

January 31, 2023

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Re: **Staging Assessment Memo**

1.0 INTRODUCTION

McIntosh Perry Consulting Engineers Ltd. (MP) was retained by the City of Brantford to complete the preliminary and detailed design for the replacement of the Ava Road Bridge. The purpose of this Staging Assessment Memo is to provide recommendations for the preferred construction staging approach.

2.0 STAGING ASSESSMENT

MP proposed two staged construction for the replacement of the superstructure anticipating two years of construction. However, the proposed two year construction is not desirable to the City and MP was requested to review a full closure that can be completed in one construction season. A detailed assessment of the two alternatives is provided below.

2.1 Alternative 1: Replacement in Two Stages

Replacement under two stages of construction would be comprised of completing removals, repairs, and new construction of each half of the structure independently. The intent of this approach was to maintain traffic during the construction, particularly for pedestrian traffic as the bridge provide a keyaccess from the northside of the CN track to the community centre and the school at the south.

2.2 Alternative 2: Replacement during Full Closure

Replacement under a full closure would allow all removal, and reconstruction work to be completed in one mobilization for each element consecutively, or simultaneously where practical. Construction joints between the east and west half of the structure would be removed providing improved durability of the superstructure and substructure elements. Duration of construction will be significantly reduced, temporary crane platform on the approaches or underneath of the structure would not be required. The construction could be expedited and to be completed in one construction season. However, fabrication and delivery of the girders and precast deck will be in the very critical path and has a potential construction delay risk.

2.3 Construction cost

The combined estimated construction cost of the proposed bridge replacement is \$8.6 M under two stages of construction.

This total cost would be reduced by approximately \$1.5 M due to the reduced labour and simplified construction when completed under a full closure, bringing the total to an estimated \$7.1 M.

A 15% contingency was applied to the overall cost to account for additional works that could arise during the construction. A detailed construction cost breakdown for work under staged construction is included in **Appendix C**.

2.4 Construction duration

The duration of construction is anticipated to be approximately 202 working days for two-staged construction (without winter shutdown), and 134 working days under a full closure.

The preliminary construction working days estimates are included in **Appendix D**.

2.5 Traffic Management

Analysis indicates that the full closure option is a viable solution from a traffic perspective, as volumes can be adequately accommodated by the adjacent road network with minor optimizations. A full closure would allow for several benefits during construction by allowing the contractor unmitigated access to the work zone resulting in opportunities for reduced construction duration and cost savings. However, full closure would prohibit pedestrians from crossing the bridge and construction area. The out of way travel for pedestrians would result in approximately 1.4 km detour to foot traffic and require additional consideration should the full closure option be pursued.

2.6 Evaluation of Alternatives

Both alternatives are evaluated with a weighted decision Matrix. A summary of the criteria description and weighting are provided in Table 1 below. A summary of the advantages and disadvantages of each alternative, including score and weighted total, has been provided in **Table 1**.

Table 1: Evaluation Criteria and Weighting

Criteria	Description	Weighting
Constructability	Lower with more risks such as CN flagging required, additional crane platform built outside of the roadway, higher score for avoiding winter construction and multiple mobilizations	15
Durability	Providing longevity of the structure is preferred including no construction joints and avoiding winter construction (potential low concrete quality)	15
Working Days	Shorter duration is preferred	15
Traffic Management	Fewer traffic impacts	15
Pedestrian Access	Available pedestrian access is preferred. This is weighted higher than other categories as it will require approximate 1.4 km detour for pedestrians	20

Criteria	Description	Weighting
Cost	Lower construction cost is preferred	20

Following the selection of the evaluation criteria above, scores for alternatives are assigned based on the favourability of the alternative between 0 and 1. A rating of 0 is deemed not acceptable, with 1 most preferred. The score then multiplied with the weighting to measure of favourability of the alternative with a total maximum of 100 points.

Table 1: Comparison of Alignment Alternatives

Criteria	Alternative 1	Rating	Alternative 2	Rating
	Two Stage Construction		Full Closure	
Constructability	<ul style="list-style-type: none"> Roadway protection system required Greater complexity Longer duration flagging by CN Temporary crane platform required outside of approach road platform Winter construction slow construction 	0.3	<ul style="list-style-type: none"> No roadway protection system need Single mobilization Shorter duration flagging by CN No additional crane platform outside of existing roadway platform 	1.0
Durability	<ul style="list-style-type: none"> Construction joints at piers, ballast walls, and deck Winter construction 	0.6	<ul style="list-style-type: none"> No construction joints Completed before winter conditions 	1.0
Working Days	<ul style="list-style-type: none"> 202 Working days 	0.2	<ul style="list-style-type: none"> 134 Working days 	1.0
Traffic Management	<ul style="list-style-type: none"> Both directions of traffic maintained in stage 1 and southbound traffic only open in stage 2 	0.8	<ul style="list-style-type: none"> Traffic fully detoured. Traffic detour is manageable 	0.8
Pedestrian Access	<ul style="list-style-type: none"> Maintains pedestrian access 	1.0	<ul style="list-style-type: none"> No pedestrian access 	0.2
Cost	<ul style="list-style-type: none"> Greater cost (\$7.19 M) 	0.8	<ul style="list-style-type: none"> Lower cost (\$6.79 M) 	1.0
Total Score		64.5	Technically Preferred	81.0

The results are in favor of a full closure construction. Based on the traffic analysis, the traffic at the adjacent intersections are manageable. However, it should be noted that the pedestrians particularly the commuters to

W.Ross Macdonald School and Alternative Education Resources located at the south of the structure would have to detour approximately 1.4 km and 15 minutes.

As per McIntosh Perry's letter to the City on April 26, 2022, public notification is required as part of the Schedule A+ Municipal Class Environmental Assessment process. MP has prepared a "Notice of Public Contact" for the City's review and comment. MP recommends that the notice be posted on the City's website, as well as circulated to affected property owners, governing agencies stakeholders and Indigenous Communities. However, based on previous discussions with City, it is our understanding that the City would like to host a in-person Public Information Centre (drop-in format) to notify the public and stakeholders (i.e., emergency services, etc.) of the project, as well as advise them of the potential closure of the structure during construction and detour route to be implemented. If the City would like to proceed with the Public Information Centre (PIC), the above noted Notice will need to be updated to include PIC details and we recommend scheduling well in advance of Tendering of this assignment.

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APPENDIX A

CONSTRUCTION COST ESTIMATE

PART 1- AVA ROAD BRIDGE REHABILITATION & IMPROVEMENTS TO ADJACENT INTERSECTIONS

STAGED CONSTRUCTION

General

Spec. No.	Description	Estimated Quantity	Unit of Measure	Unit Price	Extended Price
SP1	Site Mobilization and Demobilization Including Field Office(s)	LS	1.0	\$ 180,000.0	\$ 180,000
SP2	Pre-Construction Photos and Videos	LS	1.0	\$ 8,000.00	\$ 8,000
SP7	Permits, Flagging and Coordination with Canadian National Railway (CNR)	LS	1.0	\$ 90,000	\$ 90,000
SP3	Utility Locates (Provisional)	Each	8.0	\$ 4,500	\$ 36,000
SP29	Environmental Protection	LS	1.0	\$ 50,000.00	\$ 50,000

Subtotal \$ 364,000

Structural

Spec. No.	Description	Estimated Quantity	Unit of Measure	Unit Price	Extended Price
OPSS.MUNI 919, SP5	Access to Work Area, Work Platform and Scaffolding	LS	1.0	\$ 140,000	\$ 140,000
OPSS.MUNI 539, SP6	Track Protection System	LS	1.0	\$ 60,000	\$ 60,000
OPSS.MUNI 539, SP8	Roadway Protection System	LS	1.0	\$ 30,000	\$ 30,000
OPSS.MUNI 902	Earth Excavation for Structure	m ³	490	\$ 150	\$ 73,500
OPSS.MUNI 902	Granular A (Structure)	t	420	\$ 45	\$ 18,900
OPSS.MUNI 902	Granular B Type III (Structure)	t	832	\$ 45	\$ 37,440
OPSS.MUNI 405, SP9	Pipe Subdrains	m	150	\$ 65	\$ 9,750
OPSS.MUNI 510, SP10	Removal of Bridge Superstructure	LS/m ³	100%	\$ 500,000	\$ 500,000
OPSS.MUNI 913	Embedded Work in Structure	m	148	\$ 90	\$ 13,320
OPSS.MUNI 928, SP11	Concrete Removal - Full Depth	m ³	74	\$ 1,800	\$ 133,200
OPSS.MUNI 928, SP12	Concrete Partial Depth Removal - Type C	m ³	12.5	\$ 12,000	\$ 150,000
OPSS.MUNI 930, SP13	Concrete Patches - Form and Pump	m ³	2.1	\$ 15,000	\$ 31,500
OPSS.MUNI 906, SP14	Fabrication of Structural Steel	LS/t	122.5	\$ 5,663	\$ 693,677
OPSS.MUNI 906, SP14	Delivery of Structural Steel	LS/t	122.5	\$ 292	\$ 35,790
OPSS.MUNI 906, SP14	Erection of Structural Steel	LS/t	122.5	\$ 2,600	\$ 318,500

OPSS.MUNI 911, SP15	Coating of Structural Steel	LS/m ²	546.0	\$ 80	\$ 43,680
OPSS.MUNI 914, SP16	Bridge Deck Waterproofing	m ²	1381	\$ 68	\$ 93,908
OPSS.MUNI 904, SP17	Concrete in Deck	LS/m3	214.2	\$ 2,200	\$ 471,240
OPSS.MUNI 904, SP18	Concrete in Substructure	m ³	100	\$ 2,800	\$ 280,000
OPSS.MUNI 904, SP19	Concrete in Sidewalk	m ²	32.5	\$ 700	\$ 22,750
OPSS.MUNI 904, SP20	Concrete in Parapet Wall	m ³	35.5	\$ 2,500	\$ 88,750
OPSS.MUNI 904, SP21	Concrete in Approach Slabs	m ³	119	\$ 1,080	\$ 128,520
OPSS.MUNI 904, SP22	Dowels into Concrete - 15M	Each	1940	\$ 65	\$ 126,100
OPSS.MUNI 905, SP 23	Reinforcing Steel Bar	LS/t	41.7	\$ 4,500	\$ 187,650
OPSS.MUNI 905, SP23	Stainless Steel Reinforcing Bar	LS/t	6.9	\$ 16,500	\$ 113,850
OPSS.MUNI 905, SP24	Mechanical Connectors	Each	373	\$ 75	\$ 27,975
OPSS.MUNI 950, SP25	Glass Fibre Reinforced Polymer (GFRP) Reinforcing Bar	LS/t	1.87	\$ 25,000	\$ 46,750
SP26	CFRP Wrapping System	m ²	327.00	\$ 1,200	\$ 392,400
OPSS.MUNI 920	Deck Joint Assemblies, Installation	LS/m	71.70	\$ 3,600	\$ 258,120
OPSS.MUNI 908	Barrier and Parapet Wall Railing	m	153.70	\$ 350	\$ 53,795
OPSS.MUNI 922, SP27	Bearings	LS	100%	\$ 45,000	\$ 45,000
OPSS.MUNI 928	Abrasive Blast Cleaning of Reinforcing Steel	m ²	76	\$ 250	\$ 19,000
OPSS.MUNI 909, SP28	Fabrication of Precast Concrete Bridge Elements	LS	1.0	\$ 341,100	\$ 341,100
OPSS.MUNI 909, SP28	Delivery of Precast Concrete Bridge Elements	LS	1.0	\$ 15,400	\$ 15,400
OPSS.MUNI 909, SP28	Installation of Precast Concrete Bridge Elements	LS	1.0	\$ 164,700	\$ 164,700

Subtotal \$ 5,166,265

Removals

Spec. No.	Description	Estimated Quantity	Unit of Measure	Unit Price	Extended Price
206, 510	Earth Excavation (Grading)	m3	830	\$ 40.00	\$ 33,200
510	Asphalt Removal - Full Depth	m2	4700	\$ 5.00	\$ 23,500
510	Asphalt Removal - Partial Depth (40mm)	m2	90	\$ 65.00	\$ 5,850
510	Removal of concrete curb and gutter	m	580	\$ 30.00	\$ 17,400
510	Saw Cutting of Asphalt	m	370	\$ 15.00	\$ 5,550
510	Removal of Catchbasin (Any Size)	EA	3	\$ 1,000.00	\$ 3,000
510	Removal of Steel Beam Guide Rail	m	326	\$ 35.00	\$ 11,410
510	Removal of concrete sidewalk	m2	352	\$ 50.00	\$ 17,600
Subtotal					\$ 117,510

Drainage

Spec. No.	Description	Estimated Quantity	Unit of Measure	Unit Price	Extended Price
410	250 mm dia. PVC Catchbasin Lead - Class SDR 35	m	6	\$ 350.00	\$ 2,100
402, 407	600mm X 600mm Catchbasin per OPSD 705.010	EA	3	\$ 5,000.00	\$ 15,000
408	Adjust or Rebuild Catch Basins, any size	EA	2	\$ 1,200.00	\$ 2,400
405	150mm Perforated Pipe Subdrain	m	151	\$ 30.00	\$ 4,530
Subtotal					\$ 24,030

Watermain

Spec. No.	Description	Estimated Quantity	Unit of Measure	Unit Price	Extended Price
441, SP30	150 mm Watermain, PVC, CL 150, DR-18 including all appurtenances	m	229	\$ 800.00	\$ 183,100
441, 442, 493, 401, 314, 491, 501	Insulation, 50mm Thick	m2	11	\$ 100.00	\$ 1,100
441, 442, 493, 401, 314, 491, 501, SP31, SP23	Excavation and backfill for relocation, blankings and connections to existing watermains	EA	3	\$ 3,000.00	\$ 9,000
SP	Breaking into pedestrian tunnel, Incl. excavation, formwork, and unshrinkable fill	LS	1	\$ 15,000.00	\$ 15,000
510	Grout and Abandon Existing 150mm Watermain (220m)	LS	1	\$ 10,000.00	\$ 10,000
401, SP33	Unshrinkable fill for Trench Backfilling (Using 0.4 mPa Concrete)	m3	1	\$ 200.00	\$ 200
441, 442, 493, 401, 314,	150 mm Gate Valve & Valve Box	EA	1	\$ 3,000.00	\$ 3,000
Subtotal					\$ 221,400

Road

Spec. No.	Description	Estimated Quantity	Unit of Measure	Unit Price	Extended Price
310, 313	Superpave 12.5FC 2 (40mm)	t	478	\$ 325.00	\$ 155,400
310, 313	Superpave 19.0 (90mm)	t	902	\$ 300.00	\$ 270,600
310	Tack Coat	m2	9360	\$ 5.00	\$ 46,800
314, 501	Granular 'A' (Roadway)	t	1300	\$ 30.00	\$ 39,000
314, 501	Granular 'B' Type II (Roadway)	t	200	\$ 25.00	\$ 5,000
353, 904	Concrete curb and gutter as per RD-104	m	388	\$ 160.00	\$ 62,100
353, 904	Concrete barrier curb as per OPSD 600.011	m	36	\$ 140.00	\$ 5,040
351	Concrete sidewalk	m2	327	\$ 120.00	\$ 39,240
351	TWSI as per OPSD 310.039	m2	9.7	\$ 1,100.00	\$ 10,670
721	Steel Beam Guide Rail as per OPSD 912.186	m	126	\$ 180.00	\$ 22,680
721	Steel Beam Guide Rail as per OPSD 912.188	m	130	\$ 180.00	\$ 23,400
732	Steel Beam Energy Attenuator as per OPSD 922.186	EA	3	\$ 8,000.00	\$ 24,000
721	Steel Beam Structure Connection	EA	4	\$ 600.00	\$ 2,400
710	Solid White - 100 mm Wide - Pavement Markings	m	401	\$ 2.50	\$ 1,000
710	Solid Yellow - 100 mm Wide - Pavement Markings	m	323	\$ 2.50	\$ 800
710	Broken White (3-3-3) - 100mm wide - Pavement Markings	m	22	\$ 2.50	\$ 100
710	Broken White (3-6-3) - 100mm wide - Pavement Markings	m	163	\$ 2.50	\$ 400
710	Solid White - 200 mm Wide	m	80	\$ 5.00	\$ 400
710	Solid White - 600 mm Wide - Durable Pavement Markings	m	91	\$ 9.00	\$ 800
703	New Roadway Signs (any type)	EA	10	\$ 500.00	\$ 5,000
703	Removal and reinstatement of signs	EA	5	\$ 500.00	\$ 2,500

Subtotal \$ 717,330

Construction Staging

Spec. No.	Description	Estimated Quantity	Unit of Measure	Unit Price	Extended Price
706	Traffic Control Including 2 Portable Variable Message Signs (PVM	LS	1	\$ 100,000.00	\$ 100,000.00
722	Temporary Construction Fencing	m	250	\$ 300.00	\$ 75,000.00
741	Temporary Concrete Barrier	m	750	\$ 650.00	\$ 487,500.00
723	Energy Attenuator - Temporary, Narrow	EA	4	\$ 8,500.00	\$ 34,000.00
723	Energy Attenuator - Relocation, Narrow	EA	2	\$ 60.00	\$ 120.00
710	Pavement Markings, Temporary Removable	m	250	\$ 2.00	\$ 500.00
353	Temporary Curb with Bollards	m	250	\$ 75.00	\$ 18,750.00

Subtotal \$ 715,870.00

Landscaping

Spec. No.	Description	Estimated Quantity	Unit of Measure	Unit Price	Extended Price
802	Topsoil (100mm thickness)	m3	50	\$ 100.00	\$ 5,000
SP 34	Tree Supply and Plant	Each	30	\$ 400.00	\$ 12,000
804	Hydroseed	m2	500	\$ 3.00	\$ 1,500

Subtotal \$ 18,500

Electrical

Spec. No.	Description	Estimated Quantity	Unit of Measure	Unit Price	Extended Price
	Relocation of Light Standard	EA	4	\$ 30,000.00	\$ 120,000

Subtotal \$ 120,000

Total \$ 7,460,000.00

With 15% Contingency \$ 8,579,000.00

PART 1- AVA ROAD BRIDGE REHABILITATION & IMPROVEMENTS TO ADJACENT INTERSECTIONS

FULL CLOSURE

General

Spec. No.	Description	Estimated Quantity	Unit of Measure	Unit Price	Extended Price
SP1	Site Mobilization and Demobilization Including Field Office(s)	LS	1.0	\$ 135,000.0	\$ 135,000
SP2	Pre-Construction Photos and Videos	LS	1.0	\$ 8,000.00	\$ 8,000
SP7	Permits, Flagging and Coordination with Canadian National Railway (CNR)	LS	1.0	\$ 60,000	\$ 60,000
SP3	Utility Locates (Provisional)	Each	8.0	\$ 4,500	\$ 36,000
SP29	Environmental Protection	LS	1.0	\$ 40,000.00	\$ 40,000

Subtotal \$ 279,000

Structural

Spec. No.	Description	Estimated Quantity	Unit of Measure	Unit Price	Extended Price
OPSS.MUNI 919, SP5	Access to Work Area, Work Platform and Scaffolding	LS	1.0	\$ 108,000	\$ 108,000
OPSS.MUNI 539, SP6	Track Protection System	LS	1.0	\$ 60,000	\$ 60,000
OPSS.MUNI 902	Earth Excavation for Structure	m ³	490	\$ 150	\$ 73,500
OPSS.MUNI 902	Granular A (Structure)	t	420	\$ 45	\$ 18,900
OPSS.MUNI 902	Granular B Type III (Structure)	t	832	\$ 45	\$ 37,440
OPSS.MUNI 405, SP9	Pipe Subdrains	m	150	\$ 65	\$ 9,750
OPSS.MUNI 510, SP10	Removal of Bridge Superstructure	LS/m ³	100%	\$ 350,000	\$ 350,000
OPSS.MUNI 913	Embedded Work in Structure	m	148	\$ 90	\$ 13,320
OPSS.MUNI 928, SP11	Concrete Removal - Full Depth	m ³	74	\$ 1,800	\$ 133,200
OPSS.MUNI 928, SP12	Concrete Partial Depth Removal - Type C	m ³	12.5	\$ 12,000	\$ 150,000
OPSS.MUNI 930, SP13	Concrete Patches - Form and Pump	m ³	2.1	\$ 1,500	\$ 3,150
OPSS.MUNI 906, SP14	Fabrication of Structural Steel	LS/t	122.5	\$ 5,663	\$ 693,677
OPSS.MUNI 906, SP14	Delivery of Structural Steel	LS/t	122.5	\$ 292	\$ 35,790
OPSS.MUNI 906, SP14	Erection of Structural Steel	LS/t	122.5	\$ 2,094	\$ 256,540

OPSS.MUNI 911, SP15	Coating of Structural Steel	LS/m ²	546.0	\$ 80	\$ 43,680
OPSS.MUNI 914, SP16	Bridge Deck Waterproofing	m ²	1381	\$ 68	\$ 93,218
OPSS.MUNI 904, SP17	Concrete in Deck	LS/m3	214.2	\$ 2,000	\$ 428,400
OPSS.MUNI 904, SP18	Concrete in Substructure	m ³	100	\$ 2,500	\$ 250,000
OPSS.MUNI 904, SP19	Concrete in Sidewalk	m ²	32.5	\$ 700	\$ 22,750
OPSS.MUNI 904, SP20	Concrete in Parapet Wall	m ³	35.5	\$ 2,500	\$ 88,750
OPSS.MUNI 904, SP21	Concrete in Approach Slabs	m ³	119	\$ 1,080	\$ 128,520
OPSS.MUNI 904, SP22	Dowels into Concrete - 15M	Each	1940	\$ 65	\$ 126,100
OPSS.MUNI 905, SP 23	Reinforcing Steel Bar	LS/t	41.7	\$ 4,500	\$ 187,650
OPSS.MUNI 905, SP23	Stainless Steel Reinforcing Bar	LS/t	6.9	\$ 16,500	\$ 113,850
OPSS.MUNI 950, SP25	Glass Fibre Reinforced Polymer (GFRP) Reinforcing Bar	LS/t	1.87	\$ 25,000	\$ 46,750
SP26	CFRP Wrapping System	m ²	327.00	\$ 1,050	\$ 343,350
OPSS.MUNI 920	Deck Joint Assemblies, Installation	LS/m	71.70	\$ 3,240	\$ 232,308
OPSS.MUNI 908	Barrier and Parapet Wall Railing	m	153.70	\$ 350	\$ 53,795
OPSS.MUNI 922, SP27	Bearings	LS	100%	\$ 45,000	\$ 45,000
OPSS.MUNI 928	Abrasive Blast Cleaning of Reinforcing Steel	m ²	76	\$ 250	\$ 19,000
OPSS.MUNI 909, SP28	Fabrication of Precast Concrete Bridge Elements	LS	1.0	\$ 341,100	\$ 341,100
OPSS.MUNI 909, SP28	Delivery of Precast Concrete Bridge Elements	LS	1.0	\$ 15,400	\$ 15,400
OPSS.MUNI 909, SP28	Installation of Precast Concrete Bridge Elements	LS	1.0	\$ 148,230	\$ 148,230

Subtotal \$ 4,671,117

Removals

Spec. No.	Description	Estimated Quantity	Unit of Measure	Unit Price	Extended Price
206, 510	Earth Excavation (Grading)	m3	830	\$ 40.00	\$ 33,200
510	Asphalt Removal - Full Depth	m2	4700	\$ 5.00	\$ 23,500
510	Asphalt Removal - Partial Depth (40mm)	m2	90	\$ 65.00	\$ 5,850
510	Removal of concrete curb and gutter	m	580	\$ 30.00	\$ 17,400
510	Saw Cutting of Asphalt	m	370	\$ 15.00	\$ 5,550
510	Removal of Catchbasin (Any Size)	EA	3	\$ 1,000.00	\$ 3,000
510	Removal of Steel Beam Guide Rail	m	326	\$ 35.00	\$ 11,410
510	Removal of concrete sidewalk	m2	352	\$ 50.00	\$ 17,600
Subtotal					\$ 117,510

Drainage

Spec. No.	Description	Estimated Quantity	Unit of Measure	Unit Price	Extended Price
410	250 mm dia. PVC Catchbasin Lead - Class SDR 35	m	6	\$ 350.00	\$ 2,100
402, 407	600mm X 600mm Catchbasin per OPSD 705.010	EA	3	\$ 5,000.00	\$ 15,000
408	Adjust or Rebuild Catch Basins, any size	EA	2	\$ 1,200.00	\$ 2,400
405	150mm Perforated Pipe Subdrain	m	151	\$ 30.00	\$ 4,530
Subtotal					\$ 24,030

Watermain

Spec. No.	Description	Estimated Quantity	Unit of Measure	Unit Price	Extended Price
441, SP30	150 mm Watermain, PVC, CL 150, DR-18 including all appurtenances	m	229	\$ 800.00	\$ 183,100
441, 442, 493, 401, 314, 491, 501	Insulation, 50mm Thick	m2	11	\$ 100.00	\$ 1,100
441, 442, 493, 401, 314, 491, 501, SP31, SP23	Excavation and backfill for relocation, blankings and connections to existing watermains	EA	3	\$ 3,000.00	\$ 9,000
SP	Breaking into pedestrian tunnel, Incl. excavation, formwork, and unshrinkable fill	LS	1	\$ 15,000.00	\$ 15,000
510	Grout and Abandon Existing 150mm Watermain (220m)	LS	1	\$ 10,000.00	\$ 10,000
401, SP33	Unshrinkable fill for Trench Backfilling (Using 0.4 mPa Concrete)	m3	1	\$ 200.00	\$ 200
441, 442, 493, 401, 314,	150 mm Gate Valve & Valve Box	EA	1	\$ 3,000.00	\$ 3,000
Subtotal					\$ 221,400

Road

Spec. No.	Description	Estimated Quantity	Unit of Measure	Unit Price	Extended Price
310, 313	Superpave 12.5FC 2 (40mm)	t	478	\$ 325.00	\$ 155,400
310, 313	Superpave 19.0 (90mm)	t	902	\$ 300.00	\$ 270,600
310	Tack Coat	m2	9360	\$ 5.00	\$ 46,800
314, 501	Granular 'A' (Roadway)	t	1300	\$ 30.00	\$ 39,000
314, 501	Granular 'B' Type II (Roadway)	t	200	\$ 25.00	\$ 5,000
353, 904	Concrete curb and gutter as per RD-104	m	388	\$ 160.00	\$ 62,100
353, 904	Concrete barrier curb as per OPSD 600.011	m	36	\$ 140.00	\$ 5,040
351	Concrete sidewalk	m2	327	\$ 120.00	\$ 39,240
351	TWSI as per OPSD 310.039	m2	9.7	\$ 1,100.00	\$ 10,670
721	Steel Beam Guide Rail as per OPSD 912.186	m	126	\$ 180.00	\$ 22,680
721	Steel Beam Guide Rail as per OPSD 912.188	m	130	\$ 180.00	\$ 23,400
732	Steel Beam Energy Attenuator as per OPSD 922.186	EA	3	\$ 8,000.00	\$ 24,000
721	Steel Beam Structure Connection	EA	4	\$ 600.00	\$ 2,400
710	Solid White - 100 mm Wide - Pavement Markings	m	401	\$ 2.50	\$ 1,000
710	Solid Yellow - 100 mm Wide - Pavement Markings	m	323	\$ 2.50	\$ 800
710	Broken White (3-3-3) - 100mm wide - Pavement Markings	m	22	\$ 2.50	\$ 100
710	Broken White (3-6-3) - 100mm wide - Pavement Markings	m	163	\$ 2.50	\$ 400
710	Solid White - 200 mm Wide	m	80	\$ 5.00	\$ 400
710	Solid White - 600 mm Wide - Durable Pavement Markings	m	91	\$ 9.00	\$ 800
703	New Roadway Signs (any type)	EA	10	\$ 500.00	\$ 5,000
703	Removal and reinstatement of signs	EA	5	\$ 500.00	\$ 2,500

Subtotal \$ 717,330

Landscaping

Spec. No.	Description	Estimated Quantity	Unit of Measure	Unit Price	Extended Price
802	Topsoil (100mm thickness)	m3	50	\$ 100.00	\$ 5,000
SP 34	Tree Supply and Plant	Each	30	\$ 400.00	\$ 12,000
804	Hydroseed	m2	500	\$ 3.00	\$ 1,500

Subtotal \$ 18,500

Electrical

Spec. No.	Description	Estimated Quantity	Unit of Measure	Unit Price	Extended Price
	Relocation of Light Standard	EA	4	\$ 30,000.00	\$ 120,000

Subtotal \$ 120,000

Total \$ 6,170,000.00

with 15% contingency \$ 7,095,500.00

APPENDIX B

CONSTRUCTION WORKING DAY ESTIMATE

2020-066
 AVA ROAD BRIDGE
 SUPERSTRUCTURE REPLACEMENT, SUBSTRUCTURE REHAB
 Pre-Design Working Day Schedule

ID	Task Name	Duration	Start	Finish	Mar	Apr	Qtr 2, 2023	Jun	Jul	Qtr 3, 2023	Sep	Oct	Qtr 4, 2023	Dec	Jan	Qtr 1, 2024
							May			Aug		Nov		Feb		
1	MOBILIZATION (Setup Traffic Control, and Site Access)	5 days	Mon 4/3/23	Fri 4/7/23												
2	Stage 1 - Ava Road Southbound Traffic Maintained	99 days	Mon 4/10/23	Thu 8/31/23												
3	Setup TCB and Traffic Control	2 days	Mon 4/10/23	Tue 4/11/23												
4	Removal of East Portion of Superstructure (flagging required)	12 days	Wed 4/12/23	Thu 4/27/23												
5	Repair Substructure - Reconstruct Bearing Seats/New Pier Caps/Patch Repair, Construct New Ballast Walls and Top of Wingwalls (including all removals) (flagging required)	30 days	Fri 4/28/23	Tue 6/13/23												
6	Erect New Girders and Precast Deck Panels (flagging required)	12 days	Wed 6/14/23	Thu 6/29/23												
7	Construct Deck (flagging required)	15 days	Fri 6/30/23	Thu 7/20/23												
8	Construct New Approach Slab and Sleeper Slab	12 days	Fri 7/21/23	Wed 8/9/23												
9	Construct New Barrier Wall (flagging required)	14 days	Thu 8/10/23	Tue 8/29/23												
10	Waterproof and Pave	2 days	Wed 8/30/23	Thu 8/31/23												
11	Stage 2 - Ava Road Northbound Traffic Maintained	93 days	Fri 9/1/23	Wed 1/24/24												
12	Relocate TCB	5 days	Fri 9/1/23	Mon 9/11/23												
13	Removal of West Portion of Superstructure (flagging required)	12 days	Tue 9/12/23	Wed 9/27/23												
14	Reconstruct Bearing Seats and Pier Caps, Construct Ballast Wall and Top of Wingwalls (including all removals) (flagging required)	15 days	Thu 9/28/23	Mon 10/23/23												
15	Erect New Girders and Precast Deck Panels (flagging required)	12 days	Tue 10/24/23	Fri 11/10/23												
16	Construct Deck and Sidewalk (flagging required)	20 days	Mon 11/13/23	Thu 12/14/23												
17	Construct New Approach Slab and Sleeper Slab	12 days	Fri 12/15/23	Mon 1/1/24												
18	Construct New Parapet Wall (flagging required)	14 days	Tue 1/2/24	Fri 1/19/24												
19	Install New Expansion Joints	10 days	Tue 1/2/24	Mon 1/15/24												
20	Waterproof and Pave	2 days	Tue 1/16/24	Wed 1/17/24												
21	DEMOBILIZATION (Remove TCB, Traffic Control, and Site Access)	5 days	Thu 1/18/24	Wed 1/24/24												

2020-066
 AVA ROAD BRIDGE
 SUPERSTRUCTURE REPLACEMENT, SUBSTRUCTURE REHAB
 Pre-Design Working Day Schedule
 Assume Multiple Crews

ID	Task Name	Duration	Start	Finish	Apr	Qtr 2, 2023	Jun	Jul	Qtr 3, 2023	Sep	Oct	Qtr 4, 2023	Dec
						May			Aug		Nov		
1	MOBILIZATION (Setup Traffic Control, and Site Access)	5 days	Mon 5/8/23	Fri 5/12/23									
2	Setup TCB and Traffic Control	2 days	Mon 5/15/23	Tue 5/16/23									
3	Full Closure	113 days	Thu 5/18/23	Wed 11/8/23									
4	Removal of Superstructure	16 days	Thu 5/18/23	Tue 6/13/23									
5	Removal of Ballast Walls, Tops of Wingwalls and Bearing Seats, and top of Pier Caps	10 days	Wed 6/14/23	Tue 6/27/23									
6	Reconstruct Bearing Seats and Cure	9 days	Wed 6/28/23	Mon 7/10/23									
7	Reconstruct Ballast Walls and Top of Wingwalls	10 days	Tue 7/11/23	Mon 7/24/23									
8	Construct Bearing Pedestals	6 days	Tue 7/25/23	Tue 8/1/23									
9	Install Bearings	3 days	Wed 8/2/23	Fri 8/4/23									
10	Erect Steel Girders	5 days	Wed 8/9/23	Tue 8/15/23									
11	Erect Partial Depth Precast Deck Panels	5 days	Wed 8/16/23	Tue 8/22/23									
12	Construct Deck, Sleeper Slab, and Cure	25 days	Wed 8/23/23	Thu 9/28/23									
13	Construct New Sidewalk	8 days	Fri 9/29/23	Tue 10/10/23									
14	Construct New Parapet Wall	8 days	Fri 9/29/23	Tue 10/10/23									
15	Construct New Approach Slab and Parapet Wall	7 days	Fri 10/6/23	Thu 10/19/23									
16	Waterproof and Pave	2 days	Fri 10/20/23	Mon 10/23/23									
17	Install New Expansion Joints	10 days	Tue 10/24/23	Wed 11/8/23									
18	DEMOBILIZATION (Remove TCB, Traffic Control, and Site Access)	5 days	Thu 11/9/23	Wed 11/15/23									