GEORGE MASSEY CROSSING – TRANSIT AND CYCLING IMPROVEMENTS

- Bus-on-Shoulder Transit Lanes
- Hwy 99 & 17A Off-Ramp Widening & Bridgeport Road Bus Connection

Richmond/Delta, BC

Project Cost Assessment

April 12, 2021

Rev. B

PURPOSE OF THIS REPORT

As part of Charter Project Delivery Inc.'s role as Cost Consultant for the George Massey Crossing Project, analyses were conducted to identify a cost budget for the Transit and Cycling Improvements (the Project) of the George Massey Crossing project. The results of this work are provided in this report. The contents of this document reflect the opinions and experience of Charter Project Delivery Inc. based on the project information known at the time. Future events may impact these opinions and conclusions.

Control Sheet

Document	PROJECT COST ASSESSMENT – Report	Rev B

Revision Record					
Rev	**Description**	**Originator**	**Checker**	**Approver**	**Date**
A	Report	Devin Jones	Ed Green	Ed Green	April 7, 2021
B	Final Report	Devin Jones	Ed Green	Ed Green	April 12, 2021

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1 EXECUTIVE SUMMARY

Charter Project Delivery Inc. (CHARTER) completed an overall Project Cost Assessment for the George Massey Crossing Phase 1 Project (the Project) based on information provided to CHARTER prior April 12, 2021. The work comprised of two independent bottom-up construction cost estimates and Owner's project cost estimates to arrive at a recommended overall project budget for the Phase 1 works.

The Highway No. 99 corridor between Delta, Richmond, and Vancouver is a major commuter route and is one of the most congested traffic routes in the Lower Mainland, with large queues during peak times. It also connects the Canada and US border to Metro Vancouver, as well as the Tsawwassen ferry terminal, and industrial lands. The objectives of the Project are to improve connectivity of Highway No. 99, and to alleviate traffic in problem areas, with a focus on public transit, by providing increased general-purpose capacity and bus/HOV priority lanes. The Project is also the first phase of construction for the overall George Massey Crossing Project and will assist in mitigating traffic issues during future construction phases.

The Project consists of a variety of civil construction works along the Highway No. 99 alignment between Bridgeport Road in Richmond and Ladner Trunk Road in Delta. The work generally consists of major road/highway construction in three different areas on Highway No. 99, and thus has been split into two standalone projects. The projects are as follows:

- Highway No. 99 Bus-on-Shoulder Transit Lanes
- Highway No. 99 & 17A Interchange Improvements (Off-Ramp Widening) and Bridgeport Road Bus Connection (at Highway No. 99)

The two projects consist of a variety of interchange improvements and will each be delivered via a standard design-bid-build (DBB) method. The Project may be built under the Government of BC's recently introduced Community Benefits Agreement (CBA), and thus this estimate includes the potential costs and budget for the applicable agreement framework and operating costs.

CHARTER follows estimating procedures of the civil construction industry to better align the construction budget with the anticipated tender bids. CHARTER developed the construction costs by considering labour, materials, subcontractors, equipment operating expenses, local market trends, and productivity using bid development methods and resources consistent to the civil and transportation sectors in British Columbia. The estimate is based on the Project scope as defined by the design drawings, project schedules, quantities, and other project documents provided to CHARTER prior to the development of this report.

Given the scope, assumptions and exclusions noted herein, CHARTER's overall project cost estimate for the **GEORGE MASSEY CROSSING TRANSIT AND CYCLING IMPROVEMENTS** in as-spent dollars, including escalation, is as follows:

Overall Project Cost Estimate: $49,341,815

Includes [redacted]% Project Contingency.

The construction cost estimates were developed independently without any reliance on other project estimates. Some Owner's costs were not estimated by CHARTER, and were taken from information provided to CHARTER by the Project Team. Please note, the cost estimate includes a [redacted]% project contingency that applies to both the construction and Owner's costs. A basic overview of the Project costs can be found in ***Table A*** below.

- A project overview can be found in ***Section 3***.
- An explanation on CHARTER's costing methodology can be found in ***Section 4.***

- A breakdown of the Owner's cost estimates with assumptions can be found in ***Section 5.***
- A breakdown of the construction cost estimates with assumptions can be found in ***Sections 6.***

In addition to assumptions noted elsewhere in this report, the following need to be considered together with this estimate:

- **Schedule** – Schedule dates and assumptions as per the provided schedule. See ***Section 3.1, Table B.***
- **Procurement** – The Projects are delivered DBB approaches.
- **Competing Projects** – The cost impact of competing projects is outside of the scope of this construction cost estimate and should be considered further when finalizing the overall Project Contingency.
- **Bidder Motivation** – It is assumed there will be a suitable number of qualified and motivated bidders responding to the bid requests. Motivation will stem from confidence in the procurement process and the project delivery agency.
- **Escalation** – Escalation continues as it has over the past five to ten years.
- **Tariffs** – All current tariffs known to date are included. Impacts of future tariffs is unknown and consequently, are not included.
- **Industry Conditions** – It is assumed that conditions regarding the supply of materials, including fabricated components, will be similar to those seen in the past five to ten years.
- **Contingency** – Currently the cost estimate includes a [redacted]% contingency on construction and a [redacted]% contingency on Owners costs, for a total project contingency of [redacted]%.
- **Site Office** – Site office requirements will be the responsibility of the Contractor and are carried in the construction budget.
- **Access** – Project to provide unfettered access to working easements, local roadways and right of ways when and where necessary.

GEORGE MASSEY CROSSING - PHASE 1		
Project Cost Estimate - 2021.04.07		
Project Total (Transit Improvement Projects)		
Property Acquisition	$	[redacted]
Construction (DBB)	$	
Community Benefits	$	
Engineering	$	
Project Management	$	
Construction Supervision	$	
Indigenous Engagement	$	
Environmental	$	
Project Contingency		
Owner Cost Contingency	$	
Construction Contingency	$	
Interest During Construction	$	
TOTAL PROJECT COST (As Spent)	$	**49,341,815**

*Table A – Project Cost Overview - **Escalated***

2 REFERENCES

CHARTER developed the cost estimate using all available references provided, with special consideration to the following documents:

Reference Document No.	Document Title – Bus-on-Shoulder Transit Lanes	Type
1	Highway 99 Bus-on-Shoulder Transit Lanes – 100% Detailed Design – Schedule 7 – Urban Systems "08601-0002-SCH7-99BUS-2021-01-26-draft3"	Excel Document
2	HWY99 BOS CIVIL COMBINED HALF SIZE, dated February 22, 2021	PDF Documents (136 pages)
3	HWY99 BOS ELECTRICAL COMBINED HALF SIZE, dated February 22, 2021	PDF Documents (42 pages)
4	HWY99 BOS STRUCTURAL COMBINED HALF SIZE, dated October 9, 2020	PDF Documents (2 pages)
5	PRELOAD_X-SECTIONS_L300-1961046101, dated February 11, 2021	PDF Documents (11 pages)
6	PRELOAD-PLAN-SECTIONS-1961046101, dated February 11, 2021	PDF Documents (8 pages)
7	20201030_H99_BOS_Transit_Lanes_Detailed_Design_Report_100pct-R1_FULL	PDF Document (318 pages)

Reference Document No.	Document Title – Hwy 99 & 17A Off-Ramp Widening	Type
8	George Massey Crossing Phase 1 – Bridgeport Road Bus Connection & Highway 99/17A Interchange Improvements – Schedule 7	PDF Document (2 page)
9	Highway 99 / 17A Interchange Improvements – 100% Detailed Design – Construction Drawings – McElhanney, dated February 3, 2021	PDF Document (61 pages)
10	Highway 99 / 17A Interchange Improvements & Bridgeport Road Bus Connection – 100% Detailed Design – Report – McElhanney, dated October 2, 2020	PDF Document (43 pages)

Reference Document No.	Document Title – Bridgeport Road Bus Connection	Type
11	George Massey Crossing Phase 1 – Bridgeport Road Bus Connection & Highway 99/17A Interchange Improvements – Schedule 7	PDF Document (2 page)
12	Bridgeport Road Bus Connection – 100% Detailed Design – Construction Drawings – McElhanney, dated January, 2021	PDF Document (37 pages)
13	Highway 99 / 17A Interchange Improvements & Bridgeport Road Bus Connection – 100% Detailed Design – Report – McElhanney, dated October 2, 2020	PDF Document (43 pages)

3 PROJECT OVERVIEW

The below is a general overview of the Project including anticipated key milestone dates and scope of work.

3.1 Project Schedule

Based on the Project schedules provided to CHARTER, the following dates were used to develop construction and projects costs, but by shifting the contract award date to the Q3 of 2021 as directed by the project team.

Bridgeport & HWY 99/17A Transit Improvements

Timeline	Activities
Q2 2021 (May)	Issue tenders
Q3 2021 (August)	Award contracts
Q3 (September)	Construction Start
Q1 2022 (March)	Construction Complete

HWY 99 BOS Transit Lane

Timeline	Activities
Q2 2021 (May)	Issue tenders
Q3 2021 (August)	Award contracts
Q4 2021 – Q4 2022	Construction

Table B – GMCP1 Anticipated Project Schedule

In Particular, the construction duration for the Bridgeport project is expected to last approximately 7 to 8 months, including a winter 2021/2022 holiday break and winter work. The construction duration for the Highway 99 off-ramp widening is expected to last approximately 6 months, including a winter 2021/2022 holiday break and winter work The construction duration for the Bus on Shoulder set of widening projects is expected to last approximately 20 months, including two winter holiday breaks and winter work over two years.

These dates formed the basis of contractor and Owner staffing costs, quality management, PMO costs, interest during construction, traffic management costs, mobilization costs and site running costs. CHARTER developed independent high-level construction schedules for each project to validate the construction durations provided, and to assist with our cash-flow modeling. Cash-flows for each project, not inclusive of interest during construction, were generated by CHARTER and have been provided separately. The contractor may choose to install the preload and delay construction by 3 months to avoid a gap between the non-preloaded and preloaded areas of the Bus on Shoulder projects.

It should be noted that the assumptions to create the construction schedules assumed a 50 hour 5-day work week.

3.2 Scope of Work

George Massey Crossing Phase 1 Transit Improvement Projects is currently divided into two standalone projects. The general scope of work for each of these projects as defined in the provided documents, Schedule 7s, and detailed design drawings are summarized below.

BUS-ON-SHOULDER TRANSIT LANES ON HIGHWAY NO. 99:

The Bus-On-Shoulder Transit Lanes Project generally consists of the widening of Highway No. 99 South of the George Massey Tunnel to allow for Transit/Bus bypass lanes in three locations. The construction scope is that of a typical highway widening project, including:

- Granular pre-loading of some widened areas;
- Construction of new full-depth road structure of the widened areas (granular subbase, granular base, asphalt paving);
- Drainage improvements in required areas;
- Pedestrian underpass structural protections;
- Replacement of concrete barriers;
- Electrical upgrades for the Project alignment; and,
- Signage upgrades, including advance warning flashers and street lighting.

- Preloading (NB STA 300+191 - STA 300+434 - STA 301+427, STA 301+445 - STA 301+507, STA 301+445 - STA 302+359) for a period of 8 – 12 months per Thurber geotechnical memo within the report "20201030_H99_BOS_Transit_Lanes_Detailed_Design_Report_100pct-R1_FULL". 12 months chosen for costing and scheduling purposes.

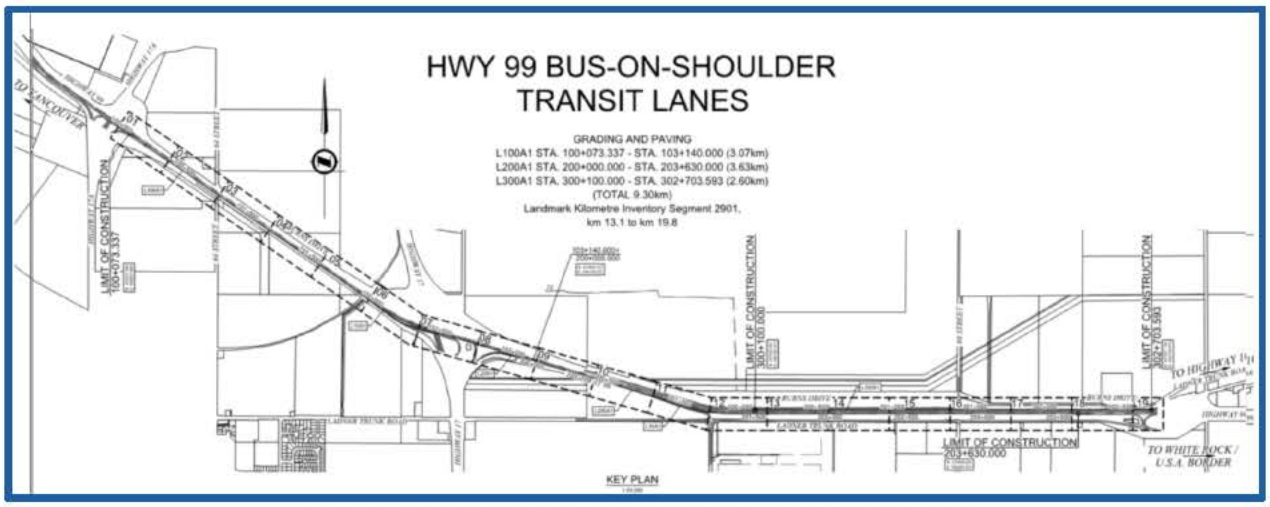

Figure 1.3 – Bus-on-Shoulder segment locations from Urban Systems Report

HIGHWAY NO. 99 & NO. 17A OFF-RAMP WIDENING:

- Widening of Highway 99 northbound off-ramp to add a right-turn to allow for bus priority;
- Widening of Highway 99 northbound on-ramp to add a second lane for bus/HOV priority;
- Widening of Highway 17A to support reconfiguration of the eastbound lanes for bus/HOV priority;
- Upgrades and modifications to the traffic signals at the Highway 99 off-ramps;
- Upgrades to drainage;
- Improvements to the Bicycle Shuttle pull-out on Highway 17A; and,
- Improvements to the cycling facilities along Highway 17A.

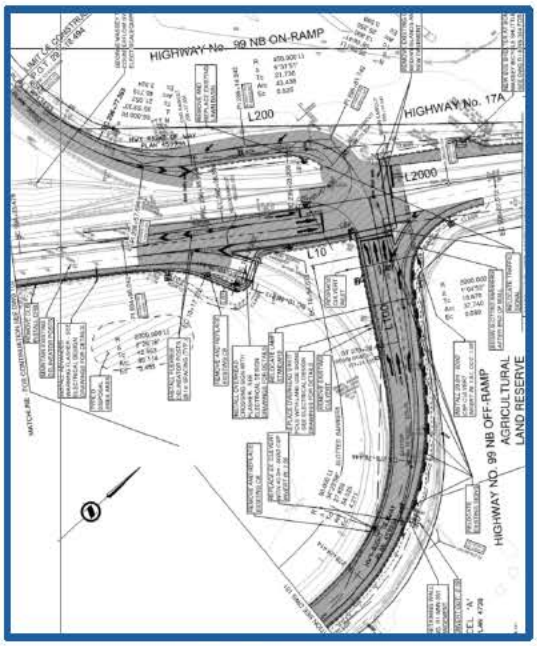

Figure 1.4 – Highway 99 & 17A Off-Ramp Widening Project Overview

BRIDGEPORT ROAD BUS CONNECTION AT HIGHWAY NO. 99:

- Construction of a new dedicated bus lane connection from Bridgeport Road to the Highway 99 southbound on-ramp, including a new transit activated signal at Sea Island Way;
- Widening of the Highway 99 southbound on-ramp to accommodate bus lane merge;
- Construction of a new multi-use path (MUP) connecting Patterson Road to Highway 99 northbound;
- Construction of a new interlocking concrete block retaining wall;
- Electrical and signal upgrades at Sea Island Way intersection; and,
- Addressing invasive species.

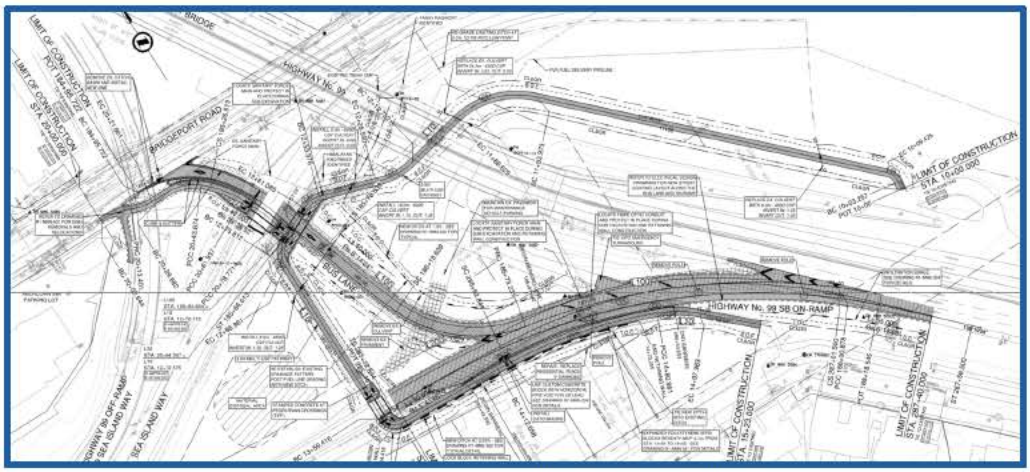

Figure 1.5 – Bridgeport Road Bus Connection Key Plan

3.3 Constructability and Staging

CHARTER has based constructability of these projects off of the suggested staging in the provided reports and drawings, specifically:

BUS-ON-SHOULDER:

Due to preloading certain segments of the bus-on-shoulder alignment, preload should be deposited with construction starting on other areas as soon as possible. Based on the provided 100% design report "20201030_H99_BOS_Transit_Lanes_Detailed_Design_Report_100pct-R1_FULL" and Thurber memo on geotechnicals and preloading, the preload is expected to require 8 to 12 months to achieve desired consolidation, and CHARTER assumed 12 months for the schedule. With this in mind, there is an expected delay in construction of 3 months between the completion of the non-preloaded construction areas, and the start of construction of the preloaded areas, leading to a 20 month construction period.

HIGHWAY 99/17A OFF-RAMP WIDENING:

CHARTER costed and scheduled the construction based on the suggested staging in the 100% design drawing package, drawings R1-984-1101 to R1-984-1103.

BRIDGEPORT ROAD BUS CONNECTION:

CHARTER costed and schedule the construction based on the suggested staging in the 100% design drawings package, drawings R1-983-1101 to R1-983-1103.

4 COSTING METHODOLOGY

CHARTER uses a cost-based approach or "bottom-up" method of estimating to determine the overall construction costs specific to the Project. This method of estimating is based on determining the Contractor's cost for labour, equipment, materials, and any specialty subcontractor effort for each item needed to complete the work. In order to accomplish this, CHARTER divided the estimate into direct, indirect and markup components.

For construction, the direct, indirect, and markup costs were assessed separately as discussed below. The indirect and markup costs were then evenly distributed into the direct costs to arrive at the final unit rates, which make up the section totals reported on the construction cost breakdown in ***Section 6***. The rates have not been redistributed to create a 'front end loaded bid' as is often the approach used by contractors to achieve a positive cash flow earlier in the Project. As a result, a rate for rate comparison with the Project Team's unit rates may require interpretation to get a meaningful result.

Once the construction cost and overall project schedule has been determined, CHARTER assesses the Owner's costs over and above the cost of construction to establish an overall project budget. To determine the Owner's costs, CHARTER uses a 'Level of Effort' assessment for each work discipline together with our internal knowledge and past experience on comparable projects to arrive at the budget proposed.

4.1 Direct Costs

Direct costs are those associated with directly producing the permanent construction works included within each specific bid item.

These costs were determined by conducting a detailed assessment of all labour, equipment, materials, and specialty subcontractors required for each specific bid item and their associated costs. Once each bid item was broken down into these cost elements, base unit rates for the specific labour, equipment, materials, and subcontractors required

were used to develop the overall unit rate for the bid item. This method ensures the specific intricacies of each task are fully explored and encapsulated including productivity and temporary work requirements.

The labour, equipment, materials, and productivity rates used to develop the overall unit rates are based on the CBA Lower Mainland Labour Rates, feedback received from our recent involvement in similar projects, past contracting experience, and market sounding with local material suppliers and subcontractors.

4.2 Indirect Costs

Indirect costs are those that are required to facilitate the works at a project-level as opposed to a specific bid item level. These costs are comprised of items including project staff, management oversight, support staff, site office provisions, support equipment, and other project-wide contractor expenses.

4.3 Markup Costs

Like indirect costs, markup costs were estimated separately and distributed proportionally throughout the bid items. Markup costs include profit, overhead, bonding, insurance, and escalation.

4.4 Owner's Costs

Owner's costs are the costs incurred by the Owner to deliver the Project such as land acquisition, stakeholder consultation & engagement, environmental certification, capacity funding, and project supervision & administration on the Owner's side during construction. These costs are not the responsibility of the Contractor and are therefore over and above the construction cost.

5 OWNER'S COSTS AND PROJECT BUDGET

The major assumptions used by CHARTER to determine costs beyond construction on the Owner's side and an appropriate overall budget for the GMC Phase 1 Project are outlined below.

The following two tables summarize the cost of the GMC Transit and Cycling Improvement projects, with the total for each row displayed in the far-right column. The first table shows the costs with escalation broken out, while the second table shows the costs with escalation spread into the appropriate cost categories.

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GMCP1 TRANSIT IMPROVEMENT PROJECT COSTS - ESCALATED
RICHMOND/DELTA, BC
Project Cost Assessment

GMC Phase 1	CHARTER 2021-04-12 Hwy 17A & Bridgeport	CHARTER 2021-04-12 Bus-on-Shoulder	CHARTER 2021-04-12 Total ($)
Property Acquisition (by MoTI)	[redacted]		
Construction (DBB)			
Community Benefits			
Engineering			
Project Management			
Construction Supervision			
Indigenous Engagement (by MoTI)			
Environmental (by MoTI)			
Project Contingency			
Owner Cost Contingency			
Construction Contingency			
Interest During Construction (by MoTI)			
Total Project Cost (As Spent $)	$ 11,168,856	$ 38,172,959	$ 49,341,815

5.1 Owner's Costs - Escalated

Construction (DBB) – $[redacted] – This is an independent cost estimate of all project construction costs, which also includes contractor's mobilization, quality management, supervision, traffic management, office overheads, bonding, insurance and profit for all projects. This cost is shown in As Spent dollars. See ***Section 6*** below for a more detailed breakdown of the Project construction costs.

Community Benefits – $[redacted] – This represents the framework costs payable by the Owner to cover the operating costs of a community benefits agreement associated with administering these projects.

Engineering – $[redacted] – This represents the total reasonable engineering costs to support the Owner, for internal staffing and external consultants during construction. It is assumed that all costs to bring the designs to 100% detailed design are past costs, and are not a part of these project costs, and are therefore not included in the budget. Cost includes redlining drawings and generating record drawings.

Project Management – $[redacted] - The reasonable cost for project oversight and management for the duration of the Project, from procurement to completion. This project does not carry costs for a site office, and the team will utilize the Highway 91/17 project office.

Construction Supervision – $[redacted] - The reasonable cost for construction supervision and inspections on the Owner's side for the duration of construction. On DBB projects the Owner needs to ensure construction meets the Owner's provided designs. Construction supervision costs on a DBB contract are higher than those of a DB contract since the design is the responsibility of the Owner, and ensuring the project is built to the Owners design is a cost that is born by the Owner.

Indigenous Engagement, Capacity Funding & Accommodation – $[redacted] – The cost for First Nations Accommodation was provided to the CHARTER team by the Project Team, per the "P1 Cashflow Nov 6 (DC)" document, and includes the cost of Indigenous relations project team resources.

Environmental – $[redacted] – The cost for environmental was provided to the CHARTER team by the Project Team per the "P1 Cashflow Nov 6 (DC)" document, however CHARTER conducted our own independent estimate of environmental costs which approximated the costs carried by the Project Team. The environmental costs on these projects and associated budget is higher than is typical for a project of this size due to the higher environmental standards these projects are being held to as part of the George Massey Crossing EAC Permit.

Owner Contingencies – $[redacted] – The project (Owners) contingency represents a [redacted]% contingency on all soft costs, with the exception of IDC. This cost estimate is based on 100% design drawings, which have seen increased costs over the previous cost estimate and report.

Construction Contingency - $[redacted] – The construction contingency represents changes in scope, quantities, and contractor claims that may arise during construction, and is [redacted]% of the construction cost.

Interest During Construction (By MoTI) – $[redacted] – IDC has been provided by MoTI.

6 CONSTRUCTION COSTS

A breakdown of the construction costs for each of the two individual projects can be found in the tables below, including separated cost breakdown in MOTI Schedule 7 Section format for each the applicable projects. Please note the construction costs below are in as-spent dollars, including Contractor's Escalation.

BUS-ON-SHOULDER TRANSIT LANES Construction Cost Estimate		
SECTION		COST
Section 1 - General	$	[redacted]
Section 2 - Grading	$	
Section 3 - Drainage	$	
Section 4 - Utilities	$	
Section 5 - Structures	$	
Section 6 - Paving	$	
Section 7 - Electrical	$	
Section 8 - Signing	$	
Section 9 - Fencing, Seeding & Landscaping	$	
Provisional Sum for Site Modifications	$	
Protection of the Environment	$	
CONDITIONAL ITEMS - 78th St	$	
CONSTRUCTION TOTAL	**$**	

COMBINED HWY 99 & 17A OFF-RAMP WIDENING Construction Cost Estimate		
SECTION		COST
Provisional Sum	$	[redacted]
Section 1 - General	$	
Section 2 - Site Preparation	$	
Section 3 - Grading	$	
Section 4 - Drainage	$	
Section 5 - Utilities	$	
Section 6 - Structures	$	
Section 7 - Paving	$	
Section 8 - Concrete Works	$	
Section 9 - Electrical	$	
Section 10 - Signing & Pavement Markings	$	
Section 11 - Fencing, Seeding & Landscaping	$	
CONSTRUCTION TOTAL	**$**	

*Table D – Construction Cost Breakdown per Project – **Escalated***

6.1 Markup Costs

Based on our CHARTER's knowledge from previous project experience and from observations of recent market trends, we applied the below markups to the direct and indirect construction costs determined in the estimate:

Profit – [redacted]**%** - The percentage adopted reflects an observed trend toward a somewhat competitive and hungry civil construction market. Specifically, [redacted]% profit has been applied to the Bus-on-Shoulder projects, and [redacted]% profit has been applied to the Off-Ramp Widening and Bridgeport Road projects.

Overhead – [redacted]**%** - The percentage adopted reflects the expected office overhead costs associated with the type of contractor expected to bid on a project of this size.

Bonding – [redacted]**%** - This percentage refers to the cost for contractor to acquire a 50% Labour & Material Bond, and 50% Performance Bond generally required for a project of this scope and size.

Insurance – [redacted]**%** - This percentage refers to the cost of the contractor to acquire a All Risk Insurance generally obtained for a project of this scope and size.

Escalation – Escalation was calculated based on CHARTER's anticipated cash flow for the Projects using the 2020 Historical Cost Index. [redacted]**%** for year 1, [redacted]**%** for year 2, and [redacted]**%** for year 3.

6.2 Indirect Costs

The indirect costs for MOTI Projects are typically allocated in the General section of the Schedule 7. These indirect costs are those that are required to facilitate the works at a project-level as opposed to a specific bid item level. These costs are comprised of items including project staff, management oversight, support staff, site office provisions, support equipment, protection of the environment, and other project-wide contractor expenses.

Unlike other cost consultants, CHARTER does not simply apply an expected percentage of construction costs to guesstimate the indirect costs. Each indirect items' cost is individually calculated based on all expenses required for completion of construction that are not directly attributable to one particular pay item but included in the applicable indirect item. A basis for CHARTER's estimate for indirect items for each segment of the Project are outlined below.

Mobilization – This item comprises typical costs incurred by the contractor to manage the works including laydown, storage and staging areas, and general operations for the anticipated schedule. The costs for delivery and demobilization of construction equipment is within this item. Mobilization also includes telecommunication services, temporary site utilities, computer equipment, surveying equipment, hoarding, crew transportation, site safety,

consumable supplies, nonproduction labour, plant equipment, security personnel, permitting, and temporary construction fencing.

Traffic Management – This item comprises costs for all associated work required to develop and implement an approved Traffic Management Plan for the Project sites. Maintaining constant traffic through the Project work zones with minimal disruption will be challenging for the contractor, in particular on Highway No. 99. The cost for Traffic Management includes dynamic messaging boards, construction signage, flagging labour and equipment, temporary line painting services, and construction roadside barrier placement and relocations.

Quality Management – This item includes costs incurred by the Contractor for nonproduction staff and quality control for the duration of the Project schedules. This includes full-time and part-time staff to cover construction management, construction supervision, administration, survey, quality management, and communication liaisons for the duration of the Project. Note that CHARTER has observed a recent upward trend in Quality Management costs in the construction industry due to higher wages and increased demand for skilled individuals in the BC market.

Protection of the Environment / Environmental Management – This item consists of costs incurred by the contractor for environmental mitigation efforts that are not directly associated to any one particular pay item. This includes all associated costs of developing, implementing, and maintaining a Construction Environmental Management Plan for the duration of construction. This consists of overall project erosion & sediment control, water detention & treatment, waste management, environmental restorations, ancillary protective measures for environmentally sensitive areas, and protection of archaeological resources. It also includes allowances for bird surveys and invasive plant management.

6.3 Direct Costs

Direct costs are those associated with directly producing the permanent construction works included within each specific bid item.

These costs were determined by conducting a detailed assessment of all labour, equipment, materials, and specialty subcontractors required for each specific bid item and their associated costs. Once each bid item was broken down into these cost elements, base unit rates for the specific labor, equipment, materials, and subcontractors required were used to develop the overall unit rate for the bid item. This method ensures the specific intricacies of each task are fully explored and encapsulated including productivity and temporary work requirements.

The labour, equipment, materials, and productivity rates used to develop the overall unit rates are based on feedback received from our recent involvement in similar projects, past contracting experience, and market sounding with local material suppliers and subcontractors.

6.4 CBA Labour Rates

For the construction cost estimate, CHARTER has applied the Labour Rates from the CBA (including erratum #1-3) for work in the Lower Mainland. Greater Vancouver has a large working-class population skilled in civil construction and thus it is assumed that the entire workforce can be supplied from residents within the region.

As Room and Board, Living Out Allowance, and Camp Establishment are not applicable to CBA projects within the Lower Mainland and Fraser Valley, no associated costs for these articles have been included in the estimate. It is assumed BCIB will have the capacity to supply the workforce required to complete the **Transit and Cycling Improvements**.

7 RISKS & CONSTRAINTS

Risk registers for the two projects were provided to CHARTER by the Project Teams. Key risks identified in the registers include:

[redacted]

8 ASSUMPTIONS & EXCLUSIONS

The major assumptions and exclusions to CHARTER's cost estimate are outlined below:

Un-Costed Items and Allowances:
CHARTER had insufficient information to provide construction cost estimates for the following activities:

- Check Dam (Site 1)
- Removal of Existing Underground Equipment (Site 2)

CHARTER used allowances for the cost estimate activities below:

- Remove and Dispose Existing Sign Bridge @ Hwy 17A (Site 2)
- Settlement Gauges and Hubs (BoS)
- Impervious Clay Blanket (BoS)
- Piezo Sensors (BoS)

The CHARTER estimate is based on the following assumptions:

- Project schedules are as noted above, on a 50-hour 5-day work week.
- A suitable number of qualified bidders are available to respond to tenders for the two projects;
- The quantities used for the estimate were provided by the Project Teams and reflect the 100% detailed design for the Bus-on-Shoulder, Highway 17A off-ramp widening, and the Bridgeport Bus Jumper projects;
- The cost impact of competing projects is outside of the scope of this construction cost estimate, however, considerations made in this regard are provided in ***Section 9***.

- Escalation will continue as it has over the past five to ten years;
- All current tariffs known to date are included. Impacts of future tariffs is unknown and consequently, are not included;
- Industry conditions with regard to the supply of materials, including fabricated components, will be similar to those seen in the past five to ten years; and,
- Allowance for scope creep and/or adjustments to quantities.

The major exclusions to CHARTER's cost estimate are outlined below:

- Cost considerations due to third-party agreements;
- Property acquisition costs (permanent and/or temporary) beyond the budget value listed above;
- Construction delays or liquidated damages; and,
- Allowance for scope creep and/or adjustments to quantities.

9 MARKET TRENDS

Prior to the COVID-19 situation CHARTER noted that the trend in market conditions was showing an overall increase in contractor bids by approximately [redacted]%. This was generally reflected in an increase to the profit margins contractors believed they could successfully tender, as well as an overall increase in construction costs in the local market. However, considering the current health situation CHARTER believes that the market may correct this increase and the Project could experience some quiet aggressive pricing. Consequently, CHARTER has not considered this potential price fluctuation to the overall markup (bonding, insurance, administrative overhead, and profit) for the Project; however, due to recent tender feedback we have flagged this trend to be considered by the Project Team. This market condition is above and beyond the escalation assumption noted in ***Section 6.1*** of this report. CHARTER has also noted that recent 2021 bid tenders and feedback from suppliers indicate **significant** increases in material costs ranging from structural steel to PVC which should be monitored and tracked as a project risk outside of expected inflation.

The projects will be of interest to small to medium sized local contractors. Some of these have business models that may be incompatible with the requirements of the CBA/BCIB. This could limit the number of bidders.

10 CLOSURE

We trust this work meets your expectations, however, should you have any questions or require further clarifications, please contact the undersigned and we will be happy to discuss further.

Yours truly,

Devin Jones, P.Eng.
Estimator
CHARTER Project Delivery Inc.