,757		126,168,465	6372	
9800	MANAGEMENT RESERVE	0	0	0	0	0	0	0	0	0	0		0	0	
	TOTAL	20,444,866	9,841,545	11,397,490	11,916,404	6,879,512	3,900,268	13,818,297	21,520,595	15,434,730	11,014,757		126,168,465	6372	
9900	ESCALATION	0	0	0	0	0	0	0	0	0	0		0	0	
	TOTAL COST	20,444,866	9,841,545	11,397,490	11,916,404	6,879,512	3,900,268	13,818,297	21,520,595	15,434,730	11,014,757		126,168,465	6372	
	Const. Less Resident Eng.	11,898,079	5,743,460	6,669,141	6,927,167	4,024,018	2,230,141	8,061,646	12,536,052	8,914,155	6,395,017		73,398,876	3707	

File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 5 - Between 264 and Mt	19+800	21+200	22+400	24+400	25+400	26+300	18+600	21+600	24+400	26+300			Total
	Parsons **Hwy 1 Widening**	to 16+500	to 19+800	to 21+200	to 22+400	to 24+400	to 25+400	to 16+500	to 18+600	to 21+600	to 24+400			Line
	(2016Dollars) **Package 5 - Btw 264 & Mt Lehman**	West of Rest	East and	East of Bradner	East of Automall's	E of Fraser Hwy	W of Peardonville	East of 275 St	East of Bradner	W of Fraser Hwy	To the east and			Cost
	ACTIVITY **EST.DATE April 4, 2016**	Stop to east of	West of the	to east of Rest	Western Tip to	WB On ramp to E	to E of Fraser Hwy	to east of	Underpass to just	IC to east of	west of the			
	CODE R3 DATE: Sept 15, 2016	264 St IC	Rest stop	Stop Off-Ramp	east of Bradner	of automall W tip	WB on ramp	264 St IC	East of 275 St	Bradner	Fraser Hwy IC			C/LM
	Conceptual Est. Divison\site	**Section W.9**	**Section W.8**	**Section W.7**	**Section W.6**	**Section W.5**	**Section W.4**	**Section E.11**	**Section E.10**	**Section E.9**	**Section E.8**	**MR**	**19800**	
	Blk Est. # 6.14A Road Type	16	16	16	16	16	16	16	16	16	16	OR	0	
	Version Sept.1, 200 DESCRIPTION \Length	3300	1400	1200	2000	1000	900	2100	3000	3000	1900	TR	19800	19800
		MR	MR	MR	MR	MR	MR	MR	MR	MR	MR			
2500	PLANNING													
2521	Consultant - transport. planning study	0	0	0	0	0	0	0	0	0	0		0	0
2531	Consultant - corridor study	0	0	0	0	0	0	0	0	0	0		0	0
2541	Consultant - functional plan. study	0	0	0	0	0	0	0	0	0	0		0	0
2502	Consultant - general	0	0	0	0	0	0	0	0	0	0		0	0
	Consultant sub-total	0	0	0	0	0	0	0	0	0	0		0	0
2510	Client - project ident.	0	0	0	0	0	0	0	0	0	0		0	0
2520	Client - transport. planning study	0	0	0	0	0	0	0	0	0	0		0	0
2530	Client - corridor study	0	0	0	0	0	0	0	0	0	0		0	0
2540	Client - functional plan. study	0	0	0	0	0	0	0	0	0	0		0	0
2501	Client - general	0	0	0	0	0	0	0	0	0	0		0	0
	Client Sub-total	0	0	0	0	0	0	0	0	0	0		0	0
2599	Planning Contingency	0	0	0	0	0	0	0	0	0	0		0	0
	TOTAL PLANNING	0	0	0	0	0	0	0	0	0	0		0	0
3000	PRELIMINARY DESIGN													
3013	Consultant - aerial base plan	0	0	0	0	0	0	0	0	0	0		0	0
3014	Consultant - prel. design	231,000	98,000	84,000	140,000	70,000	63,000	147,000	210,000	210,000	133,000		1,386,000	70
3015	Consultant - control survey	0	0	0	0	0	0	0	0	0	0		0	0
3021	Consultant - environmental impact	92,400	39,200	33,600	56,000	28,000	25,200	58,800	84,000	84,000	53,200		554,400	28
3031	Consultant - funct.-road field survey	0	0	0	0	0	0	0	0	0	0		0	0
3041	Consultant - functional design	165,000	70,000	60,000	100,000	50,000	45,000	105,000	150,000	150,000	95,000		990,000	50
3051	Consultant - funct. structural des.	0	0	23,079	0	0	0	0	22,530	0	0		45,609	2
3061	Consultant - geotechnical design	49,500	21,000	18,000	30,000	15,000	13,500	31,500	45,000	45,000	28,500		297,000	15
3071	Consultant - right-of-way research	0	0	0	0	0	0	0	0	0	0		0	0
3002	Consultant - general	0	0	0	0	0	0	0	0	0	0		0	0
	Consultant sub-total	537,900	228,200	218,679	326,000	163,000	146,700	342,300	511,530	489,000	309,700		3,273,009	165
3010	Client - aerial base plan	0	0	0	0	0	0	0	0	0	0		0	0
3011	Client - prel. design	0	0	0	0	0	0	0	0	0	0		0	0
3012	Client - control survey	0	0	0	0	0	0	0	0	0	0		0	0
3020	Client - environmental impact	0	0	0	0	0	0	0	0	0	0		0	0
3030	Client - funct.-road field survey	0	0	0	0	0	0	0	0	0	0		0	0
3040	Client - functional design	0	0	0	0	0	0	0	0	0	0		0	0
3050	Client - funct. structural des.	0	0	0	0	0	0	0	0	0	0		0	0
3060	Client - geotechnical design	0	0	0	0	0	0	0	0	0	0		0	0
3070	Client - right-of-way research	0	0	0	0	0	0	0	0	0	0		0	0
3001	Client - general	0	0	0	0	0	0	0	0	0	0		0	0
	Client Sub-total	0	0	0	0	0	0	0	0	0	0		0	0
3099	Preliminary design Contingency	161,370	68,460	65,604	97,800	48,900	44,010	102,690	153,459	146,700	92,910		981,903	50
	TOTAL PRELIMINARY DESIGN	699,270	296,660	284,283	423,800	211,900	190,710	444,990	664,989	635,700	402,610		4,254,912	215
6700	UTILITIES													
6710	Util. Prov. - Hydro	15,000	0	50,000	0	5,000	0	10,000	70,000	0	5,000		155,000	8
6711	Util. Prov. - Telephone	0	0	0	0	0	0	50,000	0	0	0		50,000	3
	Util. Prov. sub-total	15,000	0	50,000	0	5,000	0	60,000	70,000	0	5,000		205,000	10
6712	Util.Others - pipelines	50,000	0	50,000	50,000	50,000	0	0	50,000	50,000	50,000		350,000	18
6713	Util.Others - telecommunication	0	0	0	0	0	0	0	0	0	0		0	0
6714	Util.Others - storm & sewer inspect.	0	0	0	0	0	0	0	0	0	0		0	0
6715	Util.Others - waterworks inspect.	0	0	0	0	0	0	0	0	0	0		0	0
6716	Util.Others - engineering services	0	0	0	0	0	0	0	0	0	0		0	0
6717	Util.Others - parks/recreation-prel.	0	0	0	0	0	0	0	0	0	0		0	0
6718	Util.Others - transit	0	0	0	0	0	0	0	0	0	0		0	0
6719	Util.Others - tr-ops/signs & detours	0	0	0	0	0	0	0	0	0	0		0	0
6701	Util.Others - general	0	0	0	0	0	0	0	0	0	0		0	0
	Util.Others sub-total	50,000	0	50,000	50,000	50,000	0	0	50,000	50,000	50,000		350,000	18
6799	Util.Others Contingency	19,500	0	30,000	15,000	16,500	0	18,000	36,000	15,000	16,500		166,500	8
	TOTAL UTILITIES	84,500	0	130,000	65,000	71,500	0	78,000	156,000	65,000	71,500		721,500	36
5000	GRADE CONSTRUCTION													
5032	Grade Const - water	50,000	0	50,000	50,000	100,000	0	50,000	50,000	50,000	100,000		500,000	25
5033	Grade Const - sanitary	50,000	0	0	0	50,000	100,000	50,000	0	0	150,000		400,000	20
5034	Grade Const - storm	0	0	0	0	50,000	0	0	0	0	50,000		100,000	5
5031	Grade Const - mobilization	3,000	0	1,500	1,500	6,000	3,000	3,000	1,500	1,500	9,000		30,000	2

File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 5 - Between 264 and Mt	19+800	21+200	22+400	24+400	25+400	26+300	18+600	21+600	24+400	26+300			Total
	Parsons **Hwy 1 Widening**	to 16+500	to 19+800	to 21+200	to 22+400	to 24+400	to 25+400	to 16+500	to 18+600	to 21+600	to 24+400			Line
	(2016Dollars) **Package 5 - Btw 264 & Mt Lehman**	West of Rest	East and	East of Bradner	East of Automall's	E of Fraser Hwy	W of Peardonville	East of 275 St	East of Bradner	W of Fraser Hwy	To the east and			Cost
	ACTIVITY **EST.DATE April 4, 2016**	Stop to east of	West of the	to east of Rest	Western Tip to	WB On ramp to E	to E of Fraser Hwy	to east of	Underpass to just	IC to east of	west of the			
	CODE R3 DATE: Sept 15, 2016	264 St IC	Rest stop	Stop Off-Ramp	east of Bradner	of automall W tip	WB on ramp	264 St IC	East of 275 St	Bradner	Fraser Hwy IC			C/LM
	Conceptual Est. Divison\site	**Section W.9**	**Section W.8**	**Section W.7**	**Section W.6**	**Section W.5**	**Section W.4**	**Section E.11**	**Section E.10**	**Section E.9**	**Section E.8**	**MR**	**19800**	
	Blk Est. # 6.14A Road Type	16	16	16	16	16	16	16	16	16	16	OR	0	
	Version Sept.1, 200 DESCRIPTION \Length	3300	1400	1200	2000	1000	900	2100	3000	3000	1900	TR	19800	19800
		MR	MR	MR	MR	MR	MR	MR	MR	MR	MR			
5039	Grade Const - utility contingency	30,900	0	15,450	15,450	61,800	30,900	30,900	15,450	15,450	92,700		309,000	16
	Grade Const. Utilities Sub-total	133,900	0	66,950	66,950	267,800	133,900	133,900	66,950	66,950	401,700		1,339,000	68
5010	Grade Const - site prep./clear,grubbing	59,813	20,300	36,975	36,250	10,875	9,788	57,094	27,188	32,625	13,775		304,681	15
5020	Grade Const - road grade/exc,placing,fill	5,433,375	2,252,840	1,574,930	3,386,510	1,530,950	1,032,665	3,434,535	4,417,790	4,458,575	2,776,940		30,299,110	1530
5030	Grade Const - drainage/pipe,cul.	2,500,000	500,000	0	1,000,000	1,000,000	0	2,000,000	1,000,000	1,000,000	1,000,000		10,000,000	505
5040	Grade Const - muiltiplate	0	0	0	0	0	0	0	0	0	0		0	0
5050	Grade Const - SGSB/produce,place,comp	1,081,063	858,125	389,265	654,984	326,414	283,904	686,102	970,622	985,248	616,323		6,852,049	346
5051	Grade Const - CBC/produce,place,comp	738,431	562,238	268,909	447,555	223,886	202,493	470,097	672,527	671,053	425,773		4,682,961	237
5060	Grade Const - grade finishing landscaping	0	0	0	0	0	0	0	0	0	0		0	0
5061	Grade Const - grade finishing hydro seed.	53,467	31,820	18,434	32,350	15,893	11,717	33,540	45,418	49,252	29,183		321,074	16
5062	Grade Const - grade finishing fencing	0	0	0	0	0	0	0	0	0	0		0	0
5063	Grade Const - noise barriers	0	0	0	0	0	0	0	0	0	0		0	0
5064	Grade Const - passing lanes	0	0	0	0	0	0	0	0	0	0		0	0
5090	Grade Const - sidewalks,curb & gutter	0	0	0	0	0	0	0	0	0	0		0	0
5005	Grade Const - detours c/w ex,bf,paving	0	0	0	0	0	0	0	0	0	0		0	0
5001	Grade Const - mobilization	295,984	126,760	68,655	166,729	93,241	46,217	200,441	214,006	215,903	145,860		1,573,796	79
5099	Grade Const - Contingency	3,048,640	1,305,625	707,150	1,717,314	960,378	476,035	2,064,542	2,204,265	2,223,796	1,502,356		16,210,101	819
	Grade Construction Sub-total	13,210,772	5,657,708	3,064,318	7,441,692	4,161,636	2,062,818	8,946,351	9,551,817	9,636,451	6,510,211		70,243,773	3548
	GRADE CONSTRUCTION COSTS	13,344,672	5,657,708	3,131,268	7,508,642	4,429,436	2,196,718	9,080,251	9,618,767	9,703,401	6,911,911		71,582,773	3615
3510	Grade Eng. - detailed design	934,127	396,040	219,189	525,605	310,061	153,770	635,618	673,314	679,238	483,834		5,010,794	253
3519	Grade Eng. - detailed design/Contingency	280,238	118,812	65,757	157,681	93,018	46,131	190,685	201,994	203,771	145,150		1,503,238	76
6810	Grade Eng. - general const. supervision	400,340	169,731	93,938	225,259	132,883	65,902	272,408	288,563	291,102	207,357		2,147,483	108
6811	Grade Eng. - quality assurance	266,893	113,154	62,625	150,173	88,589	43,934	181,605	192,375	194,068	138,238		1,431,655	72
6812	Grade Eng. - surveying	266,893	113,154	62,625	150,173	88,589	43,934	181,605	192,375	194,068	138,238		1,431,655	72
6819	Grade Eng. - Residency Contingency	280,238	118,812	65,757	157,681	93,018	46,131	190,685	201,994	203,771	145,150		1,503,238	76
	Grade Engineering Sub-total	2,428,730	1,029,703	569,891	1,366,573	806,157	399,803	1,652,606	1,750,616	1,766,019	1,257,968		13,028,065	658
	Total Grade Const. & Eng. Costs	15,773,402	6,687,410	3,701,158	8,875,215	5,235,594	2,596,521	10,732,856	11,369,382	11,469,420	8,169,878		84,610,837	4273
5500	STRUCTURAL CONSTRUCTION													
5522	Struct.Const - water	0	0	0	0	0	0	0	0	0	0		0	0
5523	Struct.Const - sanitary	0	0	0	0	0	0	0	0	0	0		0	0
5524	Struct.Const - storm	0	0	0	0	0	0	0	0	0	0		0	0
5521	Struct.Const - mobilization	0	0	0	0	0	0	0	0	0	0		0	0
5599	Struct.Const - utility contingency	0	0	0	0	0	0	0	0	0	0		0	0
	Structural Const. Utilities Sub-total	0	0	0	0	0	0	0	0	0	0		0	0
5510	Struct.Const - tunnel site preparation	0	0	0	0	0	0	0	0	0	0		0	0
5511	Struct.Const - tunnel construction	0	0	0	0	0	0	0	0	0	0		0	0
5512	Struct.Const - snow shed site prep.	0	0	0	0	0	0	0	0	0	0		0	0
5513	Struct.Const - snow shed site const.	0	0	0	0	0	0	0	0	0	0		0	0
5514	Struct.Const - bridge site preparation	0	0	500,000	0	0	0	0	500,000	0	0		1,000,000	51
5515	Struct.Const - bridge piers	0	0	0	0	0	0	0	0	0	0		0	0
5516	Struct.Const - bridge abutments	0	0	0	0	0	0	0	0	0	0		0	0
5517	Struct.Const - bridge superstructure	0	0	2,365,200	0	0	0	0	2,365,200	0	0		4,730,400	239
5518	Struct.Const - retain. wall site prep.	0	0	0	0	0	0	0	0	0	0		0	0
5519	Struct.Const - retaining wall const.	0	0	582,000	0	0	0	0	500,000	0	0		1,082,000	55
5501	Struct.Const - mobilization	0	0	103,416	0	0	0	0	100,956	0	0		204,372	10
5529	Struct.Const - Contingency	0	0	1,065,185	0	0	0	0	1,039,847	0	0		2,105,032	106
	Structural Construction Sub-total	0	0	4,615,801	0	0	0	0	4,506,003	0	0		9,121,804	461
	STRUCTURAL CONSTRUCTION COSTS	0	0	4,615,801	0	0	0	0	4,506,003	0	0		9,121,804	461
3520	Struct. Eng. - detailed design	0	0	369,264	0	0	0	0	360,480	0	0		729,744	37
3529	Struct. Eng. - detailed design/Contingency	0	0	110,779	0	0	0	0	108,144	0	0		218,923	11
6820	Struct. Eng. - general const. supervision	0	0	184,632	0	0	0	0	180,240	0	0		364,872	18
6821	Struct. Eng. - quality assurance	0	0	92,316	0	0	0	0	90,120	0	0		182,436	9
6822	Struct. Eng. - surveying	0	0	23,079	0	0	0	0	22,530	0	0		45,609	2
6829	Struct. Eng. - Residency Contingency	0	0	90,008	0	0	0	0	87,867	0	0		177,875	9
	Structural Engineering Sub-total	0	0	870,078	0	0	0	0	849,382	0	0		1,719,460	87
	Total Structural & Eng. Costs	0	0	5,485,879	0	0	0	0	5,355,384	0	0		10,841,264	548
6000	PAVING CONSTRUCTION													
6020	Paving Cons - machine paving asphalt	1,416,678	812,376	516,195	998,212	499,397	389,319	902,021	1,291,174	1,287,224	785,062		8,897,659	449

File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 5 - Between 264 and Mt	19+800	21+200	22+400	24+400	25+400	26+300	18+600	21+600	24+400	26+300			Total
	Parsons **Hwy 1 Widening**	to 16+500	to 19+800	to 21+200	to 22+400	to 24+400	to 25+400	to 16+500	to 18+600	to 21+600	to 24+400			Line
	(2016Dollars) **Package 5 - Btw 264 & Mt Lehman**	West of Rest	East and	East of Bradner	East of Automall's	E of Fraser Hwy	W of Peardonville	East of 275 St	East of Bradner	W of Fraser Hwy	To the east and			Cost
ACTIVITY	**EST.DATE April 4, 2016**	Stop to east of	West of the	to east of Rest	Western Tip to	WB On ramp to E	to E of Fraser Hwy	to east of	Underpass to just	IC to east of	west of the			
CODE	R3 DATE: Sept 15, 2016	264 St IC	Rest stop	Stop Off-Ramp	east of Bradner	of automall W tip	WB on ramp	264 St IC	East of 275 St	Bradner	Fraser Hwy IC			C/LM
Conceptual Est.	Divison\site	**Section W.9**	**Section W.8**	**Section W.7**	**Section W.6**	**Section W.5**	**Section W.4**	**Section E.11**	**Section E.10**	**Section E.9**	**Section E.8**	**MR**	**19800**	
Blk Est. # 6.14A	Road Type	16	16	16	16	16	16	16	16	16	16	OR	0	
Version Sept.1, 200	DESCRIPTION \Length	3300	1400	1200	2000	1000	900	2100	3000	3000	1900	TR	19800	19800
		MR	MR	MR	MR	MR	MR	MR	MR	MR	MR			
6030	Paving Cons - machine paving concrete	0	0	0	0	0	0	0	0	0	0		0	0
6040	Paving Cons - hot reprofiling	0	0	0	0	0	0	0	0	0	0		0	0
6050	Paving Cons - shoulder paving	0	0	0	0	0	0	0	0	0	0		0	0
6060	Paving Cons - pavement finishing	0	0	0	0	0	0	0	0	0	0		0	0
6070	Paving Cons - seal coating	0	0	0	0	0	0	0	0	0	0		0	0
6001	Paving Cons - mobilization	42,500	24,371	15,486	29,946	14,982	11,680	27,061	38,735	38,617	23,552		266,930	13
6010	Paving Cons - pavement design	0	0	0	0	0	0	0	0	0	0		0	0
6099	Paving Cons - Contingency	437,754	251,024	159,504	308,448	154,314	120,300	278,725	398,973	397,752	242,584		2,749,377	139
	PAVING CONSTRUCTION COSTS	1,896,932	1,087,772	691,185	1,336,606	668,693	521,298	1,207,807	1,728,882	1,723,593	1,051,198		11,913,966	602
3560	Paving Eng. - detailed design	132,785	76,144	48,383	93,562	46,808	36,491	84,546	121,022	120,651	73,584		833,978	42
3569	Paving Eng. - detailed design/Contingency	39,836	22,843	14,515	28,069	14,043	10,947	25,364	36,307	36,195	22,075		250,193	13
6860	Paving Eng. - general const. supervision	37,939	21,755	13,824	26,732	13,374	10,426	24,156	34,578	34,472	21,024		238,279	12
6861	Paving Eng. - quality assurance	75,877	43,511	27,647	53,464	26,748	20,852	48,312	69,155	68,944	42,048		476,559	24
6862	Paving Eng. - surveying	9,485	5,439	3,456	6,683	3,343	2,606	6,039	8,644	8,618	5,256		59,570	3
6869	Paving Eng. - Residency Contingency	36,990	21,212	13,478	26,064	13,040	10,165	23,552	33,713	33,610	20,498		232,322	12
	Paving Engineering Sub-total	332,912	190,904	121,303	234,574	117,356	91,488	211,970	303,419	302,491	184,485		2,090,901	106
	Total Paving Const. & Eng. Costs	2,229,844	1,278,676	812,488	1,571,181	786,048	612,786	1,419,777	2,032,301	2,026,083	1,235,683		14,004,867	707
6500	OPERATIONAL CONSTRUCTION													
6510	Operat.Cons - lighting	0	170,500	0	0	0	0	0	0	0	88,000		258,500	13
6520	Operat.Cons - signals	0	0	0	0	0	0	0	0	0	0		0	0
6530	Operat.Cons - signing	6,600	2,800	2,400	4,000	2,000	1,800	4,200	6,000	6,000	3,800		39,600	2
6540	Operat.Cons - guard rail	66,000	346,500	61,500	42,000	31,500	124,500	60,000	178,500	36,000	97,500		1,044,000	53
6550	Operat.Cons - pavement markings	33,000	18,675	12,000	25,000	12,500	9,000	21,000	30,000	30,000	19,000		210,175	11
6501	Operat.Cons - mobilization	3,168	16,154	2,277	2,130	1,380	4,059	2,556	6,435	2,160	6,249		46,568	2
6599	Operat.Cons - contingency	32,630	166,389	23,453	21,939	14,214	41,808	26,327	66,281	22,248	64,365		479,653	24
	OPERATIONAL CONSTRUCTION COSTS	141,398	721,018	101,630	95,069	61,594	181,167	114,083	287,216	96,408	278,914		2,078,496	105
3540	Operat. Eng. - detailed design	9,898	50,471	7,114	6,655	4,312	12,682	7,986	20,105	6,749	19,524		145,495	7
3549	Operat. Eng. - detailed design/Contingency	2,969	15,141	2,134	1,996	1,293	3,805	2,396	6,032	2,025	5,857		43,648	2
6840	Operat. Eng. - general const. supervision	7,777	39,656	5,590	5,229	3,388	9,964	6,275	15,797	5,302	15,340		114,317	6
6841	Operat. Eng. - quality assurance	2,828	14,420	2,033	1,901	1,232	3,623	2,282	5,744	1,928	5,578		41,570	2
6842	Operat. Eng. - surveying	707	3,605	508	475	308	906	570	1,436	482	1,395		10,392	1
6849	Operat. Eng. - Residency Contingency	3,394	17,304	2,439	2,282	1,478	4,348	2,738	6,893	2,314	6,694		49,884	3
	Operational Enginering Sub-total	27,573	140,599	19,818	18,538	12,011	35,328	22,246	56,007	18,800	54,388		405,307	20
	Total Operational Const.& Eng.Costs	168,971	861,617	121,448	113,607	73,605	216,494	136,329	343,223	115,208	333,302		2,483,803	125
5200	ROAD SIDE CONSTRUCTION													
5203	RoadSide Cr - water	0	0	0	0	0	0	0	0	0	0		0	0
5204	RoadSide Cr - sanitary	0	0	0	0	0	0	0	0	0	0		0	0
5205	RoadSide Cr - storm	0	0	0	0	0	0	0	0	0	0		0	0
5202	RoadSide Cr - mobilization	0	0	0	0	0	0	0	0	0	0		0	0
5209	RoadSide Cr - Utility Contingency	0	0	0	0	0	0	0	0	0	0		0	0
	Road Side Const. Utilities Sub-total	0	0	0	0	0	0	0	0	0	0		0	0
5210	RoadSide Cr - weighscales	0	0	0	0	0	0	0	0	0	0		0	0
5220	RoadSide Cr - safety rest areas	0	0	0	0	0	0	0	0	0	0		0	0
5230	RoadSide Cr - tourist rest & view areas	0	0	0	0	0	0	0	0	0	0		0	0
5201	RoadSide Cr - mobilization	0	0	0	0	0	0	0	0	0	0		0	0
5299	RoadSide Cr - Contingency	0	0	0	0	0	0	0	0	0	0		0	0
	Road Side Construction Sub-total	0	0	0	0	0	0	0	0	0	0		0	0
	ROAD SIDE CONSTRUCTION COSTS	0	0	0	0	0	0	0	0	0	0		0	0
3550	RoadSide Er - detailed design	0	0	0	0	0	0	0	0	0	0		0	0
3559	RoadSide Er - detailed design/Contingency	0	0	0	0	0	0	0	0	0	0		0	0
6850	RoadSide Er - general const. supervision	0	0	0	0	0	0	0	0	0	0		0	0
6851	RoadSide Er - quality assurance	0	0	0	0	0	0	0	0	0	0		0	0
6852	RoadSide Er - surveying	0	0	0	0	0	0	0	0	0	0		0	0
6859	RoadSide Er - Residency Contingency	0	0	0	0	0	0	0	0	0	0		0	0
	Road Side Engineering Sub-total	0	0	0	0	0	0	0	0	0	0		0	0
	Total Road Side Const.& Eng.Costs	0	0	0	0	0	0	0	0	0	0		0	0

File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 5 - Between 264 and Mt	19+800	21+200	22+400	24+400	25+400	26+300	18+600	21+600	24+400	26+300			Total
	Parsons **Hwy 1 Widening**	to 16+500	to 19+800	to 21+200	to 22+400	to 24+400	to 25+400	to 16+500	to 18+600	to 21+600	to 24+400			Line
	(2016Dollars) **Package 5 - Btw 264 & Mt Lehman**	West of Rest	East and	East of Bradner	East of Automall's	E of Fraser Hwy	W of Peardonville	East of 275 St	East of Bradner	W of Fraser Hwy	To the east and			Cost
	ACTIVITY **EST.DATE April 4, 2016**	Stop to east of	West of the	to east of Rest	Western Tip to	WB On ramp to E	to E of Fraser Hwy	to east of	Underpass to just	IC to east of	west of the			
	CODE R3 DATE: Sept 15, 2016	264 St IC	Rest stop	Stop Off-Ramp	east of Bradner	of automall W tip	WB on ramp	264 St IC	East of 275 St	Bradner	Fraser Hwy IC			C/LM
	Conceptual Est. Divison\site	**Section W.9**	**Section W.8**	**Section W.7**	**Section W.6**	**Section W.5**	**Section W.4**	**Section E.11**	**Section E.10**	**Section E.9**	**Section E.8**	**MR**	**19800**	
	Blk Est. # 6.14A Road Type	16	16	16	16	16	16	16	16	16	16	OR	0	
	Version Sept.1, 200 DESCRIPTION \Length	3300	1400	1200	2000	1000	900	2100	3000	3000	1900	TR	19800	19800
		MR	MR	MR	MR	MR	MR	MR	MR	MR	MR			
5300	OTHER CONSTRUCTION													
5303	Other Const. - water	0	0	0	0	0	0	0	0	0	0		0	0
5304	Other Const. - sanitary	0	0	0	0	0	0	0	0	0	0		0	0
5305	Other Const. - storm	0	0	0	0	0	0	0	0	0	0		0	0
5302	Other Const. - mobilization	0	0	0	0	0	0	0	0	0	0		0	0
5309	Other Const. - utility contingency	0	0	0	0	0	0	0	0	0	0		0	0
	Other Const. Utilities Sub-total	0	0	0	0	0	0	0	0	0	0		0	0
5310	Other Const. - railroads main & spur lines	0	0	0	0	0	0	0	0	0	0		0	0
5320	Other Const. - railroad crossings	0	0	0	0	0	0	0	0	0	0		0	0
5330	Other Const. - marine work	0	0	0	0	0	0	0	0	0	0		0	0
5340	Other Const. - environmental mitigations	0	0	0	0	0	0	0	0	0	0		0	0
5301	Other Const. - mobilization	0	0	0	0	0	0	0	0	0	0		0	0
5399	Other Const. - Contingency	0	0	0	0	0	0	0	0	0	0		0	0
	Other Construction Sub-total	0	0	0	0	0	0	0	0	0	0		0	0
	OTHER CONSTRUCTION COSTS	0	0	0	0	0	0	0	0	0	0		0	0
3570	Other Eng. - detailed design	0	0	0	0	0	0	0	0	0	0		0	0
3579	Other Eng. - detailed design/Contingency	0	0	0	0	0	0	0	0	0	0		0	0
6870	Other Eng. - general const. supervision	0	0	0	0	0	0	0	0	0	0		0	0
6871	Other Eng. - quality assurance	0	0	0	0	0	0	0	0	0	0		0	0
6872	Other Eng. - surveying	0	0	0	0	0	0	0	0	0	0		0	0
6879	Other Eng. - Residency Contingency	0	0	0	0	0	0	0	0	0	0		0	0
	Other Engineering Sub-total	0	0	0	0	0	0	0	0	0	0		0	0
	Total Other Const.& Eng.Costs	0	0	0	0	0	0	0	0	0	0		0	0
3500	DETAILED DESIGN													
	from 3510,3520,3540,3550,3570	1,399,853	679,451	837,135	813,569	469,535	263,826	946,595	1,527,397	1,048,630	750,024		8,736,014	441
3530	Geotech. En - detailed design	92,298	44,799	76,239	53,642	30,958	17,395	62,413	121,845	69,140	49,452		618,182	31
3539	Geotech. En - Contingency	27,689	13,440	22,872	16,093	9,288	5,219	18,724	36,554	20,742	14,836		185,455	9
	TOTAL DETAILED DESIGN COSTS	1,519,841	737,690	936,246	883,303	509,781	286,439	1,027,731	1,685,796	1,138,512	814,312		9,539,651	482
6800	RESIDENT ENGINEERING													
	from 6810,6820,6840,6850,6860,6870	1,389,361	681,754	743,955	806,117	465,989	262,792	940,227	1,432,026	1,038,679	746,817		8,507,718	
	TOTAL RESIDENT ENG. COSTS	1,389,361	681,754	743,955	806,117	465,989	262,792	940,227	1,432,026	1,038,679	746,817		8,507,718	430
													0	
													0	0
	PART 1 SUMMARY													
	CONSTRUCTION	11,898,079	5,743,460	6,669,141	6,927,167	4,024,018	2,230,141	8,061,646	12,536,052	8,914,155	6,395,017		73,398,876	3707
	ENGINEERING & SUPERVISION	2,775,748	1,320,080	1,511,141	1,625,554	913,592	569,186	1,856,114	2,909,854	2,163,763	1,510,568		17,155,601	866
	CONTRACTUAL CONTINGENCY	4,402,148	2,119,062	2,454,085	2,565,816	1,481,283	839,798	2,975,328	4,633,772	3,323,375	2,371,676		27,166,343	1372
													0	0
	CONSTRUCTION COST TOTAL	19,075,974	9,182,602	10,634,368	11,118,538	6,418,893	3,639,125	12,893,089	20,079,678	14,401,293	10,277,261		117,720,819	5945
2000	PROJECT MANAGEMENT													
2060	Project Man. - office costs wages	429,209	206,609	239,273	250,167	144,425	81,880	290,094	451,793	324,029	231,238		2,648,718	134
2062	Project Man. - office costs - expenses	0	0	0	0	0	0	0	0	0	0		0	0
2063	Project Man. - printing costs	0	0	0	0	0	0	0	0	0	0		0	0
2061	Project Man. - general	0	0	0	0	0	0	0	0	0	0		0	0
	Project Manager Sub-total	429,209	206,609	239,273	250,167	144,425	81,880	290,094	451,793	324,029	231,238		2,648,718	134
2010	Client - office costs wages	381,519	183,652	212,687	222,371	128,378	72,782	257,862	401,594	288,026	205,545		2,354,416	119
2012	Client - office costs - expenses	0	0	0	0	0	0	0	0	0	0		0	0
2030	Client - printing costs	0	0	0	0	0	0	0	0	0	0		0	0
2011	Client - general	0	0	0	0	0	0	0	0	0	0		0	0
	Client Sub-total	381,519	183,652	212,687	222,371	128,378	72,782	257,862	401,594	288,026	205,545		2,354,416	119
2070	Public Rel. - wages & expenses	114,456	55,096	63,806	66,711	38,513	21,835	77,359	120,478	86,408	61,664		706,325	36
2072	Public Rel. - adv., media, displays	0	0	0	0	0	0	0	0	0	0		0	0
2073	Public Rel. - opening ceremonies	0	0	0	0	0	0	0	0	0	0		0	0
2071	Public Rel. - general	0	0	0	0	0	0	0	0	0	0		0	0
	Public Relations Sub-total	114,456	55,096	63,806	66,711	38,513	21,835	77,359	120,478	86,408	61,664		706,325	36

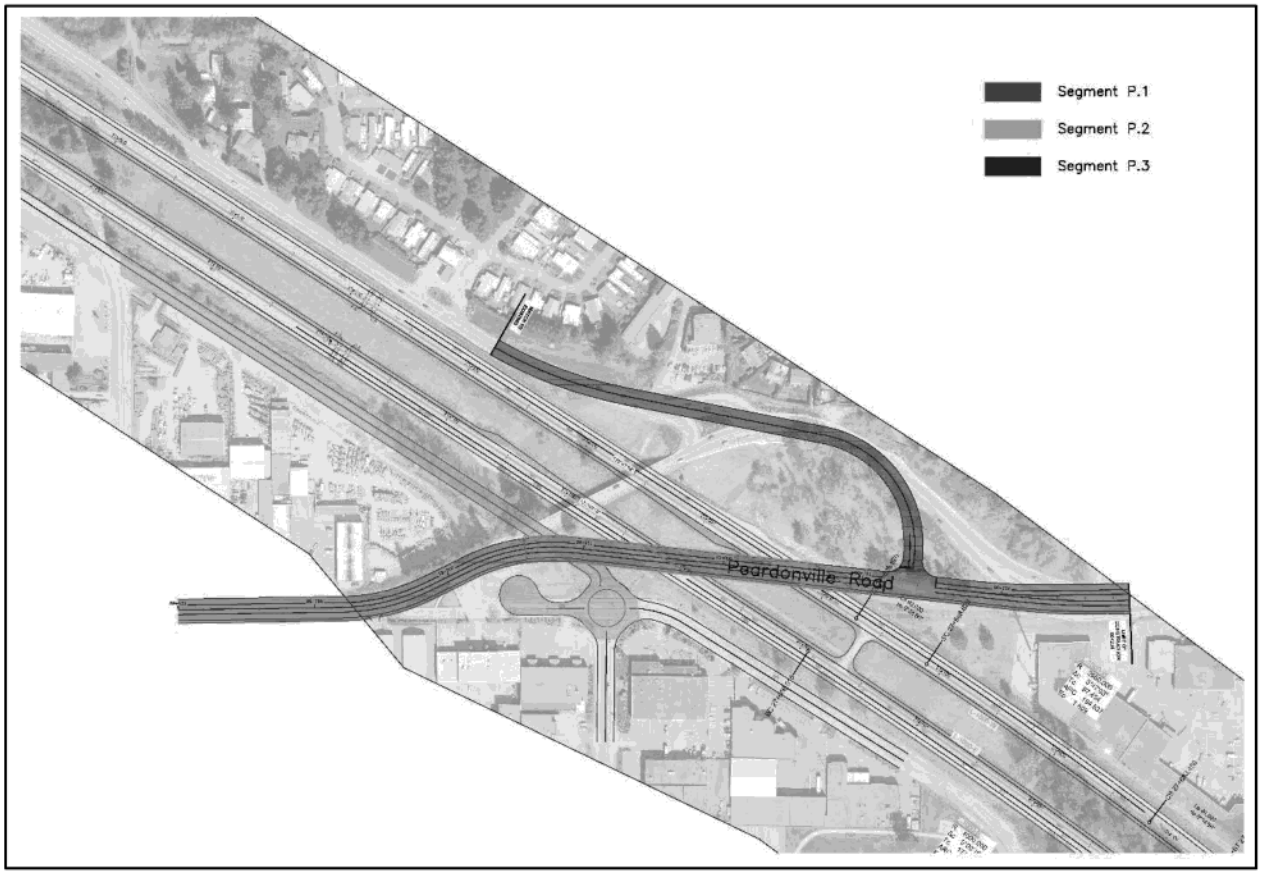
File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 5 - Between 264 and Mt	19+800	21+200	22+400	24+400	25+400	26+300	18+600	21+600	24+400	26+300				Total
	Parsons **Hwy 1 Widening**	to 16+500	to 19+800	to 21+200	to 22+400	to 24+400	to 25+400	to 16+500	to 18+600	to 21+600	to 24+400				Line
	(2016Dollars) **Package 5 - Btw 264 & Mt Lehman**	West of Rest	East and	East of Bradner	East of Automall's	E of Fraser Hwy	W of Peardonville	East of 275 St	East of Bradner	W of Fraser Hwy	To the east and				Cost
	ACTIVITY **EST.DATE April 4, 2016**	Stop to east of	West of the	to east of Rest	Western Tip to	WB On ramp to E	to E of Fraser Hwy	to east of	Underpass to just	IC to east of	west of the				
	CODE R3 DATE: Sept 15, 2016	264 St IC	Rest stop	Stop Off-Ramp	east of Bradner	of automall W tip	WB on ramp	264 St IC	East of 275 St	Bradner	Fraser Hwy IC				C/LM
	Conceptual Est. Divison\site	**Section W.9**	**Section W.8**	**Section W.7**	**Section W.6**	**Section W.5**	**Section W.4**	**Section E.11**	**Section E.10**	**Section E.9**	**Section E.8**	**MR**	**19800**		
	Blk Est. # 6.14A Road Type	16	16	16	16	16	16	16	16	16	16	OR	0		
	Version Sept.1, 200 DESCRIPTION \Length	3300	1400	1200	2000	1000	900	2100	3000	3000	1900	TR	19800		19800
		MR	MR	MR	MR	MR	MR	MR	MR	MR	MR				
2040	Legal Costs - lawyers fees	13,353	6,428	7,444	7,783	4,493	2,547	9,025	14,056	10,081	7,194		82,405		4
2041	Legal Costs - general	0	0	0	0	0	0	0	0	0	0		0		0
	Legal Costs Sub-total	13,353	6,428	7,444	7,783	4,493	2,547	9,025	14,056	10,081	7,194		82,405		4
2080	Insurance - const./ liability, E&O	114,456	55,096	63,806	66,711	38,513	21,835	77,359	120,478	86,408	61,664		706,325		36
2081	Insurance - general	0	0	0	0	0	0	0	0	0	0		0		0
	Legal Costs Sub-total	114,456	55,096	63,806	66,711	38,513	21,835	77,359	120,478	86,408	61,664		706,325		36
2099	Project Management Contingency	315,898	152,064	176,105	184,123	106,297	60,264	213,510	332,519	238,485	170,191		1,949,457		98
	TOTAL PROJECT MANAGEMENT COSTS	1,368,892	658,943	763,122	797,866	460,620	261,144	925,208	1,440,918	1,033,437	737,496		8,447,646		427
4000	LAND	0	0	0	0	0	0	0	0	0	0		0		
4010	Land(Code 4-Mrkt,ROW,Serv,Imp.V,Ease.C,T	0	0	0	0	0	0	0	0	0	0		0		0
	Acquisition Sub-total	0	0	0	0	0	0	0	0	0	0		0		0
4020	Land(Code 4-Bus.,5%,Mrg.P,Rel$,P/Tax,Etc	0	0	0	0	0	0	0	0	0	0		0		0
4030	Land(Code 4-Owners(LS,Apprsl,Rprt,Lgl,In	0	0	0	0	0	0	0	0	0	0		0		0
4040	Land(Code 4-Demolition	0	0	0	0	0	0	0	0	0	0		0		0
4050	Land(Code 4-Pro.Man,P.Tax,Util,Security	0	0	0	0	0	0	0	0	0	0		0		0
4060	Land(Code 4-Not Used	0	0	0	0	0	0	0	0	0	0		0		0
4070	Land(Code 4-Not Used	0	0	0	0	0	0	0	0	0	0		0		0
4080	Land(Code 4-Acq.F,M/Sal,TrvlV,Cntr.S,Appr.	0	0	0	0	0	0	0	0	0	0		0		0
4090	Land(Code 4-Surveys	0	0	0	0	0	0	0	0	0	0		0		0
													0		0
													0		0
													0		0
													0		0
	Associated costs-sub-total	0	0	0	0	0	0	0	0	0	0		0		0
4099	Land Contingency Sub-total	0	0	0	0	0	0	0	0	0	0		0		0
	TOTAL LAND COSTS	0	0	0	0	0	0	0	0	0	0		0		0
9800	MANAGEMENT RESERVE														
	MAN. RES. - planning	0	0	0	0	0	0	0	0	0	0		0		0
	MAN. RES. - preliminary design	0	0	0	0	0	0	0	0	0	0		0		0
	MAN. RES. - utility construction	0	0	0	0	0	0	0	0	0	0		0		0
	MAN. RES. - grade construction	0	0	0	0	0	0	0	0	0	0		0		0
	MAN. RES. - structural construction	0	0	0	0	0	0	0	0	0	0		0		0
	MAN. RES. - paving construction	0	0	0	0	0	0	0	0	0	0		0		0
	MAN. RES. - operation construction	0	0	0	0	0	0	0	0	0	0		0		0
	MAN. RES. - roadside construction	0	0	0	0	0	0	0	0	0	0		0		0
	MAN. RES. - other construction	0	0	0	0	0	0	0	0	0	0		0		0
	MAN. RES. - project management	0	0	0	0	0	0	0	0	0	0		0		0
	MAN. RES. - land	0	0	0	0	0	0	0	0	0	0		0		0
	MAN. RES. - detailed eng.	0	0	0	0	0	0	0	0	0	0		0		0
	MAN. RES. - residency eng.	0	0	0	0	0	0	0	0	0	0		0		0
	MAN. RES. - risk contingency	0	0	0	0	0	0	0	0	0	0		0		0
	TOTAL MANAGEMENT RESERVE	0	0	0	0	0	0	0	0	0	0		0		0
	TOTAL LESS ESCALATION														
	FISCAL														
9900	ESCALATION														
	YEAR PROJECTED ESCALATION														
	2006-2007	0	0	0	0	0	0	0	0	0	0		0		0
	2007-2008	0	0	0	0	0	0	0	0	0	0		0		0
	2008-2009	0	0	0	0	0	0	0	0	0	0		0		0
	2009-2010	0	0	0	0	0	0	0	0	0	0		0		0
	2010-2011	0	0	0	0	0	0	0	0	0	0		0		0
	2011-2012	0	0	0	0	0	0	0	0	0	0		0		0
	2012-2013	0	0	0	0	0	0	0	0	0	0		0		0
	2013-2014	0	0	0	0	0	0	0	0	0	0		0		0
	2014-2015	0	0	0	0	0	0	0	0	0	0		0		0
	TOTAL ESCALATION	0	0	0	0	0	0	0	0	0	0		0		0
	PART 2 SUMMARY NON-CONSTRUCTION COSTS														
	Non-Construction	1,052,994	506,880	587,017	613,743	354,323	200,880	711,698	1,108,398	794,951	567,305		6,498,189		328
	Non-Const. Contingency	315,898	152,064	176,105	184,123	106,297	60,264	213,510	332,519	238,485	170,191		1,949,457		98

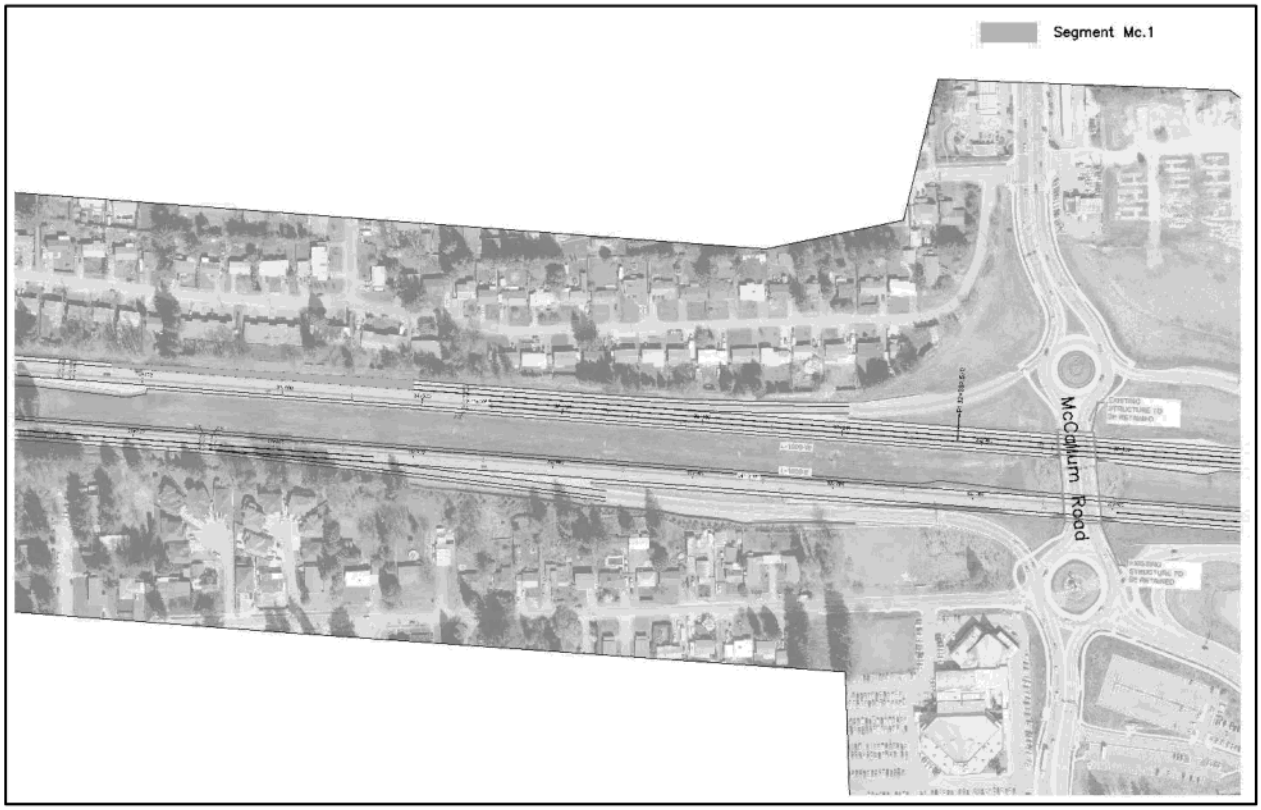
File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 5 - Between 264 and Mt	19+800	21+200	22+400	24+400	25+400	26+300	18+600	21+600	24+400	26+300			Total
Parsons	**Hwy 1 Widening**	to 16+500	to 19+800	to 21+200	to 22+400	to 24+400	to 25+400	to 16+500	to 18+600	to 21+600	to 24+400			Line
(2016Dollars)	**Package 5 - Btw 264 & Mt Lehman**	West of Rest	East and	East of Bradner	East of Automall's	E of Fraser Hwy	W of Peardonville	East of 275 St	East of Bradner	W of Fraser Hwy	To the east and			Cost
ACTIVITY	**EST.DATE April 4, 2016**	Stop to east of	West of the	to east of Rest	Western Tip to	WB On ramp to E	to E of Fraser Hwy	to east of	Underpass to just	IC to east of	west of the			
CODE	R3 DATE: Sept 15, 2016	264 St IC	Rest stop	Stop Off-Ramp	east of Bradner	of automall W tip	WB on ramp	264 St IC	East of 275 St	Bradner	Fraser Hwy IC			C/LM
Conceptual Est.	Divison\site	**Section W.9**	**Section W.8**	**Section W.7**	**Section W.6**	**Section W.5**	**Section W.4**	**Section E.11**	**Section E.10**	**Section E.9**	**Section E.8**	**MR**	**19800**	
Blk Est. # 6.14A	Road Type	16	16	16	16	16	16	16	16	16	16	OR	0	
Version Sept.1, 200	DESCRIPTION \Length	3300	1400	1200	2000	1000	900	2100	3000	3000	1900	TR	19800	19800
		MR	MR	MR	MR	MR	MR	MR	MR	MR	MR			
	TOTAL NON-CONSTRUCTION COSTS	1,368,892	658,943	763,122	797,866	460,620	261,144	925,208	1,440,918	1,033,437	737,496		8,447,646	427
	DIVISION TOTAL FOR ROAD TYPE	20,444,866	9,841,545	11,397,490	11,916,404	6,879,512	3,900,268	13,818,297	21,520,595	15,434,730	11,014,757		126,168,465	6372

PACKAGE 6 – SECTIONS

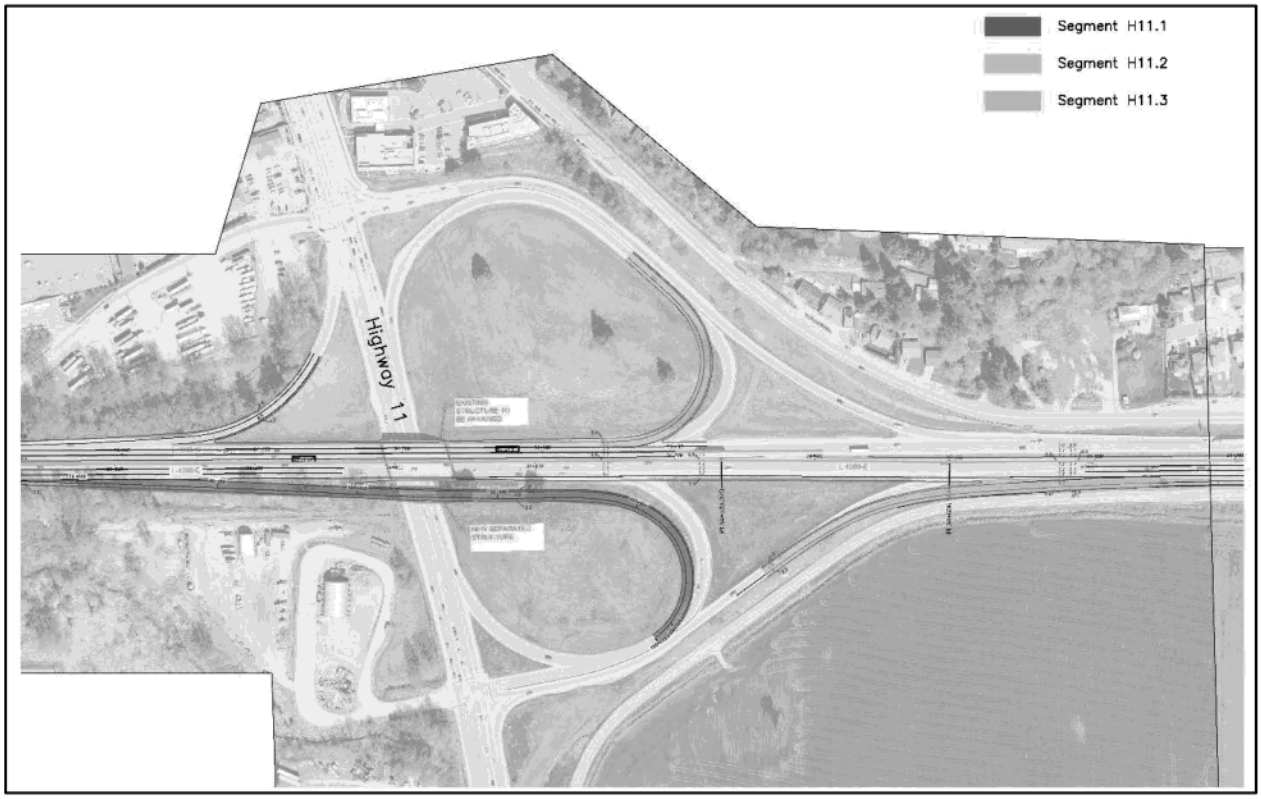
ID	Chainage Start	Chainage End	Description
P.1			Peardonville Road Overpass Replacement
P.2			S Fraser Way Extension to Peardonville Road
P.3			Livingstone Avenue Realignment to Peardonville Road
W.3	26+300	28+300	Highway 1 Westbound Lanes
W.2	28+300	29+500	Highway 1 Westbound Lanes
W.1	29+500	31+700	Highway 1 Westbound Lanes
W.0	32+700	33+700	Highway 1 Westbound Lanes
E.7	26+300	27+300	Highway 1 Eastbound Lanes
E.6	27+300	28+500	Highway 1 Eastbound Lanes
E.5	28+500	29+500	Highway 1 Eastbound Lanes
E.4	29+500	31+800	Highway 1 Eastbound Lanes
E.3	31+800	33+400	Highway 1 Eastbound Lanes
E.2	33+400	34+600	Highway 1 Eastbound Lanes
E.1	34+600	35+974	Highway 1 Eastbound Lanes
Mc.1			McCallum Road Westbound On Ramp Extension
H11.1			Highway 1 Eastbound Off Ramp to Highway 11
H11.2			Highway 11 On Ramp to Highway 1 Eastbound
H11.3			Highway 11 Northbound On Ramp to Highway 1 Westbound

APPENDIX B




Segment Mc.1
McCallum Road

APPENDIX B



File: Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 6 - Between Mt Lehman	Peardonville	New Roadway	Livingstone Ave	31+700	33+700	35+974	Hwy 1 to Hwy 11	Hwy 11 to Hwy 1	33+500	31+900			Total
Parsons **Hwy 1 Widening**	New overpass	underneath	Realignment	to 26+300	to 32+700	to 26+300	Ramp from EB	Ramp from NB	to 32+700	to 31+700			Line
(2016Dollars) **Package 6 - Mt Lehman to Hwy 11**	and approaches	Peardonville	to Peardonville	Westbound	West of Rail	Eastbound	to NB	to EB	West of Rail	McCallum WB			Cost
ACTIVITY **EST.DATE April 4, 2016**	0	Overpass	0	Widening	Overpass to East	Widening	0	0	Overpass to East	On Ramp			
CODE R3 DATE: Sept 15, 2016	0	0	0	**Sections**	of McCallum	**Sections**	0	0	of McCallum	Extension			C/LM
Conceptual Est. Divison\site	**Section P.1**	**Section P.2**	**Section 3.3**	**W.3 - W.1**	**Section W.0**	**E.7 to E.1**	**Section H11.1**	**Section H11.2**	**Section H11.3**	**Section Mc.1**	**MR**	**17944**	
Blk Est. # 6.14A Road Type	21	2	2	16	16	16	16	16	16	16	OR	0	
Version Sept.1, 200 DESCRIPTION \Length	430	440	370	5400	1000	9294	400	295	207	108	TR	17944	17944
	MR	MR	MR	MR	MR	MR	MR	MR	MR	MR			
Engineering	9,970,726	244,341	320,107	4,630,278	1,263,639	9,369,552	1,111,855	361,263	202,640	83,798		27,558,199	1536
Land	0	0	0	0	0	0	0	0	0	0		0	0
Construction	52,337,305	854,987	1,399,085	20,389,155	6,176,726	43,727,150	5,407,588	1,617,168	921,989	351,397		133,182,552	7422
Management Reserve	0	0	0	0	0	0	0	0	0	0		0	0
Escalation	0	0	0	0	0	0	0	0	0	0		0	0
Total	62,308,031	1,099,328	1,719,192	25,019,433	7,440,366	53,096,703	6,519,443	1,978,430	1,124,630	435,195		160,740,751	8958
BASIC QUANTITY SUMMARY													
Construct.Cost ONLY Per L.M.	121,715	1,943	3,781	3,776	6,177	4,705	13,519	5,482	4,454	3,254	$/LM	7,422	
Land Area	0.7	1.2	1.0	16.6	2.9	29.3	1.2	0.7	0.7	0.2	ha	54.7	
Mobilization	1,080,969	17,574	28,708	410,641	125,532	870,162	111,479	33,327	18,930	7,205		2,704,527	
Land Cont.	0	0	0	0	0	0	0	0	0	0		0	
Construction Cont.	11,133,977	181,015	295,690	4,322,604	1,307,979	9,280,665	1,148,238	343,267	194,979	74,216		28,282,631	30,734,435
Engineering Cont.	2,300,937	56,386	73,871	1,068,526	291,609	2,162,204	256,582	83,368	46,763	19,338		6,359,584	
Supervision Cont.	943,862	16,289	27,176	382,586	117,419	810,216	99,667	29,925	17,788	6,876		2,451,804	
Total Cont.	14,378,776	253,691	396,737	5,773,715	1,717,007	12,253,085	1,504,487	456,561	259,530	100,430		37,094,019	
S.G.S.B.	3,872	3,000	2,240	24,095	4,546	42,479	1,955	1,488	1,200	461	m3	85,338	
C.B.C.	2,581	1,780	1,277	13,072	2,497	22,882	1,121	896	664	272	m3	47,041	
Asphalt	2,023	909	765	18,614	3,206	32,712	1,277	844	604	378	t	61,332	
Concrete Barrier	160	0	150	1,505	420	2,275	160	110	25	108	lm	4,913	
Noise Attentuation Wall	0	0	0	0	0	0	0	0	0	0	m2	0	
No. of Light Poles	20	0	12	0	0	0	13	10	7	4	ea	66	
Sidewalk	430	0	0	0	0	0	0	0	0	0	lm	430	
Curb and Gutter	0	0	0	0	0	0	0	0	0	0	lm	0	
Signals	1	0	0	0	0	0	0	0	0	0	ea	1	
Bridge total area	3982	0	0	0	0	0	480	0	0	0	m2	4,462	
													ENG
Total Rock	0	0	0	0	0	0	0	0	0	0	m3	0	0
Total OM	0	1,260	7,255	79,720	33,150	130,530	1,204	0	5,759	1,188	m3	260,065	0
Total Stripping	0	0	0	19,700	2,500	45,100	4,120	0	0	0	m3	71,420	0
Total Borrow	0	0	0	0	0	0	0	0	0	0	m3	0	
Total Cut/Excavation	0	1,260	7,255	99,420	35,650	175,630	5,324	0	5,759	1,188	m3	331,485	0
Total Fill	7,188	0	4,429	69,736	25,174	193,994	16,374	0	4,409	911	m3	322,213	0
Surplus or Deficit	-7,188	1,260	2,826	29,684	10,477	-18,364	-11,050	0	1,350	277	m3	9,272	
ENG & PM	**9.971**	**0.244**	**0.320**	**4.630**	**1.264**	**9.370**	**1.112**	**0.361**	**0.203**	**0.084**		**27.558**	27.559
LAND	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**		**0.000**	0.000
CONST.	**1.814**	**0.855**	**1.399**	**20.389**	**6.177**	**43.291**	**1.711**	**0.542**	**0.922**	**0.351**		**77.453**	77.451
BRIDGES-R/W	**50.523**	**0.000**	**0.000**	**0.000**	**0.000**	**0.436**	**3.697**	**1.075**	**0.000**	**0.000**		**55.730**	55.731
MANAGEMENT RESERVE	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**		**0.000**	0.000
ESCALATION	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**		**0.000**	0.000
TOTAL (Millions) (2016Dollars)	**62.308**	**1.099**	**1.719**	**25.019**	**7.441**	**53.097**	**6.520**	**1.978**	**1.125**	**0.435**		**160.741**	160.741
TOTAL Cost per meter	**$ 144,902**	**$ 2,498**	**$ 4,646**	**$ 4,633**	**$ 7,440**	**$ 5,713**	**$ 16,299**	**$ 6,707**	**$ 5,433**	**$ 4,030**		**$ 8,958**	
Construction cost per meter	**$ 121,714**	**$ 1,943**	**$ 3,781**	**$ 3,776**	**$ 6,177**	**$ 4,705**	**$ 13,520**	**$ 5,481**	**$ 4,454**	**$ 3,250**		**$ 7,422**	

File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 6 - Between Mt Lehman	Peardonville	New Roadway	Livingstone Ave	31+700	33+700	35+974	Hwy 1 to Hwy 11	Hwy 11 to Hwy 1	33+500	31+900			Total
Parsons	**Hwy 1 Widening**	New overpass	underneath	Realignment	to 26+300	to 32+700	to 26+300	Ramp from EB	Ramp from NB	to 32+700	to 31+700			Line
(2016Dollars)	**Package 6 - Mt Lehman to Hwy 11**	and approaches	Peardonville	to Peardonville	Westbound	West of Rail	Eastbound	to NB	to EB	West of Rail	McCallum WB			Cost
ACTIVITY	**EST.DATE April 4, 2016**	0	Overpass	0	Widening	Overpass to East	Widening	0	0	Overpass to East	On Ramp			
CODE	R3 DATE: Sept 15, 2016	0	0	0	**Sections**	of McCallum	**Sections**	0	0	of McCallum	Extension			C/LM
Conceptual Est.	Divison\site	**Section P.1**	**Section P.2**	**Section 3.3**	**W.3 - W.1**	**Section W.0**	**E.7 to E.1**	**Section H11.1**	**Section H11.2**	**Section H11.3**	**Section Mc.1**	**MR**	**17944**	
Blk Est. # 6.14A	Road Type	21	2	2	16	16	16	16	16	16	16	OR	0	
Version Sept.1, 200	DESCRIPTION \Length	430	440	370	5400	1000	9294	400	295	207	108	TR	17944	17944
		MR	MR	MR	MR	MR	MR	MR	MR	MR	MR			
	SUMMARY BY ACTIVITY LEVEL													Cost/LM
2000	PROJECT MANAGEMENT	3,209,117	56,620	88,545	1,288,603	383,209	2,734,696	335,778	101,897	57,923	22,414		8,278,803	461
2500	PLANNING	0	0	0	0	0	0	0	0	0	0		0	0
3000	PRELIMINARY DESIGN	303,021	71,720	60,310	880,200	163,000	1,516,931	82,247	53,039	33,741	17,604		3,181,813	177
3500	DETAILED DESIGN	4,157,651	59,614	97,381	1,392,950	425,821	2,955,721	437,248	122,958	64,213	24,442		9,737,999	543
							0							
	Total Engineering	4,460,672	131,334	157,691	2,273,150	588,821	4,472,652	519,495	175,997	97,954	42,046		12,919,812	720
4000	LAND ACQUISITION	0	0	0	0	0	0	0	0	0	0		0	0
5000	GRADE CONSTRUCTION	764,252	495,808	769,084	11,319,554	3,762,510	24,653,851	976,425	192,976	526,216	138,095		43,598,772	2430
5200	ROAD SIDE CONSTRUCTION	0	0	0	0	0	0	0	0	0	0		0	0
5300	OTHER CONSTRUCTION	0	0	0	0	0	0	0	0	0	0		0	0
5500	STRUCTURAL CONSTRUCTION	35,835,492	0	0	0	0	309,000	2,622,688	762,200	0	0		39,529,380	2203
6000	PAVING CONSTRUCTION	248,407	103,014	98,599	2,247,337	406,310	4,092,893	102,378	96,282	74,776	51,923		7,521,919	419
6500	OPERATIONAL CONSTRUCTION	265,107	4,563	117,950	531,789	141,110	819,806	125,969	92,767	48,937	57,367		2,205,364	123
6700	UTILITY CONSTRUCTION	0	0	0	310,000	50,000	1,060,000	0	0	0	0		1,420,000	79
6800	RESIDENT ENGINEERING	3,146,208	54,298	90,585	1,275,285	391,397	2,700,720	332,224	99,750	59,294	22,920		8,172,681	455
													0	0
	Total Construction	40,259,466	657,683	1,076,219	15,683,965	4,751,328	33,636,269	4,159,683	1,243,975	709,223	270,305		102,448,117	5709
9700	CONTINGENCY	14,378,776	253,691	396,737	5,773,715	1,717,007	12,253,085	1,504,487	456,561	259,530	100,430		37,094,019	2067
	SUB-TOTAL	62,308,031	1,099,328	1,719,192	25,019,433	7,440,366	53,096,703	6,519,443	1,978,430	1,124,630	435,195		160,740,751	8958
9800	MANAGEMENT RESERVE	0	0	0	0	0	0	0	0	0	0		0	0
	TOTAL	62,308,031	1,099,328	1,719,192	25,019,433	7,440,366	53,096,703	6,519,443	1,978,430	1,124,630	435,195		160,740,751	8958
9900	ESCALATION	0	0	0	0	0	0	0	0	0	0		0	0
	TOTAL COST	62,308,031	1,099,328	1,719,192	25,019,433	7,440,366	53,096,703	6,519,443	1,978,430	1,124,630	435,195		160,740,751	8958
	Const. Less Resident Eng.	37,113,258	603,385	985,634	14,408,680	4,359,931	30,935,549	3,827,460	1,144,225	649,929	247,385		94,275,436	5254

File: Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 6 - Between Mt Lehman			Peardonville	New Roadway	Livingstone Ave	31+700	33+700	35+974	Hwy 1 to Hwy 11	Hwy 11 to Hwy 1	33+500	31+900			Total
Parsons		**Hwy 1 Widening**	New overpass	underneath	Realignment	to 26+300	to 32+700	to 26+300	Ramp from EB	Ramp from NB	to 32+700	to 31+700			Line
(2016Dollars)		**Package 6 - Mt Lehman to Hwy 11**	and approaches	Peardonville	to Peardonville	Westbound	West of Rail	Eastbound	to NB	to EB	West of Rail	McCallum WB			Cost
ACTIVITY		**EST.DATE April 4, 2016**	0	Overpass	0	Widening	Overpass to East	Widening	0	0	Overpass to East	On Ramp			
CODE		R3 DATE: Sept 15, 2016	0	0	0	**Sections**	of McCallum	**Sections**	0	0	of McCallum	Extension			C/LM
Conceptual Est.		Divison\site	**Section P.1**	**Section P.2**	**Section 3.3**	**W.3 - W.1**	**Section W.0**	**E.7 to E.1**	**Section H11.1**	**Section H11.2**	**Section H11.3**	**Section Mc.1**	**MR**	**17944**	
Blk Est. # 6.14A		Road Type	21	2	2	16	16	16	16	16	16	16	OR	0	
Version Sept.1, 200		DESCRIPTION \Length	430	440	370	5400	1000	9294	400	295	207	108	TR	17944	17944
			MR	MR	MR	MR	MR	MR	MR	MR	MR	MR			
2500		PLANNING													
2521	Consultant	- transport. planning study	0	0	0	0	0	0	0	0	0	0		0	0
2531	Consultant	- corridor study	0	0	0	0	0	0	0	0	0	0		0	0
2541	Consultant	- functional plan. study	0	0	0	0	0	0	0	0	0	0		0	0
2502	Consultant	- general	0	0	0	0	0	0	0	0	0	0		0	0
	Consultant sub-total		0	0	0	0	0	0	0	0	0	0		0	0
2510	Client	- project ident.	0	0	0	0	0	0	0	0	0	0		0	0
2520	Client	- transport. planning study	0	0	0	0	0	0	0	0	0	0		0	0
2530	Client	- corridor study	0	0	0	0	0	0	0	0	0	0		0	0
2540	Client	- functional plan. study	0	0	0	0	0	0	0	0	0	0		0	0
2501	Client	- general	0	0	0	0	0	0	0	0	0	0		0	0
	Client Sub-total		0	0	0	0	0	0	0	0	0	0		0	0
2599	Planning Contingency		0	0	0	0	0	0	0	0	0	0		0	0
	TOTAL PLANNING		0	0	0	0	0	0	0	0	0	0		0	0
3000		PRELIMINARY DESIGN													
3013	Consultant	- aerial base plan	0	0	0	0	0	0	0	0	0	0		0	0
3014	Consultant	- prel. design	30,100	30,800	25,900	378,000	70,000	650,580	28,000	20,650	14,490	7,560		1,256,080	70
3015	Consultant	- control survey	0	0	0	0	0	0	0	0	0	0		0	0
3021	Consultant	- environmental impact	12,040	12,320	10,360	151,200	28,000	260,232	11,200	8,260	5,796	3,024		502,432	28
3031	Consultant	- funct.-road field survey	0	0	0	0	0	0	0	0	0	0		0	0
3041	Consultant	- functional design	21,500	22,000	18,500	270,000	50,000	464,700	20,000	14,750	10,350	5,400		897,200	50
3051	Consultant	- funct. structural des.	232,931	0	0	0	0	2,009	17,047	4,954	0	0		256,941	14
3061	Consultant	- geotechnical design	6,450	6,600	5,550	81,000	15,000	139,410	6,000	4,425	3,105	1,620		269,160	15
3071	Consultant	- right-of-way research	0	0	0	0	0	0	0	0	0	0		0	0
3002	Consultant	- general	0	0	0	0	0	0	0	0	0	0		0	0
	Consultant sub-total		303,021	71,720	60,310	880,200	163,000	1,516,931	82,247	53,039	33,741	17,604		3,181,813	177
3010	Client	- aerial base plan	0	0	0	0	0	0	0	0	0	0		0	0
3011	Client	- prel. design	0	0	0	0	0	0	0	0	0	0		0	0
3012	Client	- control survey	0	0	0	0	0	0	0	0	0	0		0	0
3020	Client	- environmental impact	0	0	0	0	0	0	0	0	0	0		0	0
3030	Client	- funct.-road field survey	0	0	0	0	0	0	0	0	0	0		0	0
3040	Client	- functional design	0	0	0	0	0	0	0	0	0	0		0	0
3050	Client	- funct. structural des.	0	0	0	0	0	0	0	0	0	0		0	0
3060	Client	- geotechnical design	0	0	0	0	0	0	0	0	0	0		0	0
3070	Client	- right-of-way research	0	0	0	0	0	0	0	0	0	0		0	0
3001	Client	- general	0	0	0	0	0	0	0	0	0	0		0	0
	Client Sub-total		0	0	0	0	0	0	0	0	0	0		0	0
3099	Preliminary design Contingency		90,906	21,516	18,093	264,060	48,900	455,079	24,674	15,912	10,122	5,281		954,544	53
	TOTAL PRELIMINARY DESIGN		393,927	93,236	78,403	1,144,260	211,900	1,972,010	106,922	68,951	43,863	22,885		4,136,357	231
6700		UTILITIES													
6710	Util. Prov.	- Hydro	0	0	0	60,000	0	160,000	0	0	0	0		220,000	12
6711	Util. Prov.	- Telephone	0	0	0	50,000	0	50,000	0	0	0	0		100,000	6
	Util. Prov.	sub-total	0	0	0	110,000	0	210,000	0	0	0	0		320,000	18
6712	Util.Others	- pipelines	0	0	0	200,000	50,000	850,000	0	0	0	0		1,100,000	61
6713	Util.Others	- telecommunication	0	0	0	0	0	0	0	0	0	0		0	0
6714	Util.Others	- storm & sewer inspect.	0	0	0	0	0	0	0	0	0	0		0	0
6715	Util.Others	- waterworks inspect.	0	0	0	0	0	0	0	0	0	0		0	0
6716	Util.Others	- engineering services	0	0	0	0	0	0	0	0	0	0		0	0
6717	Util.Others	- parks/recreation-prel.	0	0	0	0	0	0	0	0	0	0		0	0
6718	Util.Others	- transit	0	0	0	0	0	0	0	0	0	0		0	0
6719	Util.Others	- tr-ops/signs & detours	0	0	0	0	0	0	0	0	0	0		0	0
6701	Util.Others	- general	0	0	0	0	0	0	0	0	0	0		0	0
	Util.Others	sub-total	0	0	0	200,000	50,000	850,000	0	0	0	0		1,100,000	61
6799	Util.Others Contingency		0	0	0	93,000	15,000	318,000	0	0	0	0		426,000	24
	TOTAL UTILITIES		0	0	0	403,000	65,000	1,378,000	0	0	0	0		1,846,000	103
5000		GRADE CONSTRUCTION													
5032	Grade Const	- water	0	0	0	300,000	100,000	1,300,000	0	0	0	0		1,700,000	95
5033	Grade Const	- sanitary	0	0	0	300,000	50,000	900,000	0	0	0	0		1,250,000	70

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	Parsons **Hwy 1 Widening**	New overpass	underneath	Realignment	to 26+300	to 32+700	to 26+300	Ramp from EB	Ramp from NB	to 32+700	to 31+700			Line
	(2016Dollars) **Package 6 - Mt Lehman to Hwy 11**	and approaches	Peardonville	to Peardonville	Westbound	West of Rail	Eastbound	to NB	to EB	West of Rail	McCallum WB			Cost
	ACTIVITY **EST.DATE April 4, 2016**	0	Overpass	0	Widening	Overpass to East	Widening	0	0	Overpass to East	On Ramp			
	CODE R3 DATE: Sept 15, 2016	0	0	0	**Sections**	of McCallum	**Sections**	0	0	of McCallum	Extension			C/LM
	Conceptual Est. Divison\site	**Section P.1**	**Section P.2**	**Section 3.3**	**W.3 - W.1**	**Section W.0**	**E.7 to E.1**	**Section H11.1**	**Section H11.2**	**Section H11.3**	**Section Mc.1**	**MR**	**17944**	
	Blk Est. # 6.14A Road Type	21	2	2	16	16	16	16	16	16	16	OR	0	
	Version Sept.1, 200 DESCRIPTION \Length	430	440	370	5400	1000	9294	400	295	207	108	TR	17944	17944
		MR	MR	MR	MR	MR	MR	MR	MR	MR	MR			
5034	Grade Const - storm	0	0	0	200,000	250,000	1,000,000	0	0	0	0		1,450,000	81
5031	Grade Const - mobilization	0	0	0	24,000	12,000	96,000	0	0	0	0		132,000	7
5039	Grade Const - utility contingency	0	0	0	247,200	123,600	988,800	0	0	0	0		1,359,600	76
	Grade Const. Utilities Sub-total	0	0	0	1,071,200	535,600	4,284,800	0	0	0	0		5,891,600	328
5010	Grade Const - site prep./clear,grubbing	1,496	56,148	45,726	97,875	0	77,575	0	0	0	0		278,820	16
5020	Grade Const - road grade/exc,placing,fill	215,645	50,400	423,060	6,149,880	2,196,205	12,984,415	704,151	0	362,644	76,445		23,162,844	1291
5030	Grade Const - drainage/pipe,cul.	0	0	0	1,000,000	500,000	2,500,000	0	0	0	0		4,000,000	223
5040	Grade Const - muiltiplate	0	0	0	0	0	0	0	0	0	0		0	0
5050	Grade Const -SGSB/produce,place,comp	271,035	210,033	156,818	1,686,677	318,255	2,973,537	136,836	104,192	83,984	32,276		5,973,643	333
5051	Grade Const -CBC/produce,place,comp	232,316	160,166	114,885	1,176,449	224,709	2,059,397	100,872	80,606	59,774	24,480		4,233,654	236
5060	Grade Const - grade finishing landscaping	0	0	0	0	0	0	0	0	0	0		0	0
5061	Grade Const - grade finishing hydro seed.	0	4,620	6,196	78,977	13,754	140,854	6,127	2,558	4,486	872		258,443	14
5062	Grade Const - grade finishing fencing	0	0	0	0	0	0	0	0	0	0		0	0
5063	Grade Const - noise barriers	0	0	0	0	0	0	0	0	0	0		0	0
5064	Grade Const - passing lanes	0	0	0	0	0	0	0	0	0	0		0	0
5090	Grade Const - sidewalks,curb & gutter	21,500	0	0	0	0	0	0	0	0	0		21,500	1
5005	Grade Const -detours c/w ex,bf,paving	0	0	0	0	0	0	0	0	0	0		0	0
5001	Grade Const - mobilization	22,260	14,441	22,401	305,696	97,588	622,073	28,440	5,621	15,327	4,022		1,137,867	63
5099	Grade Const - Contingency	229,276	148,742	230,725	3,148,666	1,005,153	6,407,355	292,928	57,893	157,865	41,429		11,720,032	653
	Grade Construction Sub-total	993,528	644,550	999,810	13,644,220	4,355,663	27,765,206	1,269,353	250,869	684,081	179,524		50,786,803	2830
	GRADE CONSTRUCTION COSTS	993,528	644,550	999,810	14,715,420	4,891,263	32,050,006	1,269,353	250,869	684,081	179,524		56,678,403	3159
3510	Grade Eng. - detailed design	69,547	45,119	69,987	1,030,079	342,388	2,243,500	88,855	17,561	47,886	12,567		3,967,488	221
3519	Grade Eng. - detailed design/Contingency	20,864	13,536	20,996	309,024	102,717	673,050	26,656	5,268	14,366	3,770		1,190,246	66
6810	Grade Eng. - general const. supervision	29,806	19,337	29,994	441,463	146,738	961,500	38,081	7,526	20,522	5,386		1,700,352	95
6811	Grade Eng. - quality assurance	19,871	12,891	19,996	294,308	97,825	641,000	25,387	5,017	13,682	3,590		1,133,568	63
6812	Grade Eng. - surveying	19,871	12,891	19,996	294,308	97,825	641,000	25,387	5,017	13,682	3,590		1,133,568	63
6819	Grade Eng. - Residency Contingency	20,864	13,536	20,996	309,024	102,717	673,050	26,656	5,268	14,366	3,770		1,190,246	66
	Grade Engineering Sub-total	180,822	117,308	181,965	2,678,206	890,210	5,833,101	231,022	45,658	124,503	32,673		10,315,469	575
	Total Grade Const. & Eng. Costs	1,174,350	761,858	1,181,775	17,393,627	5,781,473	37,883,107	1,500,375	296,527	808,583	212,197		66,993,873	3733
5500	STRUCTURAL CONSTRUCTION													
5522	Struct.Const - water	0	0	0	0	0	0	0	0	0	0		0	0
5523	Struct.Const - sanitary	0	0	0	0	0	0	0	0	0	0		0	0
5524	Struct.Const - storm	0	0	0	0	0	0	0	0	0	0		0	0
5521	Struct.Const - mobilization	0	0	0	0	0	0	0	0	0	0		0	0
5599	Struct.Const - utility contingency	0	0	0	0	0	0	0	0	0	0		0	0
	Structural Const. Utilities Sub-total	0	0	0	0	0	0	0	0	0	0		0	0
5510	Struct.Const - tunnel site preparation	0	0	0	0	0	0	0	0	0	0		0	0
5511	Struct.Const - tunnel construction	0	0	0	0	0	0	0	0	0	0		0	0
5512	Struct.Const - snow shed site prep.	0	0	0	0	0	0	0	0	0	0		0	0
5513	Struct.Const - snow shed site const.	0	0	0	0	0	0	0	0	0	0		0	0
5514	Struct.Const - bridge site preparation	1,000,000	0	0	0	0	0	0	0	0	0		1,000,000	56
5515	Struct.Const - bridge piers	0	0	0	0	0	0	0	0	0	0		0	0
5516	Struct.Const - bridge abutments	1,000,000	0	0	0	0	0	0	0	0	0		1,000,000	56
5517	Struct.Const - bridge superstructure	31,856,000	0	0	0	0	0	1,919,920	0	0	0		33,775,920	1882
5518	Struct.Const - retain. wall site prep.	0	0	0	0	0	0	0	0	0	0		0	0
5519	Struct.Const - retaining wall const.	935,740	0	0	0	0	300,000	626,379	740,000	0	0		2,602,119	145
5501	Struct.Const - mobilization	1,043,752	0	0	0	0	9,000	76,389	22,200	0	0		1,151,341	64
5529	Struct.Const - Contingency	10,750,648	0	0	0	0	92,700	786,806	228,660	0	0		11,858,814	661
	Structural Construction Sub-total	46,586,140	0	0	0	0	401,700	3,409,494	990,860	0	0		51,388,194	2864
	STRUCTURAL CONSTRUCTION COSTS	46,586,140	0	0	0	0	401,700	3,409,494	990,860	0	0		51,388,194	2864
3520	Struct. Eng. - detailed design	3,726,891	0	0	0	0	32,136	272,760	79,269	0	0		4,111,056	229
3529	Struct. Eng. - detailed design/Contingency	1,118,067	0	0	0	0	9,641	81,828	23,781	0	0		1,233,317	69
6820	Struct. Eng. - general const. supervision	1,863,446	0	0	0	0	16,068	136,380	39,634	0	0		2,055,528	115
6821	Struct. Eng. - quality assurance	931,723	0	0	0	0	8,034	68,190	19,817	0	0		1,027,764	57
6822	Struct. Eng. - surveying	232,931	0	0	0	0	2,009	17,047	4,954	0	0		256,941	14
6829	Struct. Eng. - Residency Contingency	908,430	0	0	0	0	7,833	66,485	19,322	0	0		1,002,070	56
	Structural Engineering Sub-total	8,781,487	0	0	0	0	75,720	642,690	186,777	0	0		9,686,675	540
	Total Structural & Eng. Costs	55,367,627	0	0	0	0	477,420	4,052,184	1,177,637	0	0		61,074,869	3404

File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 6 - Between Mt Lehman	Peardonville	New Roadway	Livingstone Ave	31+700	33+700	35+974	Hwy 1 to Hwy 11	Hwy 11 to Hwy 1	33+500	31+900			Total
	Parsons **Hwy 1 Widening**	New overpass	underneath	Realignment	to 26+300	to 32+700	to 26+300	Ramp from EB	Ramp from NB	to 32+700	to 31+700			Line
	(2016Dollars) **Package 6 - Mt Lehman to Hwy 11**	and approaches	Peardonville	to Peardonville	Westbound	West of Rail	Eastbound	to NB	to EB	West of Rail	McCallum WB			Cost
	ACTIVITY **EST.DATE April 4, 2016**	0	Overpass	0	Widening	Overpass to East	Widening	0	0	Overpass to East	On Ramp			
	CODE R3 DATE: Sept 15, 2016	0	0	0	**Sections**	of McCallum	**Sections**	0	0	of McCallum	Extension			C/LM
	Conceptual Est. Divison\site	**Section P.1**	**Section P.2**	**Section 3.3**	**W.3 - W.1**	**Section W.0**	**E.7 to E.1**	**Section H11.1**	**Section H11.2**	**Section H11.3**	**Section Mc.1**	**MR**	**17944**	
	Blk Est. # 6.14A Road Type	21	2	2	16	16	16	16	16	16	16	OR	0	
	Version Sept.1, 200 DESCRIPTION \Length	430	440	370	5400	1000	9294	400	295	207	108	TR	17944	17944
		MR	MR	MR	MR	MR	MR	MR	MR	MR	MR			
6000	PAVING CONSTRUCTION													
6020	Paving Cons - machine paving asphalt	241,172	100,014	95,727	2,181,881	394,476	3,973,682	99,396	93,477	72,598	50,411		7,302,834	407
6030	Paving Cons - machine paving concrete	0	0	0	0	0	0	0	0	0	0		0	0
6040	Paving Cons - hot reprofiling	0	0	0	0	0	0	0	0	0	0		0	0
6050	Paving Cons - shoulder paving	0	0	0	0	0	0	0	0	0	0		0	0
6060	Paving Cons - pavement finishing	0	0	0	0	0	0	0	0	0	0		0	0
6070	Paving Cons - seal coating	0	0	0	0	0	0	0	0	0	0		0	0
6001	Paving Cons - mobilization	7,235	3,000	2,872	65,456	11,834	119,210	2,982	2,804	2,178	1,512		219,085	12
6010	Paving Cons - pavement design	0	0	0	0	0	0	0	0	0	0		0	0
6099	Paving Cons - Contingency	74,522	30,904	29,580	674,201	121,893	1,227,868	30,713	28,884	22,433	15,577		2,256,576	126
	PAVING CONSTRUCTION COSTS	322,929	133,918	128,179	2,921,538	528,204	5,320,761	133,091	125,166	97,209	67,500		9,778,495	545
3560	Paving Eng. - detailed design	22,605	9,374	8,973	204,508	36,974	372,453	9,316	8,762	6,805	4,725		684,495	38
3569	Paving Eng. - detailed design/Contingency	6,782	2,812	2,692	61,352	11,092	111,736	2,795	2,628	2,041	1,418		205,348	11
6860	Paving Eng. - general const. supervision	6,459	2,678	2,564	58,431	10,564	106,415	2,662	2,503	1,944	1,350		195,570	11
6861	Paving Eng. - quality assurance	12,917	5,357	5,127	116,862	21,128	212,830	5,324	5,007	3,888	2,700		391,140	22
6862	Paving Eng. - surveying	1,615	670	641	14,608	2,641	26,604	665	626	486	338		48,892	3
6869	Paving Eng. - Residency Contingency	6,297	2,611	2,499	56,970	10,300	103,755	2,595	2,441	1,896	1,316		190,681	11
	Paving Engineering Sub-total	56,674	23,503	22,495	512,730	92,700	933,794	23,357	21,967	17,060	11,846		1,716,126	96
	Total Paving Const. & Eng. Costs	379,603	157,421	150,675	3,434,268	620,903	6,254,554	156,448	147,133	114,269	79,346		11,494,621	641
6500	OPERATIONAL CONSTRUCTION													
6510	Operat.Cons - lighting	110,000	0	66,000	0	0	0	71,500	55,000	38,500	22,000		363,000	20
6520	Operat.Cons - signals	90,000	0	0	0	0	0	0	0	0	0		90,000	5
6530	Operat.Cons - signing	860	880	740	10,800	2,000	18,588	800	590	414	216		35,888	2
6540	Operat.Cons - guard rail	48,000	0	45,000	451,500	126,000	682,500	48,000	33,000	7,500	32,400		1,473,900	82
6550	Operat.Cons - pavement markings	8,525	3,550	2,775	54,000	9,000	94,840	2,000	1,475	1,098	1,080		178,343	10
6501	Operat.Cons - mobilization	7,722	133	3,435	15,489	4,110	23,878	3,669	2,702	1,425	1,671		64,234	4
6599	Operat.Cons - contingency	79,532	1,369	35,385	159,537	42,333	245,942	37,791	27,830	14,681	17,210		661,609	37
	OPERATIONAL CONSTRUCTION COSTS	344,639	5,932	153,336	691,326	183,443	1,065,748	163,760	120,597	63,618	74,577		2,866,974	160
3540	Operat. Eng - detailed design	24,125	415	10,733	48,393	12,841	74,602	11,463	8,442	4,453	5,220		200,688	11
3549	Operat. Eng - detailed design/Contingency	7,237	125	3,220	14,518	3,852	22,381	3,439	2,533	1,336	1,566		60,206	3
6840	Operat. Eng - general const. supervision	18,955	326	8,433	38,023	10,089	58,616	9,007	6,633	3,499	4,102		157,684	9
6841	Operat. Eng - quality assurance	6,893	119	3,067	13,827	3,669	21,315	3,275	2,412	1,272	1,492		57,339	3
6842	Operat. Eng - surveying	1,723	30	767	3,457	917	5,329	819	603	318	373		14,335	1
6849	Operat. Eng - Residency Contingency	8,271	142	3,680	16,592	4,403	25,578	3,930	2,894	1,527	1,790		68,807	4
	Operational Enginering Sub-total	67,205	1,157	29,900	134,809	35,771	207,821	31,933	23,516	12,405	14,543		559,060	31
	Total Operational Const.& Eng.Costs	411,843	7,088	183,236	826,134	219,214	1,273,568	195,693	144,113	76,023	89,119		3,426,034	191
5200	ROAD SIDE CONSTRUCTION													
5203	RoadSide C - water	0	0	0	0	0	0	0	0	0	0		0	0
5204	RoadSide C - sanitary	0	0	0	0	0	0	0	0	0	0		0	0
5205	RoadSide C - storm	0	0	0	0	0	0	0	0	0	0		0	0
5202	RoadSide C - mobilization	0	0	0	0	0	0	0	0	0	0		0	0
5209	RoadSide C - Utility Contingency	0	0	0	0	0	0	0	0	0	0		0	0
	Road Side Const. Utilities Sub-total	0	0	0	0	0	0	0	0	0	0		0	0
5210	RoadSide C - weighscales	0	0	0	0	0	0	0	0	0	0		0	0
5220	RoadSide C - safety rest areas	0	0	0	0	0	0	0	0	0	0		0	0
5230	RoadSide C - tourist rest & view areas	0	0	0	0	0	0	0	0	0	0		0	0
5201	RoadSide C - mobilization	0	0	0	0	0	0	0	0	0	0		0	0
5299	RoadSide C - Contingency	0	0	0	0	0	0	0	0	0	0		0	0
	Road Side Construction Sub-total	0	0	0	0	0	0	0	0	0	0		0	0
	ROAD SIDE CONSTRUCTION COSTS	0	0	0	0	0	0	0	0	0	0		0	0
3550	RoadSide E - detailed design	0	0	0	0	0	0	0	0	0	0		0	0
3559	RoadSide E - detailed design/Contingency	0	0	0	0	0	0	0	0	0	0		0	0
6850	RoadSide E - general const. supervision	0	0	0	0	0	0	0	0	0	0		0	0
6851	RoadSide E - quality assurance	0	0	0	0	0	0	0	0	0	0		0	0
6852	RoadSide E - surveying	0	0	0	0	0	0	0	0	0	0		0	0
6859	RoadSide E - Residency Contingency	0	0	0	0	0	0	0	0	0	0		0	0

File: Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 6 - Between Mt Lehman	Peardonville New overpass and approaches	New Roadway underneath Peardonville Overpass	Livingstone Ave Realignment to Peardonville	31+700 to 26+300 Westbound Widening	33+700 to 32+700 West of Rail Overpass to East	35+974 to 26+300 Eastbound Widening	Hwy 1 to Hwy 11 Ramp from EB to NB	Hwy 11 to Hwy 1 Ramp from NB to EB	33+500 to 32+700 West of Rail Overpass to East	31+900 to 31+700 McCallum WB On Ramp Extension			Total Line Cost
Parsons **Hwy 1 Widening**													
(2016Dollars) **Package 6 - Mt Lehman to Hwy 11**													
ACTIVITY **EST.DATE April 4, 2016**													
CODE R3 DATE: Sept 15, 2016													C/LM
Conceptual Est. Divison\site	**Section P.1**	**Section P.2**	**Section 3.3**	**Sections W.3 - W.1**	**Section W.0**	**Sections E.7 to E.1**	**Section H11.1**	**Section H11.2**	**Section H11.3**	**Section Mc.1**	**MR**	**17944**	
Blk Est. # 6.14A Road Type	21	2	2	16	16	16	16	16	16	16	OR	0	
Version Sept.1, 200 DESCRIPTION \Length	430	440	370	5400	1000	9294	400	295	207	108	TR	17944	17944
	MR	MR	MR	MR	MR	MR	MR	MR	MR	MR			
Road Side Engineering Sub-total	0	0	0	0	0	0	0	0	0	0		0	0
Total Road Side Const.& Eng.Costs	0	0	0	0	0	0	0	0	0	0		0	0
5300 OTHER CONSTRUCTION													
5303 Other Const - water	0	0	0	0	0	0	0	0	0	0		0	0
5304 Other Const - sanitary	0	0	0	0	0	0	0	0	0	0		0	0
5305 Other Const - storm	0	0	0	0	0	0	0	0	0	0		0	0
5302 Other Const - mobilization	0	0	0	0	0	0	0	0	0	0		0	0
5309 Other Const - utility contingency	0	0	0	0	0	0	0	0	0	0		0	0
Other Const. Utilities Sub-total	0	0	0	0	0	0	0	0	0	0		0	0
5310 Other Const - railroads main & spur lines	0	0	0	0	0	0	0	0	0	0		0	0
5320 Other Const - railroad crossings	0	0	0	0	0	0	0	0	0	0		0	0
5330 Other Const - marine work	0	0	0	0	0	0	0	0	0	0		0	0
5340 Other Const - environmental mitigations	0	0	0	0	0	0	0	0	0	0		0	0
5301 Other Const - mobilization	0	0	0	0	0	0	0	0	0	0		0	0
5399 Other Const - Contingency	0	0	0	0	0	0	0	0	0	0		0	0
Other Construction Sub-total	0	0	0	0	0	0	0	0	0	0		0	0
OTHER CONSTRUCTION COSTS	0	0	0	0	0	0	0	0	0	0		0	0
3570 Other Eng. - detailed design	0	0	0	0	0	0	0	0	0	0		0	0
3579 Other Eng. - detailed design/Contingency	0	0	0	0	0	0	0	0	0	0		0	0
6870 Other Eng. - general const. supervision	0	0	0	0	0	0	0	0	0	0		0	0
6871 Other Eng. - quality assurance	0	0	0	0	0	0	0	0	0	0		0	0
6872 Other Eng. - surveying	0	0	0	0	0	0	0	0	0	0		0	0
6879 Other Eng. - Residency Contingency	0	0	0	0	0	0	0	0	0	0		0	0
Other Engineering Sub-total	0	0	0	0	0	0	0	0	0	0		0	0
Total Other Const.& Eng.Costs	0	0	0	0	0	0	0	0	0	0		0	0
3500 DETAILED DESIGN													
from 3510,3520,3540,3550,3570	4,996,118	71,380	116,601	1,667,874	509,865	3,539,500	497,112	148,243	76,887	29,266		11,652,845	649
3530 Geotech. En - detailed design	314,483	4,706	7,688	109,970	33,617	233,029	54,854	8,925	5,069	1,930		774,272	43
3539 Geotech. En - Contingency	94,345	1,412	2,306	32,991	10,085	69,909	16,456	2,677	1,521	579		232,282	13
TOTAL DETAILED DESIGN COSTS	5,404,947	77,499	126,595	1,810,834	553,568	3,842,438	568,422	159,845	83,477	31,774		12,659,399	705
6800 RESIDENT ENGINEERING													
from 6810,6820,6840,6850,6860,6870	4,090,070	70,587	117,761	1,657,871	508,816	3,510,936	431,891	129,675	77,082	29,796		10,624,485	
TOTAL RESIDENT ENG. COSTS	4,090,070	70,587	117,761	1,657,871	508,816	3,510,936	431,891	129,675	77,082	29,796		10,624,485	592
												0	
												0	0
PART 1 SUMMARY													
CONSTRUCTION	37,113,258	603,385	985,634	14,408,680	4,359,931	30,935,549	3,827,460	1,144,225	649,929	247,385		94,275,436	5254
ENGINEERING & SUPERVISION	7,606,880	185,632	248,276	3,548,435	980,218	7,173,372	851,719	275,748	157,248	64,966		21,092,493	1175
CONTRACTUAL CONTINGENCY	13,416,041	236,705	370,173	5,387,135	1,602,045	11,432,676	1,403,754	425,992	242,153	93,705		34,610,379	1929
												0	0
CONSTRUCTION COST TOTAL	58,136,179	1,025,722	1,604,083	23,344,250	6,942,194	49,541,598	6,082,932	1,845,964	1,049,330	406,056		149,978,307	8358
2000 PROJECT MANAGEMENT													
2060 Project Man. - office costs wages	1,308,064	23,079	36,092	525,246	156,199	1,114,686	136,866	41,534	23,610	9,136		3,374,512	188
2062 Project Man. - office costs - expenses	0	0	0	0	0	0	0	0	0	0		0	0
2063 Project Man. - printing costs	0	0	0	0	0	0	0	0	0	0		0	0
2061 Project Man. - general	0	0	0	0	0	0	0	0	0	0		0	0
Project Manager Sub-total	1,308,064	23,079	36,092	525,246	156,199	1,114,686	136,866	41,534	23,610	9,136		3,374,512	188
2010 Client - office costs wages	1,162,724	20,514	32,082	466,885	138,844	990,832	121,659	36,919	20,987	8,121		2,999,566	167
2012 Client - office costs - expenses	0	0	0	0	0	0	0	0	0	0		0	0
2030 Client - printing costs	0	0	0	0	0	0	0	0	0	0		0	0
2011 Client - general	0	0	0	0	0	0	0	0	0	0		0	0
Client Sub-total	1,162,724	20,514	32,082	466,885	138,844	990,832	121,659	36,919	20,987	8,121		2,999,566	167

File:	Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 6 - Between Mt Lehman	Peardonville	New Roadway	Livingstone Ave	31+700	33+700	35+974	Hwy 1 to Hwy 11	Hwy 11 to Hwy 1	33+500	31+900			Total
	Parsons **Hwy 1 Widening**	New overpass	underneath	Realignment	to 26+300	to 32+700	to 26+300	Ramp from EB	Ramp from NB	to 32+700	to 31+700			Line
	(2016Dollars) **Package 6 - Mt Lehman to Hwy 11**	and approaches	Peardonville	to Peardonville	Westbound	West of Rail	Eastbound	to NB	to EB	West of Rail	McCallum WB			Cost
	ACTIVITY **EST.DATE April 4, 2016**	0	Overpass	0	Widening	Overpass to East	Widening	0	0	Overpass to East	On Ramp			
	CODE R3 DATE: Sept 15, 2016	0	0	0	**Sections**	of McCallum	**Sections**	0	0	of McCallum	Extension			C/LM
	Conceptual Est. Divison\site	**Section P.1**	**Section P.2**	**Section 3.3**	**W.3 - W.1**	**Section W.0**	**E.7 to E.1**	**Section H11.1**	**Section H11.2**	**Section H11.3**	**Section Mc.1**	**MR**	**17944**	
	Blk Est. # 6.14A Road Type	21	2	2	16	16	16	16	16	16	16	OR	0	
	Version Sept.1, 200 DESCRIPTION \Length	430	440	370	5400	1000	9294	400	295	207	108	TR	17944	17944
		MR	MR	MR	MR	MR	MR	MR	MR	MR	MR			
2070	Public Rel. - wages & expenses	348,817	6,154	9,624	140,065	41,653	297,250	36,498	11,076	6,296	2,436		899,870	50
2072	Public Rel. - adv., media, displays	0	0	0	0	0	0	0	0	0	0		0	0
2073	Public Rel. - opening ceremonies	0	0	0	0	0	0	0	0	0	0		0	0
2071	Public Rel. - general	0	0	0	0	0	0	0	0	0	0		0	0
	Public Relations Sub-total	348,817	6,154	9,624	140,065	41,653	297,250	36,498	11,076	6,296	2,436		899,870	50
2040	Legal Costs - lawyers fees	40,695	718	1,123	16,341	4,860	34,679	4,258	1,292	735	284		104,985	6
2041	Legal Costs - general	0	0	0	0	0	0	0	0	0	0		0	0
	Legal Costs Sub-total	40,695	718	1,123	16,341	4,860	34,679	4,258	1,292	735	284		104,985	6
2080	Insurance - const./ liability, E&O	348,817	6,154	9,624	140,065	41,653	297,250	36,498	11,076	6,296	2,436		899,870	50
2081	Insurance - general	0	0	0	0	0	0	0	0	0	0		0	0
	Legal Costs Sub-total	348,817	6,154	9,624	140,065	41,653	297,250	36,498	11,076	6,296	2,436		899,870	50
2099	Project Management Contingency	962,735	16,986	26,564	386,581	114,963	820,409	100,733	30,569	17,377	6,724		2,483,641	138
	TOTAL PROJECT MANAGEMENT COSTS	4,171,852	73,606	115,109	1,675,183	498,172	3,555,105	436,511	132,466	75,300	29,139		10,762,443	600
4000	LAND	0	0	0	0	0	0	0	0	0	0		0	
4010	Land(Code 4 -Mrkt,ROW,Serv,Imp.V,Ease.C,T	0	0	0	0	0	0	0	0	0	0		0	0
	Acquisition Sub-total	0	0	0	0	0	0	0	0	0	0		0	0
4020	Land(Code 4 -Bus.,5%,Mrg.P,Rel$,P/Tax,Etc	0	0	0	0	0	0	0	0	0	0		0	0
4030	Land(Code 4 -Owners(LS,Apprsl,Rprt,Lgl,In	0	0	0	0	0	0	0	0	0	0		0	0
4040	Land(Code 4 -Demolition	0	0	0	0	0	0	0	0	0	0		0	0
4050	Land(Code 4 -Pro.Man,P.Tax,Util,Security	0	0	0	0	0	0	0	0	0	0		0	0
4060	Land(Code 4 -Not Used	0	0	0	0	0	0	0	0	0	0		0	0
4070	Land(Code 4 -Not Used	0	0	0	0	0	0	0	0	0	0		0	0
4080	Land(Code 4 -Acq.F,M/Sal,TrvlV,Cntr.S,Appr.	0	0	0	0	0	0	0	0	0	0		0	0
4090	Land(Code 4 -Surveys	0	0	0	0	0	0	0	0	0	0		0	0
													0	0
													0	0
													0	0
													0	0
	Associated costs-sub-total	0	0	0	0	0	0	0	0	0	0		0	0
4099	Land Contingency Sub-total	0	0	0	0	0	0	0	0	0	0		0	0
	TOTAL LAND COSTS	0	0	0	0	0	0	0	0	0	0		0	0
9800	MANAGEMENT RESERVE													
	MAN. RES. - planning	0	0	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - preliminary design	0	0	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - utility construction	0	0	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - grade construction	0	0	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - structural construction	0	0	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - paving construction	0	0	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - operation construction	0	0	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - roadside construction	0	0	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - other construction	0	0	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - project management	0	0	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - land	0	0	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - detailed eng.	0	0	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - residency eng.	0	0	0	0	0	0	0	0	0	0		0	0
	MAN. RES. - risk contingency	0	0	0	0	0	0	0	0	0	0		0	0
	TOTAL MANAGEMENT RESERVE	0	0	0	0	0	0	0	0	0	0		0	0
	TOTAL LESS ESCALATION													
	FISCAL													
9900	ESCALATION													
	YEAR PROJECTED ESCALATION													
	2006-2007	0	0	0	0	0	0	0	0	0	0		0	0
	2007-2008	0	0	0	0	0	0	0	0	0	0		0	0
	2008-2009	0	0	0	0	0	0	0	0	0	0		0	0
	2009-2010	0	0	0	0	0	0	0	0	0	0		0	0
	2010-2011	0	0	0	0	0	0	0	0	0	0		0	0
	2011-2012	0	0	0	0	0	0	0	0	0	0		0	0
	2012-2013	0	0	0	0	0	0	0	0	0	0		0	0
	2013-2014	0	0	0	0	0	0	0	0	0	0		0	0

File: Q:\SW\1200 - MoT A&W Contract #15\SWF - Highway 1 Functional Planning\Data\Costing\March 29th\[Package 6 - Between Mt Lehman	Peardonville	New Roadway	Livingstone Ave	31+700	33+700	35+974	Hwy 1 to Hwy 11	Hwy 11 to Hwy 1	33+500	31+900			Total
Parsons **Hwy 1 Widening**	New overpass	underneath	Realignment	to 26+300	to 32+700	to 26+300	Ramp from EB	Ramp from NB	to 32+700	to 31+700			Line
(2016Dollars) **Package 6 - Mt Lehman to Hwy 11**	and approaches	Peardonville	to Peardonville	Westbound	West of Rail	Eastbound	to NB	to EB	West of Rail	McCallum WB			Cost
ACTIVITY **EST.DATE April 4, 2016**	0	Overpass	0	Widening	Overpass to East	Widening	0	0	Overpass to East	On Ramp			
CODE R3 DATE: Sept 15, 2016	0	0	0	**Sections**	of McCallum	**Sections**	0	0	of McCallum	Extension			C/LM
Conceptual Est. Divison\site	**Section P.1**	**Section P.2**	**Section 3.3**	**W.3 - W.1**	**Section W.0**	**E.7 to E.1**	**Section H11.1**	**Section H11.2**	**Section H11.3**	**Section Mc.1**	**MR**	**17944**	
Blk Est. # 6.14A Road Type	21	2	2	16	16	16	16	16	16	16	OR	0	
Version Sept.1, 200 DESCRIPTION \Length	430	440	370	5400	1000	9294	400	295	207	108	TR	17944	17944
	MR	MR	MR	MR	MR	MR	MR	MR	MR	MR			
2014-2015	0	0	0	0	0	0	0	0	0	0		0	0
TOTAL ESCALATION	0	0	0	0	0	0	0	0	0	0		0	0
PART 2 SUMMARY NON-CONSTRUCTION COSTS													
Non-Construction	3,209,117	56,620	88,545	1,288,603	383,209	2,734,696	335,778	101,897	57,923	22,414		8,278,803	461
Non-Const. Contingency	962,735	16,986	26,564	386,581	114,963	820,409	100,733	30,569	17,377	6,724		2,483,641	138
TOTAL NON-CONSTRUCTION COSTS	4,171,852	73,606	115,109	1,675,183	498,172	3,555,105	436,511	132,466	75,300	29,139		10,762,443	600
DIVISION TOTAL FOR ROAD TYPE	62,308,031	1,099,328	1,719,192	25,019,433	7,440,366	53,096,703	6,519,443	1,978,430	1,124,630	435,195		160,740,751	8958

APPENDIX C

Environmental & Aboriginal Consultation Information Requirements

Infrastructure Canada

Ottawa, Canada
K1P 0B6

Annex D - Environmental and Aboriginal Consultation Information Requirements

As part of the application process for funding, applicants are required to complete the following questionnaire, found in Annex D of the Business Case Guide, in order for Infrastructure Canada (INFC) to determine if the *Canadian Environmental Assessment Act, 2012* (CEAA, 2012) and/or environmental assessment process in Northern Canada apply to the project. In addition, the information provided will also be used by INFC to determine if there is a requirement to consult with Aboriginal Groups.

All yellow highlighted text is instructional and is provided to explain in more detail the type of information requested by INFC. This instructional text can be deleted once information is provided in the appropriate boxes. Please provide your response in the spaces provided in the boxes, and use as much space as necessary.

Note that if you have any questions filling out the questionnaire; please submit your questions to the following email address: INFC.AboriginalConsultEnv-Consultautochtonesenv.INFC@canada.ca.

General information
Project Name: Highway 1 Widening (216 Street to Whatcom Road) Project Proponent: BC Ministry of Transportation and Infrastructure
Contact person for any question Infrastructure Canada could have regarding the environmental assessment and aboriginal consultation: Name: David Mintak Title: Regional Manager, Project Delivery Address: 310 - 1500 Woolridge, Coquitlam, B.C. V3K 0B8 Phone: (604) 527-2171 Email: David.Mintak@gov.bc.ca

Note (scope change): If you are completing this questionnaire due to a proposed project amendment for a project already submitted to Infrastructure Canada (INFC), please only include the amended project information.

Project and existing environment description
The project scope will generally include the widening of Highway 1 by adding one lane in each direction into the median between 216 Street and eventually Whatcom Road with a focus on the segment extending to Highway 11. The segment of highway between Highway 11 and Whatcom Road will be the subject of a further study. In addition to the addition of one lane in each direction of travel, the project will include the demolition of existing underpasses and reconfiguration of two interchanges, the 232 Street interchange

and the 264 Street interchange. In addition, to accommodate the Highway 1 widening a number of grade separated crossing will need to be upgraded to achieve added crossing width and/or higher clearance under the structure. Therefore the scope of the Highway 1 Widening project will also include the following key elements:

- Demolition and reconstruction of the Glover Road underpass structure;
- Demolition and reconstruction of the rail underpass structures at the CP Rail lane (Roberts Bank Corridor);
- Widening of the two overhead structures at Bradner Road;
- Upgrade of the entrance and exit ramps to the Bradner Rest Area along the westbound lanes of Highway 1;
- Demolition and reconstruction of the Peardonville Road underpass structure;
- New structure for the eastbound off-ramp to Highway 11; and
- Upgrade of the Highway 11 on-ramp to Highway 1 eastbound.

Description of the existing environment:

This section of Highway 1 passes through suburban, rural agricultural, and urban areas within the municipalities of the Township of Langley and the City of Abbotsford. The majority of the proposed works is within the existing right-of-way of the highway or the cross streets. However, a number of creeks and drainage channels cross the existing highway and the widening into the median may result in some impacts. No negative impacts are anticipated with respect to the residential areas, business and industrial parks, or agricultural areas abutting the highway corridor.

A major railway crossing, CP Rail – Roberts Bank Rail Corridor, will be affected as the existing box structures will need to be removed to accommodate the additional highway lanes. A new rail bridge structure is included in the project scope.

Project Location Part

PL.1.1: Would any part of the project or activities be located on:		
Yes ☐ No ☑	Federal land. If yes, provide details regarding the federal land administrator:	
Yes ☑ No ☐	Provincial land. If yes, provide details:	
Yes ☐ No ☑	Indian Reserve land. If yes, provide details:	
If you answered "**yes**" to any of the above.	Is the entire project footprint located on that land? If not, please indicate the portions that will take place on that land (provide a map).	Yes ☑ No ☐

PL.1.2: Would any part of the project or activities be located in:	
Yes ☐ No ☑	Internal waters of Canada, in any area of the sea not within a province *Internal waters refers to: the internal waters of Canada as determined under the Oceans Act, including the seabed and subsoil below and the airspace above those waters.*
Yes ☐ No ☑	The territorial sea of Canada, in any area of the sea not within a province *Territorial sea refers to:* *The territorial sea of Canada as determined under the Oceans Act, including the seabed and its subsoil below and the airspace above that sea.*
Yes ☐ No ☑	The exclusive economic zone of Canada *Exclusive economic zone refers to:* *The exclusive economic zone of Canada as determined under the Oceans Act, including the seabed and its subsoil.*
Yes ☐ No ☑	The continental shelf of Canada *Continental shelf refers to: the continental shelf of Canada as determined under the Oceans Act.*
If you answered "**yes**" to any of the above:	Please provide the information regarding the land administrator.

PL.2 In order to facilitate and accelerate INFC's assessment of your application for funding, please provide an accurate project location in order for INFC to geographically locate your project.		
Option 1: Project with a fixed address		
Address of the project Civic Number: Unit/Suite/Apt: Street Name: Municipality: County: Province: Postal Code:	Location 1	Location 2
Project Longitude:49°06'05.7"N Project Latitude: 122°29'31.6"W Project Latitude:		
Option 2: Project with no fixed address or multiple components		
Please indicate, <u>for each project component</u>, any points of interest, intersections, major highways or streets, or other physical characteristics located in the vicinity of the project (e.g. near airport, adjacent to Lions Gate Bridge, 3 km east from Centennial Park, at intersection of Fifth and Queen, etc.)		
Component A: Highway 1 widening from 216 Street to Whatcom Road (section to Highway 11 is current focus). The project is located within the Township of Langley and the City of Abbotsford.		
Component B: 232 Street / Highway 1 interchange		
Component C: 264 Street / Highway 1 interchange		

PL.3 Project Location Documents	
A project location map, as a minimum, has been included with this questionnaire. *If available, include also any other additional project map (e.g. site plan, etc.) that may be useful in locating the project.* Map Attached	Yes ☑

Environmental Requirement Part

ER.1.1: Does any part of your project involve the construction, operation, decommissioning or abandonment of the following infrastructure?	
Yes ☐ No ☑	Electrical transmission lines
Yes ☐ No ☑	Electrical generating facility
Yes ☐ No ☑	Structure for the diversion of water including dam, dyke or reservoir
Yes ☐ No ☑	Canal, lock or structure to control water level
Yes ☐ No ☑	Oil and gas pipeline
Yes ☐ No ☑	Marine terminal
Yes ☑ No ☐	Railway line and / or Railway yard
Yes ☑ No ☐	All season public highway
Yes ☐ No ☑	Aerodrome or airport runway
Yes ☐ No ☑	Hazardous waste facility
Yes ☐ No ☑	Waste management facility
Yes ☐ No ☑	Industrial facility

ER.1.2: Are any part of the project or activities proposed within:	
Yes ☐ No ☑	A wildlife area *A wildlife area means: (according to the wildlife areas listed in Schedule 1 of the Wildlife Area Regulations).* *To use this list, find the section corresponding to the province in which the project is located and then determine if the project is located in one of the wildlife areas listed. If necessary, the cadastral lot numbers can be used.*
Yes ☐ No ☑	A migratory bird sanctuary *A migratory bird sanctuary means: (according to the migratory bird sanctuaries listed in the schedule of the Migratory Bird Sanctuary Regulations).* *To use this list, find the section corresponding to the province in which the project is located and then determine if the project is located in one of the bird sanctuaries listed. If necessary, the geographical coordinates expressed in latitude and longitude can be used.*

ER.1.3: Is the project a designated project according to the *Regulations Designating Physical Activities?** ***http://laws-lois.justice.gc.ca/eng/regulations/SOR-2012-147/index.html*** ***If a project appears on the list, it will likely be considered a designated project and has to be referred to the Canadian Environmental Assessment Agency. Should this be the case, it is recommended you contact them as soon as possible to confirm their requirement and process.***	
Yes ☐	Please elaborate:
No ☑	
Unknown ☐	*It is possible that the project's status in the Regulations Designating Physical Activities is unknown at the time of the application.*

ER.1.4: If you have answer yes to previous question ER1.3 (i.e. the project is a designated project), have you provided the Canadian Environmental Assessment Agency with a project description as per Section 8(1) of the Canadian Environmental Assessment Act, 2012?
Yes ☐ No ☐ *To learn more about the information required by the Canadian Environmental Assessment Agency (Agency), please refer to the Prescribed Information for the Description of a Designated Project Regulations*

ER.2: Does the project (either in full or in part) require an environmental assessment under a northern regime or other regime?	
Yes ☐	Please elaborate:
No ☑	

ER.3: Are public concerns expected as a result of this project? ***The project may have potential to cause significant public concern. Here is a non-exhaustive list of examples:*** ***•Water and/or land use disputes and the possible cumulative effects of an unequal distribution of access rights to the land or water in question;*** ***•Health and safety risks from potential accidents (e.g. potential spills in water bodies, etc.);*** ***•Breaches of the cultural values of local communities;*** ***•Etc.*** ***If the public is concerned about the project, information on the nature of the concern and any other relevant information must be provided to INFC.***	
Yes ☐	Please elaborate:
No ☑	

ER.4.1: Are environmental issues expected as a result of this project?	
Yes ☑	Please elaborate: The existing highway shoulder and median materials could contain heavy metals and hydrocarbons from vehicle emissions over the past several decades. However, it is anticipated that there is insufficient amounts to classify the median and shoulder materials as hazardous waste.
No ☐	

ER.4.2: Is any part of the project located in whole or in part on land potentially contaminated by previous activities:	
Yes ☐	Please elaborate:
No ☑	

ER.4.3: Is an environmental site assessment available for this project regarding contaminated site(s):		
Yes ☐	No ☑	Phase I
Yes ☐	No ☑	Phase II
Yes ☐	No ☑	Phase III
If you answered "**yes**" to any of the above, please provide copies of all reports related to the project, if not already provided. If the report(s) is/are at the development stage, please indicate the phase, and when a copy will be provided to INFC.		

ER.4.4: Does the project (either in full or in part) require a provincial environmental assessment?	
Yes ☐	If not already provided, please provide copies of all reports related to the project. If the report(s) is/are at the development stage, please indicate when it/they will be completed and when a copy will be provided to INFC.
No ☑	

Aboriginal Consultation Part

This section contains a number of questions aimed at developing a better overview of the types of activities and/or work that will be carried out to determine the potential impact it could have on the Aboriginal or treaty rights of Aboriginal peoples. To determine whether the Crown conduct could have an adverse impact on established or potential Aboriginal or treaty rights, information must be compiled on those rights, which could include the right to hunt, fish, trap, gather and trade, and may either be established by a court or in a treaty, or may be asserted by an Aboriginal group, for example, in litigation or for the purpose of negotiating a treaty.

This step must be taken into consideration very early on in the process otherwise project delays can be expected if consultation is not completed satisfactorily or in a timely manner.

AC.1: Activities Related to the Project that could potentially impact Aboriginal rights. *Examples of traditional Aboriginal activities can vary, and include gathering wild mushrooms and medicinal herbs on a river bank, fishing in a salmon river, hunting moose in the forest, and may involve ceremonial sites and former burial grounds.* *If one or more of the questions in this part are answered in the affirmative, please provide a description of the activity or activities in the last line of the table.*		
Yes ☑	No ☐	Does the project involve works or activities on, under, over, through or across a water body such as a wetland, stream, river or lake? Check all that apply. **Fresh water:** ☑ Stream ☐ Lake ☐ Wetland ☐ River ☐ Pond ☐ Reservoir ☐ Active Floodplain ☑ Fish Bearing Watercourse **Coastal and Marine:** ☐ Beach ☐ Cove ☐ Mud Flat ☐ Salt Marsh ☐ Bay ☐ Exposed Coastline ☐ Estuary ☐ Fish Bearing Watercourse **Other:** ☐ Please describe:
Yes ☐	No ☑	Can the work proposed have upstream or downstream impacts (e.g. change in water or temperature level upstream that could result in positive or negative impacts downstream, change in the turbidity, etc.)?
Yes ☐	No ☑	Are there activities proposed that may affect aboriginal traditional activities. Check all activities that apply. ☐ Fishing (e.g., preventing access to a fishing area or work in a waterbody such as river, lake, stream, culverts) ☐ Hunting (e.g., preventing access to a hunting area or clearing of forest or other vegetation etc.) ☐ Gathering (e.g., preventing access to a gathering area or clearing of forest or other vegetation etc.) ☐ Other (e.g. work close to or preventing access to sites of cultural/historical/archeological/ceremonial significance near the project etc.)
Yes ☐	No ☑	Is the project (in full or in part) occurring on undisturbed or undeveloped land? *If yes, please provide information about how much land will be affected*

		by the project in the appropriate space. Disturbed and/or developed land may include land that has undergone deforestation, land previously used for agricultural purposes, or land that has been built up (e.g. buildings were previously constructed upon, etc.).
Yes ☐	No ☑	Is any component of the proposed project located outside the existing infrastructure footprint (build up footprint)?
Yes ☑	No ☐	Are there any relevant project activities that might affect other aspects of the environment (e.g. increases sound and/or noise levels, creates barriers to or limits access to harvesting areas, adds runoff to a watercourse, involves excavation)?
If you answered "**yes**" to any of the above, please provide details. The existing highway will be widened by one lane in each direction which may increase runoff into the adjacent ditches and watercourses. In some areas of the median, excavation and the placement of fill will be required to widen the highway. Higher traffic volumes are expected in future years which will increase traffic noise, however, no encroachment to existing development is proposed as the majority of the construction will take place in the existing median.		

AC.2: Has another federal, provincial or territorial government entity indicated that Aboriginal consultation is required for this project?	
Yes ☑	Please specify. It is anticipated that consultation with adjacent Aboriginal groups will be required in the next phases of the project. No engagement with any Aboriginal groups has taken place during the project planning phase.
No ☐	
Unknown ☐	

AC.3.1: Has the province (or territory) been in contact with any Aboriginal groups regarding this project?	
Yes ☐	Please provide a summary of the consultation activities completed to date. If available, please provide details such as if any concerns were raised by Aboriginal groups, the nature of the concerns raised, and include in an attachment any information that may be useful (e.g. consultation plan, consultation summary, contact information, letters, emails, public notices, and any other types of communications).
No ☑	

AC.3.2: Have you been in contact or plan to contact any Aboriginal groups regarding this project?	
Yes ☑	Please provide a summary of the consultation activities completed to date. If available, please provide details such as if any concerns were raised by Aboriginal groups, the nature of the concerns raised, and include in an attachment any information that may be useful (e.g. consultation plan, consultation summary, contact information, letters, emails, public notices, and any other types of communications). It is anticipated that consultation with adjacent Aboriginal groups will be undertaken in the next phases of the project. No engagement with any Aboriginal groups has taken place during the project planning phase.
No ☐	

AC.4: Involvement of the Crown -
Other Federal or Provincial Departments or Agencies may be involved in the project (e.g., if a permit, authorization, land transfer agreement, lease, etc. is required), such as, but not limited to:

The purpose of this section is to identify if other federal or provincial departments or agencies may be undertaking Aboriginal consultation activities as a result of their involvement in the project (e.g., issuing a permit and/or authorization).

If other authorities are involved, it is important to identify them, and to describe their role, particularly if they have to issue or have issued a permit and/or authorization. This is necessary for a number of reasons: to avoid procedural duplication, to enable the coordinated actions of the various authorities involved and to avoid submitting unnecessary repetitive requests to the Aboriginal groups concerned.

The information provided about the authorities and their actual or potential involvement in the project will help INFC to confirm their collaboration as early on in the process as possible.

Yes ☐	No ☐	Unknown ☑	Fisheries and Oceans Canada (e.g. *Fisheries Act*)
Yes ☐	No ☑	Unknown ☐	Transport Canada (e.g. *Navigation Protection Act*)
Yes ☐	No ☑	Unknown ☐	Natural Resources Canada (e.g. *Explosives Act*)
Yes ☐	No ☐	Unknown ☑	Environment Canada (e.g. *Species at Risk Act, Migratory Birds Convention Act, Canadian Environmental Protection Act*)
Yes ☐	No ☑	Unknown ☐	Parks Canada Agency
Yes ☐	No ☐	Unknown ☑	Other departments (e.g. federal department, provincial department, funding department, …) If applicable, please identify the federal department or agency and approval required.

If you answered "**yes**" to any of the above, please describe the involvement of the identified department(s)/agency(s) in detail. No other Federal or Provincial Agencies have been involved at this time (during the planning phase).

Please provide contact information for each department identified so INFC can coordinate with them to avoid delays and duplication.

AC.5: Provincial (or territorial) permits
Please list all provincial (or territorial) permits that will be required for the project. Unknown at this time. *Please provide contact information for each department already contacted so INFC can coordinate with them to avoid delays and duplication.*

Declaration of Information

Please check boxes to acknowledge you understand and/or agree to the following statements:

☐ INFC may have a duty to consult and, where appropriate, accommodate aboriginal groups, when the Crown contemplates conduct (such as providing funding) that might adversely impact potential or established Aboriginal or Treaty rights. INFC will rely to the extent possible on other processes that included Aboriginal consultation (e.g., a provincial environmental assessment process). However, it is understood that INFC may delegate certain procedural responsibilities to the proponent and the proponent will assist or carry out various aspects of consultation (e.g., the gathering of information). Note that a Proponent Guide and Toolkit for Aboriginal Consultation Process will be provided at the appropriate time.

☐ It is understood that INFC may not enter into a contribution agreement until such time as INFC has determined that its Aboriginal consultation obligations have been met.

☐ I hereby certify that the information provided is accurate to the best of my knowledge and I understand that inaccurate information may result in the requirement for additional environmental and/or aboriginal consultation review.

Questionnaire completed by:

_____

Signature:

_____

Date:

_____

Appendix B

MoTI Responses to Infrastructure Canada Annex D – Environmental and Aboriginal Consultation: **Truck Parking Facility.**

General information
Project Name: North Surrey Truck Parking Project Project Proponent: British Columbia (BC) Ministry of Transportation and Infrastructure
Contact person for any question Infrastructure Canada could have regarding the environmental assessment and aboriginal consultation: Name: Derek Drummond Address: 300-175 2nd Avenue Kamloops BC V2C 5W1 Phone: 250-571-8708 Email: Derek.Drummond@stantec.com

Note (scope change): If you are completing this questionnaire due to a proposed project amendment for a project already submitted to Infrastructure Canada (INFC), please only include the amended project information.

Project and existing environment description
Project Description: The BC Ministry of Transportation & Infrastructure is proposing a commercial truck parking facility in North Surrey, BC, to improved truck parking in the Lower Mainland as part of the Ministry's 10-year strategic plan titled 'BC on the Move'. The identified project site is owned by the Province and would involve the development of approximately 158 commercial truck parking stalls and approximately 40 passenger vehicle parking stalls. The project will include new pavement structure including drainage systems with oil-water separators, water and sanitary hookups for trucks, lighting, fencing, plumbed restroom facilities, a security attendant kiosk, and waste receptacles. Direct access to the project site is proposed from Highway 17 by way of a protected-T intersection with a half traffic signal to accommodate safe left turn movements in and out of the Truck Parking Site.
The proposed Project is located on a site that was previously used as a placement area for excavated surplus soils resulting from construction of the South Fraser Perimeter Road (SFPR). The Site was planted after the placement of surplus excavated soil from SFPR and is currently in an early successional state and structural stage. In its current state, much of the replanted area provides limited ecological value with modest terrestrial habitat for birds and small mammals. Surrounding the previously disturbed areas of the site, Bon Accord Creek and Landfill Creek and their tributaries adjacent to the west of the Site provide aquatic habitat for fish and amphibians.

Project Location Part

PL.1.1: Would any part of the project or activities be located on:		
Yes ☐ No ☑	Federal land. If yes, provide details regarding the federal land administrator:	
Yes ☑ No ☐	Provincial land. If yes, provide details: BC Transportation Financing Authority (BCTFA) owned	
Yes ☐ No ☑	Indian Reserve land. If yes, provide details:	
If you answered "**yes**" to any of the above.	Is the entire project footprint located on that land? If not, please indicate the portions that will take place on that land (provide a map).	Yes ☑ No ☐

PL.1.2: Would any part of the project or activities be located in:	
Yes ☐ No ☑	Internal waters of Canada, in any area of the sea not within a province *Internal waters refers to: the internal waters of Canada as determined under the Oceans Act, including the seabed and subsoil below and the airspace above those waters.*
Yes ☐ No ☑	The territorial sea of Canada, in any area of the sea not within a province *Territorial sea refers to:* *The territorial sea of Canada as determined under the Oceans Act, including the seabed and its subsoil below and the airspace above that sea.*
Yes ☐ No ☑	The exclusive economic zone of Canada *Exclusive economic zone refers to:* *The exclusive economic zone of Canada as determined under the Oceans Act, including the seabed and its subsoil.*
Yes ☐ No ☑	The continental shelf of Canada *Continental shelf refers to: the continental shelf of Canada as determined under the Oceans Act.*
If you answered "**yes**" to any of the above:	Please provide the information regarding the land administrator.

PL.2 In order to facilitate and accelerate INFC's assessment of your application for funding, please provide an accurate project location in order for INFC to geographically locate your project.		
Option 1: Project with a fixed address		
Address of the project Civic Number: 11688 Unit/Suite/Apt: Street Name: Highway 1 Municipality: Surrey County: Province: BC Postal Code:	Location 1 **Highway 17** **Surrey** **BC**	Location 2
Project Longitude: 49.213221 degrees Project Latitude:122.801480 degrees		
Option 1: Project with no fixed address or multiple components		
Please indicate, <u>for each project component</u>, any points of interest, intersections, major highways or streets, or other physical characteristics located in the vicinity of the project (e.g. near airport, adjacent to Lions Gate Bridge, 3 km east from Centennial Park, at intersection of Fifth and Queen, etc.)		
Component A: The Site is located east of the Port Mann Bridge, between Highway 17 and the Canadian National Railway (CN) tracks along the Fraser River (PID 026-242-991).		
Component B:		
Component C:		

PL.3 Project Location Documents	
A project location map, as a minimum, has been included with this questionnaire. *If available, include also any other additional project map (e.g. site plan, etc.) that may be useful in locating the project.*	Yes ☑

Environmental Requirement Part

ER.1.1: Does any part of your project involve the construction, operation, decommissioning or abandonment of the following infrastructure?	
Yes ☐ No ☑	Electrical transmission lines
Yes ☐ No ☑	Electrical generating facility
Yes ☐ No ☑	Structure for the diversion of water including dam, dyke or reservoir
Yes ☐ No ☑	Canal, lock or structure to control water level
Yes ☐ No ☑	Oil and gas pipeline
Yes ☐ No ☑	Marine terminal
Yes ☐ No ☑	Railway line and / or Railway yard
Yes ☐ No ☑	All season public highway
Yes ☐ No ☑	Aerodrome or airport runway
Yes ☐ No ☑	Hazardous waste facility
Yes ☐ No ☑	Waste management facility
Yes ☐ No ☑	Industrial facility

ER.1.2: Are any part of the project or activities proposed within:	
Yes ☐ No ☑	A wildlife area *A wildlife area means: (according to the wildlife areas listed in Schedule 1 of the Wildlife Area Regulations).* *To use this list, find the section corresponding to the province in which the project is located and then determine if the project is located in one of the wildlife areas listed. If necessary, the cadastral lot numbers can be used.*
Yes ☐ No ☑	A migratory bird sanctuary *A migratory bird sanctuary means: (according to the migratory bird sanctuaries listed in the schedule of the Migratory Bird Sanctuary Regulations).* *To use this list, find the section corresponding to the province in which the project is located and then determine if the project is located in one of the bird sanctuaries listed. If necessary, the geographical coordinates expressed in latitude and longitude can be used.*

ER.1.3: Is the project a designated project according to the *Regulations Designating Physical Activities?** ***http://laws-lois.justice.gc.ca/eng/regulations/SOR-2012-147/index.html*** ***If a project appears on the list, it will likely be considered a designated project and has to be referred to the Canadian Environmental Assessment Agency. Should this be the case, it is recommended you contact them as soon as possible to confirm their requirement and process.***	
Yes ☐	Please elaborate:
No ☑	
Unknown ☐	*It is possible that the project's status in the Regulations Designating Physical Activities is unknown at the time of the application.*

ER.1.4: If you have answer yes to previous question ER1.3 (i.e. the project is a designated project), have you provided the Canadian Environmental Assessment Agency with a project description as per Section 8(1) of the Canadian Environmental Assessment Act, 2012?
Yes ☐ No ☑ **n/a** *To learn more about the information required by the Canadian Environmental Assessment Agency (Agency), please refer to the Prescribed Information for the Description of a Designated Project Regulations*

ER.2: Does the project (either in full or in part) require an environmental assessment under a northern regime or other regime?	
Yes ☐	Please elaborate:
No ☑	

ER.3: Are public concerns expected as a result of this project? ***The project may have potential to cause significant public concern. Here is a non-exhaustive list of examples:*** ***•Water and/or land use disputes and the possible cumulative effects of an unequal distribution of access rights to the land or water in question;*** ***•Health and safety risks from potential accidents (e.g. potential spills in water bodies, etc.);*** ***•Breaches of the cultural values of local communities;*** ***•Etc.*** ***If the public is concerned about the project, information on the nature of the concern and any other relevant information must be provided to INFC.***	
Yes ☐	Please elaborate:
No ☑	

ER.4.1: Are environmental issues expected as a result of this project?	
Yes ☑	Please elaborate: The project site was disturbed by placement of surplus excavated soils from the South Fraser Perimeter Road (SFPR) Project along Highway 17. The soil placement activities were authorised under the SFPR Environmental Assessment Certificate (EAC) and restoration of the site was included in the EAC Commitments. Despite being replanted, the site is considered to provide limited ecological value. However, if the site is left undisturbed it would have future potential to provide valuable wildlife habitat. To ensure the intentions of the EAC Commitments are respected, the project team has created a habitat offsetting plan that will compensate for the potential wildlife habitat (i.e.areas replanted post soil placement) at a 1:1 ratio at a nearby location.
No ☐	

ER.4.2: Is any part of the project located in whole or in part on land potentially contaminated by previous activities:	
Yes ☐	Please elaborate: A Phase II Environmental Site Assessment was completed on the Project site. It was determined that the surplus soils placed on the site are of residential quality under the Contaminated Sites Regulation standards.
No ☑	

ER.4.3: Is an environmental site assessment available for this project regarding contaminated site(s):		
Yes ☐	No ☑	Phase I
Yes ☑	No ☐	Phase II – Copy could be made available to INFC at any time
Yes ☐	No ☑	Phase III
If you answered "**yes**" to any of the above, please provide copies of all reports related to the project, if not already provided. If the report(s) is/are at the development stage, please indicate the phase, and when a copy will be provided to INFC.		

ER.4.4: Does the project (either in full or in part) require a provincial environmental assessment?	
Yes ☐	If not already provided, please provide copies of all reports related to the project. If the report(s) is/are at the development stage, please indicate when it/they will be completed and when a copy will be provided to INFC.
No ☑	

Aboriginal Consultation Part

This section contains a number of questions aimed at developing a better overview of the types of activities and/or work that will be carried out to determine the potential impact it could have on the Aboriginal or treaty rights of Aboriginal peoples. To determine whether the Crown conduct could have an adverse impact on established or potential Aboriginal or treaty rights, information must be compiled on those rights, which could include the right to hunt, fish, trap, gather and trade, and may either be established by a court or in a treaty, or may be asserted by an Aboriginal group, for example, in litigation or for the purpose of negotiating a treaty.

This step must be taken into consideration very early on in the process otherwise project delays can be expected if consultation is not completed satisfactorily or in a timely manner.

AC.1: Activities Related to the Project that could potentially impact Aboriginal rights. *Examples of traditional Aboriginal activities can vary, and include gathering wild mushrooms and medicinal herbs on a river bank, fishing in a salmon river, hunting moose in the forest, and may involve ceremonial sites and former burial grounds.* *If one or more of the questions in this part are answered in the affirmative, please provide a description of the activity or activities in the last line of the table.*		
Yes ☑	No ☐	Does the project involve works or activities on, under, over, through or across a water body such as a wetland, stream, river or lake? Check all that apply. **Fresh water:** ☑ Stream ☐ Lake ☑ Wetland ☐ River ☐ Pond ☐ Reservoir ☐ Active Floodplain ☑ Fish Bearing Watercourse **Coastal and Marine:** ☐ Beach ☐ Cove ☐ Mud Flat ☐ Salt Marsh ☐ Bay ☐ Exposed Coastline ☐ Estuary ☐ Fish Bearing Watercourse **Other:** ☐ Please describe:
Yes ☑	No ☐	Can the work proposed have upstream or downstream impacts (e.g. change in water or temperature level upstream that could result in positive or negative impacts downstream, change in the turbidity, etc.)?
Yes ☐	No ☑	Are there activities proposed that may affect aboriginal traditional activities. Check all activities that apply. ☐ Fishing (e.g., preventing access to a fishing area or work in a waterbody such as river, lake, stream, culverts) ☐ Hunting (e.g., preventing access to a hunting area or clearing of forest or other vegetation etc.) ☐ Gathering (e.g., preventing access to a gathering area or clearing of forest or other vegetation etc.) ☐ Other (e.g. work close to or preventing access to sites of cultural/historical/archeological/ceremonial significance near the project etc.)
Yes ☐	No ☑	Is the project (in full or in part) occurring on undisturbed or undeveloped land?

		If yes, please provide information about how much land will be affected by the project in the appropriate space. Disturbed and/or developed land may include land that has undergone deforestation, land previously used for agricultural purposes, or land that has been built up (e.g. buildings were previously constructed upon, etc.).
Yes ☐	No ☑	Is any component of the proposed project located outside the existing infrastructure footprint (build up footprint)?
Yes ☑	No ☐	Are there any relevant project activities that might affect other aspects of the environment (e.g. increases sound and/or noise levels, creates barriers to or limits access to harvesting areas, adds runoff to a watercourse, involves excavation)?

If you answered "**yes**" to any of the above, please provide details.

The following watercourses have been identified within the project site:

- One Class AO (red-dashed)ephemeral ditch (Landfill Creek tributary) potentially inhabited during the over-wintering period with access enhancement
- One wetland adjacent to the ephemeral ditch.
- One Class B (yellow) (154A Street Watercourse) non-fish-bearing cattail marsh (Wm05) blue listed wetland / with significant food/nutrient value

With the exception of a fish passage culvert on the Class AO ephemeral ditch, the project design will avoid impacts to the Class AO watercourse and the adjacent. A culvert will also be installed on the Class B non-fish-bearing cattail marsh, the culvert will allow for water flow however the functionality of the wetland will be greatly reduced. The appropriate *Water Sustainability Act* Approvals will be obtained prior to construction works on the watercourses mentioned above.

AC.2: Has another federal, provincial or territorial government entity indicated that Aboriginal consultation is required for this project?	
Yes ☑	Please specify. As per BC MOTI best practices, Aboriginal Group notification letters with an invitation for comment will be submitted for the project.
No ☐	
Unknown ☐	

AC.3.1: Has the province (or territory) been in contact with any Aboriginal groups regarding this project?	
Yes ☐	Please provide a summary of the consultation activities completed to date. If available, please provide details such as if any concerns were raised by Aboriginal groups, the nature of the concerns raised, and include in an attachment any information that may be useful (e.g. consultation plan, consultation summary, contact information, letters, emails, public notices, and any other types of communications).
No ☑	

AC.3.2: Have you been in contact or plan to contact any Aboriginal groups regarding this

project?	
Yes ☑	Please provide a summary of the consultation activities completed to date. If available, please provide details such as if any concerns were raised by Aboriginal groups, the nature of the concerns raised, and include in an attachment any information that may be useful (e.g. consultation plan, consultation summary, contact information, letters, emails, public notices, and any other types of communications).
No ☐	

AC.4: Involvement of the Crown -
Other Federal or Provincial Departments or Agencies may be involved in the project (e.g., if a permit, authorization, land transfer agreement, lease, etc. is required), such as, but not limited to:

The purpose of this section is to identify if other federal or provincial departments or agencies may be undertaking Aboriginal consultation activities as a result of their involvement in the project (e.g., issuing a permit and/or authorization).

If other authorities are involved, it is important to identify them, and to describe their role, particularly if they have to issue or have issued a permit and/or authorization. This is necessary for a number of reasons: to avoid procedural duplication, to enable the coordinated actions of the various authorities involved and to avoid submitting unnecessary repetitive requests to the Aboriginal groups concerned.

The information provided about the authorities and their actual or potential involvement in the project will help INFC to confirm their collaboration as early on in the process as possible.

Yes ☑	No ☐	Unknown ☐	Fisheries and Oceans Canada (e.g. *Fisheries Act*)
Yes ☐	No ☐	Unknown ☑	Transport Canada (e.g. *Navigation Protection Act*)
Yes ☐	No ☑	Unknown ☐	Natural Resources Canada (e.g. *Explosives Act*)
Yes ☑	No ☐	Unknown ☐	Environment Canada (e.g. *Species at Risk Act, Migratory Birds Convention Act, Canadian Environmental Protection Act*)
Yes ☐	No ☑	Unknown ☐	Parks Canada Agency
Yes ☑	No ☐	Unknown ☐	Other departments (e.g. federal department, provincial department, funding department, …) If applicable, please identify the federal department or agency and approval required.

If you answered "**yes**" to any of the above, please describe the involvement of the identified department(s)/agency(s) in detail.

The agencies listed above will be contacted regarding environmental permits and approvals required to complete construction of the project. Upon completion of the habitat offsetting plan the BC Environmental Assessment Office and Ministry of Forest Lands and Natural Resources will be consulted. *Please provide contact information for each department identified so INFC can coordinate with them to avoid delays and duplication.*

AC.5: Provincial (or territorial) permits

Please list all provincial (or territorial) permits that will be required for the project.

Environmental permits and approvals to complete this work will include those associated with the BC *Water Sustainability Act*, federal *Fisheries Act*, and Riparian Areas Regulations. In addition to permits, construction works will have to be in accordance with the *Wildlife Act*, *Species at Risk Act, Fisheries Act, Fisheries Protection Act*, Riparian Areas Regulations, and *Water Sustainability Act*.

Declaration of Information

Please check boxes to acknowledge you understand and/or agree to the following statements:

☐ INFC may have a duty to consult and, where appropriate, accommodate aboriginal groups, when the Crown contemplates conduct (such as providing funding) that might adversely impact potential or established Aboriginal or Treaty rights. INFC will rely to the extent possible on other processes that included Aboriginal consultation (e.g., a provincial environmental assessment process). However, it is understood that INFC may delegate certain procedural responsibilities to the proponent and the proponent will assist or carry out various aspects of consultation (e.g., the gathering of information). Note that a Proponent Guide and Toolkit for Aboriginal Consultation Process will be provided at the appropriate time.

☐ It is understood that INFC may not enter into a contribution agreement until such time as INFC has determined that its Aboriginal consultation obligations have been met.

☐ I hereby certify that the information provided is accurate to the best of my knowledge and I understand that inaccurate information may result in the requirement for additional environmental and/or aboriginal consultation review.

Questionnaire completed by: _____

Signature: _____

Date: _____

Additional Links
Complete versions of the various acts outlined in this document please copy and paste these links into your browser. • ***Oceans Act***-http://laws-lois.justice.gc.ca/PDF/O-2.4.pdf • ***Wild Life Regulation***-http://laws-lois.justice.gc.ca/PDF/O-2.4.pdf • ***Migratory Bird Sanctuary***-http://laws-lois.justice.gc.ca/PDF/C.R.C.,_c._1036.pdf • ***Regulations Designating Physical Activities***-http://laws-lois.justice.gc.ca/PDF/C.R.C.,_c._1036.pdf • ***Prescribed Information for the Description of a Designated Project Regulations***-http://laws-lois.justice.gc.ca/PDF/SOR-2012-148.pdf

Appendix C

Highway 17 / Truck Access
Synchro / SimTraffic Model Reports

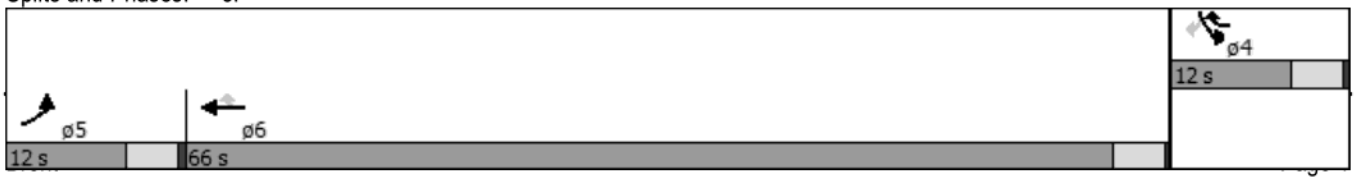
2017 AM Peak

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	81	799	1812	56	88	132
Satd. Flow (prot)	1014	2944	2944	907	1014	907
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1014	2944	2944	907	1014	907
Satd. Flow (RTOR)				62		123
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	80%	24%	24%	80%	80%	80%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	90	888	2013	62	98	147
Turn Type	Prot	NA	NA	pm+ov	NA	Perm
Protected Phases	5	Free!	6	4	4!	
Permitted Phases				6		4
Total Split (s)	12.0		66.0	12.0	12.0	12.0
Total Lost Time (s)	3.0		3.0	3.0	3.0	3.0
Act Effct Green (s)	9.0	92.1	65.0	77.1	9.0	9.0
Actuated g/C Ratio	0.10	1.00	0.71	0.84	0.10	0.10
v/c Ratio	0.91	0.30	0.97	0.08	0.99	0.74
Control Delay	112.6	0.3	27.6	0.6	132.9	33.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	112.6	0.3	27.6	0.6	132.9	33.9
LOS	F	A	C	A	F	C
Approach Delay		10.6	26.8		73.5	
Approach LOS		B	C		E	
Queue Length 50th (m)	15.6	0.0	148.8	0.0	17.2	3.9
Queue Length 95th (m)	#43.3	0.0	#229.7	1.4	#47.4	#32.1
Internal Link Dist (m)		280.8	97.9		280.8	
Turn Bay Length (m)	152.4					76.2
Base Capacity (vph)	99	2944	2078	769	99	199
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.91	0.30	0.97	0.08	0.99	0.74

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 92.1	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.99	
Intersection Signal Delay: 25.4	Intersection LOS: C
Intersection Capacity Utilization 69.5%	ICU Level of Service C
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
! Phase conflict between lane groups.

Splits and Phases: 3:



3: Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	2.8	0.2	0.0	0.0	0.2	0.2	0.2
Total Delay (hr)	0.7	0.1	2.6	0.0	2.1	0.1	5.7
Total Del/Veh (s)	58.0	1.2	10.5	1.4	145.3	7.2	13.7
Travel Dist (km)	12.6	120.2	106.6	2.9	13.9	17.6	273.8
Travel Time (hr)	0.9	1.4	3.7	0.1	2.5	0.7	9.4
Avg Speed (kph)	14	89	29	37	5	24	29
Fuel Used (l)	1.2	10.9	8.3	0.0	2.5	1.5	24.4
Fuel Eff. (kpl)	10.9	11.1	12.9	70.6	5.5	11.3	11.2
HC Emissions (g)	66	266	151	2	113	84	681
CO Emissions (g)	1143	6552	2656	34	1541	1229	13155
NOx Emissions (g)	122	648	376	3	182	187	1518
Density (m/veh)							99
Occupancy (veh)	2	3	7	0	5	1	19

Total Network Performance

Denied Delay (hr)	0.1
Denied Del/Veh (s)	0.3
Total Delay (hr)	9.7
Total Del/Veh (s)	23.1
Travel Dist (km)	894.3
Travel Time (hr)	20.3
Avg Speed (kph)	44
Fuel Used (l)	90.1
Fuel Eff. (kpl)	9.9
HC Emissions (g)	2455
CO Emissions (g)	51744
NOx Emissions (g)	6031
Density (m/veh)	68
Occupancy (veh)	40

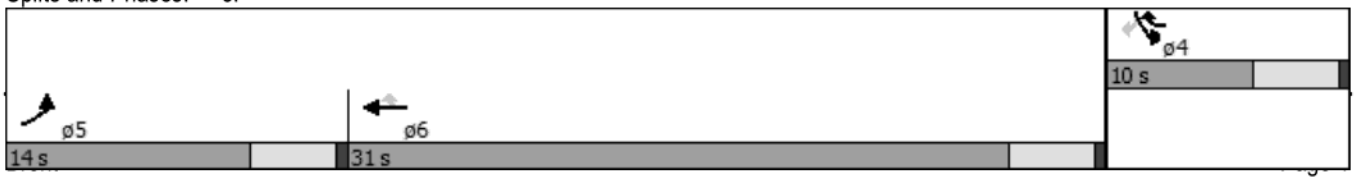
2017 PM Peak

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	115	1519	1076	88	56	84
Satd. Flow (prot)	1014	2944	2944	907	1014	907
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1014	2944	2944	907	1014	907
Satd. Flow (RTOR)				98		93
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	80%	24%	24%	80%	80%	80%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	128	1688	1196	98	62	93
Turn Type	Prot	NA	NA	pm+ov	NA	Perm
Protected Phases	5	Free!	6	4	4!	
Permitted Phases				6		4
Total Split (s)	14.0		31.0	10.0	10.0	10.0
Total Lost Time (s)	3.0		3.0	3.0	3.0	3.0
Act Effct Green (s)	10.2	53.2	32.3	40.0	7.0	7.0
Actuated g/C Ratio	0.19	1.00	0.61	0.75	0.13	0.13
v/c Ratio	0.66	0.57	0.67	0.14	0.47	0.47
Control Delay	39.7	0.8	12.8	1.3	36.2	14.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.7	0.8	12.8	1.3	36.2	14.7
LOS	D	A	B	A	D	B
Approach Delay		3.6	11.9		23.3	
Approach LOS		A	B		C	
Queue Length 50th (m)	11.8	0.0	47.0	0.0	5.9	0.0
Queue Length 95th (m)	#32.2	0.0	70.4	2.9	#18.4	#11.0
Internal Link Dist (m)		280.8	97.9		280.8	
Turn Bay Length (m)	152.4					76.2
Base Capacity (vph)	210	2944	1787	706	134	200
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.57	0.67	0.14	0.46	0.47

Intersection Summary	
Cycle Length: 55	
Actuated Cycle Length: 53.2	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.67	
Intersection Signal Delay: 7.8	Intersection LOS: A
Intersection Capacity Utilization 52.0%	ICU Level of Service A
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
! Phase conflict between lane groups.

Splits and Phases: 3:



3: Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	2.3	0.4	0.0	0.0	0.1	0.1	0.3
Total Delay (hr)	0.4	0.3	1.2	0.0	0.2	0.0	2.2
Total Del/Veh (s)	22.7	1.5	8.2	1.8	27.3	1.3	5.3
Travel Dist (km)	17.0	228.5	63.6	5.3	9.1	12.2	335.6
Travel Time (hr)	0.7	2.7	1.9	0.1	0.5	0.4	6.4
Avg Speed (kph)	27	87	34	35	17	29	54
Fuel Used (l)	1.2	19.7	4.7	0.1	0.9	1.0	27.6
Fuel Eff. (kpl)	14.6	11.6	13.6	56.8	10.1	11.8	12.2
HC Emissions (g)	78	500	92	5	44	56	775
CO Emissions (g)	1447	11684	1830	76	631	827	16495
NOx Emissions (g)	162	1246	229	8	94	130	1868
Density (m/veh)							147
Occupancy (veh)	1	5	4	0	1	1	13

Total Network Performance

Denied Delay (hr)	0.2
Denied Del/Veh (s)	0.4
Total Delay (hr)	4.2
Total Del/Veh (s)	10.1
Travel Dist (km)	898.3
Travel Time (hr)	14.8
Avg Speed (kph)	61
Fuel Used (l)	85.4
Fuel Eff. (kpl)	10.5
HC Emissions (g)	2421
CO Emissions (g)	53274
NOx Emissions (g)	5992
Density (m/veh)	93
Occupancy (veh)	29

2027 AM Peak

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	81	1023	2320	56	88	132
Satd. Flow (prot)	1014	2944	2944	907	1014	907
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1014	2944	2944	907	1014	907
Satd. Flow (RTOR)				62		83
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	80%	24%	24%	80%	80%	80%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	90	1137	2578	62	98	147
Turn Type	Prot	NA	NA	pm+ov	NA	Perm
Protected Phases	5	Free!	6	4	4!	
Permitted Phases				6		4
Total Split (s)	14.0		121.0	15.0	15.0	15.0
Total Lost Time (s)	3.0		3.0	3.0	3.0	3.0
Act Effct Green (s)	11.0	150.0	118.0	133.0	12.0	12.0
Actuated g/C Ratio	0.07	1.00	0.79	0.89	0.08	0.08
v/c Ratio	1.22	0.39	1.11	0.08	1.21	0.99
Control Delay	228.4	0.4	76.2	0.4	221.6	101.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	228.4	0.4	76.2	0.4	221.6	101.9
LOS	F	A	E	A	F	F
Approach Delay		17.1	74.4		149.8	
Approach LOS		B	E		F	
Queue Length 50th (m)	~32.6	0.0	~460.8	0.0	~35.4	20.0
Queue Length 95th (m)	#69.0	0.0	#496.5	1.3	#73.7	#66.8
Internal Link Dist (m)		280.8	97.9		280.8	
Turn Bay Length (m)	152.4					76.2
Base Capacity (vph)	74	2944	2315	811	81	148
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.22	0.39	1.11	0.08	1.21	0.99

Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 150
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 1.22
Intersection Signal Delay: 61.8 Intersection LOS: E
Intersection Capacity Utilization 79.0% ICU Level of Service D
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

! Phase conflict between lane groups.

Splits and Phases: 3:

3: Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	2.8	0.3	0.0	0.0	0.2	0.2	0.1
Total Delay (hr)	2.1	0.3	4.9	0.0	2.7	0.5	10.5
Total Del/Veh (s)	169.4	2.0	15.3	1.7	193.0	27.3	20.3
Travel Dist (km)	11.7	155.2	136.6	3.1	13.1	18.5	338.2
Travel Time (hr)	2.3	1.9	6.3	0.1	3.2	1.2	14.9
Avg Speed (kph)	5	84	22	36	4	16	23
Fuel Used (l)	1.9	14.0	14.1	0.1	2.9	1.9	34.9
Fuel Eff. (kpl)	6.1	11.1	9.7	55.4	4.5	10.0	9.7
HC Emissions (g)	89	325	243	3	123	92	875
CO Emissions (g)	1323	8010	3997	44	1662	1329	16365
NOx Emissions (g)	131	803	611	5	187	192	1928
Density (m/veh)							62

Total Network Performance

Denied Delay (hr)	1.0
Denied Del/Veh (s)	2.0
Total Delay (hr)	19.0
Total Del/Veh (s)	35.9
Travel Dist (km)	1117.9
Travel Time (hr)	32.8
Avg Speed (kph)	35
Fuel Used (l)	120.6
Fuel Eff. (kpl)	9.3
HC Emissions (g)	3034
CO Emissions (g)	61591
NOx Emissions (g)	7444
Density (m/veh)	43

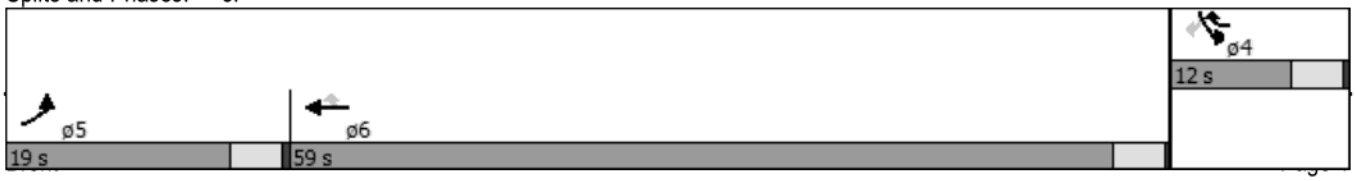
2027 PM Peak

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	115	1944	1377	88	56	84
Satd. Flow (prot)	1014	2944	2944	907	1014	907
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1014	2944	2944	907	1014	907
Satd. Flow (RTOR)				98		93
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	80%	24%	24%	80%	80%	80%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	128	2160	1530	98	62	93
Turn Type	Prot	NA	NA	pm+ov	NA	Perm
Protected Phases	5	Free!	6	4	4!	
Permitted Phases				6		4
Total Split (s)	19.0		59.0	12.0	12.0	12.0
Total Lost Time (s)	3.0		3.0	3.0	3.0	3.0
Act Effct Green (s)	14.8	91.3	58.8	70.5	8.6	8.6
Actuated g/C Ratio	0.16	1.00	0.64	0.77	0.09	0.09
v/c Ratio	0.78	0.73	0.81	0.14	0.65	0.55
Control Delay	67.4	1.7	17.0	1.1	70.7	21.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	67.4	1.7	17.0	1.1	70.7	21.5
LOS	E	A	B	A	E	C
Approach Delay		5.3	16.0		41.1	
Approach LOS		A	B		D	
Queue Length 50th (m)	21.0	0.0	99.2	0.0	10.5	0.0
Queue Length 95th (m)	#47.6	0.0	133.1	3.1	#28.8	14.4
Internal Link Dist (m)		280.8	97.9		280.8	
Turn Bay Length (m)	152.4					76.2
Base Capacity (vph)	178	2944	1897	726	100	173
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.72	0.73	0.81	0.13	0.62	0.54

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 91.3	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.81	
Intersection Signal Delay: 11.0	Intersection LOS: B
Intersection Capacity Utilization 63.7%	ICU Level of Service B
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
! Phase conflict between lane groups.

Splits and Phases: 3:



3: Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.2	0.0	0.0	0.0	0.0	0.2
Denied Del/Veh (s)	2.1	0.7	0.0	0.0	0.1	0.2	0.4
Total Delay (hr)	0.7	0.6	1.7	0.0	0.5	0.0	3.6
Total Del/Veh (s)	42.6	2.2	9.0	2.0	55.7	2.9	7.0
Travel Dist (km)	17.7	287.9	81.5	5.2	8.8	10.8	411.8
Travel Time (hr)	1.0	3.7	2.5	0.1	0.8	0.4	8.6
Avg Speed (kph)	18	82	32	35	11	27	49
Fuel Used (l)	1.5	23.9	6.2	0.1	1.1	0.9	33.6
Fuel Eff. (kpl)	12.1	12.1	13.1	58.3	8.3	11.6	12.2
HC Emissions (g)	75	615	118	6	54	50	917
CO Emissions (g)	1306	13837	2306	80	761	725	19015
NOx Emissions (g)	150	1552	290	8	105	112	2217
Density (m/veh)							110
Occupancy (veh)	2	7	5	0	2	1	17

Total Network Performance

Denied Delay (hr)	0.3
Denied Del/Veh (s)	0.5
Total Delay (hr)	6.5
Total Del/Veh (s)	12.7
Travel Dist (km)	1107.6
Travel Time (hr)	19.3
Avg Speed (kph)	58
Fuel Used (l)	104.2
Fuel Eff. (kpl)	10.6
HC Emissions (g)	2822
CO Emissions (g)	61491
NOx Emissions (g)	7037
Density (m/veh)	72
Occupancy (veh)	38